A REVIEW

of

SELECTED SOVIET ARTICLES

on

FOOT-AND-MOUTH DISEASE

1929 - 1957

STAT

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

A REVIEW

of

SELECTED SOVIET ARTICLES

on

FOOT-AND-MOUTH DISEASE

1929 - 1957

STAT

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

1. PREFACE

In preparing this report, on the review of Soviet literature concerned with foot-and-mouth disease (FMD) or matters relating to it, the reviewer was guided by the "Suggested Scope, Coverage and Outline (appended and hereafter referred to as "Suggested Outline"). This Suggested Outline was agreed upon by the Washington Office and the reviewer and his associates after consultation in person and by correspondence. With some minor deviations this outline was followed in the report. The deviations are noted in the appropriate places.

In this presentation, especially in Subdivision 6, Discussion, the reviewer referred to the generally prevailing and accepted opinions on phases of the FMD complex, also included is information from the experiences or studies of the reviewer and others in FMD. Publication references to these are included in a number of instances. Obviously this was done to give the readers, who probably will have various degrees of acquaintance with the subject, a better understanding of the review or certain portions of the report.

Aside from the few general textbook-type articles on FMD (Skomorokhov, 1952[27]; Revo, 1956[81]; Skomorokhov, 1956[84]; and Ratner, L. S., 1956[91]) and those dealing primarily with rules, regulations and instructions involved in the control of the disease, the Soviet FMD literature studied left the reviewer with insufficient material to enable him to give the specific information called for or implied in a goodly number of items listed in the Suggested Outline.

The translations, in general appeared to be rather good. In many, certain English words were used to describe conditions for which we ordinarily use different words; for example, for infected - unsafe or adverse was used, and for non-infected - safe was used, et cetera. After these were learned, confused statements were cleared. The translation in a few instances was not clear enough for the reviewer's purpose. On the whole, very little was lost by inadequate translation.

One hundred and thirty-four publications were received. These were published between 1929 and 1957. Six between 1929 to and including 1940, and 14 from 1941 through 1951. From 1951 to and including 1957 there were 110 (81%+). The articles were numbered sequentially by the reviewer when they arrived from Washington irrespective of the publication date; these numbers are retained in the subdivision 7, "References", and it is this number which appears as a superscript in the text reference.

The articles varied in length from a single typewritten or photo printed copy (No author, 1956[82]) to 125 typewritten pages (Revo, 1956[81]). While many articles quoted authorities for statements made, only three gave detailed references. Skomorokhov (1952)[27] has 226 items in the reference table. Of these only 5 referred to publications other than Russian; 45 to articles by Skomorokhov and coworkers. L. S. Ratner (1956)[91] gives 11 references in the bibliography, 6 are foreign publications, mostly German of text or reference book variety. S. I. Ratner et al (1956)[80] have 13 references with their monograph - 5 Russian and 8 from other European countries.

The personnel in the Washington office concerned with this project were of tremendous assistance to the reviewer in the planning, working and in reporting the review. In fact, every request for advice or material help (maps, related material et cetera) received prompt attention. There were consultations in Washington, at the Plum Island Animal Disease Laboratory on Long Island, in Cleveland, and on two occasions at the University of California in Berkeley. If more assistance should have been given, it was the reviewer's fault for not asking for it. The Washington Office was deeply interested in the project and showed unlimited patience with the reviewer.

The review was made to obtain information on the prevalence, extent and impact of FMD on the Soviet economy and politics; to determine the progress in prevention, control and eradication of the disease, and the means and methods to accomplish these objectives. It was undertaken to learn and assess the trends and programs, and accomplishments in control and in research. In addition it was desired to report on facilities and the capabilities to accomplish these and to evaluate and compare the Soviet programs with those of other countries to indicate whether or not any or portions of these programs, proposed and accomplished, in research and control should be adopted or further studied in other countries.

In a general sense answers to these were obtained. It will be evident from what has been stated above and from the body of the report that the answers to many of the above would have to be that not enough information was available, or at least not published, to give the reviewer opinions. In many areas a reasonably good evaluation was obtained.

To include supplements to the various subdivisions of the report was decided after the writing of the report had already been started. It was a sort of a compromise between not giving enough and giving too much in the body of the report. It appeared highly desirable that the reader should have a further look into the original if he desired, to see the bases for statements made in the report, without having to consult the entire article which might not be available to him.

The reviewer realizes that the report needs more editing and perhaps some improvement in organization and he regrets that his planning and timing were not more carefully husbanded. To his shortcomings were added other handicaps such as lack of facilities and assistance at certain critical stages and the appearance of other barriers which were not, or could not have been anticipated. It was hoped that an opportunity would have presented itself to enable further editing and perhaps rearrangement of the final report before submitting it to Washington. Perhaps an opportunity to do this will be made available even after acceptance of the report.

SUGGESTED SCOPE, COVERAGE AND OUTLINE

1. Preface

Includes publishing notes, references to other studies, explanation of unusual features of the paper, acknowledgements of coordination and the information cut-off date. It also points out the general meaning and implications of the study and sets the stage for the reader.

2. Contents Page

Headings and subheadings that appear in the paper including the appendices are tabulated. Figure legends and titles of tables are given in separate lists that follow the table of contents.

3. Problem

To assess the status of foot and mouth disease.....through an evaluative analysis of the current problem, control measures, and research and development.

4. Conclusions

In 1-4 paragraphs, these should incisively answer or bear on the basic questions for which the study was initiated. For example, they might include:

a. An evaluative comparison of the level of development and competency of FMD research in the area of interest versus elsewhere.

b. Trends in FMD research (both basic and applied, but with emphasis on the latter), particularly as they might influence development of new or improved techniques for prevention, control or eradication of the disease.

c. Current status of developments as they may affect FMD capabilities in the future.

d. Significant research findings worthy of Western confirmation.

e. Unorthodox or bizarre research approaches and interests in FMD.

5. Summary

Briefly highlights in an abridged, but all-inclusive version, the major evidence and argumentation covered in the Discussion relating to and substantiating the Conclusions. Insofar as possible, describe in non-technical language to aid the reader. (Usually 3-4 manuscript pages).

6. Discussion

A. HISTORY

It is desirable to know history of occurrence, how long the disease has been recognized, when it reached epizootic proportions, types of viruses encountered, etc. However, emphasis should be placed on significant facts and developments, particularly since World War II. Include outstanding research achievements.

B. THE CURRENT PROBLEM OF FMD

(1) General - directed primarily to relationship of FMD to the national economy.

(2) Epizootiology

(a) Introduction
(b) Geographic distribution
(c) Prevalence - (Include incidence in specific areas and the relative prevalence between areas; mortality rates, etc.)
(d) Natural susceptibilities - (by breed, species, age groups, and types, such as draft, dual-purpose, dairy, etc.)
(e) Seasonal variations
(f) Virus types encountered - sub-types recognized
(g) Sources of infection
(h) Reservoirs - (include wildlife, camels, reindeer, birds, etc.)
(i) Routes and methods of spread - (feed, forage, pastures, water, markets, animal movement)
(j) FMD in man

(3) Clinical and Pathological Picture

(a) Symptomatology and course of the disease
(b) Pathologico-anatomical changes
(c) Malignant FMD
(d) Complications

C. CONTROL AND ERADICATION OF FMD

(1) Organization of control measures - (for example, system and effectiveness of disease reporting, subordination of responsibilities and instructions for control of outbreaks).

(2) Measures for controlling outbreaks - (isolation, quarantine, etc.; percentage of livestock slaughtered during eradication programs; availability of personnel and equipment used or in readiness for use in control of epizootics through non-scientific, scientific and military, if needed to enforce regulations. Attitudes of livestock workers and owners to control and policement measures; all in all, evaluate efficacy of slaughter and vaccine programs in the control of FMD in past epizootics).

(3) Decontamination - (procedures and agents used; effectiveness; extent used and availability).

(4) Diagnosis - (include diagnostic tests used or procedures available; describe network of facilities engaged in diagnostic work as well as competency for diagnosis, typing and frequency of sample submission).

(5) Prevention - (procedures, agents, etc.)

(6) Therapy

D. FMD RESEARCH AND DEVELOPMENT

(1) Status and trends

(2) Reservoir studies - (susceptible animals; experimental infections; normal hosts; alien species adaptation; experimental epidemiology, etc.)

(3) Etiological agent

(a) Properties of the virus - (characterization and morphology; modification of strains and genetic studies; strain selection program and studies; multiplicity of type; virulence or infectivity studies; resistance studies; symbiosis, etc.)

(b) Biochemical investigations - (crystallization, purification and viral composition studies; virus cell interaction; protein synthesis; effects of enzymes, etc.)

(c) Biophysical investigations - (studies on the environmental effects such as temperature, humidity, pressure, U-V light, etc.; use of the virus in aerosol studies; physical purification of the virus; use of ultrasonics, etc.)

(d) Cultivation and propagation studies - (tissue culture; methods used for studying virus propagation)

(4) Disinfection - (include use of viricidal agents; effects of antibiotics)

(5) Diagnosis and Identification - (include rapid detection work)

(6) Immunology - (include immunochemical analyses; plurality of antigens; studies on cross-protection; immunogenesis, etc.)

(7) Immunizing agents

(a) Types - (methods of virus production, vaccine formulation and fabrication, field testing, quality control procedures, longevity of immunity studies, comparative effectiveness, dosages, modes of administration, limitations and contra-indications, etc.)

(b) Production capability - (procedures for vaccine or live virus preparation, preservation or stabilizing techniques, facilities and equipment, quantities produced, distribution pattern, subordination of biological industry, etc.)

(8) Therapy

7. References

Throughout the Discussion, authentication should be made by reference to source documents. These are cited in tabular form in this section.

8. Appendices

Tables, charts, maps, etc., can be attached here. The following would be of definite value:

a. List of key installations engaged in FMD research, giving locations, details of interests and activities, etc.

b. List of key investigators engaged in FMD research...

c. List of key installations engaged in virus or vaccine production...

d. List of key persons engaged in virus or vaccine production...

Note: There are other factors which bear on various of the above sections and, if available, would increase the value of the study. These include descriptions of (1) collaborative projects between installations and between ministries, (2) military interest, (3) exotic interests, (4) foreign exchanges and travels of key scientists, etc.

2. TABLE OF CONTENTS

3. PROBLEM

The Soviet method of controlling FMD depends upon quarantine and disinfection measures to which have been added the use of prophylactic serums and vaccine after these were developed. Similar system of control has been used by most countries of the world. The Soviet problems have not differed materially from those of the countries using similar methods of control excepting as the political, economic or local conditions may have somewhat affected these problems.

Organization which included formulating rules, regulations and methods of control and providing means of executing these constituted an early and formidable problem. This they have done and probably have strict enforcement or rather severe regulations. When new methods or modification of methods were introduced in other countries, the Soviets had the problem of developing and introducing such methods into their control program. Thus when the convalescent and hyperimmune serums were added to the control programs in Europe, the Soviets had the problem of adopting and introducing procedures for collecting, processing and distributing the convalescent serum. Considerable work was done on the production and testing of hyperimmune serum also but this type of serum was not extensively used. When European and other countries reported the development, production and use of vaccines that proved to give satisfactory protection against FMD, the Russians had the problem of studying various types of vaccine, producing and testing some of them. The Vallée-Schmidt-Waldman (VSW) vaccine was being used extensively in Europe and in other parts of the world. The USSR had the problem of producing and testing this type of vaccine, in fact it was used in Russia with apparently satisfactory results. Later, the Soviets developed, tested and produced and are now using the VIEV vaccine, a modification of the VSW vaccine. Both are aluminum hydroxide adsorbed, formalin inactivated vaccines. The VIEV differs from the other in being produced with non-filtered suspension of infected bovine tongue epithelium and containing more formalin. Chinosol is added to VIEV and not to VSW. The VIEV vaccine is apparently as effective as VSW vaccine and is claimed to be more stable than VSW vaccine under conditions of the USSR.

The vaccine problem is by no means solved. There has been demand to develop a method of obtaining the virus for the vaccine which will be less costly and less laborious than the one now used.

The use of rabbit adapted virus and other methods were studied, produced and tested, but these were apparently not satisfactory. The Soviets are aware of the explant tongue epithelium culture and tissue cell culture methods of producing virus but thus far they have not discussed it in their publications and there has been no indication in the Soviet literature that they have been studying or employing these methods.

There was the problem of introducing serological tests to aid in typing virus and in diagnosis. The complement fixation test appears to be the one used almost exclusively. Studies on the conglutination and other serologic tests were reported but these seem to have been of experimental nature.

Two papers published in 1957 reported on the typing of virus by the serum neutralization test with the suckling mice as the host animals.

The Russians, like other countries, have been interested in the explanation for the appearance and development of the immunologically different types of virus and variants of these types. Two reports on studies were reviewed. The study of virus types are contained in the summary.

Like other countries concerned with control of FMD, the carrier state of recovered animals has received considerable attention and the Soviets have made it a problem to be solved. Some experimental studies were recently made on this phase in the USSR. There is still no general agreement on this problem of FMD, but most Soviet writers appear to be satisfied that their quarantine regulations amply protect against this possible source of infection.

Although there have appeared indications for the need of developing new disinfectant agents, not much appears to have been done in this matter excepting that several reports have appeared on experiments and tests of methods for decontaminating raw hides. The one which seems to have most promise is the one in which the hides are treated with 1% copper sulfate solution for 6 hours.

The Soviets had problems of providing laboratory and other facilities to maintain the service needed in control and experimental work. Details to permit an evaluation of these facilities and equipment were not available excepting to some extent in the case of two laboratories reviewed in the summary. From the publications studied it can be stated that laboratory facilities for animal experiments and laboratory tests are available at various institutes in different parts of the USSR. The problem of providing more laboratory facilities to meet the need for further service and study still exists.

4. CONCLUSION

a. An evaluative comparison of the level of development and competency of FMD research in the area of interest versus elsewhere.

The material contained in most of the articles reviewed was of practical nature and published in journals or other printed media devoted to the professional side of veterinary practice and control. The references to experimental or research developments were mostly given in abbreviated or summarized form and would not permit critical analysis of the basis upon which the conclusions were drawn in the article. The answers given to the questions implied in this section of the Suggested Outline, should be considered with these introductory remarks in mind.

By reputation and from the literature it can be said that some of the Soviet leaders in veterinary and allied sciences have the knowledge, training and experience to do or direct sound experimental or research work. To what extent pressures and limitations of facilities, of equipment and of personnel affected the character of work done and reported can not be judged. Practically all that can be said is that the Soviets have been slow in adopting and using the newer techniques and methods which have been developed in the virus field and especially those which have been applied to FMD study and use. For example, the explant tissue culture and cell culture method of virus propagation involve relatively simple procedures to adopt and use, but these have not been reported as having been developed or applied in their experiment and research work nor in studies and laboratory service.

b. Trends in FMD research.

The trends in Soviet research have, of necessity, been mostly of applied nature to augment and assist in the control work.

c. Current status of developments as they may affect FMD capabilities in the future.

As to the status of developing future capabilities it can only be stated that there have been demands that the Soviet scientists keep informed of the newer developments in other countries on FMD and related fields and contribute new knowledge and develop new methods and improve those now being used in the Soviet research institutes and laboratories. There is no reason that their capabilities will not be advanced and enhanced as soon as practical and when conditions permit. The reports indicate that some Soviet veterinary scientists and administrators attended various international meetings and made visits of inspection to institutions studying FMD in foreign countries. The observations made in foreign travels and visit and the material obtained from foreign journals will no doubt influence the Soviets to keep abreast of the development and stimulate them to develop newer knowledge in FMD research and control.

d. Significant research findings worthy of Western confirmation.

As far as could be determined, new or improved techniques or methods of control were not reported in the articles reviewed.

The observations on the appearance of different types and variants of types made and reported by Kindiakov, Baiadinov, Filippovich, and Nikonova in 1952 [32] and by Filippovich in 1957 [118] deserve attention especially by those interested in studies on this phase of FMD. In substance these workers claim to have proven that immunologic types are changed in nature and can be changed in the laboratory by providing only an environment of animals immune to the particular type. This is not an entirely new explanation on the appearance of types and variants. Apparently this explanation is not accepted by many Soviet workers (See Etiological agent 6D(3)). The work of these Soviet authors is discussed by Moehlmann (1954)[87]. The information contained in the Soviet literature reviewed does not contain sufficient detail to permit a critical review of the work upon which the above conclusions were drawn.

Perhaps a few exceptions to this appraisal could be considered. The VIEV vaccine, which as indicated above is a modified form of the aluminum hydroxide, formalin inactivated VSW type vaccine, appears to be more satisfactory under Soviet conditions than the original VSW vaccine. Otherwise the difference in effectiveness is very slight as indicated by the comparative tests made by Pyl and Heimig* who claim that the difference is not sufficient to justify any change in method of preparing the VSW vaccine.

Perhaps the use of 1% copper sulfate solution in the decontamination of hides could be mentioned here. This method appears to be an improvement in several respects, over these previously used methods. A check of the literature was not made to determine whether or not copper sulfate had been used for this purpose.

e. Unorthodox or bizarre research approaches and interests in FMD.

Under the classification of bizarre or unorthodox research could be placed Bashenin's [89] claim that he had successfully converted the virus to a bacterial form. The cultures were said to be Gram positive and also able to form crystals. This was reported bySkomorokhov (1952)[27] but not included by him nor by others in later publications. This should be considered to be without any basis of fact according to Western authorities.

In this category could also be included the report by Shelkoviy (1957)[134] on effect of drug-induced sleep on the course of FMD in guinea pigs. The author concludes "As seen from the results of the experiment, drug-induced sleep had a retarding effect on the clinical manifestation of experimental FMD which indicates the role of the functional condition of the nervous system in the pathogenesis of this disease." Here also attention could be called to the reference in the report of the important 39th plenary session of the Veterinary section of VASKhNIL, where was related the inactivation of FMD virus with ASD (A. V. Dorogov's antiseptic serum) and the ASD FRACTION 2 which inactivates FMD virus for the production of vaccines. No other reference to A. V. Dorogov's work could be found.

* Reference is given in section 6D(6&7) on immunity

5. SUMMARY

The Russians under Soviet rule, in their drive to improve their economic condition, essential in establishing and maintaining the communist state, had to become more efficient in many endeavors than was their position under Czarist government. To accomplish this the Soviets directed and aimed at many goals in the form of 3 five-year and other plans. Also, early in their efforts for international power they made and had to meet certain committments. The Soviets early realized and emphasized the drain, in many ways, that the effects of rapidly spreading, highly contagious diseases of domestic animals have on agricultural and general economy of the country. Most important of these diseases, especially in the past 30 years, has been FMD which affects practically all the milk and meat producing animals.

In the literature reviewed, no official figures, tabulations or maps were found to give a fair idea of the geographic distribution, prevalence or extent of FMD in the USSR. It was only in reports of test trials or use of serums and vaccines, and in discussions of methods of control involving certain areas of USSR that numbers of animals or places were mentioned. From these it can be concluded that FMD has been, and probably still is present in some parts of the USSR. Which areas, or how many animals were involved, could not definitely be determined.

Several of the important Soviet articles call special attention to the fact that the system of nationally operated or controlled state and cooperative farms, meat combines, animal food supply, transportation and other utilities and industrial operations involved in FMD control work make it possible for them to control and eradicate the disease more effectively than in non-communist countries. This can be appreciated and accepted in making comparisons with conditions under Czarist regime and with those in some non-communist countries. It is, however, extremely doubtful that the Soviet control measures are more effective than those in Great Britain, US, and in the Scandinavian and in some other non-communist countries.

Their reports of the FMD situations and effectiveness of control measures in other countries are not always correct. This may be intentional or it may be due to carelessness in translating foreign reports.

The Soviets in several articles mention the spread of FMD into their country from the western border. Their tight control of the western border should make that very difficult and very rare. Their reports indicate that the disease has been at least as prevalent in areas of their country far removed from the western border as in those bordering it.

In their drive to control this disease, the Soviets early turned their attention to the development of laboratory and research facilities for service and research work. On October 20, 1932 the Foot-and-Mouth Institute on the Island of Gorodomlia in Lake Seliger in the Kalinin Oblast was dedicated and opened. No further report on, or reference to this institute was encountered in the Soviet literature reviewed.

An article published in December 1938 reported that the All-Union Institute of Veterinary Medicine opened a laboratory for the study of FMD on Lisii Island in Vyshnevolotskii raion also in the Kalinin Oblast. This laboratory was to concern itself principally with developing methods of active immunization against FMD, and to improve methods of obtaining, processing and distributing convalescent serum. No reports from this laboratory or mention of it has been encountered in the Soviet literature excepting reference to an article by a member of its staff in his report of a paper presented by Waldmann at the IV International Conference of Pathologists in Rome in 1937.

Whether or not either of these research facilities are functioning has not been determined from the literature reviewed. One might infer from Skomorokhov's statement in 1953 at the 39th Plenary Session, Veterinary Section of VASKhNIL, when he urged the creation of a specialized Institute to study FMD that the FMD Institute on Gorodomlia Island in Lake Seliger is no longer used. That this institute or the laboratory on Lisii Island are not to be advertised could be a possibility.

Laboratories at institutes in various republics or oblasts have sections set aside for the diagnosis and study of FMD. The VIEV vaccine and some of the serologic testing agents are prepared at some of the Bioplants. At the meeting of the Scientific Council of the Ministry of Agriculture in 1957[126] it was announced that the following laboratories are working on various FMD problems: VIEV, UzNIVI, KazakhNIVI, GNKI, UIEV, Novosiborsk NIVOS, Kirghis and Tadzhik Institute of Animal Husbandry and Veterinary Medicine.

The system of control used in the USSR is similar to that used in most countries of the world. This system is based on general quarantine measures conducted on infected premises, on broad prophylactic vaccination in exposed areas and assisted by police measures. Probably the USSR is severe in enforcing these quarantine measures. In some respects it is more severe than most countries. There is some inkling to indicate that there has been some relaxing in this regard in the USSR. There have been criticisms of the attitude taken by some veterinarians for depending too much on vaccination and not enforcing the regulations and instructions as prescribed in the veterinary sanitary code and official instructions.

It is evident from the Soviet articles that the research and experiments have been mainly directed towards obtaining information and assistance needed in the control work. Some, but very little, has been reported on fundamental research, and these had an important and direct bearing on their control problem.

For a period in the twenties and with the developing procedures and methods in obtaining, processing and supplying convalescent and hyperimmune serums, the indications are that they had satisfactorily solved that problem. Comparatively little hyperimmune serum had been used. Convalescent serum is still being employed in control work as a prophylactic measure but to a great deal lesser extent than fifteen or twenty years ago. It has been recommended for use in very early stages of the disease as a therapeutic agent.

The procedure of artificially infecting animals on infected premises with the virus on such premises has been almost entirely abandoned. It still is being used in rare instances under restricted rules.

With decrease in the use of serum prophylaxis in the control program, the Soviets concentrated most of their research efforts on developing, producing, testing and making available an active immunizing agent. Several laboratories, especially the one at the VIEV have been primarily concerned with the development of an active immunizing agent. In general it can be said this was accomplished when the VIEV vaccine was developed and officially approved.

While the Soviets may have inherited a legacy of incompetance, disorganization and uninterested attitude of the officialdom towards control and research of FMD and other infectious animal diseases, they were developing at a period when substantial progress had been and was being made and when newer fundamental knowledge on FMD had been and was being accumulated. A great deal was available for them to learn and to follow.

The VIEV vaccine is a modified form of the VSW vaccine which has been used in Europe, South America and elsewhere for the past two decades. Before the VIEV vaccine was accepted, the Soviets produced and used the VSW vaccine for a number of years with satisfactory results. It is claimed that the VIEV vaccine possesses better keeping qualities under conditions in which a vaccine can be stored, transported and used in Russia. The reports on the use of the VIEV vaccine on several million cattle, swine, sheep and goats have been very good. The Soviets claim, and present results of experimental trials and other observations to prove that the VIEV vaccine can be used effectively to protect swine against FMD. On the other hand the VSW vaccine has not beem considered by the Germans to be a satisfactory agent when used in swine unless swine strains of virus are used to infect the cattle which provide the infected tongue epithelium for the production of the vaccine.

Some criticism of the vaccine has recently been reported. Most of it declares that the methods of obtaining the virus needed for the production of the vaccine is too costly and too laborious. Veterinary officials and others call upon the laboratories to study and use newer methods of virus production including those reported in other countries. The Soviets, before and after the introduction of the VIEV vaccine have studied and used other sources of virus propagation but apparently none proved to be satisfactory. To reduce the cost and make the supply of vaccine go farther, the vaccine has been injected intradermally with a dose equal to 1/5 - 1/10 of the originally recommended subcutaneous dose. That the VIEV vaccine has not always possessed the needed immunogenic power has appeared in an article by a high ranking official. The need for other methods of obtaining the virus for the vaccine has long been recognized in Russia by those who developed the VIEV vaccine and by other interested persons and no doubt efforts to obtain another source of virus are being studied.

The discovery that different immunological types of virus are involved in producing FMD has posed serious problems in Russia and elsewhere where FMD is of some concern. All types produce the same clinical and pathological pictures in the infected animal, but each type can produce immunity only against itself but not against disease produced by any of the other types.

The Soviets have worked on this problem as explained in Section 3. Two papers by Soviet research workers on this subject were available. Both in substance concluded that virus type can be changed in its immunological behavior by placing it in an environment where only hosts immune to its type of virus are available for its propagation. This or similar explanation for the development and change of virus types had been advanced before. It appears that this explanation is questioned by some Soviet and other scientists. A discussion of these papers and similar articles is found in the monograph by Moehlmann[87].

In the diagnosis of the disease and in typing of FMD virus, the complement fixation test has been the principal serologic test used. Work with the conglutination and other serologic tests have been reported, but appears to have been primarily of an experimental nature. Attention has recently been focused on serum neutralization studies using white mice as the test host. Tissue culture does not appear to have been used, nor is sufficient mention made of it to assume that the Soviets have seriously considered its use as a diagnostic aid.

The more current Soviet literature shows an increasing interest in the problem of typing. Types A, O, and C have already been identified in the USSR, and they are aware of types within their country which do not conform to the standard A, O, C. One wonders whether any of these non-standard types could be related to the SAT 1, 2 and 3 or to the more recently recognized Asian 1 type or perhaps to some as yet unidentified type. Apparently the Soviets did not test for the presence or absence of 4 types (SAT 1, 2, 3 and Asia 1) not previously reported to have existed in USSR.

The problem of carriers appears to be of importance in Soviet thinking. Experiments described by them indicate that 30 days after recovery from FMD the animal no longer excretes or eliminates FMD virus, and therefore does not pose any danger to susceptible animals. While the Soviets consider the problem of carriers still unsolved, they believe that their quarantine regulations which prohibit placing susceptible animals with recovered animals or on previously infected premises for at least 3 months following lifting of quarantine regulations, are adequate to handle the carrier problems.

The subject of FMD in man is naturally of interest in all countries where outbreaks of this disease occur in animals. The Soviet literature reviewed contained descriptions and discussion of this subject. In general the Soviet authors consider man to be only slightly susceptible to FMD and that the disease is contracted principally by drinking milk from infected animals. A most unusual case of FMD is described in one of the Soviet articles. In this case the infection was acquired through a skin injury. This and other cases are given more fully in Section 6B(2j). There also can be found a general discussion of the susceptibility of man to FMD.

6. DISCUSSION

6A. HISTORY

In the Soviet articles reviewed one finds practically no chronologically arranged nor historical records nor reports of outbreaks of the disease in the USSR. An occasional report was found which gave dates of outbreaks. For instance, Bannov (1955)[68] states: "There were six outbreaks of FMD in Krasnoiarsk Krai during the past 25 years - 1920, 1935, 1938, 1941, 1949 and 1953." Whether or not there were cases or small outbreaks of FMD between or after these periods is not mentioned.*

Some data are given for Czarist Russia. Skomorokhov (1956)[84] refers to reports of the disease in the middle and latter part of the 19th century.

L. S. Ratner (1956)[91] speaks of the spread of the disease in Western Europe and states: Subsequently it spread through all of Western and Central Europe. It reached the USSR's western borders in 1939 and its repercussions were still observed in USSR in 1941 and 1942." He gives maps to show the spread of FMD in Western Europe but has none for the USSR. He also reports that "In pre-revolutionary Russia, too, the epizootic spread of FMD, according to statistical data, was quite considerable. In 1905, e.g., 2,145,025 heads of cattle, 547,089 sheep and goats and 45,911 swine were reported in 77 provinces. Conditions were similar in 1911." L. S. Ratner gives one graph which gives annual totals of animals infected with FMD for 1881-1930. This graph is attached on the following page.

Somewhat more information on history, still very meagre however, is found in the articles on the progress made in providing facilities, in organizing and training scientific, professional and other groups and in formulating rules and regulations for the general control of FMD.

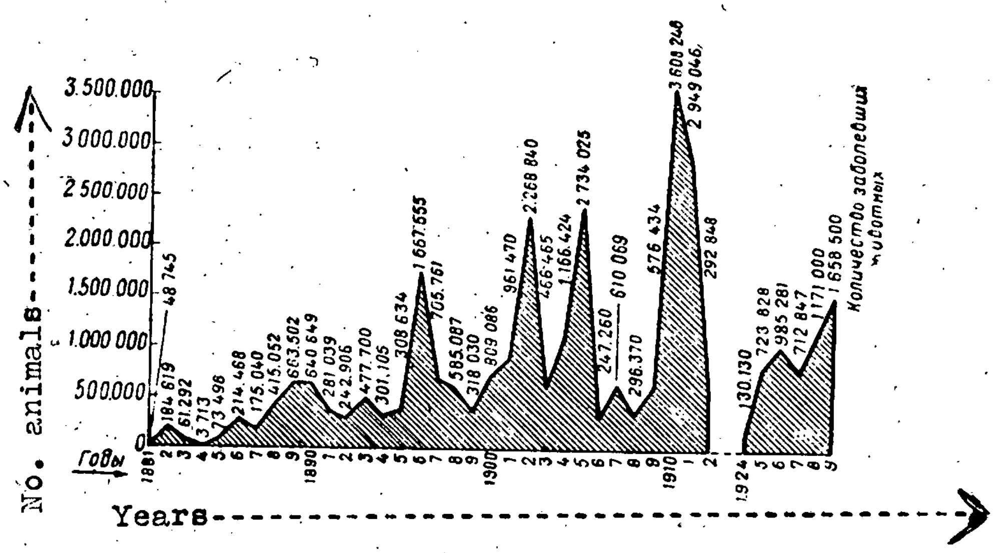
From Ginzburg (1932)[2] it is learned that in Oct. 1932 the grand opening of the Foot-and-Mouth Disease Institute of the Peoples Commissariat for Agriculture was held on the Island of Gorodomlia in Lake Seliger near Ostashkov. Work on the disease began on that day. Further reference to the Island of Gorodomlia or to Ginzburg was not found in any of the other articles reviewed. For more detail on this reference see Item #1 in the supplement to this section.

L. S. Ratner (1938)[4] reports on the dedication of the Institute for the Study of FMD on Lisii Island in the Vyshnevolotskii raion, Kalinin Oblast. He states in part:

> "By the decree of the Main Veterinary Administration, USSR Narkomzem, No. 136, of June 2, 1938, a laboratory for the study of foot and mouth disease has been newly organized in the All-Union Institute of Experimental Veterinary Medicine.

---

* Additional items relating to history of outbreaks will be found in section on Geographical Distribution and Prevalence, 6B(2,b,c) and on Control and Eradication, 6C, and other sections. In section on Immunity, 6D(6,7) there are historical items on the development, production and use of serums and vaccines.



Graph 71. Incidence of foot and mouth disease in Russia, 1881--1930; annual totals of animals affected.

"The methodical commission of VIEV has approved, for study in the laboratory in 1938, two principal themes on the problem of specific prophylaxis of foot and mouth disease: a) search for the methods of active immunization against foot and mouth disease; b) further perfection of the methods of obtaining and using the serum of convalescents."

More detail is quoted from this reference in Item #2 in the supplement to this section.*

The Second World War (more frequently referred to by Russian writers as the Second Imperialistic or Patriotic War) caused serious setbacks in the organization to combat and study the disease. Leonov and Alikaev (1946)[11] primarily discuss the work of VIEV in the years of the Patriotic War. Detail on this may be found in Item #3 of the supplement to this section. Foot-and-mouth disease was not mentioned during the prewar period activities. Diagnosing diseases and development of veterinary biologics and pharmaceuticals received considerable attention. The budget of the institute reached 2.8 million rubles in 1940.

Two branch stations at Izhoma on the Pechora to study diseases of deer, and one experiment base for the study of FMD (in Kalinin Oblast) were expanded. In addition, VIEV continued the earlier broadly expanded work on methodological direction of the scientific activity ofperpipheral NIVI and NIVOS.

Skomorokhov (1952)[27] states: "Deeper study of the specialized field has enabled us to expand considerably the data on the achievements of Soviet science in its study of FMD. This has led us to revise the monograph for its second edition on the basis of the current data of science." See Item #4 in the supplement for further detail.

In a more recent article, Skomorokhov (1956)[84] adds further detail. Refer to Item #5 in the supplement to this section.

Koliakov (1957)[130] relates the accomplishments and the growth of veterinary-microbiologic establishments. These are given in detail in Item #6 of the supplement.

Naturally and proudly the Russian writers refer whenever appropriate, to D. I. Ivanowskii's (1892) discovery of the cause of the mosaic disease of tobacco to be filter passing and it is also natural to show, that the discovery of Loefler and coworkers (1897) that FMD was caused by a filterable virus, was due mainly to the Ivanowskii discovery. Skomorokhov (1952)[27] states: "When D. I. Ivanowskii learned of the results of studies by the German commission he viewed them as a confirmation of his own discoveries and wrote as follows: As we see, then, the phenomena in FMD are entirely similar to those which I have established in mosaic disease."

*The only other mention of Lisii Island was found in our bibliography reference #6 as follows: Molchanov, D. P (Lisii Island, Vyshne-Volotskii raion, Experiment Base for Study of FMD Disease. This gives a verbatim report (obtained dictaphone) of Waldmann's presentation on "Struggle against FMD at IV International Congress of Pathologists in Rome 1939."

It is somewhat surprising that Vyshelesskii and Kalugin (1957)[129] do not mention FMD in their article of 42 typewritten pages which covers 40 years of accomplishments (1917-1957) in which are discussed control and eradication of many animal diseases. Portions of their paper are given in Item #7 in the supplement to this section. They state in part:

"After the Great October Socialistic Revolution (1917), the Soviet Government turned its attention to the restoration and consolidation of the economical state of the country.

"As early as in the first years of the Soviet regime, the Communist Party, the Soviet Government, and V. I. Lenin personally, paid great attention to the control of epizootics in the country."

6A. SUPPLEMENT

1. I. V. Ginzburg (1932)[2]

"The foot and mouth disease institute was put into operation when to the fate of veterinary science has fallen the extremely great and responsible role in the cause of protection of animal husbandry of our country. The dynamics of the spread of foot and mouth disease for three years speaks for a reduction in foot and mouth disease morbidity.

"However, this circumstance must not soothe our vigilance and steadfast will for a victory over this epizootic, which is annually inflicting a considerable economic loss to the state. Foot and mouth disease as an epizootic must be liquidated, and the foot and mouth disease institute, which began its work on October 20th of this year, will help veterinary workers to resolve this problem.

"The Soviet government has appropriated 2,200,000 rubles for the construction of the institute.

"Thanks to the party line correctly carried out by the cell and directorate of the institute, firm management and loyalty to the cause on the part of the aktiv of the institute headed by comrade Skomorokhov, and enthusiasm of workers the difficulties were left behind.

"The institute received several tens of telegrams from eminent scientists of the West - professor Kal'met (Calmette), professor Val'dman (Waldman), professor Gins, professor Bozredko (Besredka), and others. Some of them wrote that they would have been glad to be present at the opening of the foot and mouth disease institute, but that the material conditions gave them no such opportunity."

---

2. L. S. Ratner (1938)[4]

"The work of the laboratory on the indicated themes has begun, and the experiments on small laboratory animals have been arranged.

"By this same order, Main Veterinary Administration, USSR Narkomzem, has charged the All-Union Institute of Experimental Medicine with the construction of an experimental base for the study of foot-and-mouth disease on Lisii island, Vyshnevolotskii raion, Kalinin oblast. At the present time the construction of an experimental base on the island of Lisii is being carried out in accelerated tempos. The island of Lisii is isolated from all sides and is located in the Vyshnevolotskii reservoir. It occupies 236ha and is covered with pine forest.

"By its geographical location and negligible value in economic respect, the uninhabited Lisii island is a most favorable place for carrying out experiments on foot-and-mouth disease.

"A land area measuring 9.85ha has been set aside for the construction of the experimental base for the study of foot and mouth disease. It is proposed to locate on this section three cattle yards consisting of 25 head of cattle each, an ice plant, a nursery for guinea pigs, living quarters, bath and other private facilities.

"It is projected to construct a sanitary sewer and a laboratory in each cattle yard. Thus, it will be possible to conduct experiments on the island simultaneously with three types of the virus of foot-and-mouth disease.

"The total cost of the construction will be approximately 500,000 rubles."

---

3. N. I. Leonov and V. A. Alikaev (1946)[11]

"The All-Union Institute of Experimental Veterinary Medicine is the largest and oldest scientific research veterinary establishment of the Union. It was created on the basis of the decree of the RSFSR Council of People's Commissars, signed by V. I. Lenin in 1919, on the base of the Veterinary Laboratory, Ministry of Internal Affairs, as a scientific center for development of the problems of the fight against epizootics.

"The basic tasks of the institute: a) research work in the field of veterinary science and, primarily, in the field of the fight against infectious and protozoan diseases of animals; b) methodological direction of scientific work of peripheral NIVI and NIVOS; c) consultation with central and local governmental organs and agricultural organizations on the problems of sanitary improvement of animal husbandry, and fulfillment of individual operative missions of the Main Veterinary Administration, USSR People's Commissariat for Agriculture (Narkomzem); d) training of scientific workers and increasing the qualification of veterinarians.

"VIEV, jointly with the All-Union Institute of Helminthology named for Academician K. I. Skriabin, was publishing the journal 'Vestnik Veterinarii' in volume of 40 quires per year with circulation of 2,000, and independently, the veterinary reference journal 'Biulleten Biuro Inostrannogo Opyta' in 25-35 quires per year, with 1,000 circulation. The coworkers of the institute, through the Sel'khozgis (State Agricultural Publishing House), have published monographs, manuals, textbooks, popular pamphlets - 15-20 titles annually.

"The war introduced great changes in the work of the institute. From July to December, 1941, 109 persons from the staff of VIEV including over 20 scientific workers, all the post-graduate students from the staff of VIEV were called into the army. In connection with the approaching front line, the branches in Leningrad and Kalinin oblast were liquidated. In November, 1941, VIEV was evacuated to Omsk, where, on the base of the Omsk NIVI, its research work unfolded, though in reduced volume. The staff of the institute was reduced to 100 units, and the budget - to 800,000 rubles.

"The war produced great changes. In 1945 the staff of the institute was expanded to 183 persons including one member of the Belorussian Academy of Sciences and 55 on the Scientific staff, 10 of which were 'veterinarian' epizoologists, and other trained persons."

---

4. A. L. Skomorokhov (1952)[27]

"No statistics on the incidence of foot-and-mouth disease were kept during the First Imperialist War (World War I), but it is hardly likely to have been less widespread than before the war.

"It is well known, however, that this disease killed 24,623 head of cattle on one front alone in 1915. This was 6.43 per cent of the total number of animals brought up to supply that front.

"The USSR. Foot and mouth disease, like many other infectious diseases of animals, was one of the grievous inheritances from the prerevolutionary Russia. The Soviet veterinary organization could not make use of experience in foot-and-mouth disease control accumulated in the past, for there really was hardly any, if we except the inoculation with the 'saliva' of diseased animals that had been widely practised up to then.

"In 1926 the first 'Instructions for Combatting Foot-and-Mouth Disease' in the USSR were drawn up and approved. They provided for a definite system of measures for the liquidation and prophylaxis of foot-and-mouth disease. (In 1925 a special circular 'On the Adoption of Approximate Measures to Stop the Spread of Foot-and-Mouth Disease' had been issued by the People's Commissariat of Agriculture RSFSR.) The disease is not widespread throughout the USSR today (1952).

"Soviet veterinary workers, using current scientific data and the experience accumulated in the control of foot-and-mouth disease under the conditions of production, are continuing to cope successfully with the task of liquidating it. (Professor Magnusson -- of Sweden -- on visiting the the USSR in 1932, where he familiarized himself with the set-up for the control of foot-and-mouth disease, stated: 'In the field of foot-and-mouth disease the USSR today stands in the foremost ranks among the countries of Europe.' Sovetsk. veter. (Soviet Veterinary Medicine), No. 1, 1934)."

---

5. A. L. Skomorokhov (1956)[84]

"The literature of the prewar period has much information on the foot-and-mouth disease; it was published in Russian journals since the end of the last century. The names of two Russian researchers of the end of the last and of the beginning of the present century must be mentioned, they are: D. Dovel and N. Ekkert (1900). Both of them studied the foot-and-mouth disease in deer, since it caused great losses to deer breeding. Much later, S. A. Gruener (1929) devoted his research to the same cause. The works of A. V. Dediulin (1917) were dedicated to the studies of the foot-and-mouth disease in cattle; he was the one who had introduced the so-called 'accelerated method in the fight against the foot-and-mouth disease in infected herds.' (Probably means artificial infection.)

"After the October Socialistic Revolution, a Foot-and-Mouth Disease Laboratory was organized at the State Institute of Experimental Veterinary Medicine; it was headed at that time by S. N. Vyshelesskii. Many scientific works on the foot-and-mouth disease were published by this Laboratory. Later on, a great number of specialized establishments on the foot-and-mouth disease were organized where, at the present time, great scientific-research work is conducted. In addition to the considerable great number of works which we, or our students, have published (A. A. Dubianskii and N. A. Khomenko, K. A. Popova, V. M. Dobrotvorskaia, A. IA. Baidalin, N. E. Labrovskii and others) the research of V. I. Kindiakov and of his collaborators (N. N. Doronin, A. S. Rushchits, V. I. Len'kov, A. N. Baiadinov and others) deserves special attention. A quite great number of works was also published by L. S. Ratner. The works on the foot-and-mouth disease by K. I. Plotnikov, G. F. Bondarenko, S. I. Voinov, A. A. Sviridov and others are also very interesting.

"The works of the Soviet scientists are mostly dedicated to methods of radical eradication of the foot-and-mouth disease, also to the elaboration of methods of a specific prophylaxis, to studies of the various types of the virus of the foot-and-mouth disease and to the clarification of the nature and biological properties of the pathogen of the foot-and-mouth disease. The mentioned works are a considerable contribution to the world's studies of the foot-and-mouth disease. Practical workers have also made many interesting observations especially concerning the epizootics of the foot-and-mouth disease."

---

6. Ia. E. Koliakov (1957)[130]

"The number of veterinary-microbiological establishments and that of cadres of microbiologists grew every year. There is a wide net of interraion veterinary laboratories in the USSR at the present time, and there are many scientific-practical establishments in the republics and oblast's, headed by the All-Union Institute of Experimental Veterinary Medicine. The veterinary microbiologists and epizootiollgists are a significant squad of veterinary specialists of the Soviet-land; many of them are Candidates of Veterinary Sciences, others - Doctors of Veterinary Medicine.

"Soviet microbiologists utilized broadly the progressive ideas of foreign biology and contributed also many valuable achievements to the development of world microbiology.

"In USSR, the biopreparations are standardized and controlled by the State Scientific-Control Institute of Veterinary Preparations and also by special controllers on bioplants. Such a uniform system of State control of the production of biopreparations guarantees the supply of vaccines, serums and diagnostical means of highest quality."

---

7. S. N. Vyshelesskii and V. I. Kalugin (1957)[129]

"The legacy, left to the Soviet peoples by the Czaristic Government, was not easy. Russia was economically and technically a retarded country. Especially low was the state of the country's agriculture, and not better the veterinary-sanitary and epizootic matter. In numerous 'guberniles' (provinces) of the prerevolutionary Russia, especially in its periferies, as Transcaucasus, Transbaikalia, Siberia and the East, various infectious diseases of agricultural animals were endemic (plague, /rinderpest/, epidemic pneumonia of cattle, anthrax, glanders, pox of sheep and others).

"The epizootic state in Russia turned to the worst during the First Imperialistic War (1914-1918).

"After the Great October Socialistic Revolution (1917), the Soviet Government turned its attention to the restoration and consolidation of the economical state of the country.

"As early as in the first years of the Soviet regime, the Communist Party, the Soviet Government, and V. I. Lenin personally, paid great attention to the control of epizootics in the country.

"The historical decrees of the Soviet Regime played a special role in the progressive development and rational utilization of the scientific achievements in the control of contagious animal diseases in USSR. A great number of decrees, signed by V. I. Lenin, were published by the Soviet of Peoples Commissars during this period, for instance, 'On the foundation of the State Institute of Experimental Veterinary Medicine' (1918), 'On the supply of necessary material and inventory to the Bacteriological Institutes and Laboratories' (1918), 'On measures concerning the supply of vaccinational material needed for the fight against contagious diseases of domestic animals in RSFSR' (1919) and others.

"A planned and systematic fight against the epizootics in the USSR has started in 1932." (Note: This year laboratory on Lisii island was opened.)

"The passing and approval of the general veterinary law: the 'Veterinary Statute of RSFSR', was one of the most important events of historical significance in the development of the veterinary-sanitary affairs and in the success of the control of contagious animal diseases. The following prominent Soviet scientists of veterinary medicine participated in the compiling of the first project of the 'Veterinary Codex': N. G. Tartakovskii, S. N. Vyshelesskii, S. Y. Drachimskii, N. D. Ball, M. I. Romanovich, S. N. Pavlushkov and others. This historical document played the decisive role in the mobilization of veterinary specialists for the fight against epizootics. It required the subordination of veterinary activities to one cause: to the consolidation of Soviet veterinary medicine and to the improvement of the veterinary work in our country.

"The Veterinary Statute was approved and numbered 78/1922 by the Central Executive Committee and by the Council of Soviet Commissars on October 27, 1936; it was enforced and served as legislative code for fifteen years. This Statute played also an important part in the formation and development of Soviet epizootiology as a science, and also in the eradication of special other animal diseases in the USSR."

6B. THE CURRENT PROBLEM OF FMD

6B(1). General - Relation to National Economy.

Responsible government officials, especially those concerned with agriculture and animal husbandry, writers of veterinary texts on infectious disease, especially those dealing specifically with FMD and especially with its control leave no doubt about the very serious detrimental impact FMD has had and could have on the economy and political life of the USSR, particularly in certain republics or their subdivisions.

As a legacy from Czarist Russia, the USSR found regulations, and methods of control of FMD which were inadequate and even these had been almost entirely neglected or had not been carried out in any systematized or regular fashion. Practically the only procedure from Czarist Russia followed by USSR officials in the control of the disease was artificial infection of apparently non-infected animals with the current virus to hasten the course and spread of infection.

Attention has been repeatedly called to the need for more efforts by those in research work in the laboratories and those in the field work. The rather severe rules, regulations and methods which are expected to be, and probably are, followed in detail in the majority of instances as far as possible in stamping out, combatting and in preventing the introduction and spreading of the disease indicate the seriousness with which Soviet officials consider FMD. Attention has been called, in USSR, to the undesirable impact, the spread of FMD could have on the general welfare of USSR and especially on areas in SSRs or subdivisions on the political effect in the effort to meet certain goals and committments of the various 3 or 5 year plans. Such effects could extend to meeting certain international committments in other parts of the world. L. S. Ratner (1956)[91] states in part, on the losses to the economy caused by FMD:

> "The damage inflicted upon the national economy by the foot and mouth disease is enormous, for the disease strikes the main categories of farm animals: cattle, swine, sheep and goats, i.e., those serving as the chief sources of vitally important animal foods and raw materials for popular consumption, such as milk, butter, lard, hides and wool. Considerable losses suffered by the individual enterprise attain colossal proportions on the national scale, particularly with the mass spread of epizootics.
>
> "Direct losses result as a rule from decrease in productivity in various spheres: quantity of milk drawn at a milking, live weight, quality of meat, wool yield, etc. In addition, considerable mortality in young animals retards replenishment of herds. Of no lesser importance are indirect losses connected with quarantining and sanitary restrictions imposed upon affected or imperiled enterprise. Moreover, incidence of the foot-and-mouth disease may seriously hamper the plan-directed governmental stockpiling of livestock, animal produce and raw materials of animal origin, the shipment of cattle to meatpacking combines, the cross-country transportation of animals for breeding and consumption, and the driving of large herds to seasonal pastures."

More detail may be found in Item #1 of the supplement to this section. Vyshelesskii and Terent'ev (1954)[98] state briefly:

"Losses from FMD are caused mainly by deaths of young animals, among large cattle, swine, sheep and goats; also by loss of milk in cows, by decrease in weight of cattle for slaughtering, on account of emaciation of animals who had the disease, and by the loss of working ability of draught oxen. It is also necessary to take into consideration that pregnant cows, which have FMD, sometimes have abortions. Veterinary measures and quarantines, which restrain the movement of cattle and retard many farm operations, expenses for disinfections, vaccinations, treatment of animals, which cause more or less serious complication, - all these taken together constitute huge sums."

Dobrokhotov (1953)[44 or 56] reporting on Skomorokhov's presentation at the XXXIX Plenum of the Veterinary Section of VASKhNIL on Problems of the Fight against FMD of Agricultural Animals states: "Professor Skomorokhov pointed out that one of the important tasks in the field of animal husbandry is the liquidation of the most dangerous contagious diseases of animals and, especially, of foot and mouth disease."

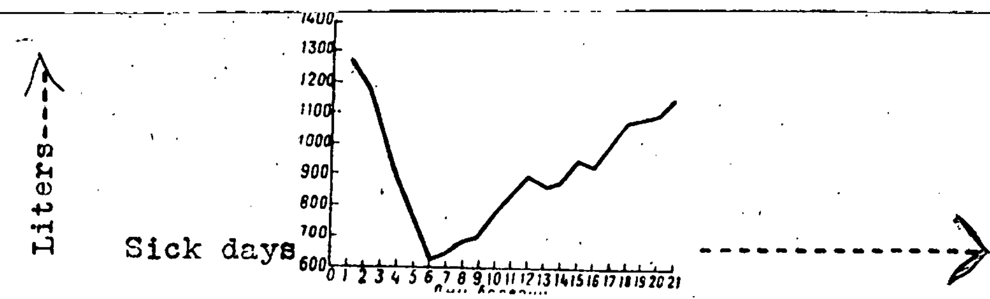
Skomorokhov (1952)[27], (1956)[84] and Revo (1956)[81] discuss the economic impact of FMD. Details may be found in Items #2 and 3 of the supplement to this section.

Bedenashvili (1950)[19] after discussing requirements to be met by the 3-year plan (1949-1951) for development of public kolkhos and sovkhos productive breeding plan relates the success of the record harvest of field crops of "our Socialist Agriculture", points out that basic livestock developments have failed to make much progress in reaching the goal outlined by a great margin and states: "Of the many diseases of agricultural animals, foot-and-mouth disease is one of the very infectious diseases, which inflicts heavy losses to livestock breeding." Bedenashvili defined the extent in figures that Georgia SSR must increase in its livestock front to meet the goalof the 3-year plan. He points to FMD as the most important stumbling block to overcome in reaching the outlined goal. He shows how FMD causes economic damage. This is given in detail in Item #4 of the supplement to this section.

1. L. S. Ratner (1956)[91]

"The following examples will indicate the extent of damage. The loss of milk in a kolkhoz market dairy, where 27 milch cows were stricken, amounted to 3,503 liters. In another kolkhoz infection of 107 cows caused a 15,000 liter drop in milk production. A small sovkhoz dairy farm affected by the disease showed a milk loss of 8,025 liters.

"How the quantity of milk drawn at a milking is affected in the course of the disease is shown in the above chart (Graph 72). (Reproduced below). According to published data, total losses of milk (in butter equivalents) during the 1924-'25 foot and mouth disease flareup in the USSR equaled 100,000 puds (roughly 1,610 metric tons). Assuming an average annual 4.6 per cent loss in milk yield due to foot and mouth disease, Zhukov computed for the USSR in 1926-1928 an annual loss of 1,416 metric tons."



Graph 72. Change in daily milk yield of 120 **cows** through 20 days of reported foot and mouth disease; data of the market dairy, Voroshilov kolkhoz.

2. A. L. Skomorokhov (1956)[84]

"The emergence of the foot-and-mouth disease causes always enormous economical losses. If the foot-and-mouth disease takes a mild course, the death rate among the mature cattle is not high (0.5-2%), but however, among the young animals (of the milk period), the losses reach sometimes 60% and even more.

"According to G. F. Bondarenko's data, the losses in mature cattle had reached 50-70% during epizootics of a malignant form of the foot-and-mouth disease, they were even higher among the young animals and 100% among goats. The sickness with the foot-and-mouth disease caused a drastic decrease of milk yield in dairy cows. According to N. I. Grigor'eva's data (1952), in a herd of highly productive dairy cattle sick with the foot-and-mouth disease, the milk yield had decreased almost one-half (44.1%) within 9 days; it was restored only to 76.8% after 2 weeks. In beef cattle and fattened animals, the foot-and-mouth disease causes a drastic decrease in weight.

"The malignant form of the foot-and-mouth disease might cause losses in mature cattle also. Very often in animals, the foot-and-mouth disease has serious complications which are difficult to cure. During the sickness with the foot-and-mouth disease, the selectional-breeding is interrupted on farms. Quarantine measures are difficult to bear and reflect upon the life of a farm, not mentioning all the expenditures for the conduction of the disinfection and for the treatment of the sick animals. Summarized, the economical losses, caused by the foot-and-mouth disease, are very high always."

---

3. M. V. Revo (1956)[81]

"Since FMD is a highly contagious disease, the losses it causes are great and the mortality rate, especially in the younglings of swine, sheep and goats are also quite high. Decrease of milk yield and of weight of animals during their illness, loss of efficiency in draft animals (oxen) and abortions of pregnant cows constitute the other economical losses. Furthermore, the expenditure on the carrying out of veterinary-sanitary measures, on the quarantining of animals, on restrictions concerning the movement of cattle, on disinfections, vaccinations and treatments of the sick animals is also very high."

---

4. G. G. Bedenashvili (1950)[19]

"Some say that 'foot and mouth is not a grave disease -- animals endure it easily, and that it does not inflict any particular damage', as a result, they do not utilize serious measures in the fight against it. Such a view and similar attitude toward foot and mouth is absolutely incorrect, and must be abandoned. In comparison to other diseases, though the foot and mouth does not cause death to the animals so frequently, the economic damage caused by it is nevertheless very great.

"In what then is this economic loss, caused by foot and mouth, reflected? In hoof and mouth diseased cows, the milk yield is sharply reduced. Thus, for example, if a cow has been giving 10 liters of milk a day, it gives a maximum of 2 liters a day when ill, i.e., it loses 8 liters of milk a day. On the average, the illness lasts 12 days, and during this period 96 liters of milk will be lost. This is for one cow, and if there are 50 cows giving the same yield of milk, the loss of milk would be 4,800 liters. The working animals ill with foot and mouth lose their working ability, the result of which is a delay in timely carrying out of farming chores (plowing, sowing, harvesting, etc.). The young of cattle, swine, and particularly the piglets endure foot and mouth disease with difficulty, and there may result a significant fatalities among them, especially if kept under poor feeding and maintenance conditions. Sometimes a significant loss from the disease occurs among the young pigs. In some farms the death of piglets reaches 60-80 per cent and above."

He calls special attention to loss because breeding bulls cannot function properly and goes on to state:

"In addition to this; foot and mouth causes emaciation in animals, a reduction in meat yield, etc. So the foot and mouth disease is not such a mild and harmless disease as it seems to some, but, on the contrary, it inflicts a great economic damage. Serious measures must be applied against it for a speediest possible eradication of the epizooty."

EPIZOOTIC.

6B(2). Epizootiology

6B(2)(a). Introduction

Views on epidemiology found in presentations contained in the Soviet articles reviewed agree in the main with those held elsewhere, differing mostly where conditions may differ from those in Western countries. An appraisal of the epizootiology is based on the presence or absence of knowledge concerning the virus and its pathogenesis, especially its localization and concentration in, and its elimination from the body; in knowing the mechanical, physical and chemical influences in and outside of the animal body and how these affect the virus. In fact, the knowledge and understanding of most all phases of disease must be brought into consideration for a proper epizootiological understanding.

The fact that the lesions containing the FMD virus are principally located in the mucosal covering surface of the mouth, in the external tissues of the feet, udder, et cetera makes the influence of the environmental conditions on the virus an important link in the epizootiology of this disease. Political, economical and geographical conditions also have important bearings. The host range, and the degree of susceptibility of the animals included in this range are factors in the epizootiological chain.

Information of the Russian opinions and conceptions of many of these phases are commented upon and discussed under the appropriate items in other portions of this report.

6B(2)(b,c). Geographic Distribution and Prevalence

Reliable figures, statistics or definite information either from official sources of from "probably" reliable reports, essential for some sort of fair estimate of the prevalence of FMD were not encountered in the articles reviewed. It was not possible to obtain a fair idea of either the extent in numbers of outbreaks and animals involved or in geographic locations where FMD has been occurring. Only when other phases of FMD were treated were there any references to the occurrence of the disease. From these bits one strongly suspects that FMD has been found in practically all the republics of the USSR. To estimate to what extent would not even be a poor guess.

Several general articles on FMD give all sorts of figures on outbreaks in European countries, but practically nothing for Russia. The European figures were probably taken from the O. I. E. (International Bureau of Epizootics) reports or from reports of the various European countries. Similar information for the USSR has either not been accumulated, or perhaps there are restrictions on its availability and were not to be used in reports or journals which are accessible to foreign readers.

L. S. Ratner (1956)[91] in a well-written general article on the disease gives in a graph the seasonal per cent variation for a ten-year period 1903-1912 in Czarist Russia, but no graph nor figures for USSR. The number of animals involved is not given. In another graph, to support the cycles

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

or periodicity of mass infections, Ratner shows the number of units and and animals infected in Germany covering a period of 58 years (1886-1943). No such information for Czarist Russia or USSR is presented, even though Ratner gives periodicity of outbreaks in Russia where 4 clearly defined epizootics appeared in 29 years (1881-1910) following one another by 3-6 years. He also states: "In those zones of the USSR where long time pasturage maintenance of cattle predominates (Central Asia and Transcaucasus), epizootics, as we now know, recur more frequently -- every 2 to 3 years."

Revo (1956)[81] relates that in Czarist Russia, epizootics of FMD had not been studied much, and since no control measures were taken against them, they occurred in the form of "elemental" upheavals. Only after the October Revolution, the State Veterinary Organization realizing the seriousness of the significance which the infection had on economical situations took special measures against it. Thanks to these control measures FMD is not widely spread in the USSR any more - and its course is less malignant than in Europe. Vyshelesskii and Terent'ev (1954)[98] make a very similar statement as follows:

> "In pre-revolutionary Russia FMD epizootics were given very little attention and they took an elemental course. Only in the period after the revolution the tremendous economic loss which was caused by this contagious disease was taken into consideration; as well as measures began to be conducted for the control of FMD, which affected animals almost yearly, although in various proportions."

In discussing the effect that the condition of animals has on their susceptibility to FMD, L. S. Ratner (1956)[91] refers to Central Asia, Kazakhstan and Transcaucasus. He states: "In 1952-53 the VIEV vaccine was administered, in manifold epizootic situations to a total of over 4,000,000 heads of cattle." Ratner also states that convalescent blood and serum were used in 1953 during an outbreak of malignant FMD with heavy mortality in a West Ukrainian district - for both prevention and treatment. As late as 1957, Koliakov (1957)[130] emphasizes the need for improving the VIEV vaccine, implying that there is need for vaccine to prevent and stop infection. Reference has already been made in the subdivision on History to the report of Bannov (1955)[68] that there were six outbreaks between 1920 and 1953 in the Krasnoiarsk Krai.

Dukatsenko (1954)[58] speaks of outbreaks occurring in "fattening sovkhoz No. 1 on Jan. 14, 1953" etc. and recites other occurrences early that year.

Zorabian et. al. (1956)[133] in Armenian SSR state that:

> "In the year 1955 a foot and mouth disease epizootic, distinguished by some characteristics of epizootiology, clinical manifestations and the course of the disease, was observed in the zone of our activity.

"This epizootic originated in June when cattle of a number of districts was taken almost simultaneously to summer pastures, while there were cases of the foot and mouth disease among it. The cattle were moved over 4 routes, as a result of which infection extended over 49 populated localities with a month and attacked a large number of cattle, miscellaneous horned stock, and swine; considerable mortality was observed among them.

"A severe course of the foot and mouth disease with numerous cases ending in death was noted not only in cattle, but also among swine, and in some cases even among sheep.

"All of this indicated the malignant course of the foot and mouth disease in the year 1955 and the specially severe virulence and contagiousness of the virus strain. Footnote: Upon investigation of the foot and mouth disease virus taken from several districts, it was established that it belonged to the "A" type (in accordance with international nomenclature)."

Ampiteatrov (1956)[117] in discussing distances which FMD can jump shows how FMD was transmitted by automobile from infected point into Staroe Isakovo village of Bogulminsk Raion. "Several days thereafter, on July 22, 1955, on the farm where the automobile was parked, a cow became sick with FMD." FMD epizootics have spread in the fall (1955) over neighboring raions. Further he speaks of 4 cattle which were registered as sick Sept. 19, 1955. Continuing with the story of this infection jumping 150 Km. Ampiteatrov relates several breaks; regarding one he states: "Out of the 380 cattle of the Kolkhoz 'Udarnik' 139 had become infected." Further, "In the Bondiuzh Raion are 51 points, cattle were sick on 32 of them..." These and other quotations and items given above are not mentioned here as examples of extent but as bits on prevalence and geographical distribution.

Most Soviet authors, excepting L. S. Ratner, mention that the disease is not as widespread nor as malignant as in Western Europe or as it was in Czarist Russia. In either case the inference can be drawn that the disease has been present in recent years.

6B(2)(d). Natural Susceptibilities

The naturally affected hosts listed by Soviet authors do not differ from those found in other countries (Skomorokhov (1956)[84], L. S. Ratner (1956)[91], Revo (1956)[81]). These include cattle, sheep, goats, swine and the wild cloven-footed animals. Practically all Soviet publications discussing hosts stress the greater susceptibility of the young animals, especially mentioned are young cattle and "piglets". This is apparently based on the severity and higher mortality in this age animals. Ratner presents very little on natural animal hosts of FMD and practically dismisses the whole subject with "among farm animals most susceptible are cattle, swine, sheep, goats and northern deer." In addition, Skomorokhov writes that dogs and cats have been reported in the literature as having become infected by drinking milk. On animals in zoological parks he states, "Some animals kept in cages (in parks and gardens etc.) which are apt to become sick with the foot-and-mouth disease." To this list Revo adds chamois, llamas as being susceptible. Revo states that all species of Artiodactyla are susceptible to FMD. His reference to infections in zoological parks is practically the same as given by Skomorokhov. He states that young dogs and cats can also become infected. However, that occurs rarely.* Ratner reports that dogs, cats and fowl do not contract the disease, but are apt to carry it from "affected" to non-infected places.

According to Revo, Soviet (Skomorokhov, Savel'ev and others on swine industry farms) and foreign scientists have observed that animals in poor shape and undernourished are less susceptible and show "less express" clinical symptoms of the disease than well-fed or fat and overweight animals.** On species adaptation Revo gives the following: "It must be noted that in some cases the virus can be adapted to particular species of animals and that during FMD epizootics on farms, mainly those species of animals become infected to which the virus became 'adapted' (by passage through one species of animal)."***

Rats have been artificially infected and have also been reported in rare instances to be naturally infected. The Soviets refer to this, but not prominently, excepting Polyakov (1954)[100]; this is not accompanied by any references or observations (See under Sources and Reservoirs, 6B(2)(g,h).

Practically all Soviet writers consider the horse as nonsusceptible to FMD and some hold that where cases of infection in this species were reported these were incorrectly diagnosed. One Soviet writer does state that in very malignant form of FMD, horses have become infected. No reference or supporting evidence is given.

The susceptibility of man to FMD is discussed in another portion of epizootiology.

6B(2)(e). Seasonal Variations

The only Soviet article which gives any figures and devotes some space to seasonal variation is L. S. Ratner (1956)[91] who states:

> "From data of veterinary statistics over a number of decades, it may be gathered that FMD tends to spread on a larger scale during the summer and fall seasons than it does in winter and spring. This is not to be imputed to any qualitative differences in the animals' immunity or susceptibility to the disease at different times of the year, nor to any change in the biological properties of the agent;

---

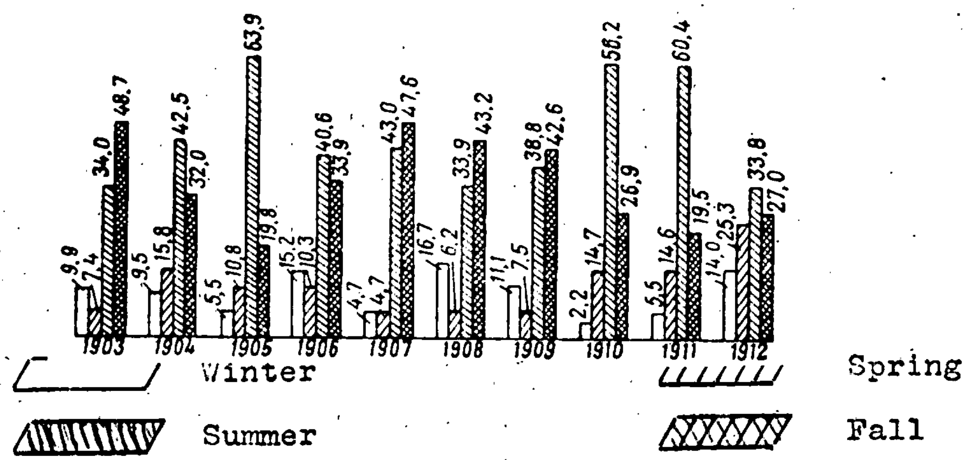
* Young cats and dogs have been artificially infected in Germany and elsewhere.

** The British and the American FMD Commission, 1927, report similar observations in experimentally exposed animals. For reference to these see Section 6D on Immunity.

*** Similar observations made by British and Germans, and perhaps the above is based on these observations.

the explanation is chiefly in the fact that all types of economic activity in the farm economy and, more specifically, in animal breeding are carried out most intensively in ~~spring and~~ summer AND FALL. (hay-mowing, crop-harvesting, pasturage, sale of animal produce, governmental stockpiling of livestock, mass driving of cattle, etc.)."

In support of the above Ratner shows a graph on "Seasonal dynamics in the spread of FMD in Russia, 1903-1912." This graph is attached below. No figures are given for USSR, but from the statement it may be inferred that similar incidence of the disease occurs in USSR.



Graph 69. Seasonal dynamics of the spread of the foot and mouth disease in Russia [???] in 1903--1912; percent cattle affected.

Indirectly under this heading, 6B(2e), might be included the so-called cycles or periodicity of the occurrence and reoccurrence of the disease of mass epizootics - alternating periods of soaring and declining and ebbing and flattening epizootic curves obtained from statistics on occurrence and spread of the infection from Central Europe and prerevolutionary Russia.

The introduction of serums and especially of vaccines may have some reducing influence on the seasonal influence on the occurrence of FMD.

Vyshelesskii & Terent'ev(1954)[98] in discussing birds as mechanical transmitters of the disease bring in seasonal influence in FMD as follows: "FMD is not a seasonal disease and the transmigration of birds happens, as is well known, during spring and fall seasons."

6B(2)(f). Virus Types

The virus types encountered are discussed under 6D(3). Etiological Agent.

6B(2)(g,h). Sources and Reservoirs of Infection*

Material in the Soviet literature reviewed bearing on these phases, as expected, was found mostly in articles covering the general subject of FMD and in those certain articles dealing particularly with rules, regulations and directions for control work with the disease and especially in the explanation and reasons for issuing and putting into effect such regulations, directions, et cetera.

Primary Sources of Infection

Obviously the infected animal is the primary source of infection. The virus is present in high concentration in large amounts in the lesions and to a lesser degree in the body fluids, secretions and excretions and in various organs. The virus can be readily demonstrated here by suitable inoculations especially during the early stages of the disease in these areas. Five to 7 days after appearance of the lesions the virus is less likely to be detected in these areas and only rarely or not at all in 10 days. Virus has been reported to have been demonstrated in saliva even before the presence of recognizable lesions in the mouth (Skomorokhov (1956)[84]). Skomorokhov and Pinus (1951)[21] refer to the demonstration of virus by others

---

* To avoid repetitions and facilitate to some extent the preparation and presentation of material, the two headings were combined under one subdivision. Wild cloven-footed animals and other species such as hedgehogs when infected with FMD could be sources as well as reservoirs of infection. Carriers could also fall into this category - and other situations. It is difficult to state when sources or reservoirs should be used. In the Suggested Outline for the report, sources and reservoirs were given in two separate subdivisions.

in the saliva 9 hours after artificial infection. This has been more or less generally accepted. On the other hand, L. S. Ratner et al (1947)[13] concluded from a study of the pathogenesis of the disease in one artificially infected young bovine animal, that salivary glands do not secrete virus and that saliva can contain FMD virus only after it has become admixed with infective material from the mouth lesions. In their experiments they obtained saliva from an artificially produced fistula of the parotid salivary gland of the infected animal. Skomorokhov (1956)[84], Skomorokhov and Pinus (1951)[21] and Ratner himself (1956)[91] do not mention this experiment of Ratner and coworkers. Revo (1956)[81], however, does refer to the above conclusion reached by these workers. Vyshelesskii&Terent'ev(1954)[98]briefly gives without comment, the experiments of Ratner and colleagues. Perhaps this view, concluded from experiments of Ratner and coworkers, is not accepted completely by most Russian leaders in the field of infectious diseases of animals.

Secondary Sources of Infection

The characteristic vesicular lesions containing virus of high titer on the mucous membrane of the oral cavity or on the skin of the feet, udder and teats, and the presence of the virus in most body fluids, secretions and excretions readily produce secondary sources of infection by widespread contamination of objects both animate and inanimate which are found in the environs of the infected animal. These briefly stated, are the generally accepted views on sources and reservoirs of secondary infection.

These views do not materially differ from those reported in the Russian articles reviewed. This will be apparent by comparing the above with the description given by L. S. Ratner (1956)[91], who no doubt has a very good understanding of the FMD situation and problems in the USSR. For more detail, see Item #1 in the supplement to this section.

Ratner then calls attention to the so-called passive carriers (sources) of infection such as dogs, cats, horses, personnel servicing or coming in contact with sick animals and cites illustrative cases. He calls attention to the dangers connected with driving or transporting sick and exposed animals. He discusses the dangers of meat and meat products from animals slaughtered during the acute stage of the disease - such as edible meat, offal, hides, horns, bones, etc. Dangers of immediately frozen meat are also discussed. Ratner refers as well to the problem posed by contaminated staple animal feeds. For more detail see Item #2 in the supplement to this section.

Articles by Skomorokhov (1956)[84] and Revo (1955)[81] also contain references to Kindiakov's work to show the important role in spreading FMD infection by milk, dairy products and by-products. Revo states: "Manure of sick animals constitute a highly dangerous source of infection and virus reservoir" unless properly composted. Composting is referred to in Soviet articles as Biothermal treatment. Further details are quoted in Item #3 in the supplement to this section.

The survival of the virus and the retention of its infectivity under the conditions discussed above are presented elsewhere under Etiologic Agent, 6D(3a), and under Control, 6C.

In the USSR detailed, strenuous procedures are outlined and ordered to prevent or minimize the spread of FMD virus, within and outside of infected premises and localities, by isolating or separating the sick from apparently noninfected animals on the involved farms or feeding lots or localities and by frequent cleaning and disinfection. Probably these recommendations and orders are carried out as far as practical. It entails considerable labor and expense. That the reduction of danger of the spread of the infection could be accomplished by strictly following the recommended procedures can not be questioned. However, it would be interesting to learn how effective such measures are in preventing spread of infection on infected premises and whether these can be or are actually executed as prescribed in the orders, rules and directions.

The transmission of FMD by vaccine lymph harvested from calves which were also affected with FMD is mentioned by Revo (1956)[81] as follows:

> "Cases of FMD transmission are described in foreign literature and there are indications that the disease was transmitted with vaccinia lymph (FMD epizootics in the USA in 1908 and 1922 caused by the lymph infected with the FMD virus)."*

There was no indication in the literature reviewed that vaccinia lymph had introduced FMD in the USSR.

Apparently the question of the role played by contaminated rivers and other bodies of water in the spread of FMD infection has received considerable attention by the Soviets. Most writers on this subject agree that the problem needs more study. From the review of the literature one could gather the opinion that the role played by rivers and other bodies of water as a source and mode of spread of FMD infection has been overemphasized. Contributions by Revo (1956)[81] and Skomorokhov (1956)[84] on this subject are given in part in the supplement, Items #4 and 5.

Pertinent to this discussion is the article by Veckenstedt (1956)[108]** on the role plankton could play in the spread of FMD infection. He presents 22 (long-sized) typewritten pages and 43 references to suggest mildly that plankton could under certain circumstances be a 'vector' of FMD virus. He discusses the literature bearing on the survival and multiplication of FMD virus and other viruses (principally polio and influenza) in the presence of bacteria, yeats, torula, protozoa and other microorganisms. He includes a review on the survival of FMD virus in waters and other fluids. These plus the references should be valuable to those interested in these or related phases of FMD. It appears that more work is needed to support or reject Veckenstedt's suggestion. Flückiger, quoted by Veckenstedt (1956)[108] gives the dilution factor as a valid argument against the probability that

---

* The 1922 outbreak in the U.S. mentioned above is news to the reviewer. This is the first and only report of FMD in the U.S. in 1922.

** This is not a Soviet article. Work was done by Veckenstedt at the Riems Institute and published in a German journal. This article was forwarded by the Washington Office for review.

virus contained in large or flowing bodies of water, even under the most favorable conditions, can act as reservoirs or transmitters of FMD. Because Veckenstedt speaks of plankton in sea water it may be of interest to call attention to a report by Pyl and Klenk* in which they show that FMD virus can survive in strong salt solution (25%) for over a year. See supplement, Item #6 for more details.

The Carrier State

Whether or not animals convalescent or recovered from FMD are sources of infection received considerable attention in the Russian general articles on FMD, in special articles on the carrier state or on various phases of the epizootiology of FMD. The opinions expressed in the Russian literature are in general not unlike those held outside of the USSR. Practically all agree that the virus can be carried for some time (1-2½ months) on hair, on hooves, or in the crevices of tissues of the feet previously involved with FMD lesions. This latter source of infection is removed by cleaning and disinfecting of skins and feet with 1% sodium hydroxide, 1-3% potassium hydroxide or 1% formalin. These are the disinfectants usually recommended for general use. Control regulations prohibit the removal of animals from premises harboring recovered cases or bringing clean animals to previously infected quarters for three months after the lifting of a quarantine. However, there are a few writers who hold that a small percent of recovered animals (2-3%) do become carriers and that the length of the carrier state of such animals goes beyond the period covered in the regulation restrictions.

Several refer to work of Waldmann-Trautwein and Pyl (1931) of the Riems Institute. Some call attention to the fact that the cattle and guinea pigs used in the Riems experiments were hyperimmunized animals and were the recipients of large doses of virus and should not be compared with the ordinary recovered case of FMD. Similar comments have been made in Western countries on the Riems results.

The monographs of Voinov (1955)[72a] and Gizitdinov (1956)[71] are the only articles reviewed which give results of planned and experimental work on the carrier state. Both argue that there is a lack of evidence to support the contention that recovered animals secrete or excrete any FMD virus beyond a 30-day period.

Voinov in two experiments, exposed susceptible young cattle to young animals which had recovered from FMD. In one experiment, 30 days after 3 cattle were infected artificially, they were placed with 3 susceptible cattle. In another experiment, 5 susceptible cattle were placed with 5 recovered cattle 30 days after the latter had shown symptoms of FMD. The skin and feet of the recovered animals were first disinfected with 1% sodium hydroxide before they were placed with the susceptible cattle. From these he concludes. "Joint maintenance for a period of 66-90 days of 8 animals which had recovered from the foot-and-mouth disease and 8 which had not been ill, brought together 30 days after the infection (of the former) failed to provoke foot-and-mouth infection in the animals which had not

* Pyl and Klenk. 1936 Haltbarkeit des Virus der MKS in hochprozentigen Salzlösungen, Zentrbl. f. Bakt. Parasit. und Infektionsk. I Abt. Orig. 137:433.

been sick heretofore." One of the 3 susceptible animals in the first experiment and all 5 susceptible animals in the second experiment were inoculated with virus and developed FMD - proving that they were susceptible. Six of the recovered animals proved to be immune upon inoculation. For further details see Item #7 in the supplement to this section.

Gizitdinov (1956)[71] calls attention to the fact that citrated blood from recovered cases had been injected into many thousand head of cattle without causing FMD. He also mentions unpublished work of Kindiakov, Baiadinov and Filippovich which indicate that serum from animals "sick" with FMD is virulent only during the first five days of illness.*

Gizitdinov reports on an experiment in which a group of 20 cattle of mixed ages from the "Laboratory on the Studies of the Foot-and-Mouth Disease of the Veterinary Institute of the Kazakh, Branch VASKhNIL" were infected by applying A_2 virus to the scarified surface of the upper lip. All developed generalized FMD - 14 showed foot lesions. Twenty-four days after onset of infection these animals were subjected to a thorough disinfection with 1% sodium hydroxide after being mechanically cleaned. They were then transferred to clean premises, held for 12 days, again cleaned and returned to their original source where they were mixed with 145 head of cattle of various ages. The animals were under clinical observation during 117 days and were examined twice by a special commission of the Kazakh SSR Ministry of Agriculture. The commission found no cases of FMD in either the immune or susceptible cattle. The cattle were kept together for 1 year and 3 months. From this he feels entitled to the conclusion that animals which had had FMD, after 36-41 days are no longer carriers of FMD virus. Gizitdinov believes regulations should be changed to lighten the restrictions. See Item #8 in the supplement to this section for further details.

Sviridov (1953)[46a] in four printed pages on carriers in FMD based on practical epizootiological observations in 3 outbreaks, states:

> "Notwithstanding the fact that experimental data on the problem of virus-carriage are contradictory, many authors consider the virus-carriage, within the range of 2-3% of the animals recovering from FMD, as proven.
>
> "In the analysis of individual cases of foot and mouth epizootic we have observed facts when the causes of the emergence of the infection in herds were indubitably the animals which have had FMD, 4-6 months after their recovery."

He realizes that the virus could have been introduced mechanically on hides and hooves of recovered cases of FMD. His conclusions may be found in Item #9 of the supplement to this section.

---

* This and many other observations show that blood does not, except in very rare instances, contain virus at periods when it is drawn for use in prevention and treatment of animals, and thus would not be expected to transmit the disease.

Gorban (1953)[45] in his paper on the role of the epizootiological factors in FMD gives his observations during outbreaks of the disease in one of the raions. And into his discussion he repeatedly brings the observation that recovered cases may have been the start of outbreaks or could have been the source of spread of disease in or through contacts with animals from such places as fattening places, stockyards, breeding establishments or in transportation vehicles. No concrete cases are cited.

Poliakov (1953)[40] in his article on the sanitary measures in the fight against FMD includes some general implications that the role of virus carriers is an important factor in transmitting the disease. See Item #10 of the supplement to this section for further details.

Skomorokhov (1956)[84] in the treatment of the carriers in a 62-page article on FMD in his book on Infectious Diseases of Animals expresses the following opinion:

"Animals - which had had the foot-and-mouth disease and are subsequently virus-carriers, can also be the source of infection and of the spread of the foot-and-mouth disease, however, the epizootic significance of this factor has not been studied sufficiently yet. Observations and experience have proved that the carrying of the virus of the foot-and-mouth disease does really exist, however, it is of a short duration and lasts not longer than 2-3 months (A. L. Skomorokhov and collaborators).

"In some cases, the cause of the emergence of the foot-and-mouth disease is the animal-virus carriers that means those animals which had had the foot-and-mouth disease and were introduced to a healthy herd 4-6 months after the recovery."

He refers to Sviridov's article (reviewed above). Skomorokhov very briefly outlines Voinov's experiments and results (reviewed above). Then he follows with the following paragraph:

"The data concerning the longevity of the carrying of virus after the sickness with foot-and-mouth disease which were obtained by the author, do not completely correspond with the contemporary viewpoint, however, they deserve the most serious attention. The work and practical observations on this subject must be carried on."

L. S. Ratner (1956)[91] takes a very cautious stand on the carrier problem. He does appear to be satisfied that the restrictions placed on movements of cattle which had recovered from FMD "may be expected to serve their purpose."

"Also, experimental data and practical observation centering on the impact of sick animals on the spread of the contagion have revealed that there was, among animals having recovered from the disease, a certain proportion of virus carriers apt to communicate contagious matter to their surroundings. Of the Soviet researchers engaged of late in the study of this problem, two -- I. G. Grinets and M. N. Zapolyanskaya -- have come to the conclusion that animals having suffered from the foot-and-mouth disease may for a long time remain a source of infection. Contrariwise, S. I. Voinov holds, on the basis of epizootiological studies, that longtime proximity of animals previously affected by the disease and such as had never contracted it does not predetermine infection. In our view, the fact that virus may be carried by formerly sick animals should be kept in mind for the duration of two months after the animals' sickness, but its importance should not be overestimated. In this respect restrictions imposed under the terms of veterinary law upon animals previously affected by the foot and mouth disease may be expected to serve their purpose."

In the above it should be noted that Ratner cites only two references, one supporting the dangers of carriers, and the other (reviewed above) minimizing the role that carriers play in the spread of FMD. Unfortunately the article by Grinets and Zapolyanskaya was not available for review.

Revo (1956)[81] refers to the work of the Riems Institute group on carriers and summarizes Sviridov's (1953) article (reviewed above). Comments on other observations may be found in Item #11 in the supplement to this section.

Revo's concluding remarks on carriers are:

"In spite of the fact that there is large material concerning discussions on questions of virus transmission and on its localization after recovery, we must agree with Professor A. L. Skomorokhov who says that 'in practice, however, we must always consider the possibility of virus transmission by animals which have recovered from FMD and therefore, special restrictions must be elaborated.'"

6B(2)(i). Routes and Methods of Spread

Routes and methods of spread are closely tied up with the sources and reservoirs of FMD infection and for better conception of these, the previous subdivision, 6B(2,g,h) should be consulted.

Direct and indirect contact by whatever method with infected animals or with secondary sources or reservoirs of infection can be a route or method of spreading the disease.

Most Soviet writers maintain and emphasize that the USSR with the nationalization and/or control of farms, feeding and breeding establishments, fattening and slaughtering combines, and control of feed processing, storing and distribution and transportation, is in a better position to prevent the introduction and spread of FMD than are the capitalistic countries. Revo (1956)[81] for instance expresses this as follows:

"In foreign capitalistic countries the cattle markets are, and have always been the source of the spread of many infectious diseases, especially of FMD, hog cholera, rinderpest, etc.

"Thanks to the measures of the Veterinary-Sanitary Control Organs, the kolkhoz markets are not (any more) such a threat as were those of pre-revolutionary Russia, however, the epizootic significance of the congestion of cattle on markets should be taken into consideration.

"The basic difference between the principles of the Soviet State cooperative systems and those of the capitalistic foreign countries (completely) enables us to conduct veterinary-sanitary measures in the processing organizations and thus to prevent the outbreak of FMD epizootics on the whole."

This is no doubt true as far as Czaristic Russia and some non-communistic countries are concerned.

Can or does the USSR prevent the introduction and spread of the disease from one area of the USSR into another area more efficiently than such non-communistic countries, as Britain, Scandinavian countries and the USA? Several of the Soviet writers claim or strongly indicate that epidemics of FMD in the USSR are traced to introduction from the capitalistic countries by way of the Western borders. This wouldn't be difficult to understand if it weren't for the fact that the border controls are no doubt very stringent and also it doesn't explain the infection in the vast USSR areas far removed from its Western border.

6B(2)(j). <u>Foot-and-Mouth Disease in Man</u>

This subject is given some space in all the general articles on FMD. Several contain a brief discussion of the disease in man including the symptoms, treatment, precautionary measures and epidemiologic implications. Other discussion of FMD in man are in portions of texts on general virology or human medicine. This latter type of article is well prepared and gives a brief description of the disease in animals. In none of the articles are figures given to show the number of reported and proven cases. All papers, with the exception of the one by S. I. Ratner et al (1956)[80] describing a very exceptional case of FMD in man, state that infection in man is mostly contracted by drinking raw milk and most cases occur in children.

Pertinent statements are made by the following Soviet writers:

Yegorov et al (1956)[113] in their handbook, <u>The Practical Doctor</u> have devoted two pages to describing FMD in man. Although written in very clear simple style as for the laity, medical terms are frequently used. They give the usually described symptoms, treatment et cetera. No figures, data or opinion on the number of cases nor on the degree of susceptibility of man in the USSR or elsewhere are given. As most writers on the disease in man, this article states that 60-65% of infections are mostly through drinking of raw milk. Diagnosis is based on epidemiological data, clinical picture, guinea pig inoculations and complement fixation test.

Bunin, (1956),[112] states that 2/3 of cases in man are contracted by drinking raw milk. He gives a lengthy description of disease, symptoms treatment et cetera. He also states that the susceptibility of man is generally not great but more frequent in children than in adults. Both Bunin and Yegorov et al mention the presence of eosinophilia. The clinical and epidemiological description given in these two references are practically identical.

Zhdanov and Krichevskiy (1956)[106] in a textbook on Infectious Diseases of Man state that FMD is "transmitted infrequently to man." Diagnosis is based on symptoms and guinea pig inoculations. They mention the three new types of FMD virus recently discovered in Africa. This is the only reference to these types found in the Russian literature reviewed.

Bashenin (1955)[89] devotes 3 pages to this subject in a textbook of Specific Epidemiology. He states: "Incidence in man occurs sporadically." He quotes Bezenkus and Engel (1897) as reporting an epidemic where whole families and villages had been stricken. The disease is seasonal, occurs most often during the summer. And Bashenin states: "This circumstance should be associated with greater possibility of infection in man. This problem has, however, been investigated inadequately, since there is no incidence of FMD in man at the present time and since it was a rare occurrence even in the past."

Shabanov and Kolesnikov (1954)[99], Editors of a Handbook for Surgeons Assistant devote one page to this problem and state that man is mainly affected through drinking cow's milk.

Vyshelesskii and Terent'ev (1954)[98] in a six page article on FMD in the 5th edition of their book, Foot-and-Mouth Disease discuss the susceptibility of different kinds of animals and state: "As experiments have shown, the susceptibility and cases of disease among people are small."

Revo (1956)[81] gives symptoms and course of treatment of the disease in man. Like other reporters on this phase of FMD, he claims that raw milk is the most frequent source of infection in man, but makes no reference to frequency nor to degree of susceptibility of man.

L. S. Ratner (1956)[91] states that: "Humans are little susceptible; but at times of epizootics there have been cases of FMD among adults and somewhat more frequently among children."

S. I. Ratner et al (1956)[80] describe a case of lingering FMD in man which is most unusual. This report covers a case of FMD in a 44-year-old man with unusual symptoms, pathology and extreme length of time during which FMD virus was isolated from the patient. The virus was proven to be type A in guinea pigs by complement fixation tests and by neutralization of A type virus by patient's serum. This is the first case of type A infection in man described in the USSR.

Of interest in the introductory remarks is the reference made to Childs' (Canada) report at the International Veterinary Congress 1953 as indicating that FMD in Canada was traced to a displaced West German dairy worker who had virulent lesions of FMD at the time of coming to the farm in Canada. Such circumstances were never even intimated in the very careful study made by the Canadians on the probable mode of the introduction of FMD virus into Canada.

S. I. Ratner et al conclude:

"1. The analysis of the data in literature shows that the foot-and-mouth disease in men has not yet been studied sufficiently and that the clinic of the disease is not clarified. The number of cases of the foot-and-mouth disease in men which had been mentioned in the press and was confirmed by laboratory methods, is small. Our observations is the fifteenth.

"2. In our patient the infection did occur through a skin injury, this proves that the infection occurs not necessarily through the alimentary canal only.

"3. The duration of the described case turned out to be the longest (as yet mentioned in literature); the preferred localization was the skin.

"4. At the beginning the clinical signs of the manifestation of the foot-and-mouth disease in our patient were just symptoms of a general indisposition (high temperature, general indisposition) with an insignificant development of vesicles on the skin of the nose, cheek, and sole; later, a general indisposition, but normal temperature with periodical eruption of vesicles on the skin of the soles, palms and, partially, of the face, also on the mucous membrane of the intestines; the mucous membrane of the mouth was not affected visibly, salivation too, was not observed. The myocardium was slightly affected and the antitoxic functions of the liver were decreased.

"5. The eruptions on the hands did appear not in the form of blisters, but as little nodules which macroscopically seen did not contain a fluid; they were situated deep in the skin, and did not break off, but resolved and exfoliated (the 'dry' and 'rudimentary' aphthae). It was established by the microscopical examination of the 'dry' aphthae that definite changes of the epidermis and in the subepithelial layer which was destroyed had occurred.

"6. It was the first time that a virus of the type A was isolated in man in the USSR.

"7. No case of carrying the virus for such a long time (not less than 6 months) was mentioned in literature before; besides, the virus was isolated on the 25th and 159th day of the disease from the aphthae of the sole of the right foot; on the 172nd day from the saliva and on the 178th day of the disease - from the saliva, and simultaneously, from the coverings of the dry aphthae of the palm and from the blood and feces.

"8. During our observations and while conducting biological tests, it was found necessary to infect not only guinea pigs, but also six-month* old white mice for the purposes of passaging from them into guinea pigs."

---

* Reviewer's comment: This is probably translator's or typographical error - probably meant 6 day old mice.

That there have been human cases of FMD in the USSR is strongly indicated in the literature reviewed. However, no figures of any sort were encountered of the reported or proven FMD infections in man except for those given by S. I. Ratner et al (1956)[80] as quoted above, in which he states in his experience he has knowledge of 15 proven cases. The case described by S. I. Ratner is an extremely unusual one. This infection was proven by animal inoculations and serologic tests to have been caused by Type A FMD virus. In general Soviet authors agree that man is slightly susceptible to FMD. Bashenin (1955)[89] as above noted states that there were no human cases known at the time and that they had been rare in the past.

In countries other than USSR, human cases of FMD occurred very rarely, despite the extensive exposure to infections in many parts of the world. Shahan and Traum (1958)* state the situation as follows:

> "Very few cases of FMD in man have been authenticated, and it has never become a public health problem except as the disease in animals may affect food supplies (milk and meat); it is mentioned here, however, because of its wide distribution and persistence in animals in Africa, Asia, Europe, and South America.
>
> "Although there has been a total of nine outbreaks of FMD in the United States, some very widespread, there is not one recorded, proved instance of the disease in man in this country. Vetterlein** has recently reviewed critically the cases reported from 1926 to 1954. He accepts a total of 21 cases as having been appropriately proved."

Of interest in this connection are 2 recently published writings on this subject. Röhrer and Pyl (1958)*** of Riems Institute give a list of the reported proven cases of human FMD infections and refer to Vetterlein's more recent investigations. Röhrer and Pyl refer to the facts that at the Riems Institute in the past 50 years a large number of employees have been exposed to massive FMD infection and only two proven cases have been diagnosed. At this institute, Vetterlein recently performed serum neutralization tests on the serums of 34 employees who, almost daily for many years, had been exposed to massive FMD infection. He determined measurable amounts of neutralizing titres in the serums of 5 individuals by use of suckling mice but could not demonstrate this when he used the less susceptible guinea pigs in the tests. More recently, Michelson and Suhr-Rasmussen (1959)**** report a proved case of FMD infection in a 44-year-old woman who has been employed at the State Veterinary Institute for Virus Research on Lindholm Island, Denmark. All through her employment she has had an almost daily contact with infected animals (facial mask and gloves not worn). This is the second case of proved human FMD infection in Denmark.

* Shahan, M. S. and J. Traum 1958 Exotic Zoonoses. Annals of the N. Y. Academy of Sciences, 70:614-623.

** Vetterlein, W. 1954 Das Klinische Bild der Maul- und Klauenseuche beim Menschen, aufgestellt aus den bisher experimentell gesicherten Erkrankungen. Arch. Exptl. Vet. Med., 8:540-564.

*** Rohrer, H. and G. Pyl 1958 Das Maul- und Klauenseuche Virus. Handbuch der Virus-Forschung, 4:395-396. Springer-Verlag-Vienna.

**** Michelsen, N. and E. Suhr-Rasmussen 1959 A verified case of FMD in man. Soertrk af for Loeger, 121(3); 1-17, gide 98-100

These above contain further lists of references on this subject for those who may be especially interested in human infections with FMD virus.

6B(2)(a-j). SUPPLEMENT

1. L. S. Ratner (1956)[91]

"The epizootic nature of the sickness is largely determined by its specific pathogenesis and biological characteristics of the agent. The spread of the contagion is determined by the fact that the aphthous vesicles concentrate in the oral cavity and external coverings: lips, nose, coronary band above the hoof, skin between the claws of the feet, udder, teats. These foci of the disease's localization are in turn most frequently exposed to manifold mechanical action, such as friction, pressure, or squeezing, whenever the animal is in vitally necessary contact with its environment -- obtaining food, eating, ruminating, moving about, being milked or suckling its young. All this as a rule causes mechanical action which crushes the vesicles; they rupture, and the highly virulent lymph they contain then freely escapes.

"This means that at the time when the infection is particularly severe the sick animal ejects into its environment an enormous amount of virulent matter which directly contaminates all surroundings and everything which comes into some kind of contact with the affected animal. It is not exaggerated to say that no other known infectious disease of animals entails intrusion into the environment of as many contaminating elements. The aforementioned specific localization of the vesicles greatly favors free escape of the virus and renders quite simple the mechanism of infection transmission from the affected to the healthy animal through direct and indirect contact. This in most instances explains the epizootic nature of the disease.

"Direct contact of animals affected by the foot and mouth disease with the mass of susceptible animals is of primary importance in the epizootic spread of the infection. The broader and the more frequent such contact, the more numerous will be the sources of contamination and the more intensively will the disease spread. As the infection takes its normal course, contamination through contact will occur wherever sick animals are kept together with susceptible healthy ones--be it in stables, at pasture, in outside pens--or when cattle are driven or shipped at a distance.

"In addition to contact, infection in places already affected by the disease spreads in other ways, too. As they secrete huge quantities of virus, sick animals infest pastures, watering places, and stopping places for animals in transport. This creates secondary sources of infection. When kept in stables, sick animals spread the virus over the stockyards, troughs, tending utensils, clothing and footwear of servicing personnel, etc. Saturated with virus to a greater or lesser degree, the sick animals' surroundings in their entirety become a virus reservoir and a potential source of infection.

"Another important source of infection is in non-immunized (reviewer's note - probably means non-pasteurized) milk and dairy products, especially milk fed to growing animals, as well as in meat products and animal raw materials from animals slaughtered during the acute stage of the disease.

Virus-infested milk vessels and packing materials may well foster transmission of the infection from one enterprise to another."

2. L. S. Ratner (1956)[91]

"Experiments have proved long-term preservation of active virus in staple feed. In particular, V. I. Kindyakov has established that virus-infected hay in stacks remained contagious for a month in summertime, and for 185 to 200 days in fall and winter. As far as we can tell, several flareups of the disease in Leningrad province in April, 1932 were due to staple fodder from an affected locality in Kazakhstan. In everyday life, the disease quite frequently gets from affected to imperiled places with infected bunches of hay or straw used as litter in carts or sleds. Neither must one rule out the possibility of contamination through infected concentrated and mineral feed (oil-cakes, mash, ground bone) or packing materials."

3. M. V. Revo (1955)[81]

"In particular, detailed investigation of the survival of the agent in manure at different times of the year was carried out in Kazakhstan by V. I. Kindyakov. He found that the virus remained contagious in manure through 29 to 33 days in summertime, and through 156 to 168 days--in freezing or frozen manure--in wintertime. Introduction of the disease into suburban farming establishments through manure delivered as fertilizer from the loading platforms of a meatpacking kombinat was recorded at different times by G. S. Savel'yev and B. V. Polikarpov.

"In terms of epizootics spread, occurrence of the foot and mouth disease among animals other than bovines--especially among sheep and goats--may assume great importance in some of the animal-breeding zones, particularly regions in which the prevalent usage is to drive the flocks off to pasture for an extended period of time. Inception of the disease in sheep and goats seems to be traceable to their having for some time shared quarters with sick cattle. Subsequently, as the epizootic spreads, there may be expected wide-range mutual contamination of bovines, caprines and ovines.

"Driven over long distances, flocks of sheep stricken by the foot and mouth disease contaminate cattle-droving trails, watering places, pasture tracts, and the area of human settlements along the trail. This renders possible the spread of infection to other susceptible species, and opens up new foci of infection within a considerable territory."

4. M. V. Revo (1955)[81]

"The significance of the water bodies as a reservoir of FMD infection was not studied sufficiently. There are experimental data indicating that in fresh water the virus can be preserved for 40 days and in salt water, for 100 days (A. L. Skomorokhov).

"However, A. L. Skomorokhov considers that the data obtained during laboratory tests are not ready yet 'for publication at-large and for the announcement that in rivers and lakes the virus remains virulent for a special time.'"

"During one of the expeditions of collaborators of the former Foot-and-Mouth Disease Institute (K. A. Popova, V. V. Krasovskii and S. D. Ovsiannikov) headed by Professor A. L. Skomorokhov, the scientists became convinced that rivers infected with the FMD virus, 'are not a factor of the FMD virus dissemination through the water.' However, the question of the significance of water bodies as an epizootiological factor must be studied thoroughly."

---

5. A. L. Skomorokhov (1956)[84]

"The data concerning the spread of the foot-and-mouth disease virus through the water of rivers and lakes, are contradictory. It is more likely to assume that the water of open water bodies, such as of rivers and lakes, is not significant in the epizootiology of the virus of the foot-and-mouth disease. However, one should not neglect the information given by G. F. Bondarenko who, during epizootics of the foot-and-mouth disease, had observed cases of the foot-and-mouth disease in herds which grazed along ~~the~~ D. A river. The first case of foot-and-mouth disease was registered in a herd which grazed 2 kilometers downstream from the point infected with the foot-and-mouth disease. Thereafter, other cases of infection of healthy herds located on different places down the river were established. The infection with the foot-and-mouth disease of another healthy herd which was located 12 kilometers downstream of the infected point was registered. However, it must be taken into consideration that, at the time when the outbreak of the foot-and-mouth disease has started in the herds grazing along the river, (infected) many cadavers of calves and goats which had died of the malignant form of the disease were thrown into the river. At the autopsy and examination of these cadavers which were taken out of the river, specific foot-and-mouth disease lesions were established. Evidently, these cadavers infected with the foot-and-mouth disease, were the cause of the spread of the disease down the river."

---

6. A. Veckenstedt (1956)[108]

"Frenkel (8) who examined the methods of Silber and Wostruchowa (32) in regard to their applicability for the breeding of the foot-and-mouth disease virus, had negative results during his experiments with torula kephir and saccharomyces fragilis.

"During the examinations of the tenacity which, unfortunately, had to be terminated prematurely, it was established that plankton, sea water and the phosphate buffer could always be used for infection up to the end of the duration of the storage, on the 15th day.

"This partial result which deviates essentially from the results of the examinations made during the summer, can probably also be explained by the conserving influence of lower temperatures (Gildemeister, Haagen and Waldmann(8)).

"Consequently, the assumption suggests itself that the planktic microorganisms ~~soaring~~ in the water favor the preservation of the virus activity in some way or other.

"Summing up it can be said that at the meeting of the foot-and-mouth disease virus with plankton there is a connection between the two components which brings about a preservation of the virus which is probably dependent upon the temperature. This result agrees with the pertinent information given by Lichatschew and others (22). 'On the resistance of the foot-and-mouth disease virus which is coupled to bacteria'. A multiplication of virus was not ascertained. The term 'symbiosis' which was chosen by Poppe and Busch (25) and a number of other above mentioned authors, for the connection between virus and microorganisms cannot be used for the results before us because of the definition of this term.

"In concluding it may be pointed out that the results of the model experiments cannot be applied to natural conditions without reservation. In spite of this it must be assumed that with the meeting of certain factors as

1. Sufficient plankton
2. Free virus which is no longer bound to the housing cells
3. Water currents or winds coming from the same direction inducing a surface current,

can bring about an occasional spread of foot-and-mouth disease virus through plankton as a 'vector' over relatively long distances."

---

7. S. I. Voinov (1955)[72a]

"In our experiment we succeeded in isolating the virus in young cattle affected by the foot-and-mouth disease following their experimental inoculation, and in provoking disease in large and in laboratory animals not immune to this infection - in the blood after 15, 24, 48, 72 and 96 hours from the time of artificial inoculation, in urine - 15 hours after the appearance of clinical symptoms of the disease; the virus was not found in excrements.

"In subsequent examinations of the specimens indicated, the virus was not found within 103 days from the moment the artificial inoculation took place. The total number of animals used in the experiments was 148 head of cattle and 28 guinea pigs."

Voinov also reports study of field observations as follows:

"Joint maintenance for a period of 3-5 months of 6,284 head of cattle recovered from the foot-and-mouth disease and of 508 head which had not been sick, brought together in different districts 30-40 days after recovery, produced no foot-and-mouth infection in nonimmune animals."

---

8. N. N. Gizitdinov (1956)[71]

"In connection with this, we consider it being necessary to introduce an amendment in the instructions on the fight against the foot-and-mouth disease and to adopt the following form:

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

"1. It is permitted, for breeding and utilization purposes, to take out animals which have had the foot-and-mouth disease from farms formerly infected with the foot-and-mouth disease virus, but freed of the ban of quarantine, and to bring the animals into healthy farms which are not infected with the foot-and-mouth disease, and also to sell these animals on markets for slaughter and beef. 2. Prior to the bringing in and taking out of the cattle for the mentioned purposes, the animals must be subjected to a most careful mechanical cleaning and scrubbing of the hoofs with a following disinfection of the furry coverings and hoofs by specific disinfectional means and that under obligatory SUPERVISION OF THE MAIN VETERINARY SURGEON OF THE RAION, regardless of the fact that the preliminary disinfectional treatment of the skin coverings of the animals had taken place prior to the freeing of the farm of the ban of quarantine."

---

9. A. A. Sviridov (1953)[46a]

"1. In certain cases the cause of the emergence of foot and mouth disease is the introduction into the herd of virus-carriers..(illegible).. the animals which have ailed with foot and mouth disease 4-6 months ago.

"2. For the purposes of prevention of cases of mechanical importation of foot and mouth disease by virus-carriers, necessary is a careful processing of hides and hoofs of recovered animals after the lifting of quarantine, in taking out or mixing the recovered animals with the healthy, particularly if the epizootic ran in winter time."

---

10. A. A. Poliakov (1953)[40]

"But can a farm, in which foot and mouth has been liquidated, be left without supervision and without subsequent conduct or sanitary improvement measures?

"The numerous experiments and observations have established that the recovered animals remain virus carriers for a long time, and periodically, together with urine, saliva and feces, discharge the virus into the environment.

"Thus, A. L. Skomorokhov reports that foot and mouth was imported into a farm by animals which three months previously were under the experiment on the study of foot and mouth.

"In another case foot and mouth was imported into a farm by the animals which have had foot and mouth in 28-139 days after the lifting of the quarantine.

"An outbreak of foot and mouth was observed on a farm after 2 heads of cattle were brought into it, which 8 months previously have had foot and mouth.

"Skomorokhov notes 408 outbreaks of foot-and-mouth in Western Europe from 1919 to 1923, the cause of which were virus-carriers... Further study of this problem will, evidently, produce the opportunity to have clearer views on this question. However, despite the apparent failure to prove the virus-carraige in foot and mouth, the danger of virus-carriers as a source of the infection must be taken into account."

---

11. M. V. Revo (1956)[81]

"Migzhe and Marks (both names transliterated)* reported on FMD outbreak in Ostered (England) which was due to the infection transmitted by a bull which had had FMD 2½ years ago and was transferred to the mentioned locality.

"In England were observed cases of virus transmission by animals 8, 6 and 4 months after their recovery.

"Experiments and studies of virus transmission were conducted at the Alfort Higher Veterinary School of France in 1926. The obtained results were negative (it was not established that cattle which had had the disease are virus carriers).

"A. L. Skomorokhov indicates that according to his personal observation 'the conclusion is, that the fact exists that the FMD virus can be carried and transmitted and that this was proved by practical observations. However, this period is short (not over 2 or 3 months) and not all animals are virus carriers and virus dischargers.'"

---

* Reviewer's note: This may mean Manninger and Marek.

6B(3). Clinical and Pathological Picture

6B(3)(a). Symptomatology and course of the disease

The basic symptoms and course of FMD in susceptible animals, particularly cattle, is similar, as described in the Russian literature (Vyshelesskii and Terent'ev (1954)[98]; Skomorokhov (1952)[27], (1956)[84]) to descriptions given by Western authorities. The incubation period varies under field conditions from 2 to 7 days, although extremes of 14-21 days are reported (Vyshelesskii and Terent'ev (1954)[98], Bunin (1956)[112], Skomorokhov (1956)[84]) while under controlled experimental conditions the period is usually 2 to 4 days. The majority of Soviet writers agree that the differences in incubation period are due to a variety of factors including virulence of the virus, route of inoculation and individual susceptibility. In cattle, attention is drawn to the formation of vesicles on the mucous membrane of the oral cavity and the subsequent spread of the virus via the blood stream to other parts of the body with the formation of aphthae on the coronary band, feet and lastly the udder (Vyshelesskii and Terent'ev (1954)[98]).

The disease in karakul sheep is described by Novaev (1955)[104] wherein he notes that while these animals become lame, aphthous lesions are very rarely found on the coronary band. Lesions elsewhere are similar to those noted in cattle, the appearance of mouth lesions being very common. Vagin (1953)[39] describes the disease in sheep and goats and notes that lesions are usually mild in older animals with occasional deaths in the younger group. It was also pointed out that foot lesions were rather late among both sheep and goats.

All writers stress the debilitating effects of the febrile period, the reduced milk flow and the losses experienced by the production of an "unthrifty" animal.

6B(3)(b). Pathologico-anatomical changes

The majority of the reports on the changes, both gross and microscopic, are very similar to those in the western literature. There are very few references to systematic or detailed pathologico-anatomical studies. Akulev (1955)[64] described a study of the pathologic changes in rabbits, wherein animals were sacrificed at various time intervals after inoculation. No references were made by this author to similar work done many years before in England. The lack of illustrative material does not permit a critique of this particular work but it is noteworthy that lesions of one type or another were found in almost every organ examined including, muscle, skin, visceral organs, cerebral and peripheral nervous system. The majority of these lesions were rather vague, although typical of infectious processes excepting for those in the striated muscles.

L. S. Ratner et al (1955)[65] inoculated young rabbits, subcutaneously with filtered virus containing blood and produced symptoms of rapidly progressive paralysis which started from the front part of the body. Specific aphthous affections on the extremeties and in the mouth were not observed in the rabbits. There was a general picture of sepsis with predominent affection of the cardiac and skeletal muscles. For more detail from L. S. Ratner et al refer to Item #8 in the supplement to section 6D(6&7).

Considerable work appears to have been done on the malignant form of the disease. Shubin (1957)[124], Liapustin and Preobrazhenskii (1956)[90] describe the histological changes in cardiac muscle as well as electrocardiagraphic studies of the heart. Their findings are similar to those of the western investigators. In general it does not appear that the available Soviet literature had contributed significantly to our knowledge of either the general clinical syndrome, or of the histopathology of FMD.

6B(3)(c). Malignant FMD

Considerable attention is devoted to so-called malignant FMD. Both Vyshelesskii and Terent'ev (1954)[98] and Skomorokhov (1952)[27] place the losses in cattle from this form as high as 50 per cent of infected animals. It is generally believed that this is a particularly virulent form of the virus, which adversely affects the myocardium, skeletal muscle, small blood vessels and occasionally the central nervous system. According to Bondarneko (1956)[76], this form of the disease is particularly severe in goats causing up to 100 per cent mortality. The histological and clinical findings have been described in detail by Meshkov and Kochetova (1954)[59] and by Plotnikov (1951)[22]. These findings are similar to those reported by western writers. A clinical syndrome known as cardiac asthma in cattle has been described by Masiukov (1957)[120] wherein he believes that animals recovered from FMD are more susceptible to sarcosporidiosis and that the relative increase in the amounts of sarcocystin thus produced is responsible for the caridac condition. Some Soviet writers believe that a virus "toxin" is responsible for the profound changes in the myocardium (Skomorokhov (1956)[84]). Vomiting in cattle is described by Bondarenko (1956)[76] beginning on the 4th to 7th day, and is usually accompanied by fever and marked cardiac changes indicated by arrythmia, tachycardia and a rise in arterial pressure. The arrythmias appear to be of the blockade type which if not treated may lead to cardiac failure. In keeping with the above syndrome, respiratory distress is frequent and clinically embarrassing. Hemorrhages in and along the mucous membranes of the intestinal tract leading to the production of blood clots in the fecal masses are not uncommon. Abortions during the last stages of pregnancy are common, and in some cases aphthae have been found on aborted feti indicating intrauterine passage of the virus.

6B(3)(d). Complications

Complications of the disease are similar to those described by western writers. Thus Aliverdiev (1952)[34] warns against secondary bacterial infections, particularly pyogenic organisms and anaerobes. Peterson (1957)[122] examined some 2,893 head of cattle suffering from FMD and established 9 types of complications in 18 per cent of the cattle. Both Aliverdiev (1952)[34] and Malinin (1956)[73] recommend good hygiene, nutritious food and local disinfection of the foot as the best means to minimize the effects of secondary infections.

6B(3)(e). Atypical and abortive forms of FMD

The Soviet literature does take note of so-called atpyical forms of FMD (Skomorokhov (1952)[27]. The majority of cases reviewed are clinical descriptions which are not typical of classical FMD. By the same token, however, no valid proof is offered to show that these were actual cases of FMD, so that these reports are of doubtful value.

6C(1)(2)(3)(5). Control and Eradication of FMD*

Information on the control of FMD in the USSR was found in a variety of articles reviewed, but principally in (1) those covering the general subject of FMD in text or reference books or in special articles on this disease (19, 21, 27, 81, 84, 91, 98). The contents of these would naturally prepare the reader for the control measures. (2) In this group are articles devoted primarily to control measures. These, in most cases, contained a brief characterization of the disease, symptoms, lesions and enough of epizootiology and some on the FMD virus to explain the reasons and objects for the various rules, methods and procedures carried out in control work (19, 40, 79, 101, 102, 103, 107, 117, 133). The effects of certain physical and chemical influences on the longevity, activity and destruction of the virus are discussed.

Some of the second group of articles go into considerable and elaborate detail. From some of these type of article (40, 101, 102, 103, 117) a great deal of the portions treating specifically with control measures have been quoted in detail either in the body of the review, or in supplement to this subdivision. This will give the reader a rather comprehensive idea of the measures used in preventing, controlling and eradication disease in the USSR.

Excerpts or summaries from other articles, other than those listed above, are given for additional Soviet thoughts, opinion and comments on control measures.

From the Soviet literature discussed or quoted in the review or in the supplement, it will be learned that very strict regulations and orders are put in force on quarantines which restrict and regulate the movement of people, animals, dairy products and other farm crops. These orders also prescribe thorough cleaning, decontamination and disinfection.

The Soviets appear to place considerable stress on treatment and isolation of the infected from the apparently non-infected animal on the farm or premises. They appear to recommend almost constant disinfection in the barns while the disease is active. Communities, especially those concerned with livestock or products from livestock are warned to be prepared to rapidly become organized to participate in the struggle against the ravishes of this disease.

In methods of control and eradication, aside from those referred to above, convalescent or hyperimmune serum has been used and is still recommended in certain situations in practically all of the articles listed above. Artificial infection with the virus current on the premises or areas has been and may still be used in some instances, at least it is referred to in rather recent publications, in what appear to be official recommendations (Goloshchapov and Poliakov (1954)[103]). It is however, in bad repute by many of the leading Soviet teachers and research workers of FMD.

---

*To facilitate reporting the review and close connection between, these were included under one heading, instead of four (1,2,3,5). To do otherwise would cause much more repetition than is already presented.

L. S. Ratner (1956)[91], Vysheleesskii and Terent'ev (1954)[98] refer to the serum-virus inoculations. The latter gives details of the procedure.

These biological measures are being more or less supplanted by compulsory vaccination, probably with the VIEV vaccine since it appears to be the official one.

The slaughter or stamping-out method as practiced in the US, Great Britain and in part in some other western countries, may not fit in well and may not be suitable for the present state of Soviet livestock and economic and political organization and plans.

Poliakov (1953)[40] is somewhat prejudiced and incorrect when he states:

"Thus the general slaughter of foot and mouth-ill animals, as well as those suspicious and even doubtful with respect to the illness, in the liquidation of foot and mouth in the USA in 1914-1925 and in Mexico in 1947, did not produce results. Hundreds of thousands head of cattle and small cattle and sheep, killed during the period of the foot and mouth epizootic, did not stop the spread of the infection in these countries but merely temporarily concealed its turbulent development.

"The capitalist system of farm management does not allow planned fight against this disease; on the contrary, it incites private owners to hide valuable animals from slaughter, to conduct illegal trade in cattle and in other goods and products in the quarantined zone, to violation of the quarantine in those cases when the owners of railroads or trucking firms are suffering losses from quarantines."

In the above, Poliakov makes it appear that 1914-1925 were the years of one continuous siege of FMD in the US. Revo (1956)[81] refers to the slaughter method in a somewhat similar attitude. L. S. Ratner(1956)[91] on the other hand is much calmer in his comment on the stamping-out method.

"... Essential in this direction is the removal and neutralization of primary sources of infection, i.e. sick animals.

"In a number of countries this task is accomplished by the slaughter and destruction of all sick and possibly infected animals (America, England, and partly Switzerland); the alternative is the most rigorous isolation of such animals, as practised in most European countries, including USSR. While mandatory slaughtering in the event of foot and mouth disease is not imposed by the veterinary legislation of the USSR, such extreme measures can and must be applied in fighting epizootics. Slaughter may be advisable in particular when the disease, in a notoriously free district, strikes low-yield cattle or animals especially bred and fattened for human consumption. Isolation of sick or possibly infected animals of course is mandatory everywhere in any case."

Whether or not the stamping-out method has been resorted to in the USSR was not learned from the literature received. There is some reference in the instructions on handling meat and by-products from emergency slaughtered animals.

In further reference to use of biological agents in the control of FMD it should be stated that while L.S. Ratner(1956)[91] favored the use of serums and even deplored the failure of the responsible Soviet agencies to furnish hyperimmune serum, he nevertheless realized the limitation and in certain situations the disadvantages of serums in the control program. Thus he states:

"Although the problem of highly active serum fully suitable for practical use has long been solved by both Soviet and foreign students, we have not so far been able to set afoot industrial manufacture of such a serum for daily veterinary practice. In this regard our veterinary-biology industry still has a debt to pay off to veterinary practice.

"In the operational conduct of the fight against the foot and mouth disease convalescent serum and blood must be used for the passive immunization of young and high-yield adult animals in the foci of infection and in affected localities. This will make it possible to eliminate in workaday veterinary operations the obsolete technique of artificial infection by natural virus, which is unacceptable in modern animal-breeding. It is also highly advisable to set up passive immunization of livestock in danger of infection in driving, shipment, or temporary midway quarters.

"However great their practical value, these specific prevention devices are not without considerable flaws, viz., high inoculation dosage and short-lived effectiveness (10 to 14 days). This limits application in imperiled places, where longer-lasting effectiveness of preventive inoculation is required. Such shortcomings obstruct wide-range use of serum prophylaxis as a radical means of combatting the foot and mouth disease."

Reporting of outbreaks and organizing to combat them are referred to and discussed in articles mentioned in the introduction to this chapter. Instructions for control of FMD as approved by the main veterinary administration of the USSR People's Commissariat of Agriculture on July 28, 1943 and supplemented October 7, 1944, and which were in effect in 1954, and as far as could be learned are still in effect. Goloshchapov and Poliakov (1954)[101] present the following on organization and reporting.

"Veterinary workers, zootechnicians, leaders of agricultural organs, presidents of kolkhozes and sovkhozes are obliged to inform the population of kolkhozes and sovkhozes about the basic symptoms of the diseases and to acquaint them with the control measures for its eradication.

"The leaders of the farms, as the presidents of kolkhozes and the directors of sovkhozes are responsible for the fulfilment and carrying out of the complex of anti-foot-and-mouth disease control measures which are mentioned in the present instructions and enforced by the local Soviet organs. The veterinary worker who is in charge of the service of a populated point of a separate farm, is responsible for the proper organization of the control measures leading to a rapid eradication of the foot-and-mouth disease and serving as a daily control.

"When conducting prophylactic and anti-foot-and-mouth disease control measures on infected farms, the compulsory regulations must be followed.

"In case one of the mentioned characteristic symptoms of the disease appears, the leaders of kolkhozes, sovkhozes, slaughteries, cattle bases, of fattening points and other farms where animals susceptible to foot-and-mouth disease are kept, as well as the owners of animals in private use, must immediately inform by telephone, telegraph or by a special messenger the nearest veterinary surgeon or veterinary fel'dsher who makes the final diagnosis; prior to their arrival, the following restrictive measures have to be carried out:"

Further information on reporting and organizing is from Ampiteatrov's (1956)[117] article.

"As soon as FMD is established, all possible ways of its transmission from the primary infection focus must be excluded. In order to fulfill this task, the President of the Rural Council, the farm leaders and the whole population of the respective point must be engaged in the fight.

"The veterinary specialist reports the case to the Main Veterinary Surgeon of the Raion (city), imposes quarantine restrictions, determines the group of infected animals (herd, farm, flock, cattle base) and subjects them to strict isolation. He also orders the separate maintenance of cattle, swine, sheep, and goats and carries out other measures prescribed by the instructions.

"After the obtaining of the report, the Main Veterinary Surgeon of the Raion organizes in the raion anti-FMD measures immediately; he reports the FMD outbreak to the Executive Committee of the Raion (city) Council of Working People's Deputies, the Head of the Anti-FMD Disinfectional Detachment, to the Veterinary Department of the Oblast'(Krai) Agricultural Administration or the Veterinary Administration of the Ministry of Agriculture of the Republic, to the Executive Committees of the neighboring raions, to the Transport Veterinary Supervision and to the Raion Department of Health Protection.

"The main Veterinary Surgeon of the Raion consults the President of the Raion Executive Committee concerning the organization of a Raion Commission for the Fight against FMD.

"The Raion Commission must leave immediately for the primary focus of infection and participate in the organization of quarantine measures."

and in another portion of his paper Ampiteatrov states:

"Furthermore besides the mentioned measures on eradication of FMD, vaccination with the anti-FMD vaccine of cattle must be carried out."

Details of rules, instructions and methods of applying these, which are concerned with restrictions, prohibitions of movements of farm animals, human beings, dairy, livestock and other farm products and equipment, and the management of quarantines, the methods of cleaning and disinfections, are given in detail in the several supplements to this section.

At this point are presented brief statements, discussion and comment on quarantine, disinfectants in general and decontamination of infected hides and manure.

The use of Military in control work has been mentioned only by L. S. Ratner (1956)[91] when he states: "Militia personnel should be enlisted for guard duty at the most important check points as civilian volunteers are not always up to the task."

Quarantine:

The veterinarian or the veterinary assistant (fel'dsher) in cooperation with the farm leaders determines the borders of the territory to be quarantined and the borders of exposed (most often referred to as menaced) area. Animals which come in contact with infected animals as in pasture or at work must be considered as infected for the purpose of quarantine. Quarantines are lifted 14 days after complete recovery of the infected animals (Bedenashvili (1950)[19]. The veterinarian and the farm leaders examine the condition of the premises and final disinfection and compliance with all the veterinary sanitary measures, which include among other details the decontamination by disinfection or boiling of clothing, footwear of the caretakers and veterinary personnel and the cleaning and treatment of animals' skin and feet with 1% NaOH or 1% formalin. They then prepare a statement (translator referred to it as a deed) for presentation to the chief veterinarian of the raion department of agriculture, to be submitted by him to the executive committee to "formalize" the lifting of the quarantine.

For a period of three months after the lifting of the quarantine certain restrictions are in force on previously quarantined places, principal among these are that when animals are to be added to the previously infected herd they should be placed in prophylactic isolation and that no previously infected animal is to be removed to previously non-infected areas for utilization or breeding purposes. Prophylactic disinfection is to be done at regular intervals.

Disinfectants:

Sodium hydroxide 2%, potassium hydroxide 2-3%, and formalin 1% are the agents recommended in all the Soviet articles where disinfectants are discussed. Thus Skomorokhov (1956)[84] states: "Best results were obtained with alkali hydroxide and formalin. According to the data of Soviet researchers, 2% solutions of sodium hydroxide and potassium hydroxide decontaminate for sure the virus of FMD. (S. D. Ovsiannikov, L. S. Ratner and E. E. Toniks). Formalin also possesses reliable decontaminating properties if applied in a 1-2% solution (S. D. Ovsiannikov and others)." Articles by Bedenashvili (1950)[19], L.S. Ratner (1956)[91] and others also emphasize 2% sodium hydroxide, 2-3% potassium hydroxide and 1% formalin. Several mention additional disinfectants. Poliakov (1953)[40] speaks of calcium hypochlorite, containing 2% active chlorine. Sodium carbonate, generally in 5% solution is referred to and recommended by Revo (1956)[81] and others. While this agent has been used in several Western countries including US and Great Britain especially for decontaminating automobiles and other vehicles and equipment and for shoes and boots at quarantine stations, its value has not been satisfactorily proven and at present is not considered by many as a satisfactory disinfectant for FMD.

Apparently there have been places and times when the above recommended solutions were not readily available. Substitutes have been suggested. L.S. Ratner (1956)[91] states: "In emergencies locally available substances with some disinfectant properties may be used as substitutes. Milk of lime (1 part freshly slaked lime and 2 parts of water); hot diluted soda ash, peat ash thrown in thin layers over contaminated surfaces and sprinkled with water." Bedenashvili (1950)[19] states: "There are many disinfectants, but in order that FMD virus be quickly and reliably neutralized, a 2% solution of NaOH or 3.5% solution of potassium hydroxide, or 1 per cent solution of formalin should be used. If there are no above mentioned disinfectants, then disinfection may be carried on by solutions of milk of lime, or 3 per cent solution of creolin, by hot lye solution etc." (What is meant by hot lye?).

Decontamination of Hides:

Revo (1956)[81] refers to Belagorskii's recommendation for the disinfection of hides of animals: "For the immersion specifically, brine solution with 0.1 to 0.2% of sodium dioxide, or with a o.5% solution of bisulfate, or a 5% solution of sodium carbonate." (From the bibliography in Skomorokhov (1952)[27] it is evident that this recommendation is contained in "Instructions No. 177119 of the Central Veterinary Administration" dated Oct 1938). Brief, direct criticism of this method is contained in Item #1, supplement to this section by Rumiantsev (1955)[72]. L. S. Ratner (1956)[91] states: "Hides are disinfected by brine with addition of disinfectants (.1 to .2 caustic sodium, .5 per cent bisulphite of sodium, or 5 per cent calcinated soda). A simpler and quite practical procedure recently suggested by T. S. Lavrova offers the advantage of combining disinfection with dry-salt preservative treatment of spread-out hides; dry calcinated soda at the rate of 5 per cent or dry silicofluoride at the rate of 2.8 per cent is added as a disinfectant to the salt used for conservation (percentages of rawhide weight)." More details on the use of silicofluoride with dry salting of hides is contained in the supplement, Item #2, (Luchin and Kuz'mina (1955)[105]) which apparently has the sanction for official in control measures.

Rumyantsev (1955)[72], (1955)[82a] describes an effective decontamination of hides with 1% copper sulfate which appears to be effective, easy to apply and can be done under the simplest conditions. Rumyantsev gives experimental data, and from this work he concludes:

"A 0.1% aqueous solution of copper sulfate inactivates the virus within 24 hours when its influence is exerted directly upon a lymphatic* and aphthoid* virus of the foot-and-mouth disease at a plus 12 degrees room temperature.

"1% and 2% copper sulfate solutions inactivate it in 2 hours when their influence is exerted directly upon the foot-and-mouth virus (lumph and aphthae) at a plus 12 degrees room temperature.

"A 1% copper sulfate solution inactivates the virus of the foot and mouth disease of large horned cattle when applied as a disinfectant to the surface of hides infected with the foot-and-mouth virus, at a six hour exposure and a plus 10-12 degrees room temperature.

"1% and 2% solutions of copper sulfate exerting their action under conditions of lower temperatures (from minus 10 degrees to minus 23 degrees) fail to destroy the foot-and-mouth virus.

"A 1% copper sulfate solution exerts no negative influence upon the quality of hides disinfected with it.

"The use of a 1% copper sulfate solution to disinfect hides infected by the foot-and-mouth disease requires no special technical devices. The solution can be applied in any room with a temperature not below plus 10 degrees, and answering sanitary requirements.

"The copper sulfate solution used to disinfect raw hides infected by the foot-and-mouth disease requires no subsequent neutralization.

"The copper sulfate method which we are proposing for the disinfection of raw hides infected by the foot-and-mouth disease reduces many times the expenditures involved in the disinfection process as compared with existing methods.

"The copper sulfate solution used to disinfect raw hides is harmless for the individuals who perform the disinfection."

This same article by Rumyantsev (1955)[72] contains some pertinent information regarding other methods referred to above. For this information refer to Item #1 in the supplement to this section.

Decontamination of Manure:

Manure is decontaminated by the Biothermal Method (composting). It is discussed in practically every reference on control in the Soviet literature reviewed. Most of the papers in general contain the same sort of details of this method and Poliakov (1953)[40] is representative of these descriptions.

* Author probably refers to vesicle fluid (lymph) and covering.

"The manure in foot and mouth unsafe farms may serve as a source of the infection if it is not subjected to neutralization. The only rational method of neutralization of manure is the biothermal method. The effect from the employment of the biothermal method of manure neutralization can be expected only when the stacking of manure into piles has been carried out in fulfillment of all the regulations stipulated by the instructions of the USSR Ministry of Agriculture.

"For the piling of manure, an area should be set aside at a distance of 100-200 meters from homes and animal quarters, from water reservoirs and wells and without slopes on the approaches to it.

"On this site is set up a special platform suitable for accomodating all the manure of a stall or a cattle yard.

"In summer in the manure, piled up into a heap, the neutralization of the foot and mouth virus is complete towards the end of one month; in winter the neutralization is much more difficult to achieve. Low air temperatures in poorly stacked manure heaps retard the biothermal process.

"Kindiakov, placing the material, contaminated with foot and mouth, into frozen manure which had been piled up into a heap, obtained its neutralization only after one month after the onset of heating, when the manure was thawing out and biothermal processes began.

"The foot and mouth virus in Kindiakov's experiments, laid in winter, died in manure heaps at various depths within 136 to 154 days in the first experiment, and in the second — within 134-168 days.

"Hence it follows that the heap containing frozen manure should be kept another month after it starts warming up. However, the heap containing warm manure with a thick covering of straw, peat or even burnt out manure at 25-30 cm, supplemented with sand by 20-25cm, may be considered neutralized after one month only in the case, if an increase in temperature to 60-75 is observed in it."

L.S. Rather (1956)[91] refers to other methods when, in some instances, the Biothermal Method is not applicable. He states: "Epizootic conditions sometimes make it necessary to inter contaminated manure or to burn it: the latter way is doubtless the most effective way of destroying the virus outside of the animal organism."

6C(4). Diagnosis

All Soviet authors naturally realize and emphasize the importance of early diagnosis. The official diagnosis is made by the veterinarian serving the political subdivision or unit. Practically all references to and discussion of diagnosis in the Soviet literature point to the clinical picture and to the epizootiologic course of the infection as sufficient guidance in establishing a diagnosis of FMD. Other countries also depend to a great extent on the clinical and epizootiologic picture in establishing diagnosis but they use animal inoculation and especially serologic tests, mainly complement fixation (CF) for identifying and typing the virus and/or serum neutralization tests in diagnosing the disease and identifying and typing the virus. The use of serologic test to determine the type of virus is especially essential in countries where vaccine is used. Few Soviet authors include animal inoculations in their discussion of diagnosis. Revo (1956)[81] and Bedenashvili (1950)[19] include the inoculation of the horse primarily to differentiate between FMD and vesicular stomatitis (VS). Vyshelesskii & Terentev (1954)[98] briefly refer to animal inoculation in differential diagnosis. Discussion or even mention of the use of serologic tests was found principally in the long general articles (Skomorokhov (1952)[27], Revo (1956)[81], Skomorokhov (1956)[84]). L. S. Ratner (1956)[91] refers to the serologic test, but mainly in establishing the type of virus.

Skomorokhov (1956)[84] states:

"Material for the Laboratory Examination. The laboratory examination is very seldom used for diagnostical purposes of the foot-and-mouth disease. Sometimes, it is necessary to apply it, but only in cases for the identification of the type of the virus which had caused the outbreak of the foot-and-mouth disease. However, for this purpose, the laboratory must possess the types of the viruses O, A and C."

Bedenashvili (1950)[19] states:

"Foot and mouth is such a disease that it is easily recognized not only by a veteinarian but also by shepherds and cattle owners who have seen this disease even once.

"As was described above, foot and mouth has such obvious, characteristic symptoms that establishing of the diagnosis presents no great difficulty. It is necessary here to examine some diseases which resemble foot and mouth so as to not confuse them in establishing the diagnosis.

"Cattle sometimes ail with the infectious vesicular inflammation of mouth--stomatitis, which resembles foot and mouth. The former is distinguished by the fact that it does not spread so fast as does foot and mouth, and it does not affect the hoof. The animals have normal temperature at the beginning of the disease.

"Horses are used for differential diagnosis. They do not contract foot and mouth but do get stomatitis if the mucous mass is taken from the mouth of ill cattle and introduced into the mouth of a horse."

From Vyshelesskii and Terent'ev (1954)[98] we learn:

"Diagnosis of FMD is not difficult with its extremely characteristic clinical picture; its exceptional contagiousness and susceptibility to infection of different breeds of animals...

"Other infectious diseases of large cattle can hardly be confused with FMD, because one cannot find any similar characteristic symptoms. For an exact diagnosis of FMD at the present time a laboratory method of experimental infection of guinea pigs is used, and in practice calves and piglets, as well as sheep and goats can serve for artificial experimental infection.

"A method is described in literature for obtaining FMD antigen from the epithelium of aphthous vesicles which was torn away; by means of it a diagnosis of FMD is possible with serums of recovered animals according to the method of complement fixation reaction."

Revo (1956)[81] and Skomorokhov (1952)[27] devote more space to serologic tests than do other writers. In the main these two articles cover practically the same material in this field. Quoting from Revo:

"<u>Clinical Diagnosis</u>. In the majority of cases diagnosis of FMD can be based on epizootiological and clinical data. The acute course of the disease, its characteristic clinical symptoms and general epizootic spread enable us to differentiate this disease; however, we cannot agree with those authors who consider the application of additional methods, and of laboratory tests in particular, unnecessary. The contemporary methods of the serological analysis are sufficiently elaborated and we consider that they should be applied not only in critical cases, but also in those instances when there is the slightest doubt in making a correct diagnosis.

"Specific lesions in the oral cavity (aphthae and erosions), salivation, smacking, lesions on the extremities and udder, temperature rise (40.5 to 41.5) during generalization are a sufficient basis for the diagnosis of FMD, since cases of an atypical course occur comparatively seldom. However, in cases of the malignant form of the disease, when in making of the diagnosis, difficulties arise, because clinical characteristic symptoms are usually not present, the epitooziological situation must be carefully studied and the laboratory-diagnostical investigation method applied.

"In calves the non-aphthous form of FMD may be differentiated on the basis of complex studies of the clinical and pathologico-anatomic data and of the FMD cases in mature cattle. In swine, lesions on the joints and aphthae on the rim of the snout and nostrils are very characteristic symptoms. In suckling piglets

FMD takes often a non-aphthous course and causes high mortality. In sheep, the extremities are usually affected (lameness) and the FMD process is rarely complicated by secondary microfloral infestation. Making the diagnosis of FMD in sheep, various epizootiological data must be taken into consideration and compared by contra-distinction. In goats, the characteristic erosions may be observed in the oral cavity, on the extremities and the udder. On farms, single FMD outbreaks should always be expected, even when only one species of animals (either cattle or swine) are affected. However, the rigid preventive prophylactic measures must be carried out in spite of the fact that the process of FMD deviates sometimes and takes an individual course; the same do epizootics as a whole too.

"Serological methods. The great importance of the serological diagnosis should never be underestimated during FMD epizootics, particularly in the emergence of single sporadic cases, and also for the differentiation in animals of FMD and vesicular stomatitis.

"Methods for the serological diagnosis, as the complement fixation reaction, the virus hemoagglutination reaction and its inhibition should be studied thoroughly and instilled into the current diagnostical practice.

"The application of serological methods will considerably simplify the diagnosis of atypical (non-aphthous) forms of FMD.

"The Polish researcher Jusef Parnas (1951) says: 'The complement fixation reaction at the present time is an every-day test which enables us to differentiate quickly, inexpensively and positively the FMD virus and its variants.'"

Other authors including L. S. Ratner also discuss or mention the CF test principally in connection with identifying and typing the virus.

Revo (1956)[81] states that most workers obtained best results with CF test by overnight incubation at icebox temperature. He describes the limitations of the CF test when he states:

"It must be noted that the serum test of cattle is not an efficient serodiagnostical method for the determination of the results of the complement fixation reaction."

He then refers to the work of Brooksby in developing improved methods for the use of the CF test in testing cattle serums. Revo probably has reference here to the indirect CF test. Both Revo and Skomorokhov (1952)[27] devote considerable space to V. Z. Sakvarelidze's CF antigen produced by alcohol precipitation.

These writers also refer to the conglutination test developed by P. Solov'yev* who claimed this test to be more sensitive and simpler than

* Skomorokhov's reference to "P. Solov'yev. 'The conglutination reaction in foot and mouth disease.' Sov. veterin., 1934, No. 1."

the CF test. O. K. Peshenkhonova and V. N. Dobrotvorskaia obtained different results; they doubt the value of the conglutination test.

Revo briefly discusses the precipitation and other serologic tests and he states, "However, it is not applicable for serodiagnostics on cattle sick with FMD; it is good for the identification of the virus and of its variants. In this connection, results obtained by the complement fixation reaction are irreplaceable." He also notes CF antigens developed by Ubertini, Hobom and Petermann and by Paliazius and Rodrigues. Revo cites the work of Camargo, Eichhorn, Levin and Tellez-Giron in differentiating FMD from VS by CF test.

In differential diagnosis Revo includes rinderpest which had been eradicated a long time ago from USSR but is present in some of the countries bordering on the USSR. Bovine Malignant Catarrhal Fever (BMCF) sometimes develops oral lesions which resemble certain stages of FMD. He points out that BMCF is sporadic excepting the equitorial countries where it occurs in epizootic form. In viral and vesicular stomatitis Revo notes that horses are susceptible to VS and not to FMD. Papulopustular stomatitis and cowpox are mentioned in his differential diagnosis. The cattle diseases above named are also listed by the other Soviet authors in their differential diagnosis.

Revo mentions VE in swine in the US. So does Skomorokhov (1952)[27] and here Revo or the translator became confused. Revo is reported as stating that the aphthae in FMD are entirely different from the pustules in pox and vesicular exanthema. The atypical FMD in deer and in sheep may be confused with necrobacillosis. In his differential diagnosis and earlier in his article Revo refers to VS and VE and specifically mentions that VE has not been found in USSR but does not make similar statement about VS. One might infer that perhaps VS had been found in Russia.*

It is hardly conceivable that the Soviets will continue to give as little attention to the serologic tests as is indicated by the articles reviewed; especially in view of the intensive drive for increased production and use of vaccine. For this it is imperative that the type of FMD virus be known.

Apparently workers at widely separated institutions of the USSR believe more serologic work need be done in connection with the diagnosis of FMD. In publications which appear in 1957, L.S. Ratner and Sergeev[86] at the VIEV laboratory, and Nogina[127] of Novosibirsk Scientific Research Veterinary Station reported on typing the FMD virus by neutralization tests with convalescent serums. Suckling white mice challenged with virus types A, O and C were the indicator animals used. (These reports are two to be added to the very few reviewed in which white mice had been used in USSR.)

There is nothing particularly new in these reports. Guinea pigs have been used for this purpose for over 30 years. Suckling white mice have been used as substitute for, or in addition to guinea pigs, soon after Skinner made his report in 1951.

---

* We learn from American visitors that recently visited Russia that VS had not been reported in that country.

L.S. Ratner & Sergeev tested convalescent serums from 34 adult cattle, 1 swine, 5 goats and 1 sheep and could not determine the virus type in the test with serums from 5 adult cattle. (It would be interesting to know if these 5 viruses were variants of different types than either A, O or C.) These workers, as did Nogina, used only virus types A, O and C. L.S. Ratner and Sergeev encountered no neutralizing bodies for type C virus. Nogina gives details of set-up for the test with 75 convalescent cattle sera and with convalescent and hyperimmune guinea pigs sera (number not given). He concludes, in part, that convalescent cattle sera do not contain neutralizing antibodies on 5th day, but are present on the 7th day after the onset of the disease, and were found at the high point on the 12th day and remained high for 8 months.

6C(6). Therapy

The therapeutic status of FMD has never been particularly satisfactory due to two basic facts: 1) the lack of a specific substance or substances capable of exerting any direct influence on the virus of FMD, and 2) the herd problem, which, regardless of how effective the therapy might be, usually limits by economics and numbers the value of therapeutic measures. Despite these limiting factors practically all Soviet writers stress treatment.

The opinion of most western writers is that therapy is directed at a purely symptomatic response. For example, it is wise to place infected animals on soft foods, to insure adequate amounts of clean drinking water and in particularly severe cases involving valuable stock to administer appropriate antibiotics to lessen the effects of secondary bacterial infections. Beyond these general measures very little can be done, unless one administers antiserum as a prophylactic measure, and in very early stages of the disease, these recommendations are contained in some of the Soviet articles.

The Soviets appear to have attempted a rather heterogeneous group of compounds and therapeutic measures. Among the more rational therapeutic measures may be listed the following: cardiac complications which according to Revo (1956)[81] are common, even in the non-malignant form of the disease, may be treated with caffein, digitalis, strophanthin and convallaria. Local remedies for serious foot lesions such as a 1:200 solution of potassium permanganate, a 2% solution of potassium alum and rivanal, acriflavine derivatives, boric acid, weak sulphuric acid solution and 1% acetic acid are recommended. In addition, a proper diet, well ventilated quarters, dry ground and if early in the disease the use of immune serum are advocated. The majority of the above, while not perhaps the drugs of choice would not be considered irrational therapy in western eyes.

Skomorokhov (1952)[27], Plotnikov (1951)[22], Ampiteatrov (1956)[117] and others recommend the use of intravenous Lugol's solution. Ampiteatrov suggests a dose of 50-100 ml for adult cattle and 20-30 ml for calves and pigs. A balsam compounded of Peruvian balsam and liquid paraffin, or one with silver nitrate is also recommended for the local lesions. Kazanskii, Nikolaev, and Karneeva (1952)[37] in a very long article tested a large number of compounds against FMD and recommended the use of metol (photographic developer), and a concoction of onion peel as efficacious in the local and systemic treatment of FMD. Ryzhkov and Maiorova (1953)[49] recommended irrigating the mouth cavity with 0.25 to 0.5% solution of commercial sulphuric acid and treated the extremities by smearing them with tar. According to these authors excellent results were obtained. Nemtsov (1952)[33a] treated the infected oral cavity of the cow with 0.5 to 1% formalin solution and treated foot lesions with 1 to 2% formalin. Dilbazi (1956)[110] recommended Furacillin-naphthalene paste be applied to the lesions of FMD. Stepanian and Avakian (1957)[121] treated the local lesions with natural gastric juice obtained from dogs and claimed excellent results. Needless to say, this latter product despite its reported excellent results might be difficult to market on any scale. As can readily be ascertained from the type of compounds tested ranging from photographic developers through onion peels and finally gastric juice, Soviet experimenters recommending these show a great deal more imagination than scientific training. The majority of these compounds, the way the experiment is planned, and the data that is supplied is simply not acceptable. It is interesting to note the lack of or the scarcity of reference to penicillin, streptomycin, terramycin, or any of the other antibiotics so prevalent in the western world.

6C. SUPPLEMENT

1. A. P. Rumiantsev (1955)[72]

"Some veterinary measures used in the elimination and prophylaxis of the foot-and-mouth disease must be essentially supplemented and amended. This pertains particularly to disinfection methods for raw hides infected by the virus of the foot-and-mouth disease.

"Raw hides obtained from animals in localities that are unsafe as regards to the foot-and-mouth disease are usually preserved with table salt, by freezing (and) drying, and are transported in that state to the place of their destination.

"When raw hides are preserved with table salt, the virulent properties of the foot-and-mouth disease virus survive up to 26 days, (*) and when the hides are frozen, (virulence) continues even longer. Consequently, hides from localities that are unsafe with regard to the foot-and-mouth disease must be considered a possible source of infection. Such hides are hauled to joint district warehouses of the storing organization, without having been adequately disinfected at the place of their procurement, and later, as they accumulate, they are transported to the processing concerns. This transportation does not exclude contact enroute with animals susceptible to the foot-and-mouth disease, and, as a result, foot-and-mouth epizootics can be carried into new localities."

"According to BELOGORSKII, the existing method used to disinfect raw hides provides that wet-salted or freshly steamed hides be soaked in a brine solution (a solution of table salt concentrated up to 24 degrees as per Baume with an added 0.1-0.2% solution of sodium hydroxide or 5% of calcined soda, or 0.5% of a bisulfite solution (solution temperature from plus 15 to 20 degrees).

"The fact that brine solutions with additions of the chemical substances indicated above disinfect foot-and-mouth infected hides safely requires no proof. Yet, regardless of the successful combination of the chemicals and the brine solution, the method itself has substantial shortcomings.

"In the first place, hides must be brined in a special room equipped with some sort of 'gashpili' (drums) with mechanically rotating (with the aid of electric energy) paddles to agitate them. The solution temperature must be maintained constantly at a level not below plus 15 degrees C. It is difficult to carry out all of this on livestock farms, on slaughtering areas and at slaughtering bases.

"In the second place, it is required that the neutralization of sodium hydroxide be carried out in a bisulfite bath, which creates additional difficulties and increases the consumption of material needed for the production of disinfectants.

---

* Sodium chloride has been found by Western workers (German and British and others) to conserve the virus rather than destroy it.

"In the third place, the strength of the brine solution must be tested continually, which is not feasible on farms without laboratories.

"It was for these technical reasons that BELOGORSKII's method for the disinfection of foot-and-mouth (infected) hides was not used extensively in practice."

---

2. I. I. Luchin and N. I. Kuz'mina (1955)[105]

"A special commission, which was formed on the initiative of the Main Administration of the Leather Industry of MPTSHP? / Ministry of Industrial Goods of Wide Consumption/ of USSR, examined the effectiveness of this method at the Moscow meatcombine imeni Mikoian and in September of the current year the Ministry of Agriculture of USSR gave permission to use this method in production.

"The main point of this method is as follows:

"The fresh hides, which were cooled, are disinfected by salting when spread out, and after that are either piled up in stacks or rolled up into packets.

"The following are used for disinfection: a) a mixture of salt consisting of 100 weight units of fine table salt and 7 weight units of sodium fluosilicate of one or two kinds (GOST 87-41) and b) a saturated water solution of sodium fluosilicate containing 0.75% of sodium fluosilicate. The salt solution is carefully mixed in a special cylinder or is mixed with a shovel; for every 100 kg of hides 40 kg of salt mixture are expanded. Ten g of sodium fluosilicate per 1 liter of water are used for the saturated solution; to facilitate the dissolving of sodium fluosilicate, water is preliminarily heated to 42-45°.

"In the first case an even thin layer of the salt mixture is spread over that part of the waterproof floor which was reserved for the stacks. Each hide, before it is piled up in a stack, is generously sprinkled with the saturated water solution of sodium fluosilicate. After this the hide is spread out with the wool side down, and to the flesh side the salt mixture is applied by spreading it evenly over the whole surface. After a stack is piled up its ends are sprinkled with the saturated solution of sodium fluosilicate and are dusted with the salt mixture to form a coating.

"When salting is followed by a rolling up into a packet, the hides, like in the first case, are generously sprinkled with a solution of sodium fluosilicate, then the flesh side of the spread out hide is covered with an even layer of the salt mixture, distributing it all over the surface of the hide. After this the hide is rolled up into a pack and the whole surface of the pack is again sprinkled with the saturated solution of sodium fluosilicate and dusted with the salt mixture. The packs are then piled up in stacks. Its top and ends are sprinkled with the saturated solution of sodium fluosilicate and coated with the salt mixture. Then the stack is covered up with preserved hides which were obtained from slaughtering healthy animals.

"The hides are considered to be fully disinfected after they remain in stacks for 10-12 days at a temperature not lower than plus 10°. The presence of salt in the salt mixture ensures a simultaneous preservation of hides.

"Sodium fluosilicate, as well as its mixture with salt and the solutions must be kept in a special, enclosed space like all other poisonous substances.

"All the work, which is connected with the utilization of sodium fluosilicate, should be conducted observing measures of personal prophylaxis: the workers must be told beforehand about the properties of this preparation, they must know how to take precautionary measures in working with it and must be provided with appropriate special work clothes.

"A successful use of the new method of disinfection will greatly help in the conservation and a more adequate utilization of raw hides."

6D. FMD Research and Development

6D(1). Status and trends

The most significant trends obtained from a review of the Soviet literature are those concerned with the need for and the development of an effective veterinary sanitary organization for control. The majority of applied research efforts have centered around the production of prophylactic agents designed to aid in the control of FMD. The Soviet vaccine efforts were begun in the late thirties after the development of the Vallée-Schmidt-Waldmann (VSW) vaccine and subsequently culminated in the VIEV vaccine which is a modification of the original VSW product. The Soviet vaccine appears to be quite satisfactory, though it has been criticized by Boiko, Chief of the USSR Veterinary Service. His criticism was not specific excepting to state that the present vaccine does not always possess the necessary immunogenic properties and that workers of VIEV should develop a better vaccine. Most other criticisms were aimed directly and indirectly at the costly and laborious method of obtaining the virus for vaccine production. To reduce the expense and make more vaccine available, the Soviets have resorted to intradermal injection of the vaccine and have reduced the amount necessary for the production of immunity to 1/5 - 1/10 of the original subcutaneous dose.

Efforts to develop a variety of methods for obtaining virus for vaccine products have been attempted, but have not met with success -- or at least no other suitable method appears in the Soviet literature.

The development of serological tests for typing and diagnosis has received considerable attention, but until very recently only the complement fixation test was in use. Currently serum neutralization using suckling mice as the test host has been introduced and appears to be finding favorable attention from Soviet authorities.

The carrier state in FMD has received considerable discussion and wide disagreement in the literature concerning both its presence and importance. Two limited and controlled experiments may have at least temporarily satisfied the demand for more information on this subject. At any rate most Soviet writers appear to be satisfied that their quarantine regulations adequately take care of this problem. Attention has also been focused on the appearance and development of different antigenic types of the virus and this would appear to be a definite trend for future work in the Soviet Union.

There has been a demand by some Soviet authors for disinfectants other than those being used. Nothing however appears to have been done in this matter excepting on the decontamination of hides. The results of the experiments with 1% copper sulphate solution indicated that this agent used as directed may provide a more satisfactory method, in many respects, than procedures previously followed in treatment of hides.

Probably work done and published since 1957 would indicate trends in other directions especially in use of tissue culture, upon which practically no Soviet work has been encountered in the FMD literature.

6D(2). Reservoir studies

There were no experimental hosts listed by the Soviet writers which have not been used in other parts of the world, excepting Revo (1956)[81] states that, "K. A. Popova (1932) infected successfully susliks; other rodents, as hamsters, wild rats, field mice can also be infected, the same chiroptera, as bats." This is an exact quote. Among the laboratory animals used in FMD studies and routine work, Skomorokhov (1956)[84] gives the following as susceptible to FMD: rabbits, guinea pigs, hedgehogs and white rats. (Does Skomorokhov mean white rats? Perhaps the translation is incorrect. White rats are not routinely used in other laboratories because they are not considered very suitable.) Suckling mice are used a great deal in Europe, in the Americas and no doubt elsewhere where FMD is studied. In the Soviet literature reviewed, L. S. Ratner (1956)[91], L. S. Ratner and Sergeev (1957)[86], Nogina (1957)[127] and S. I. Ratner et al (1956)[80] refer to the use of suckling white mice. Of interest is the high mortality in guinea pigs when experimentally infected with FMD virus. This has not been the reported experience in laboratories in other parts of the world. Skomorokhov (1952)[27] in discussing malignant form of FMD states "that the Russian investigator, S. A. Gryuner has observed it (malignant FMD) among deer and described it in great detail." Skomorokhov continues, "We and our associates at the Institute of Foot and Mouth Disease have observed it (malignancy) repeatedly under experimental conditions in guinea pigs, among which specified cases reached 80%." This is exact quote. He gives the following reference: "Bol', B. K. and Agul'nik, M. A. 'Pathoanatomical changes in the Parenchymatous organs in the So-called Malignant Form of Foot and Mouth Disease in Guinea Pigs.' Vest. Sovrem. Veterin., 1930, No. 3-4."

Rabbits have been found in other laboratories as irregularly susceptible to experimental inoculation and show a septicemia and paralytic form of the disease rather than the vesicular form. In the USSR rabbits have been used especially in attempting to produce modified virus for vaccine production. Skomorokhov (1956)[84] states: "L. S. Ratner and V. N. Gribanov and others have adapted the organism of the rabbit to FMD by successive passaging. The course of the foot-and-mouth disease in rabbits is connected with a rapidly progressive paralysis and has no characteristic marks of the foot-and-mouth disease, such as the specific aphthous lesions on the extremities and in the mouth area. Refer to the supplement to section 6D(6&7) for additional detail from L. S. Ratner et al (1955)[65].

6D(3). Etiological agent

6D(3)(a). Properties of the virus (Genetic studies of the virus):

In terms of what we would call genetics concerning virology, there is simply no information. Almost to a man the Soviet writers, as late as 1957, praise the work of Michurin and Lysenko. They appear to accept the general thesis that the environment is all important in the production of genetic changes, and that control of the environment also means control of the genetic destiny of the agent in question. Where information relative to this general subject does appear, it is rarely if ever accompanied by data so that it can be subjected to analysis.

The Russians recognize the existence of the three original antigenic types A, O and C. In addition, they are aware of variants within the types such as A_1, A_2, A_3 etc. and O_1, O_2 et cetera (Revo (1956)[81], L. S. Ratner (1956)[91], Vyshelesskii and Terent'ev (1954)[98], and Skomorokhov (1952)[27]). In the reports available to us, reference to Asia 1 type has not been found. SAT type 1, a, 2 are not mentioned in any veterinary or animal husbandry publications. The only reference to these types was found in a volume on infectious diseases of man, where Zhdanov and Krichevskiy (1955)[106] state that recently three new serologic types were discovered in Africa.

There is a basic recognition by Soviet authors of the importance of the antigenic types. Thus Revo (1956)[81] states that: "The identification of the types of the FMD virus and the presence of its variants is now one of the most important tasks in the complex of general control measures against FMD, since because of the narrow type specificity of immunity the sickness caused by one type does not prevent a reinfection with the other."

Typing in the Soviet Union has been done primarily by cross infection of guinea pigs and by the use of complement fixation test (Gribanov (1952)[36]). In 1928, Revo (1956)[81] was apparently the first to attempt the typing of FMD virus in the Soviet Union. This work was carried out in the Ukrainian SSR using cross immunization of guinea pigs to determine the types. In this study, 9 strains were of the O type, and 1 type A. Kindiakov et al (1952)[32] investigated an epidemic in Central Asia during 1947 to 1950. They studied 45 strains and found 7 type O, 27 type O variants, 2 type C, and 5 type A. One strain could not be classified. The method used to type these strains was again cross immunization of guinea pigs. There is general agreement among Soviet writers that type O is the dominant type in the USSR, and that other types may occasionally be found (Skomorokhov (1952)[27], Revo (1956)[81]). Very recently L. S. Ratner and Sergeev (1957)[86] and Nogina (1957)[127] reported on typing the FMD virus by neutralization tests with convalescent serums. Suckling white mice challenged with virus types A, O, and C were the indicator animals used. L. S. Ratner and Sergeev tested convalescent sera from 34 adult cattle, 1 swine, 5 goats and 1 sheep and could not determine the virus type in the test with sera from 5 adult cattle. These workers, as did Nogina, used only virus types A, O, and C. L. S. Ratner and Sergeev encountered no neutralizing bodies for type C virus. Nogina gives details of set-up for the test with 75 convalescent cattle sera and with convalescent and hyperimmune guinea pig sera (number not given). It would have been interesting to have made further studies to determine whether or not these unidentified strains above noted belong to the South African types (SAT 1, 2, 3), Asia type A or to a previously unidentified type.

With regard to changes in type which the Soviet writers agree occur, the leading article by Kindiakov et al (1952)[32] claim the following: "One of the main factors causing the modification of the virus of foot and mouth disease is its passage through the immune organism of an animal." This is regarded as fulfilling the concepts of Lysenko regarding the effect of environment on genetic changes and is in fact used as a classical example of the validity of Lysenko's theories. The current attitude of Soviet writers on the genetics of FMD is quoted from Lysenko as follows: "It must be understood that the development of a species is a transition from quantitative changes into qualitative in the historical process. Such a jump is prepared by the peculiar activity of organic forms as a result of quantitative accumulation of perceptions of the influence of specific conditions of life. This is fully accessible for study and control."(Kindiakov et al (1952)[32]). Granted that this statement may have lost a little or been changed somewhat by translation, it still represents a lot of words of dubious meaning. This then represents the status of genetic studies with FMD virus.

Skomorokhov (1952)[27] believes that on long storage in glycerine medium, types A and C may acquire the properties of type O and remain as a stable O strain. Proof for this statement which he considers irrefutable is not given. Again, the statement is made that type O virus does not change its type properties and displays no tendency whatever to transform into other types, again without references.

Filippovich (1957)[118] indicates that "several strains of virus with different antigenic properties can be obtained from one immune animal organism which has been infected repeatedly with the same foot-and-mouth disease virus strain." This is in the same vein as the statement made by Skomorokhov (1952)[27] that we have actually succeeded in achieving the production of the malignant form of FMD by alternate passage of the virus through different species of susceptible animals.

Such statements as noted above are rarely accompanied with anything approximating what we would call experimental proof. In theory at least, the production of strains of viruses with different characteristics and perhaps even with a different antigenic structure is possible. The material at hand does not lead us to believe that the Soviets have actually achieved this goal. Certainly we would tend to believe that the production of "tailor made" strains or of even different strains by passage through immune animals or by any other means would be successful only in the hands of people wherein a long history of genetic research had been carried out. There is no present evidence of any real Soviet body of knowledge concerning the genetics of FMD virus, and certainly we have no evidence that the Soviets have had, at the time the articles reviewed were written, either the techniques available to the western world or that they have developed methods different from ours with which to pursue such a problem.

6D(3)(b). Biochemical investigations

Under the heading Biochemical investigations is included a rather diverse category of items because again, as we know it, biochemical studies on the virus are simply not reported. Included under this heading are such things as resistance, purification, and such other items as are mentioned in the literature which could fit under this.

Perhaps one of the most interesting statements in the Soviet literature is found in Skomorokhov's monograph (1952)[27] to the effect that G. M. Boshyan had successfully converted the virus form to a bacterial form. These cultures were said to be Gram positive and also able to form crystals. This rather remarkable statement is not repeated in Skomorokhov's (1956)[84] monograph, nor is it mentioned in Revo (1956)[81] or Vyshelesskii and Terent'ev (1954)[98]. Needless to say, this is considered to be without any basis in fact, according to western authorities.

The subject of resistance of the virus is discussed at great length in a variety of monographs. The majority of the information is derived from the existing literature, particularly the western literature. Soviet contributions in this field have not been particularly notable. A few examples will suffice to indicate the type and level of work done on the resistance of the virus. Thus, Kindyakov and Nikonova (1952)[31] tested the resistance of the virus in sugar beets. Their observations showed that FMD virus persists in sugar beet residue, for between 1 and 1½ hours. They believed that the death of the virus was caused by the low pH (4.8) of the sugar beet residue. The manner in which the experiment was conducted leaves their results open to serious question. Zhitenko (1956)[111] studied the resistance of the virus in guinea pig tissue and also on glass, metal and cloth items coated with infected guinea pig blood. Results are given which indicate that guinea pig carcasses maintained at 4°C for 3 days still retained viable virus in 30% of the animals. Virus coated on the various objects indicated above, could be recovered when the objects were stored at 4°C for 21 days, but in only single cases, (whatever that means), when kept for 20 days in the sun. This paper, again, is typical of so many in the Soviet literature in that no definitive data accompanies these statements. It is therefore impossible to assess the validity of the conclusions which have been reached. Voinov (1956)[74] claimed that the virus survived no longer than 2-5 days when infected aphthous coverings were placed on various pasture grasses. Belogorskii and Lipatov (1936)[3] studied the neutralization of the virus in silage and found that it was no longer viable when tested 2½ months later. No other time period was tested. In acid solutions comparable to those found in silage, the virus died in 24 hours. Considerable detail concerning the resistance of the virus is given by Revo (1956)[81].

The effects of various chemicals are given again in detail by Revo (1956)[81]. For the most part, the data is similar to, if not copied directly from the western literature. There is general agreement, that formalin and strongly alkaline solutions are the best chemical disinfectants. As usual western authors are completely ignored with very few exceptions.

Studies relating to the purification, concentration and chemical analysis of the virus are essentially non-existent. Revo's monograph (1956)[81] mentions not a single Soviet author in his short section relating to size of the virus. Vyshelesskii and Terent'ev (1954)[98] indicate the size to be from 2-3mμ without a single reference. Skomorokhov (1952)[27] discusses the size of the virus but again gives no Soviet references. L. S. Ratner (1956)[91] does not discuss the subject. It is, therefore, fair to conclude that the Soviet scientists have not had the opportunity engage in this field up to 1957. The problem of concentration has been similarly neglected. A single paper by Rushchits (1952)[38a] described attempts to release virus by digestion with trypsin. The paper claims that this method releases virus in quantity which can then be adsorbed by a solution of gypsum. The paper is of very low quality and apparently is the only one dealing with this subject.

Studies relating to the composition of the virus, virus cell interaction, effects of enzymes, or any other metabolic study are not available or are so crude as to be of no value.

6D(3)(c). Biophysical investigations

There are no papers worthy of note concerning environmental effects of temperature, humidity, UV energy, aerosol studies, physical purification or other biophysical fields. Revo's (1956)[81], monograph, which is probably one of the better of the Soviet literature, simply quotes western literature on any and all biophysical subjects. It should be noted here, however, that in all fairness, biophysical studies are of relatively recent origin in the western world as well. This is due mainly to the difficulty encountered in producing large quantities of virus and subsequent assay of material. The recent breakthrough in the field of tissue culture since 1950 has made such studies practical for the first time.

6D(3)(d). Cultivation and propagation studies

The Soviets claim to have cultivated the virus in explanted tissue fragments of guinea pig spleen in a medium composed of equal parts of plasma, chick embryo extract and Tyrode's solution in 1927 (Revo (1956)[81]). They deliberately ignore the work of Hecke (1930) and the Maitlands (1931), both of whom are generally credited with the first successful cultivation of the virus. In another paragraph, Revo (1956)[81] states: "The virus was successfully reproduced on bovine serum with Tyrode's solution added, and on bovine serum with agar added by 0.75%." The Soviets are aware of the work of Frenkel in Amsterdam, Michealson in Denmark, Demnits, Schneider, Traub and others, yet apparently have not entered the field themselves. They confuse growth in eggs and suckling mice with what we would call tissue culture. In short, there is no evidence that tissue culture as practiced on an ever increasing scale in the western world since 1950 is either known to any extent or practiced at all in the Soviet Union in the field of FMD.

6D(4). Disinfection

To prevent needless repetition, information in this category has been included under Section 6C(3).

6D(5). Diagnosis and identification

A review of this information has been included under Section 6C(4).

6D(6)(7) Immunity*

The general conceptions of immunity in FMD given in the texts in USSR, Skomorokhov (1952)[27], Revo (1956)[81], and L. S. Ratner (1956)[91] do not essentially differ from those held and described by most students and writers on FMD in other parts of the world. Skomorokhov devotes more than 1/3 (39 pages) of his 114 page general article on FMD to discussion of immunity and methods of immunization against FMD. His presentation calls attention to several phases which are not ordinarily contained in a broad discussion of immunity in general articles on this disease.

Like most authors, Skomorokhov begins by stating the universally accepted proven fact that recovery from FMD confers a rather prolonged resistance to the disease, which can not be broken by either natural or artificial exposure to FMD infection. Neither L.S. Ratner nor Revo specifically state that this is a virus type specific immunity and even Skomorokhov only refers to it incidentally in this duscussion. The Soviet writers no doubt considered this as universally accepted, and they do bring it into their discussion of plurality of types of viruses.

Skomorokhov also refers to cross protection by different virus types. He states:

> "It must be remembered that the animal's having been attacked by a particular type of virus confers immunity only against the homologous virus type. However, this statement is true only with respect to the guinea pig, which, on subsequent inoculation with all three types of virus, contracts the disease each time in 100% of the cases. In cattle, on cross-infection with virus of a different type, the disease cannot be induced in more than 85% of the experimental animals.
>
> "The literature records one outbreak of foot-and-mouth disease caused by type O virus, in which animals immune to type C virus proved immune to type O virus as well during the epizootic."

L.S. Ratner calls attention to the observation that for many years the Russian animal breeders and cattle industrialists have recognized this "unsusceptibility" to reinfection and which no doubt led to the practice of artificial exposure to the disease. This was done as a means of speeding up the course of the disease and protecting the livestock against some later infection perhaps at a less desirable time, such as driving to pasture or at fattening time. This of course is also the history in other countries.

The immunity following FMD infection, according to Skomorokhov, persists for from one to two years. It begins, and can be demonstrated rather early in

---

* Footnote: To facilitate presentation and to avoid unnecessary repetition, subdivisions 6D(6)(7a,b) are combined. Some items mentioned under 6D(6)(7) have been discussed under 6D(3a,b,c,d); portions which were not treated there and upon which information has been found in the Soviet literature will be discussed in this area. A considerable discussion on various phases of immunity was found in articles reviewed. It was thought desirable to include them in the report, even though most of these phases were not specially itemized in the Suggested Outline.

the course of the disease. L.S. Ratner gives 6-8 days after onset of symptoms others place it as early as 4 days. This immunity can be demonstrated by the inability to reinfect animals at this time by exposure to natural or artificial infection. By this time, or soon after, the blood of the animal contains antibodies capable of protecting healthy animals from natural or intentional efforts to produce FMD.

Skomorokhov is the only author who refers to the generally described local or histogenic and general or humoral immunity. The other Soviet authors do however discuss partial resistance and remnants and degrees of immunity. It is generally accepted in other countries that local immunity develops early, within a week, and disappears on the average within 7 months-- much shorter time than general immunity.

On the duration of general immunity there is naturally a considerable difference of opinion because several factors are involved. Thus L.S. Ratner states:

> "Opinions differ as to the durability and intensity of post-infectious immunity. According to findings of A. V. Ozerov, immunity keeps up for an average 8 to 9 months, never extending beyond 14 months. Vallée and Carré have estimated the duration of acquired immunity at 12 months on the average. An American study committee found an average seven-month immunity.* Waldmann and Trautwein, who experimented with intentionally induced infection, described a relative postinfectious immunity lasting 6 to 7 months, and stated that no immunity at all was left after 18 months. Our observations in everyday practice indicate that recovered animals remain immune for a period oscillating between 12 and 18 months."

---

*Apparently L.S.Ratner was mistaken in his interpretation of that portion of the Report of the FMD Commission of the U.S. Dept. of Agric. (Tech. Bull. 76, p. 13, 1928) dealing with immunity which states:

"The writers' experimental work was done within a period covering less than one year. It was not possible, therefore, to plan experiments on the duration of immunity. In spite of this the commission did not find any recovered cattle susceptible to reinfection with the same type of virus. The longest period of observation, however was only 137 days. Most of the observations on this phase covered a three-month period.

"Waldmann and Trautwein (79), present data which may be used in estimating the duration of immunity. They found that 4 of 5 cattle, inoculated from 7 to 8 months after recovery, exhibited local inoculation vesicles but no generalization of the disease. The fifth was solidly and wholly immune. Of 30 animals about 18 months after recovery, injected locally, 8 showed no resistance and developed both primary lesions and generalization on reinoculation, while 22 showed only local inoculation vesicles.

"Although the number of cases and the periods of retest included in the work of Waldmann and Trautwein and of the commission are not numerous, nevertheless one may conclude that animals are, as a rule, wholly and solidly immune for a period of at least 3 months; that most of the animals lose their local resistance after 7 months; but possess humoral immunity; and that 18 months after infection practically all the animals have no local resistance, and a small number have no general immunity."

According to Revo, Waldmann stated in 1942 that immunity following FMD lasts on the average 1½ years and Revo comments that at the present time after illness natural immunity endures much longer than 1½ years.

Revo gives an interesting observation made at Riems FMD Institute as follows:

> "In 1945 the Riems Anti-Foot-and-Mouth Disease Institute was not in the position any more to utilize for virus experiments animals younger than 3 years old, as they did it before. The Institute had to experiment on animals of different ages. At that time it was established that over 6 year old cows demonstrated immunity to mass infection with the A type FMD virus.
>
> "Analysis of this interesting fact has shown that cows which were immune to the A type virus, had had the disease in 1938. Based on this fact and on other observations the specialists of the Riems Institute consider that the duration of immunity adquired through natural illness endures for six years. This clears and explains the cause of the so-called cyclic* FMD epizootics, which is the seeming interval between two big epizootics. It is obvious that there is no such thing as 'real cyclism' and also no natural law depending on the so-called 'mutation' in nature, as well as there are no spontaneous alleged changes of virulence in the FMD virus types and variants."

Revo also refers to Mussmeier and Röhrer's report that post vaccination immunity was indicated in the outbreak in 1944 in animals which had been vaccinated in 1939 and 1940. Revo however warns that the absence of infection between these dates was not ruled out. And Skomorokhov also warns (cited by Revo, 1956[81]) "That while single notes may be found in epizootiological literature which, evidently based on practical observation indicate that after natural illness immunity to FMD lasts 3 to 5 years. However, these observations must be examined somewhat critically since they may contradict with contemporary standpoint concerning immunity duration in FMD."

The duration of immunity in hogs persists for 8-12 months, in guinea pigs about 3 to 4 months. No information on duration of immunity in sheep, goats, deer or other susceptible animals has been found in the Soviet literature reviewed.

Inherited immunity receives some attention from these authors. L.S. Ratner states:

> "Some importance should be attributed to the question of inherited immunity. Published data show that calves born from cows affected by the disease shortly before delivery, resisted infection for a period of time. Institute studies in Riems, Germany, established an inherited immunity lasting 14 days in newborn calves. K. N. Orlov has recorded inherited immunity of 1½ months in newborn farrows. And day-by-day experience shows that the young of mothers recovered from the disease very often are not susceptible to infection."

---

* See this report 6B(2,c) for notes on infection cycles.

Skomorokhov states:

"The question of the transmission of immunity to foot-and-mouth disease to offspring has been little studied. However, many investigators recognize that such hereditary immunity does exist. The strength and persistence of hereditary immunity apparently depends on how far advanced the pregnancy is when the animal passes through the disease. If the cow, for instance, has recovered long before calving, then the immunity of its offspring to foot-and-mouth disease will be less persistent. Hereditary immunity in cattle may last up to 2.5 months. It may be assumed that the stability and persistence of hereditary immunity also depend on the stage of recovery of the pregnant cow. According to the literature, the hereditary immunity in cattle is always 'passive' and lasts no longer than 14 days in the newborn calf. K. N. Orlov observed the birth of pigs immune to foot-and-mouth disease at a farm where there had been foot-and-mouth disease 1.5 months before. He assumes that the sows acquired active immunity during the period of pregnancy and as a result bore young that were immune to the disease."

It is difficult to properly determine to what extent, if any, immunity was transferred in-utero or whether or not immunity in newly born was present only after the consumption of colostrum and milk and also whether immunity could have developed or persisted because of exposure to infected environment.

Practically all Soviet writers including the three mentioned above emphasize the greater susceptibility of young animals to FMD. An explanation in part for this is that they have not had opportunity to develop immunity and secondly that, inherently they are not capable, at that early stage, of developing immunity, at least not to the same extent as the older animals, with equal stimulation. (This has been observed in bacterial infections.) On this point Skomorokhov states:

"The influence of age on the formation of immunity to foot-and-mouth disease has also been insufficiently investigated. Up to now young animals have been considered more susceptible to the disease than old ones. Young animals (suckling calves, and also calves not over 4-6 months old and suckling pigs up to 2 months old) are unquestionably always more sensitive to the disease. It is precisely at this age that the highest mortality from it among the young is observed. Young animals that are older than this, on the other hand, are more resistant than adult animals. This has been explained by their freedom from the 'remnants' of the immunity acquired during the period of the individual life of the immunity. Others have explained it by the physiological peculiarities connected with the growth and development of the young organism. Among other things, an opposite relationship of age to sensitivity to the disease holds among guinea pigs: young animals weighing not over 200-250 g, are only slightly susceptible, while older ones weighing 300 g and over are highly susceptible."

Natural immunity in susceptible species also receives some attention from Soviet writers. They claim that this is very rare, but when it seemingly does occur, inapparent infection must be considered in coming to conclusions on this point. Skomorokhov states:

"Natural immunity to foot-and-mouth disease is very rare among the susceptible species of animals and must be regarded as an exception. The occasional cases of natural resistance to spontaneous infection that are observed during epizootics are evidently of different origin. Finally, the existence of 'asymptomatic infection' (subclinical forms) of the disease cannot be denied.

"Under experimental and field conditions we have repeatedly observed asymptomatic forms of foot-and-mouth disease. From one locality that had been free of the disease for many years, Siementhal cattle were taken to produce serum. A considerable portion of them passed through the disease without visible clinical manifestations after artificial infection, while subsequent reinfection with the same strain of virus this group of cattle remained clinically healthy."

Revo states:

"Single cases of 'unsusceptibility' are sometimes observed during epizootics, but they can not be explained; neither the phenomenon that causes them nor their mechanism are known yet. Partial resistance and the possibility of asymptomatic FMD infection must be considered in these cases."

Regarding the influence of breed on resistance to FMD infection, Skomorokhov states:

"The breed of the animals apparently has a certain significance for the development of immunity, since the degree of sensitivity to the disease differs markedly among the different breeds. According to the literature, the highly cultivated breeds are somewhat more sensitive than the local, primitive breeds.

"However, the explanation of this increased sensitivity must be sought, not in their breed nor in their high productivity, but in the conditions under which they are kept, which do not correspond to the physiological requirements of their organisms."

British* and American** observers report that animals in poor state of nutrition are not as susceptible to FMD as are properly nourished animals. The British report refers to cattle and rats and the American report to guinea pigs.

---

* Fifth Progress Report of the FMD Research Committee of British Ministry of Agriculture and Fisheries, 1937, p.22.

** Report of the FMD Commission of the U.S. Dept. of Agriculture, Tech. Bull. 76, 1928.

Serums and Vaccines

Serums and vaccines and artificial infection have already received some discussion under the heading of Control, 6C, and that portion is also considered as part of this subdivision. To the above the following is presented:

The Soviets realized that their rather strict and severe quarantine, control, and disinfection program provided by their rules, regulations, orders, methods and instructions were not sufficient to satisfactorily economically control and eradicate the disease. On this they were convinced despite their belief or knowledge that the control program was executed as closely to orders as possible under the existing physical and material conditions. L. S. Ratner (1956)[91] reflects their attitude in the following:

> "Summing up the above information on the practical application of specific prophylaxis in the fight against the foot and mouth disease, one may state categorically that active immunization takes the first place in solving the problem of prevention. Appropriate combination of active immunization with other veterinary and sanitary action provides a sound basis for combatting and eradicating the disease on the national level."

There were no doubt some Soviet authorities, among these Skomorokhov (1952)[27] who thought they were doing nicely and making good progress. He concludes his whole article as follows:

> "The experience in combatting foot-and-mouth disease that has been accumulated in the USSR shows that it is entirely possible to liquidate and eradicate the disease by systematic and persistent execution of the whole combination of anti-epizootic and prophylactic measures that are prescribed by the veterinary legislation. Foot-and-mouth disease has actually been completely liquidated throughout extensive regions of the USSR, without great losses to the national economy, primarily through organizational measures. The system of socialist agriculture itself facilitates the implementation of these measures. Quarantine measures and the restrictions connected with them are always easier to carry out on kolkhozes and sovkhozes than formerly on the individual peasant farms. And it is quarantine that constitutes the fundamental link in the whole complex of measures."

Later, however, he showed more favorable interest in vaccine (Dobrokhotov, 1953[56]).

Like most other countries where FMD was endemic, the Soviets introduced and used whatever biologic assists were being used in other parts of the world in the struggle against this disease. Among these were convalescent cattle serum and to some extent hyperimmune serum produced in cattle. The Soviets even toyed with immune serum produced in horses. Then, as in other countries, they introduced vaccines when these began to emerge and to be more or less successfully used. The Soviets experimented with, produced, and used various types of vaccine.

Serum

They did considerable work on methods of producing, testing and using anti-serums -- mostly convalescent serum from cattle about 3 weeks after onset of the disease. Skomorokhov and his coworkers were especially active in this field, so, to a lesser extent, were L.S. Ratner, Kindiakov and others.

In 1929 Skomorokhov visited Riems Institute in Germany, and the FMD Laboratory on Lindholm Island in Denmark and also the Serum Institute in Copenhagen. At Riems he discussed with Waldmann and Trautwein the production and use of hyperimmune serum. In Denmark, under C. Jensen and Schmitt-Jensen, convalescent serum had been processed and used for several years at the time of Skomorokhov's visit. Here he had opportunity to learn how the Danes were organized for procurring and processing the convalescent serum and then distributing it to livestock men for use. He learned from them that they had also produced hyperimmune serum but found it too expensive and besides the convalescent serum gave them all that could have been expected from an antiserum.

He also learned from observations in Denmark, and he reported, that in "capitalistic" countries the farmers and livestock men cooperated to the fullest with the authorities in this work. He stated (1929)[1]: "Denmark has a special government regulation which obliges every owner to submit his cows once for taking the blood from them... There are no misunderstandings with the populace in regards to the obtaining of the serum of convalescents. More than that, the owners themselves submit very willingly to the blood taking program. The taking of blood serum is usually done only in large farms."

Skomorokhov explains that the immunity which follows the injection of convalescent or hyperimmune serum lasts only 10-14 days and this protection is afforded only against generalization of the disease and not against locally occurring or applied infection. This has been known and appreciated by students and workers in FMD for some time and especially since the early twenties, soon after Waldmann and Pape, 1921, reported on the use of guinea pigs as experimental animals in FMD studies.

Vaccines

Whether or not active immunity of practical value can be obtained by totally killed virus has for a long time been the subject of research and discussion not only in FMD but in other viral diseases. Skomorokhov devotes several pages to this phase of active immunity in FMD. He speaks of sterile immunity and of non-sterile infectious immunity. He refers to the work of L. A. Zil'ber and to that of G. M. Bosh'yan to indicate that active immunity can only be induced by living virus. He goes into considerable interesting discussion (some of which was not clear perhaps because of faulty translation). He states:

> "On the basis of our own investigations we believe that the establishment of immunity to foot-and-mouth disease is entirely possible without the appearance of any clinical visible reaction, and consequently without the formation of aphthae. Other Soviet

investigators have reached the same conclusion from their own researches (L. S. Ratner, V. I. Kindyakov, and others).

"Some progressive investigators in other countries have also come to the conclusion, on the basis of their own investigations, that immunity to foot-and-mouth disease in animals may be achieved without the formation of aphthae and may be reinforced and made more persistent by repeated inoculation with foot-and-mouth disease antigen, without producing aphthae or other visible reaction in this case either.

"Abundant data from Soviet investigators and some foreign ones leave no doubt whatever that active immunity to the disease really is possible even without aphthae. However, a clinically expressed postvaccination reaction (slight fever, etc.) does as a rule guarantee a more stable immunity.

"Our own experiments, in collaboration with A. A. Dubyanskiy and N. A. Khomenko, N. Ye. Lavrovskiy, and V. M. Dobrotvorskaya, and also the experiments of other Soviet researchers, performed under field conditions on tens of thousands of head of cattle, showed that immunization of animals with virus inactivated by chloroform or formalin confers a relatively and fairly long-lived immunity without the manifestation of visible clinical symptoms of the disease (V. I. Kindyakov, M. K. Yuskovets, G. S. Savel'yev, and others)."

Skomorokhov refers to studies of T. P. Zhernosek on guinea pigs which indicate that only in the presence of living virus can active immunity be developed. (See Supplement to this section, Item #1, for further details).

Moehlman (1954)[87] after quoting instances, especially of experience in East Germany to indicate that FMD vaccine (presumably Vallée-Schmidt-Waldmann) is an effective vaccine and has not been the causing of infection. He goes into interesting lengthy discussion of "avirulent" and "infective" vaccine and refers to unsuccessful attempts by him and independently by Hobohom to isolate living virus from the vaccine. He states in part:

"The virus of foot-and-mouth disease vaccine is therefore not a non-living antigen. It has not been fully settled whether the vaccine contains traces of active virus or whether all the virus, while its pathogenicity has been extremely attenuated, still has not been killed. But in both cases the vaccine must be regarded as an infective vaccine and its immunizing effect must be considered to be the result of a subclinical infection."

His final two paragraphs on this discussion read as follows:

"According to the present state of our investigations the immunizing action of foot-and-mouth disease vaccine depends substantially on its content of an immunizing antigen which is still present in high concentration in the aphthous covers long after infection, even when the infectivity titers themselves have already fallen to very low levels. Foot-and-mouth disease vaccine is therefore regarded also as an antigen vaccine.

"The immunization process is accordingly to be attributed to the reaction to 2 effects, first that of the immunizing antigen in the vaccine and second that of the antigen newly formed during the subclinical infection. If the subclinical infection does not develop the disease, there can be two reasons for such failure. The newly formed virus may, like its mother generation, lack the property of pathogenicity, as was the case in 4 out of our 5 experimental series. In the 5th of these series, however, pathogenic virus was present in the blood of the vaccinated animal on the 4th and 5th day p.v.; but in spite of that the infection still remained subclinical. Here it must be assumed that the tissue immunity on the 4th day p.i. was already sufficient to prevent the disease from developing."

As already indicated in the section on Control, 6C(1-5) the VIEV vaccine is the officially recommended vaccine to be used in the USSR. Other types of vaccine, especially those reported to have some value or promise of value in other countries were produced, in some cases modified, and tested in the USSR before the official introduction of the VIEV vaccine in 1953. Some are still being produced and tested -- (to what extent is not reported). Skomorokhov (1956)[84] states "under productional (field)* conditions a number of other (than VIEV)* FMD vaccines are tested."

L.S. Ratner(1956)[91], L.S. Ratner & Gribanov(1954)[62] to a large extent give practically the same introduction to and discussion of the VIEV anti-FMD vaccine. They refer to the many attempts, over a long period of time, to produce a satisfactory vaccine against FMD. Included among these were viruses "fixed" by prolonged passaging in pigs, guinea pigs, embryonal tissue, chicken embryos or mice. None, according to these authors, proved to be satisfactory. Ratner and his coworkers considered the vaccines made with virus inactivated by chloroform or formalin as most promising. They and other Soviet colleagues were favorably impressed with the aluminum hydroxide adsorbed formalin vaccine known as Vallée-Schmidt-Waldmann (VSW) vaccine, which is referred to as "GOAL" vaccine in several of the Soviet articles and also known as Schmidt-Waldmann or as Waldmann-Koebe vaccine. Ratner (1956)[91] states:

"In 1938-1940 a number of Soviet research workers (L. S. Ratner, F. I. Drygin, E. E. Tonigs, D. P. Molchanov, V. I. Kindyakov and N. N. Doronin) tested the aluminum hydroxide vaccine on guinea pigs and bovines, and obtained favorable reactions. Wide-range field testing, however, revealed certain shortcomings reducing the practical usefulness of the preparation. In the first place, the required inoculation dosage (30 to 60 milligram) was quite high, and the standard temperature indispensable for shipment and storage (7 to 8° centigrade /44.6 to 46.4°F/) made long-distance shipment of the vaccine in winter and summer rather difficult.

---

* Reviewer's explanatory note in parentheses( ).

"In more recent years research carried out at the All-Union Institute for Experimental Veterinary Medicine (VIEV) by L. S. Ratner and V. N. Gribanov produced an adsorbent tissue vaccine against the foot and mouth disease superior in preparation principles, stability, and high small-dosage effectiveness to the aluminum hydroxide vaccine of Vallée-Schmidt and Waldmann generally accepted in foreign veterinary practice. The VIEV vaccine is safe and innocuous. Subcutaneous injection precludes postinocular complications and postvaccinal infection in both adult and young (incl. newborn) animals. It is administered for prevention purposes to all species of susceptible animals regardless of age in a single subcutaneous injection. The dosage is as follows: adult bovines, porcines, ovines and caprines, 5 milligram; bovines up to 6 months, and porcines from 4 to 8 months of age, 3 milligram; porcines up to 4 months, and young ovines and caprines, 2 milligram.

"In 1952-'53 the VIEV vaccine was administered, in manifold epizootic situations, to a total of over 4,000,000 heads of cattle."

For more detail by L. S. Ratner, refer to Item #2 in the supplement to this section.

L. S. Ratner and Gribanov (1954)[62] and L. S. Ratner (1956)[91] do not give the method of preparation or composition of VIEV vaccine. Revo (1956)[81] does give some details of production of VIEV vaccine (See supplement Item #3).

L. S. Ratner and Gribanov (1954)[62] give a table (See next page) which compares the differences between the VSW and the VIEV vaccines. A somewhat similar table and more information on production of VIEV vaccine is contained in an Unsigned Monograph (1955)[63]. Other Soviet writers report satisfactory results with the VSW vaccine.

The shortcomings of the VSW vaccine mentioned by L. S. Ratner and Gribanov have been noted by producers and users of this vaccine in other countries. For instance Moehlmann (1954)[87] states that the directors of vaccine production institutes reported at the 1947 conference in Berne, Switzerland that VSW vaccine had the following disadvantages:

"1. The relatively large dose required for immunization;
2. The temperature sensitivity of the vaccine, which causes trouble mainly in tropical regions, but also in the mountains;
3. The relatively short time the vaccine can be stored, said to be only 8 months.
A further disadvantage is the difficulty of procuring the amounts of virus required for the preparation of the vaccine..."

Moehlmann further reports that some of these shortcomings were corrected by Rosenbusch of Argentina, without decreasing the efficiency of the vaccine, by increasing the virus content to 5% and decreasing the dose to 2 ml. and injecting it intradermally. This method of producing and applying the vaccine was in the main followed in Mexico in 1947-1949 as reported by Camargo and Mott*, where vaccine production and use were thoroughly controlled

* Camargo, N. F., L. O. Mott 1953 First year's production and testing of twelve million doses of vaccine by Mexican U. S. Com mission for Eradication of FMD. Bulletin de l'Office International des Epizooties, 39(5-6): 435.

A comparison of the differences

between

VSW and the VIEV vaccines

according to

L. S. Ratner and Gribanov (1954)[62]

	"VIEV vaccine	VSW vaccine
Original virus material for preparation of vaccine	3% suspension of native epithelial tissue of F&M disease aphthae not subjected to centrifugation and filtration through Seitz filter.	0.7-0.1% extract from epithelial tissue subjected to centrifugation and filtration through Seitz filter.
Saturation of vaccine with immunizing substances	Vaccine saturated with virus containing proteins and cells of epithelial tissue of F&M disease aphthae.	Vaccine contains small amount of virus-containing protein and is completely free from virus-containing tissue.
Inoculation dose (in cc)	3-5	30-40
Quantity of original virulent material required for 1 dose of vaccine (in grams)	0.09-0.15	0.3-0.4 (0.2-0.3)*
Stability of vaccine	Stabilized with glycerin and quinosol; kept and shipped under conditions usual for biopreparations.	Not stabilized; kept and shipped under strictly fixed temperature (plus 3, plus 7°) in special refrigerators."

* Figures in parentheses are quoted from Unsigned Monograph (1955)[63]

and tested on a huge scale. In Mexico, in a large number of experimentally controlled tests, 2 ml of vaccine were injected subcutaneously, the results were at least equally as good as obtained by the intradermal injection. See supplement to this section for further information on intradermal and other methods of injection of vaccine: Item #4, Didovets'(1956)[79]; Item #5, Ivanov (1956)[77]; Item #6, Alenkovich (1954)[60]; Item #7, Arifdzhanov (1956)[132].

Pyl, G. and A. Heimig* give the following composition of the VIEV vaccine as taken from a paper by Gribanov**.

50%	- of 6% virus extract of a fine suspension of untreated vesicle coverings.
30%	- Aluminum hydrate
20%	- Glycerine
0.1%	- Chinosol
0.25%	- Formalin

In addition to the results of the use of the VIEV vaccine in the field, which from reports gave very satisfactory results, there no doubt were considerable planned and controlled field tests and various institutes which also gave satisfactory results. Skomorokhov (1951)[25] states: "At present time the Ratner and Gribanov aluminum hydroxide-formol vaccine is being tested by the All-Union Institute of Experimental Veterinary Medicine in Georgia and Moscow Oblasts."

From the review of the literature, the following on the use of the VIEV vaccine under somewhat controlled conditions is quoted from L. S. Ratner and Gribanov (1954)[62]. More is given in the supplement, Item #6, Alenkovich (1954)[60].

> "Simultaneously with the check of effectiveness of the VIEV anti-foot and mouth disease vaccine under production conditions by means of epizootiological observations, a series of experiments were set up on the check of its activity in artificial infection of the vaccinated animals with the virus of foot and mouth disease.
>
> "Fourteen days after the inoculation the vaccinated animals and simultaneously the control - nonvaccinated animals - were infected with the virus of foot and mouth disease by means of rubbing the virus suspension into the scarificated surface of the tongue.
>
> "In summing up a number of commissioned experiments which were conducted at various periods, it was found that of the 104 vaccinated animals, after their infection with the virus, 11 contracted foot and mouth disease, the remaining 93, or 89% were fully protected from the disease. At the same time all the control nonvaccinated animals (52) fell ill.

---

* Pyl, G. and A. Heimig 1956 Über Gewebsvakzine gegen Maul-und Klauenseuche, Arch. für Experimentelle Veterinärmedizin, 10(3): 378-383.

** Gribanov, V. 1955 L'Efficacite de L'Immunisation du Beteuil contre la Fievre Aphtheuse en USSR, Bull. Off. Internat. Epizoot., Paris, 43, 660.

"These data cogently show that the VIEV anti-foot and mouth disease vaccine develops in the vaccinated cattle an extremely stable immunity, protecting them from foot and mouth disease not only in natural but also in artificial infection.

"It is necessary to dwell on certain examples which demonstrate the effectiveness of the VIEV anti-foot and mouth disease vaccine and the intensity of the immunity developed by it.

"1. In the sovkhoz 'Dobrush', 132 head of the young, found in the isolated section, were transferred to the unsafe farm of the sovkhoz 12 days after the vaccination. Despite the contact with the sick animals, the vaccinated young did not contract foot and mouth disease. The illness was liquidated within 30 days.

"2. In the kolkhoz 'Stalinskii gorodok', 279 head of cattle, found in camps, were vaccinated and after 15 days transferred to the unsafe farm. In contact with the sick animals, the vaccinated animals remained healthy until the lifting of quarantine.

"The examples here cited are sufficient to arrive at the conclusion that the VIEV anti-foot and mouth disease vaccine develops a stable immunity in the inoculated animals and is an effective biopreparation.

"On the basis of the experiments which have been carried out for inoculation of 40,000 sheep and goats (K. A. Arifdzhanov, Uzbek NIVI) and more than 200,000 pigs (A. IA. Bobyr, VIEV) the effectiveness of the VIEV anti-foot and mouth disease vaccine has been demonstrated for the specific prophylaxis of foot and mouth disease in these types of animals.

"On the basis of positive results of the experimental and commercial verification, the VIEV anti-foot and mouth disease vaccine was in 1953 accepted by the USSR Ministry of Agriculture for implantation into veterinary practice as the approved biopreparation for specific prophylaxis of foot and mouth disease. The mass production of the vaccine has been fully assimilated by the biological industry.

"The VIEV vaccine is safe and harmless. It does not cause a complication after the inoculation and is not in the condition to cause the post-vaccinal infection in any method of its introduction both into the grown animal and young, including also the new born. It is employed for prophylactic purposes for all types of animals which are susceptible to foot and mouth disease, irrespective of the age, in form of single subcutaneous inoculation in the following doses: grown cattle, pigs, sheep and goats - 5cc, young of cattle aged up to 6 months and piglets aged from 4 to 8 months - 3cc, piglets-suckling, suckling lambs and kids - 2cc."

Alenkovich (1954)[60], (Chief Veterinary Administration, Ministry of Agriculture, Belorussian SSR) gives experiences with VIEV vaccine in which large numbers of animals were involved and in some of this work these vaccinated animals had close contact with infected ones, and in other instances FMD virus was applied to the vaccinated animals. Alenkovich endorsed the vaccine very strongly.

Because of scarcity of the vaccine he used the vaccine beyond the 6 month expiration date and reduced the vaccine to 2 ml and applied it intradermally. See his conclusions in the supplement, Item #6.

Skomorokhov showed a little more interest in vaccine than indicated above when he is reported as stating at the USSR meeting on FMD (Veterinary Section of VASKhNIL)(Dobrokhotov (1953)[56]) that of the vaccines presently suggested as prophylactics for it, the most deserving attention in Skomorokhov's opinion is the formalin hydrate vaccine which has already been tested in practice.

At the same meeting L. S. Ratner and Gribanov reported results of practical application of the VIEV vaccine. It was first proposed and tried out in 1948. Its effectiveness was verified in 1949-1952 by veterinary research institutes and practicing veterinarians. Voinov (1953)[56] and Arifdzhanov (1953)[56] of the Uzbek NIVI also reported excellent results with VIEV vaccine on 67,288 cattle and about 40,000 sheep. Kindyakov (1953)[56] from the Kazakh NIVI did not have such good results with VIEV type vaccine produced from local virus at the Kazakh NIVI and came to the conclusion that further research work had to be done to improve the VIEV vaccine. Later, however, (1955)[63] he obtained better results and recommended the intradermal injection.

The VIEV vaccine received official recommendation for approval in a notice of the Meeting of the Veterinary Division of the Zoo-technical Soviet, Main Administration of Animal Husbandry, USSR Ministry of Agriculture (1952)[30].

Of interest is a comparative study of VIEV and VSW vaccines by Pyl and Heimig at the Loeffler Institute on Riems Island (cited above) to obtain answers to:

1. Does chinosol used in VIEV vaccine have any virucidal properties?
2. Does the formalin content of VIEV vaccine, which is 5X that of GOAL vaccine add any particular value to the vaccine?
3. Do the insoluble proteins which are removed from VSW vaccine but not from the VIEV contain any demonstrable FMD antigenic properties?

The answers to the above are as follows:

1. Chinosol showed no appreciable virucidal properties when tested on mouse neurotropic FMD virus.
2. The 5X formalin content of VIEV vaccine sterilizes the vaccine sooner than is accomplished in VSW vaccine.
3. No, is the answer for this question. But for some undemonstrated reason the non-completely centrifuged vaccine showed a somewhat better value than highly centrifuged material. "The effect is so small that no cause exists to alter the proven, prescribed method of producing the (VSW) vaccine."

Boiko (1957)[125], Head of Main Veterinary Administration, Member of the USSR Ministry of Agriculture apparently is not satisfied with the results of FMD control in some Soviet republics or certain Oblasts in them. He specifically mentions the poor showing in the Moldarian and Armenian republics. He feels the use of vaccine alone will not do a satisfactory job of control and further that the vaccine needs improvement. Interesting is his comment on the VIEV vaccine:

> "On the territory of our country, science is much behind our practice and neither the studies nor research of the foot-and-mouth disease infection, types and variants have yet met the requirements of the practice. The present anti-foot-and-mouth vaccine does not always possess the necessary immunogenic properties. Consequently, the scientific workers, the workers of VIEV in the first place, must give us a more improved vaccine..."

This criticism of the VIEV vaccine is the only unsatisfactory report besides the one by Kindyakov mentioned above.

It is somewhat strange that the VIEV vaccine apparently produced from bovine tongue epithelium infected with bovine adapted strains of FMD virus has been recommended and has been used on all types of animals including swine, with reportedly excellent results. In reports from other countries, especially in German literature, (among these are reports from the research institute on Riems Island), it is claimed that vaccine made from bovine tongue epithelium infected with bovine virus does not give satisfactory immunizing results in hogs. At Riems, this was remedied by adapting a swine adapted virus to cattle and vaccine produced from bovine tongue epithelium of such infection would give equally good results in swine and in cattle.

L. S. Ratner and Gribanov (1955?)[63]* were aware of the unsatisfactory results reported in Germany in vaccinating swine with the VSW vaccine made with bovine adapted FMD virus. They state, "In addition to immunization experiments, we proved the possibility of using VIEV vaccine effectively for specific foot-and-mouth prophylaxis in sheep and goats (K. A. Afridjanov) and also in hogs (A. I. Bobir). In view of the known difficulties in immunizing hogs against foot-and-mouth disease with vaccines prepared with cattle virus, it is necessary to clarify the assertion made above with facts." Direct experiments were performed in which 24 vaccinated hogs and 4 controls were artificially infected 21 days after vaccination. The 4 unvaccinated controls and two of the 24 vaccinated hogs developed lesions. The article continues:

> "The results of such direct experiments and of field tests, as well as the mass vaccination of more than 200,000 hogs with VIEV antiaphthic vaccine, permit us to draw the following conclusions:
> (a) VIEV vaccine confers on hogs vaccinated with it an adequately strong immunity against infection by the virus of foot-and-mouth disease.

* Refence #63. This undated article marked "Unsigned Monograph" is in all probability the same as given above in references by Pyl and Heimig. The title is exactly the same as given in this reference table. Reference #63 is probably authored by L. S. Ratner and Gribanov or by the latter and no doubt has their complete support.

"(b) The vaccination of hogs in time on farms where cases of the disease have occurred among the cattle protects the herds of hogs against the disease.

"(c) The vaccination of possibly healthy hogs on hog farms already affected with foot-and-mouth disease gives a positive result provided sanitary veterinary measures are applied at the same time. In certain cases, in order to insure a more certain immunization of such farms, it is necessary to effect the vaccination in two injections at an interval of from eight to ten days."

A frequently mentioned objection to the VIEV vaccine is the large number of susceptible cattle it requires for its production, thereby making it rather expensive and thus reducing the apparently much needed supply. To remedy these objections, small doses (1-2cc) have been suggested and tested intradermally or in the submucosa of the upper lip (see supplement references #4, 5, 6, 7). Other types of vaccine have been produced and experimentally tested.

No reference to explant-tissue-culture vaccine of Frenkel has been found in the Soviet literature reviewed. It appears the Frenkel method of producing virus for the vaccine would have received some consideration since no live cattle are needed for this type vaccine. Reference to Frenkel's work has been found in Revo's (1956)[81] discussion on virus propagation, and again in the section on vaccine production, not, however, in connection with the Frenkel vaccine.

Other Vaccines

L. S. Ratner (1956)[91] reports on vaccines produced with rabbit adapted virus.

> "Of the other new immunizing biological preparations having successfully passed initial testing for effectiveness and innocuousness, the new variant of the hoof and mouth disease vaccine should be mentioned which was developed at the All-Union Institute for Experimental Veterinary Medicine (by L. S. Ratner, V. N. Gribanov and Ye. A. Sokolova) in 1953. Instead of vesicular secrete from cattle, it uses as basic virus-carrying substance virus matter taken from rabbits of 10 to 30 days of age. According to A. Ya. Bobyr', L. V. Vinogradov, A. Pazdnyakov, N. S. Monkahova and V. P. Fedyushin, who tested the new VIEV variant in a number of affected and infection-menaced establishments, the preparation may be considered innocuous and highly effective."

For additional information on this type vaccine see supplement Item #8, L. S. Ratner et al (1955)[65]. The "Unsigned Monograph" (1955?)[63] contains a lengthy report on this vaccine.

In the search for a less expensive and more readily obtainable virus for production of vaccine than is used in the VIEV vaccine, high ranking Soviet veterinarians were encouraging work, as late as 1957 (Koliakov[130]) with the rabbit adapted virus and UIEV vaccine. The latter is the embryonal type vaccine (See supplement Item #3, Revo (1956)[81]).

K-VIEV vaccine is discussed in Dobrokhotov's (1953)[56] report of the 39th plenary session of the Veterinary Section of VASKhNIL. It is the only place where K-VIEV vaccine has been encountered in the Soviet literature reviewed. Since it is allotted almost a full page of a 6½ page report of a 3 day meeting of high ranking and prominent veterinarians, it is believed that it deserves some notice here. It is difficult to determine how K-VIEV is produced. The rather meagre information presented does not leave a favorable impression of value of this vaccine. The name K- is apparently derived from the initials of the workers who presented it at the meeting (See supplement Item #9, Dobrokhotov (1953)[56]).

Revo (1956)[81] gives some information on the production and composition of the VIEV vaccine and other vaccines which have received some attention in the USSR. Some of these have been produced and given some field trials. Some may still be under consideration and study. Even though Revo's descriptions are lacking in some details and some may have lost a little in value in translations, they are being included in the supplement (Items #3, 10) for reference.

Of these, the Vallée-Carré-Rinjard (V-C-R) formol vaccine which was the pioneer of the modern FMD vaccines is just barely mentioned in the majority of articles published in all countries in the past 25 years even when FMD vaccines are dealt with in detail. Revo, however, gives a good idea of its composition and production. Revo gives a number of reports on favorable use of VIEV. Some are included in the supplement (Item #10).

6D(8). Therapy

To avoid needless repetition, information on this subject has been included under Section 6C(6).

6D(6)(7). SUPPLEMENT.

1. A. L. Skomorokhov (1952)[27]

"The studies of T. P. Zhernosek are of extraordinary interest. She undertook to elucidate the nature of the vaccinal reaction and the related immunity by using variants of aluminum-hydroxide-formol vaccine of various degrees of inactivation. The experiments were made on guinea pigs, and aluminum-hydroxide vaccine was used for immunization. Histological examination of the pathological material taken from the vaccinated guinea pigs showed that foot-and-mouth disease infection actually does result from immunization with these different variants of vaccine. Only a vaccine that did induce specific infection in the guinea pig was found to confer immunity. From this she deduces that an effective aluminum hydroxide-formol vaccine must contain live attenuated virus. 'The degree of inactivation of the virus should be such that it can induce a reaction which, even though in attenuated form, will still qualitatively reflect the peculiarities of the original infectious disease. For practical use a vaccine which induces a vaccinal reaction easily overcome by the organism, and yet confers a stable immunity, is of value'".

---

2. L. S. Ratner (1956)[91]

"Analysis of research in the field of immunizing preparations against the foot and mouth disease done in recent decades by domestic and foreign scholars suggests that numerous variegated investigations most of which failed to pay off in terms of practical steps to combat the disease, had to be carried out before a successful solution was arrived at. In vain were the attempts to obtain fixed virus vaccine through consecutive inoculation of swine and guinea pigs, or through cultivating the virus in embryo tissues of chicks and mice. Some encouraging results were gained through weakening and disactivation of the virus by means of chemical substances, formalin and chloroform proving to be the most appropriate ones. Formalin and chloroform vaccines in various modifications were tested by research both in laboratory and industrial manufacture. Experiments on a broader scale indicated, however, that immunity induced by these vaccines was short-lived and inconstant. Moreover, in actual practice it was not possible to use an identical technique for turning out vaccine bunches of equal stability that would provide lasting and constant immunity without causing postvaccinal infection in inoculated animals.

"Of all vaccines offered and tested during the last decade, the adsorbent ones proved most effective and promising. Preparation of adsorbent vaccines derives from original principles developed in 1901 -- 1906 by the Russian scholar M. S. Tsvet. His adsorption method has found broad uses in the study of biologically active substances, such as ferments, hormones and ultraviruses. The fact noted by Tsvet that of many possible adsorbents, an anorganic colloid--aluminym hydroxide--displays the highest adsorptive property attracted the attention of researchers engaged in the development of immunizing biological preparations. Through virus adsorption on aluminum hydroxide the Danish scholars Schmidt-Jensen, Schmidt and Hansen succeeded in 1934--1936 in producing a vaccine capable of immunizing guinea pigs against the foot and mouth disease.

In partial modification of the Danish technique German researchers in 1938 evolved a different aluminum hydroxide vaccine, which showed positive results in cattle.

"Within 12 to 24 hours from inoculation (of the VIEV vaccine) a local reaction appears at the spot of the entry of the vaccine: a tough painful swelling of some 4 by 6 or 5 by 3 centimeters, which begins to subside on the sixth day. A general reaction may show in a 1 to 2° Centigrade (1.8 to 3.6°F) increase in body temperature. Immunity develops by the fourteenth day, and keeps up, according to field observation, for over a year. The period during which the vaccine may be considered unimpaired under storage conditions normal for veterinary-biology preparations has been fixed at 6 months, although actually the vaccine retains its immunizing property for about one year."

---

3. Revo (1956)[81]

"Anti-Foot-and-Mouth Disease Vaccine VIEV

"The vaccine is composed of the following components: 1) virus material consisting of FMD vesicle coverings ground in a special grinding apparatus; 2) phosphate buffer solution; 3) glycocoll buffer solution; 4) glycerin; 5) aluminum hydroxide. The vaccine must pass a control for sterility, innoquity, avirulence and efficacy.

"According to L. S. Ratner and V. I. Gribanov (1954)[62] the VIEV vaccine 'differs to its advantage from the foreign GOAL-Vallée-Schmidt-Waldmann vaccine which is generally used in veterinary practice.' Table 7 shows the actual advantage of the vaccine prepared in USSR over the Waldmann-Koebe vaccine." This table has been given in the body of the report.

---

4. Didovets', S. R. (1956)[79]

Limited use of VIEV vaccine by submucosal injection of 1 ml in the upper lip gave encouraging results. This method would reduce the dose of vaccine now recommended for the VIEV vaccine.

This is mainly a report on the use of VIEV vaccine (produced at the Kursk-Biological Establishment (factory). Injection of 1 ml in the submucosa of the upper lip in adult cattle on various collective farms in the Ukraine SSR. The change to this site and mode of injection was inaugurated to make the vaccine go farther. Results seem to satisfy Didovets'. He states:

"As our observations have shown, the most effective method for the formation of immunity against foot and mouth disease was a single introduction of the anti-foot and mouth disease vaccine VIEV into the undermucous membrane of the upper lip of the animal in a dose of 1 ml.

"It is necessary to investigate the length of immunity after the introduction of the vaccine into the undermucous membrane."

---

5. Ivanov, A. D. (1956)[77]

"The editor's office received a number of reports on the application of the anti-foot-and-mouth disease vaccine VIEV; the vaccine was injected intradermally, not as usually, subcutaneously.

"The Veterinary Surgeon F. S. Priakrin informs that he conducted an experiment on the application of the anti-foot-and-mouth diseases vaccine (VIEV) intradermally. The vaccine was injected into cattle or into the upper third part of the neck into the thick part of the skin of the caudal fold at a dose of 0.5 ml. It was observed that 0.2 - 0.3% of the intradermally vaccinated cattle, became sick with the foot-and-mouth disease within 14 days.

"K. A. Arifzhdanov, and S. I. Voinov, (Candidates of Veterinary Sciences) conducted an experiment on a large scale in the Uzbek Scientific Research Institute on the intradermal application of the anti-foot-and-mouth disease vaccine VIEV. The vaccine has been tested on cattle, sheep, goats and camels.

"The vaccine was applied once; it was injected into the root area of the ear of cattle and of camels; to sheep and goats, it was injected into the caudal fold or into the surface of the upper part of the lip, at doses of 0.5 to 2 ml.

"Based on the results of these experiments, the authors consider that, in the vaccinated animals, the immunity starts on the 8th or 10th day after the inoculation and lasts up to 8 months; it prevents 100% of the animals in the average 90 - 95% from becoming sick with the foot-and-mouth disease."

---

6. Alenkovich, A. A. (1954)[60]

"1. The VIEV vaccine is safe, does not cause complications; its single injection creates convenience in use and facilitates the labor of veterinary workers.

"2. The vaccine constitutes an effective means of protection of cattle from F&M disease in menaced points, in complex with execution of other measures prescribed by the instruction on the struggle against F&M disease, developing a stable and long lasting immunity by the 9th-14th day.

"3. In the points stricken with F&M disease, by the 7th-10th-14th day the vaccine checks the further spread of the epizootic, speeds up the exhibition of the disease in earlier infected animals and deliverance of the establishment from F&M disease. It is necessary to revise the provisional directions on the use of the VIEV anti-F&M disease vaccine, authorizing the vaccination in the points stricken with F&M disease.

"4. The period of fitness of the vaccine exceeds that indicated in the provisional directions. Its use in the menaced and stricken points is possible with the elapsed 3-month period of fitness. Raising the period of fitness from 6 to 9 months increases considerably the practical value of the vaccine.

"5. The young of cattle aged up to 6 months, inoculated in 3cc dose, and grown cattle, inoculated in 5cc dose, develop a sufficiently stable immunity withstanding the natural infection with F&M disease, which also increases the positive properties of the vaccine and reduces the cost of its manufacture.

"6. The use of the vaccine in broad practice has contributed to a rapid liquidation of the epizootic in a number of raions and oblasts. The VIEV vaccine has won the confidence and authority not only among veterinary specialists, but also among the population, and it deserves broad use in the struggle against foot and mouth disease."

---

7. Arifdzhanov, K. A., S. I. Voinov (1956)[132]

"1. The VIEV anti-foot-and-mouth disease vaccine (L. S. Ratner and V. N. Gribanov) injected intracutaneously in cattle in 1-2 ml doses protects vaccinated cattle from the foot-and-mouth disease.

"2. Immunity in vaccinated animals sets in by the fifth-seventh day after intracutaneous injection of vaccine and lasts no less than eight months.

"3. Intracutaneous application of the VIEV anti-foot-and-mouth disease vaccine to infected herds makes it possible to put a stop to the disease in the animals within the herd on the condition that it be applied at the very first appearance of infection, that sick animals be isolated from the herd within the first five-seven days and kept in isolation for seven days after immunization.

"4. Intracutaneous application of vaccine permits to decrease the cost of animal immunization two-three times as compared with subcutaneous vaccination.

"5. Artificial reinfection of animals used as a control method for the foot-and-mouth disease can be substituted successfully with the method of intracutaneous vaccination.

"6. Use of the vaccine in threatened herds, as well as in herds infected with regard to the foot-and-mouth disease, in combination with the sum total of comprehensive measures, improves radically the existing system of control of the foot-and-mouth disease and makes it possible to provide prophylaxis more rapidly and to insure localization and elimination of the foot-and-mouth disease on farms."

---

8. Ratner, L. S., V. N. Gribanov, E. A. Sokolova, A. IA. Bobyr (1955)[65]

The FMD virus was adapted to rabbits by subcutaneous injection of dilute virulent blood which had been filtered through disks! Rabbits up to 45 days of age were used.

"The clinical picture of the disease in the infected young rabbits was usually expressed in the symptoms of a rapidly progressing paralysis which started with the front part of the body and ended with the general paralysis of the entire trunk and rear extremities (pictures). It should be noted, moreover, that as a rule the specific aphthous affections on the extremities and in the mouth cavity, which are characteristic for foot and mouth disease, were lacking in the rabbits."

The virus can be detected in rabbit ear vein blood 5 hours after subcutaneous inoculation. Rabbits which died 72-96 hours after infection revealed a picture of general sepsis with predominant affection of skeletal and cardiac muscles.

The vaccine was made according to the K-VIEV method substituting rabbit virus for cattle virus. In 1953 several batches of vaccine were made and tested for sterility, safety, and avirulence. Vaccine was injected subcutaneously in 10 cc doses for adults and 5 cc for cattle up to 6 mos. old. Limited field trials and some experimentally exposed animals suggests prospects that vaccine made from rabbit adapted virus would make a satisfactory prophylactic vaccine.

---

9. Dobrokhotov, A. M. (1953)[56]

"Prof. I. I. Kazanskiy and Candidate of Veterinary Sciences V. Ye. Karneyeva (VIEV) reported on experiments with a foot-and-mouth disease virus which had been attenuated (inactivated) by treatment with ASD (A. V. Dorogov's Antiseptic Serum).

"From their reports, it was clear that during the period from 1949 to 1952 the Chemotherapy Division of VIEV conducted extensive experiments on the action of various chemical substances on viruses and bacteriophages. In all, 232 compounds were tested. The nature of their (virus-) inactivating effect was thereby determined to a large extent, as was the possibility of reactivating viruses and bacteriophages by various methods.

"The most interesting of the investigated materials was A. V. Dorogov's ASD Fraction 2, which inactivates the foot-and-mouth disease virus. In order to ascertain the degree of inactivation to which a virus treated with the ASD preparation is subjected, experiments were carried out on farms threatened by the foot-and-mouth disease. These experiments showed that a slightly or weakly inactivated virus did not deter the outbreak of foot-and-mouth disease, but hastened the clinical appearance of the disease in latently ill animals and incubatics, bringing about a simultaneous, but less severe, infection of the other animals.

"A virus which had undergone a more extended period of inactivation did not provoke the disease, and was used, therefore, as a prophylactic to inoculate cattle, sheep, and goats in places threatened by the disease. This virus has been provisionally named K-VIEV vaccine.

"The preliminary results of an extensive test of the K-VIEV vaccine in various geographic zones on more than 500,000 animals permit us to draw the following conclusions:

"(1) The K-VIEV vaccine is harmless and does not provoke foot-and-mouth disease in inoculated healthy animals (cattle, sheep, and goats).

(2) The inoculation of threatened herds with the K-VIEV vaccine, in conjunction with other measures, made it possible to protect on the average 90-95% of the inoculated cattle from coming down with the disease.

(3) Only 0.2% of the vaccinated sheep and goats contracted natural foot-and-mouth disease. Experiments on swine gave good results after a double inoculation.

(4) Experiments on calves, as well as on adult cattle, showed that the immunity was not always constant or enduring.

(5) In isolated herds and regions, immunization with the K-VIEV vaccine did not afford lasting results, and it will therefore be necessary to do further research on improving the quality of the vaccine and on an analysis of its effectiveness."

---

10. Revo, M. V. (1956)[81]

"Vallée, Carré and Renzhar (Rinjard) vaccines (1925-1927). By injecting into cattle the formol vaccine which they have prepared, the mentioned authors proved experimentally that active immunity can be produced. The mentioned vaccine is a pellicular virus vaccine prepared from the virus which was ground in Latapi apparatus, suspended in physiological solution and to which 0.5% of formalin was added. The formalinized virus was kept at 20° for 24 hours. The dose for cattle was 50 ml. Immunity developed at the end of the third week after the vaccination and endured not less than for three months. Donasien, Lestokar, and Planture (all three names transliterated) (1929) approved Carré's, Vallée's and Renzhar's data.

"In the USSR, A. L. Skomorokhov and collaborators (Lavrovskii, Popov, Krasovskii, Babich, Lipatov) and also Iuskovets, Savel'ev, Mirotvorskii and the Veterinary Surgeons-Practicians Maslov, Kostiuchenko, Lomakin, Sil'chenko and others have vaccinated at different periods 7699 head of cattle with the Vallée type preparation.

A. L. Skomorokhov suggested the intradermal injection of the Vallée vaccine; the results Skomorokhov obtained by such vaccination were somewhat different from the others, for instance, immunity started considerably sooner, but it did not endure over $1\frac{1}{2}$ or 2 months.

"This method was not instilled into practice because the vaccine proved to be expensive, the immunity it produced was relative and not long lasting and the doses to be administered were extremely large.

"The Schmidt-Hansen aluminum hydroxide-vaccine. The Danish scientists Schmidt-Hansen and Schmidt-Iensen (1934) introduced a new method for the preparation of an anti-foot-and-mouth disease vaccine. The FMD virus of the coverings of 24-hour guinea pig aphthae is the initial material for this vaccine. A two-percent suspension was prepared from the coverings, it was centrifuged and mixed with aluminum orthohydroxide (prepared according to Wilstetter) in the proportion 4:6. In experiments the Schmidt vaccine proved to be highly effective. However, it was not perfect, since it contained active virus which caused FMD infection in susceptible animals. This vaccine and its preparation method were improved of late by the author and other researchers. This rendered the preparation applicable for practical use. It must be emphasized that all other types of aluminum hydroxide vaccines are only modification of the vaccine of the Danish scientists and that the Waldmann-Koebe vaccine is also the improved vaccine of the Danish scientists.

"The Waldmann-Koebe aluminum-hydroxide vaccine. Waldmann and Koebe have slightly modified the vaccine which was introduced by the Danish researchers; this has improved the aluminum-hydroxide vaccine and made it applicable in practice. The preparation techniques of the Waldmann-Koebe vaccine are as follows: into the lingual epithelium of the 'virus'-cattle the active virus is introduced; 24 hours post-inoculation, the aphthae virus and the aphthae coverings are taken from the animals. The approximate amount of the initial material obtained from one animal is 30 g. The material must be thoroughly ground in the Latapi apparatus, the obtained mass must be placed into freshly distilled water at a rate of 7% of pure material. In order to free the suspension of microorganisms, it must be centrifuged and filtered. A mixture of the virus and of aluminum hydroxide must be prepared; the rate is as follows: 100 liters of the mixture contain 50 liters aluminum hydroxide (prepared according to Wilstetter-Schmidt), 10 liters centrifuged suspension of the virus and 100 liters glycol solution which guarantee 9 pH in the mixture; thereafter, 50 ml chemically pure formalin must be added. The mixture must be vacuum closed and shaken for one hour in the electric shaker, thereafter it must be distributed into flasks of 1 liter capacity and left in the thermostat at 25° for 48 hours. The vaccine must be kept at the temperature of 3 to 5° through the whole period of control and up to the time of its delivery. The innocuity of each series of the vaccine (100 to 200 liters) must be checked and tested on cattle. The dosage of the vaccine is 15 to 60 ml, it depends on the animal's weight.

"The vaccine has not caused illness with FMD. Immunity develops within 5 to 14 days; its duration is 4 to 6 months." *

"N. V. Eliseev's report also shows favorable vaccination results obtained on farms which were exposed to FMD infection. K. A. Arifdzhanov, D. F. Zaikin, T. IA. Vannovskii, F. I. Denisenko and others reported that under conditions of monadic animal husbandry, the anti-foot-and-mouth disease vaccinations used in the complex with other prophylactic measures have quickly stopped the course of epizootics and prevented its further spread.

"A. A. Nechaev, L. L. Verteletskii, A. D. Ivanov, S. R. Didovets, N. P. Arkhipov and others indicated that their reports are based on the analysis of material obtained during the practical application of the VIEV vaccine on 2,000,000 head of cattle in different zones of the USSR; they found the vaccine being highly effective and said that it prevented the infection of cattle if used in the complex with other FMD control measures; they also added that the vaccine simplifies considerably the fight against the disease in general and minimizes the broad scale of quarantine measures.

"Chloroform vaccine. Galeya and Khomutov (in France) have established that the FMD virus when treated with chloroform loses its virulence but preserves its antigenic properties. The chloroform vaccine prepared by Galeia was tested in France with positive results; however, later it turned out that this type of vaccine possesses many negative properties and that they do not produce such persistent immunity which was claimed by the author and which he had obtained at one time. (Footnote: In the USSR too were prepared chloroform vaccines according to Galeia's method and also by using

* For modification to this vaccine see reference to Rosenbusch and to Camargo and Mott and also consult Moehlmann (1954)[87].

various other modifications. However, we do not have time to discuss all of them and to cite the literary sources for the studies of the efficacy of the chloroform vaccine, since this method was found not being suitable for our country; however, as to foreign countries, there this method is being investigated and checked in laboratories and the mechanism of the vaccine's effect is tested).

"UIEV Anti-Foot-and-Mouth Disease Vaccine. Collaborators of the Ukrainian Institute of Experimental Veterinary Medicine I. I. Kulesko, A. M. Govorov, I. N. Doroshko and E. Andreev elaborated for the obtaining of anti-foot-and-mouth disease vaccines at large amounts a new advantageous method.

"The vaccine consists of the FMD virus specially treated and grown in the body of cattle into which embryonal tissue suspension was inoculated.

"In order to study the histoblastic possibilities of tissues, F. M. Lazarenko developed in the thirties new techniques for tissue propagation in the animal's body. According to his data and to tests conducted by Frenkel and others it was established and by scientific collaborators of the UIEV approved that the cow embryo epithelium, if ground and suspended in isotonic liquid of a special composition and later injected subcutaneously into cattle, causes at the spot of the injection a large sterile yellow infiltrate perforated with blood vessels. The newly developed tissue separates most easily from the subcutaneous tissues and does not destroy the animal's carcass. The mentioned infiltrate of the so-called embryoma is the nutritive medium for the multiplication of the virus injected simultaneously with the embryonal tissue inoculated into the lingual membrane of the experimental animals; the virus accumulates in the filtrate in high concentration.

"Using the mentioned method the collaborators of the UIEV prepared from the virus two types of vaccines: the formol vaccine and the crystal violet vaccine. It was proved by experimental tests on cattle that the crystal violet vaccine possesses better expressed immunogenic properties than the formol vaccine; therefore, further studies and tests concerned the crystal violet vaccine only."*

"The new preparation methods of the vaccine are inexpensive and effective; they open new prospects in the fight against FMD. However, commissioned and thorough tests of the preparation and application of the crystal violet embryonal FMD vaccine must be still continued.

"For this purpose in the oblasts of the Ukrainian SSR experimental productional mass vaccinations must be organized; they must be conducted under a steady methodical supervision of the Ukrainian Institute of Experimental Veterinary Medicine. Thereafter, the vaccine which is an economical

---

*Reviewer's note: This, from description, is very much like the so-called "Embryoma" type vaccine of Thomas, Thiery, Salomon and Salomon. Their names are not mentioned in the Revo reference to this vaccine. Briefly this vaccine is made from virus propagated in the skin of 3-6 month bovine fetuses, kept alive artificially, then the inoculated fetal skin is transferred to adult bovine animal subcutaneously where large amounts of virus are produced. Technical difficulties were encountered by the French workers and by Moehlmann (1954)[87]. Probably the Soviet workers had similar difficulties.

and very effective means in the prophylaxis against FMD, must be instilled into general veterinary practice immediately.

"The new type of the vaccine must be studied in every respect; in order to improve the composition of the medium for the propagation of the virus investigations must be conducted; the optimal dosages of the vaccine for all species of susceptible animals must be studied; the onset of immunity, its duration and persistence, and the preservation period of the vaccine must be established.

"Some Data of Foreign Literature Concerning Anti-Foot-and-Mouth Disease. Schmidt, Hansen and Holm (1947, 1949) studying the effect of ultraviolet rays on the FMD virus, established that in the destruction of the virulence of the FMD virus the short wave rays are most effective; in the mean time, they do preserve a considerable part of the antigen.

"Based on their research, the scientists introduced a new type of vaccine which is an FMD virus suspension treated with ultraviolet rays during 197 seconds. The vaccine showed positive immunizing properties which by adding aluminum hydroxide can be increased. The authors emphasized the fact that immunity produced by this vaccine was long lasting, but they have not indicated its duration.

"Demnitz (1951) prepared an anti-foot-and-mouth disease vaccine from a virus grown on chick embryos. The experiments were conducted with the O-type virus. During these experiments it was established that the virus of the 145th serial passage had lost its virulence to cattle and produced specific immunity; on its 198th passage, the virus became avirulent to swine.

"The A-type virus became inactive to swine on its 70th passage, on its 72nd passage, it was avirulent toward cattle. However, as to its practical application, nothing is known.

"Tondo (1951) prepared an anti-foot-and-mouth disease vaccine by the effect of ultraviolet rays on the O-type virus adsorbed on aluminum hydroxide and diluted with distilled water. The virus exposed for 80-160 seconds, did lose its virulence but it preserved its immunogenic properties. Under experimental conditions, the irradiated virus protected guinea pigs against the effect of a 10,000 minimal infective dose.

"Studying the stabilizing effect of glycerin on the FMD adsorbate vaccine, Moosburger established that the addition of 10% of glycerin decreased the required amount of aluminum hydroxide and increases the potency of adsorbtion. Such stabilized vaccine has proved to effective during immunizing experiments on cattle, even when kept under fluctuating thermal conditions for a long time.

"Rotgardt and Piracci (1952), Rotgardt and Gorgardt (1952) have prepared the FMD vaccine by treating the virus with formalin and using tapioca as depositive. The virus for the vaccine was derived from the coverings of the FMD vesicles; the vaccine was injected subcutaneously in amounts of 2 to 10 ml; according to the authors, the results were very satisfactory.

"Geiger (1953) indicated that the monovalent, bivalent and trivalent adsorbate vaccines proved to be highly effective and completely preserved in field experiments their immunizing properties for 21 months during the epizootics of 1951.

"Waldmann and Nagel (1953) formerly prepared the formol-aluminum-hydroxide vaccine according to the ordinary method, but, of late, they are using other techniques such as: they employ a FMD virus which was preliminarily passaged many times through the organism of young premature (? - reviewer's) mice. The vaccine was tested on 12 to 15 month old cattle which were infected thereafter. The authors came to the conclusion that the passaged murine virus is a highly satisfactory and for the preparation of the FMD vaccine an inexpensive material."

---

7. REFERENCES

(Following pages 1-11)

7. REFERENCES*

1. SKOMOROKHOV, A. L. 1929 Through the veterinary scientific research establishments of Germany and Denmark. Report on scientific mission abroad. Trudy Gusudarstvennoge Instituta, Eksperimental'noi Veterinarii, 6(1):109-133. Moscow.

2. GINZBURG, I. V. 1932 On the occasion of the opening of the Foot and Mouth Disease Institute. Sovetskaia Veterinariia, No. 23-24:43-44. December.

3. BELOGORSKII, M. A., LIPATOV, G. I. 1936 Silage as a method of neutralization of fodder in foot-and-mouth disease. Sovetskaia Veterinariia, 13(9): 49-50.

4. RATNER, L. S. 1938 Lisii Island. Sovetskaia Veterinariia, No. 12:67. December.

5. DORONIN, N. N., KINDIAKOV, V. I. 1940 (Kazakh Scientific Research Veterinary Station) Revealing the possibilities of employing precipitation reaction in foot-and-mouth disease. Preliminary report. Zhurnal Microbiologii, Epidemiologii i Immunobiologii, 8:86-87.

6. MOLCHANOV, D. P. 1940 (Lisii Island) Struggle against foot-and-mouth disease. Sovetskaia Veterinariia, 17(8-9):97-98. (This is a report of Professor Dr. O. Waldmann, Insel Riems b. Greifswald, at the IV International Congress of Pathologists in Rome, May 1939).

7. SHEVCHENKO, S. M. 1941 (Main Vet. Administration, USSR Narkomzem) At the XVIII Plenum of the Veterinary Section of the All-Union Academy of Agricultural Sciences named for V. I. Lenin. Veterinariia, 18(1):69-72.

8. DOBROKHOTOV, A. M. 1941 (Veterinary Section, VASKhNIL) Problems in the fight against brucellosis and the foot-and-mouth disease at the Plenum of the Veterinary Section, All-Union Academy of Agric. Sciences named after V. I. Lenin. Vestnik sol'skokhoziaistvennoi nauki Veterinariia, 1:134-142.

9. RUSHCHITS, A. C. 1943 (Kazakh Scientific Research Veterinary Institute) Ash-alkaline solutions as disinfecting agents in foot-and-mouth. Veterinariia, 20(10/11):41-42.

(10. National Geographic Society. 1945 Index to map of Union of Soviet Socialist Republics.)

11. LEONOV, N. I., ALIKAEV, V. A. 1946 The work of VIEV in the years of the Patriotic War. Veterinariia, 23(1):4-7.

---

* Author's address, when available, is given in ( ) following the date.
The source, or publishing house is quoted as it appears in the article. Variations in spelling may be noted.
In instances where the reference notation is incomplete, it is given in the form in which it appears on the original article.

11a. TERENT'EV, F. A. 1946 (All-Union Institute of Experimental Veterinary Medicine) On the 'scientific' genius of Professor N. I. Nikolaenko. Veterinaria, 23(1):22-25. Izdatel'stvo Ministerstva Zemledeliia Soiuza SSR.

12. BORISOVICH, F. 1946 Foot-and-mouth disease in cattle (Abstracts). Veterinariia, 23(10/11):23-26.

13. RATNER, L. S., KUDRIAVTSEV, A. A., LEONOV, N. I., MOLCHANOV, D. P. 1947 (All-Union Institute of Experimental Veterinary Medicine) Study of the infectiousness of saliva in foot-and-mouth disease on the basis of physiological experiment. Veterinariia, 24(3):28-29.

14. TSION, R. A., RAEVSKII, A. A. 1947 (Uzbek Scientific Research Veterinary Experiment Station) Cattle grippe - a disease simulating foot-and-mouth disease. Veterinariia, 24(2):18-20.

15. KUZ'MIN, V. V. 1948 The virus of foot-and-mouth. Veterinaraia Mikro-giologiia, Moskva, Leningrad.

16. RED'KO, A. S. 1949 Testing the serum of convalescents and anti-foot-and-mouth aluminum-hydroxide vaccine. Veterinariia (10):19-21, Moskva.

17. No author. 1949 Fifth student scientific-theoretical conference. Veterinariia, 26(4):45.

18. No author. 1950 Foot-and-mouth Disease. Spravochnik Veterinarnogo Vracha. Gosudarstvennoe Izdatel'stvo Sel'skokhoziaistvennoi Literatury. Moskva, Leningrad, 888p. p.38-41.

19. BEDENASHVILI, G. G. 1950 (Ministry of Agriculture, Georgia SSR Scientific-Experimental Veterinary Institute, Tiflis) Foot-and-mouth disease and fight against it. Central task in development of agriculture. 43p.

20. No author. 1950 Immune serum. Veterinarnyi Entsiklopedicheskii Slovar, 1:371-373.

21. SKOMOROKHOV, A., PINUS, A. 1951 Foot-and-mouth disease. Veterinarnyi Entsiklopedicheskii Slovar, 2:613-616.

22. PLOTNIKOV, K. I. 1951 (Novosibirsk Scientific Research Veterinary Experimental Station) Malignant foot-and-mouth. Veterinariia, 28(12):19-24.

23. KOVALENKO, IA. R. 1951 Reference tables. Utilization of biological and chemicotherapeutic preparations in veterinary medicine. Moskva, Gos. Izd-vo Selkhoz. Lit-ry, pp 222-239.

24. KOVALENKO, IA. R. 1951 Utilization of biological and chemicotherapeutic preparations in veterinary medicine. Organization and technique of conducting inoculations. 21. Inoculations in foot-and-mouth disease. Gosudarstvennoe Izdatel'stvo Sel'sko-khozaistvennoi Literatury, Moskva, 247p.

25. SKOMOROKHOV, A. L. 1951 Foot-and-mouth disease. Prevention and eradication of infectious diseases in animals. "pp . 33:145-46."

26. TITOV, N. N. 1951 Dry biological preparations. Nauka i Zhizn', 18(7):40.

27. SKOMOROKHOV, A. L. 1952 Foot-and-Mouth Disease, 2nd Ed. Moscow-Leningrad.

28. No author. 1952 Prevent the illness of animals with foot-and-mouth disease. Sovhoznye agroplakaty (Sovkhoz Agroposters) No. 3.

29. SKORIN, I. E. 1952 On the microbic forms of the foot-and-mouth virus. Veterinariia, 29(7):20-24. Moskva.

30. No author. 1952 In the Ministry of Agriculture, USSR. Veterinariia, 29(1):60-61. Moskva.

31. KINDIAKOV, V. I., NIKONOVA, O. S. 1952 The period of preservation of foot-and-mouth virus in beet residue. Veterinariia, 29(9):34-35. Moskva.

32. KINDIAKOV, V. I., BAIADINOV, A. N., FILIPPOVICH, S. M., NIKONOVA, O. S. 1952 On the variability of the virus of foot-and-mouth. Veterinariia, 29(8):21-27. Moskva. Reported at the Scientific Conference of NIVI, Kazakh Branch of VASKhNIL, May 6, 1951.

33. VOROVICH, A. A. 1952 Foot-and-mouth epizootic in Europe in 1952. Veterinariia, 29(6):58-60.

33a. NEMTSOV, B. A. 1952 Use of formalin in treatment of foot-and-mouth. Veterinariia, 29(12):29-30.

34. ALIVERDIEV, A. A. 1952 Complications in foot-and-mouth and their prevention. Veterinariia, 29(12):28-29.

35. RATNER, L. S., GRIBANOV, V. N. 1952 Concerning the action of trypsin on biological properties of the agent of foot-and-mouth disease. Trudy VIEV, 19(1):129-131.

36. GRIBANOV, V. N. 1952 Differentiation of the types of the virus of foot-and-mouth disease with the aid of complement fixation reaction. Trudy Vaesoiuznoge Instituta Experimental'noi Veterinarii, 19(1):105-120. Moscow.

37. KAZANSKII, I. I., NIKOLAOV, A. V., KARNEEVA, V. E. 1952 Action of chemical substances on viruses. Trudy Vaesiuznoge, Instituta Experimental'noi Veterinarii, 19(1):28-49. Moscow.

38. ZHORNOSEK, T. P. 1952 Vaccinal reaction and immunity in foot-and-mouth aluminum-hydroxide vaccine. Pathologoanatomical study. Trudy Vaesoiuznoge Instituta Ekperimental'noi Veterinarii, 19(1):120-137. Moscow.

38a. RUSHCHITS, A. S. 1947-1952 The purification and concentration of the aphthae virus of the foot-and-mouth disease. Trudy, Institute Veterinarii, Kazakhskii Filial, Vsesoiusnoi Ordena Lenina Akademii Sel'skokhoziaistvennykh Kauk imeni V. I. Lenina, 6:190-198.

39. VAGIN, I. B 1953 (Fergana Oblast Vet. Bact. Lab.) Foot-and-mouth epizootic of sheep and goats. Veterinariia, 30(1):26.

40. POLIAKOV, A. A. 1953 Sanitary measures in the fight against foot-and-mouth. Veterinariia, 30(1):49-54.

41. KOLOMAKIN, G. A. 1953 (Taldy-Kurgan Oblast Vet. Bact. Lab.) Preservation of citrated blood of convalescents of foot-and-mouth disease. Veterinariia, 30(6):36.

42. CHIZHIKOV, N. V. 1953 On susceptibility of horses toward foot-and-mouth disease. Veterinariia, 30(7):53.

43. KRIVOSHAPKIN, N. A., RED'KO, A. S. 1953 Our experiment with prophylaxis of foot-and-mouth disease of cattle. Veterinariia, 30(7):25-26.

44. DOBROKHOTOV, A. M. 1953 Problems of the fight against foot-and-mouth disease of agricultural animals. Results of the 39th Plenum of the Veterinary Section of VASKhNIL. Veterinariia, 30(7):60-63.

45. GORBAN, N. I. 1953 (Kiev Vet. Inst.) On the role of some epizootiological factors in foot-and-mouth disease. Veterinariia, 30(7):22-24.

46. KINDIAKOV, V. I., BAIADINOV, A. M. 1953 (Inst. Vet. Sci., Kazakh Branch VASKhNIL) On forced inoculations of pigs in foot-and-mouth disease. Veterinariia, 30(8):17-18.

46a. SVIRIDOV, A. A. 1953 (Novosibirsk NIVOS) On virus-carriage in foot-and-mouth disease. Veterinariia, 30(8):18-19.

47. GRIGOR'EVA, N. I. 1953 (Moscow Ag. Academy named for K. A. Timiriasev) Course of foot-and-mouth disease epizootic on one of the suburban farms. Veterinariia, 30(9):27-28.

48. EREMSEV, S. Z., KRASNENKOV, N. V. 1953 Experiment with the use of citrato-phenolized blood of foot-and-mouth disease convalescents. Veterinariia, 30(9):26-27.

49. RYZHOV, A. P., MAIOROVA, L. I. 1953 (Institute named for I. I. Mechnikov) Treatment of foot-and-mouth disease with acids. Veterinariia, 30(11):57.

50. SVIRIDOV, A. A. 1953 (Novosibirsk NIVOS) Vaccination of cattle against foot-and-mouth disease by the living vaccine from the virus which has been passed in guinea pigs. Veterinariia, 30(11):18-19.

51. LEONOV, I. I. 1953 According to the material of the 15th International Veterinary Congress. Veterinariia, 30(12):51-56.

52. ZHDANOV, V. M. 1953 Family of foot-and-mouth disease viruses. Opredelitel Virusov Zhivotnykh i Cheloveka, 134-135.

53. ZHDANOV, V. M. 1953 Order V. Protovirales ord. nov. Family III. Dermaphilaceae fam. nov. Genus 1. Dermaphilus nom. nov. Opredelitel Virosov Cheloveka i Zhivotnykh, 314-315.

54. ERSHOV, V. S. 1953 Foot-and-mouth disease. Fundamentals of Veterinary Sciences, p.303-306, Moskva. Gos, isd-vo Sel'skhoz. lit-ry.

55. DOBROKHOTOV, A. M. 1953 Thirty-ninth Plenary Session, Veterinary Section of VASKhNIL. USSR Meeting on Foot-and-mouth disease. Veterinariia, Moscow, July.

56. Duplicate of #55.

57. KOVALENKO, IA. R. 1954 Twenty-second Annual Congress of the International Epizootic Office. Veterinariia, 31(9):59-61.

58. DUKATSENKO, V. G. 1954 (Moscow Interoblast Trust of Livestock Fattening) Experimental use of the VIEV anti-foot-and-mouth disease vaccine in fattening sovkhozes. Veterinariia, 31(2):21-23.

59. MESHKOV, N. V., KOCHETOVA, E. F. 1954 (L'vov Veterinaire-Zootechnical Institute) On malignant form of foot-and-mouth disease in cattle. Veterinariia, 31(1):41-43.

60. ALENKOVICH, A. A. 1954 (Veterinary Administration, Ministry of Ag, Belorussian SSR) Use of the VIEV anti-foot-and-mouth disease vaccine (Ratner's, Gribanov's). Veterinariia, 31(5):37-39.

61. SHELKOVYI, G. T. 1954 (VIEV) On the problem concerning the treatment of animals sick with foot-and-mouth disease. Veterinariia, 31(8):29-32.

62. RATNER, L. S., GRIBANOV, V. N. 1954 (VIEV) VIEV anti-foot-and-mouth disease vaccine and its practical use. Veterinariia, 31(9):33-38.

63. Unsigned Monograph. 1955 (VIEV) The effectiveness of immunizing cattle against foot-and-mouth disease in the USSR. 14p.

64. AKULEV, A. V. 1955 (VIEV) Pathological changes in experimental foot-and-mouth disease in rabbits. Veterinariia, 32(1):20-24.

65. RATNER, L. S., GRIBANOV, V. N., SOKOLOVA, E. A, BOBYR, A. IA. 1955 (All-Union Institute of Experimental Veterinary Medicine) Results of testing the VIEV anti-foot-and-mouth disease vaccine from the virus which has been adapted on rabbits. Veterinariia, 32(1):18-20.

66. LIKHACHEV, N. V., BAZYLEV, P. M., SIURIN, V. N. 1955 On the stability of the foot-and-mouth disease virus, connected with microbes. Trudy, Gosudarstvennyi Nauchno-Kontrol'nyi Institut Veterinarnykh Preparatov, Ministerstva Sol'skoge Khoziaistva SSSR, (Biopreparaty, virusy, mikroby), 5:57-65.

67. POPLAUKHIN, S. G. 1955 (Altai NIVOS) Results of the application of the albumin protein-virus complex in the fight against foot-and-mouth disease in cattle of the Altai Krai. In 25 years of SIBNIVI. Theses and abstracts of reports of the Fifth Scientific-Productional Conference held by veterinary scientific-research establishments of Siberia, p.122-133. Omsk.

68. BANNOV, A. T. 1955 (Krasnoiarsk Ag. Krai Admin.) Method of eradication of foot-and-mouth disease in the Krasnoiarski Krai by using the Ratner-Gribanov vaccine. In 25 years of SIBNIVI. Theses and abstracts of reports of the Fifth Scientific-Productional Conference held by veterinary scientific-research establishments of Siberia, p.87. Omsk.

69. LAPIN, V. I. 1955 (Omsk Oblast Ag. Admin.) Experimental use of the Novosibirsk NIVOS anti-foot-and-mouth disease vaccine. In: 25 years of SIBNIVI. Theses and abstracts of reports of the Fifth Scientific-Productional Conference held by veterinary research establishments of Siberia, p.104-106. Omsk.

70. RUSHCHITS, A. S. 1955 On some biochemical changes of the blood in experimental foot-and-mouth disease. Trudy, Institut Veterinarii, Kazakhskii filial Vsesoiuznoi ordena Lenina Akademii Sel'skokhosiaistvennykh Hauk imeni V. I. Lenina, 7:42-46. Alma-Ata, Kazakhskoe gos, izd-ve.

71. GIZITDINOV, N. N. 1956 To the question of virus discharge in foot-and-mouth disease. Trudy, Institut Veterinarii, Kazakhskii filial Vsesoiusnoi ordena Lenina Akademii Sel'skokhoziaistvennykh Nauk imeni V. I. Lenina, 7:37-41. Alma-Ata, Kazakhskoe gos, izd-ve .

72. RUMIANTSEV, A. P. 1955 New method for the disinfection of hides in cases of the foot-and-mouth disease. Vaesoiuznaia Akad. Sel'skokhoz. Nauk. im. V. I. Lenina. Kazakhskii Filial. Inst. Vet. Trudy. 1:25-36. Alma-Ata, Kazakh gos. izd-vo.

72a. VOINOV, S. I. 1955 (Uzbek Scientific-Research Veterinary Institute) Concerning virus carriers in incidence of foot-and-mouth disease. Veterinariia, 32(1):25-28. Moskva, Izdatel'stvo Ministerstva Sel'skoge Khoziaistva SSSR.

73. MALININ, K. M. 1956 (VIEV) Effect of zoohygienical conditions on the course and consequences of foot-and-mouth disease in cattle. Veterinariia, 33(1):66-69. Moskva, Izd-vo M-va Sel'sk. Kh-a SSSR.

74. VOINOV, S. I. 1956 (Uzbek NIVI) On the resistance of the foot-and-mouth disease virus on pastures. Veterinariia, 33(6):66-67.

75. SHULIMOVA, E. S, KUZ'MIN, A. F., FED'KO, P. A. 1956 (Odessa Ag. Inst.) Effect of tissue preparations on the lactation process of cows during their sickness with the foot-and-mouth disease. Veterinariia, 33(2): 27-30. Izdatel'stvo Ministerstva Sel'skogo Khoziaistva SSSR.

76. BONDARENKO, G. P. 1956 (Vet. Admin, Ukrainian SSR Ministry of Ag) Malignant foot-and-mouth disease. Veterinariia, 33(4):46-48.

77. IVANOV, A. D. 1956 On the application of the anti-foot-and-mouth disease vaccine VIEV. Veterinariia, 33(4):--.

78. REVO, M. V. 1956 Viruses and Virus Diseases of Agricultural Animals. Kiev, Gosudarstvennoe Izd-vo sel'skokhoziaistvennoi literatury Ukrainskoi SSR. 495p.

79. DIDOVETS', S. R. 1956 (Vet. Admin., Ministry of Ag., Ukrainian SSR) Vaccination of large cattle against foot-and-mouth disease. Sotsialistichne Tvarinnitstvo 28(2):50-52. Kyiv, Min. Szl'skogo hospodarstva URSR.

80. RATNER, S. I., KOROLEV, G. P., GUBIN, G. N., KOMOLOVA, R. P. 1956 (Clinical Order of Lenin Hospital named after S. B. Botkin) A case of lingering foot-and-mouth disease in man. Klinicheskaia meditsina, 34(7):70-77.

81. REVO, M. V. 1956 Foot-and-mouth disease. Viruses and Virus Diseases of Agricultural Animals.pp87-143. Kiev, Gosudarstvennoe izdatel'stvo sel'skokhoziaistvennoi literatury Ukrainskoi SSR.

82. No author. 1956 USSR research on foot-and-mouth disease. Referativnyy Zhurnal, Biologiya, No. 12, 25 June.

82a. RUMYANTSEV, A. P. 1955 A new method of disinfecting rawhides in foot-and-mouth disease. Works of the Institute of Veterinary Medicine of the Kazakh Affiliate of VASKhNIL, All-Union Academy of Agricultural Sciences imeni Lenin, No. 7

82b. GIZITDINOV, N. N. 1955 The problem of virus excretion in foot-and-mouth disease. Works of the Institute of Veterinary Medicine of the Kazakh Affiliate of VASKhNIL, No. 7.

82c. LIKHACHEV, N., BAZYLEV, P. M., SYURIN, V. N. 1955 The stability of foot-and-mouth disease virus in combination with microorganisms. Works of the State Scientific Control Institute of Veterinary Preparations, (5):57-65.

83. RATNER, S. I., KOROLEV, G. P., GUBIN, G. N., KOMOLOVA, R. P. 1956 A lingering case of human infection with foot and mouth disease. Klinicheskaya Meditsina, 34(7):70-76. (Abstract)

84. SKOMOROKHOV, A. L. 1956 Foot-and-mouth disease. Contagious Animal Diseases. Moskva-Leningrad Gos. Izd-vo sol'khozgis, p149-175.

85. KOSITSINA, E. A. 1957 (Krasnoiarsk NIVOS) New Medical Preparation. Veterinariia 34(2):45-47. Moskva Min. S.-Kh. SSSR.

86. RATNER, L. S., SERGEEV, V. A. 1957 (VIEV) Biological method for diagnosis of types of viruses of foot-and-mouth disease by serums from reconvalescents. Veterinariia, 34(2):73-76. Moskva, Min. S.-Kh.SSSR.

87. MOEHLMANN, Dr. H. (Riems Island Epizootic Research Institute, Freidrich Loeffler Institute, Germany) 1954 The present state of research on the virus of foot-and-mouth disease. Archiv fuer Experimentelle Veterinaermedizin, 8(3):316-393.

88. SCHMIDT, W. 1949 (Goslar, Germany) Random notes on the raising of livestock in theSoviet Union. Tierarztliche Unschau, Nr. 21/22, 4. Jahrgang, pp 338-347.

89. BASHENIH, V. A. 1955 Foot-and-mouth disease (Aphthae episooticae), Course in specific epidemiology. p. 353-355. Leningrad, Medgis.

90. LIAPUSTIN, A. K., PREOBRAZHENSKII, M. M. 1956 Electrocardiographic and rumenographic examinations of cattle in cases of malignant foot-and-mouth disease. Moskov. Vet. Akad., Trudy, 12:73-81. Moskva, Sel'khozgis.

91. RATNER, L. S., (Terent'yev, F. A. and Markov, A. A., editors) 1956 Foot-and-mouth disease. Infektsionnyye i invazionnyyee bolezni krupnogo skota, Moscow. Sel'khozgis, pp 277-311.

92. ZAL'TSMAN, L. 1957 On the systems of livestock management in various zones of USSR. Voprosy Ekon., 3:52-65. Moskva/Izd. "Pravda".

93. VISHNEVSKIY, P. P. 1947 New data in the study of cattle diseases in the USSR. Abstract. Veterinariia 11:24-28.

94. OZEROV, A. V. 1948 Diseases of Agricultural Animals and Zoohygiene. Ogiz-Selkozgiz, 592p. (Excerpts pp 1-10, 21-33). Moscow.

95. OZEROV, A. V. 1948 Diseases of Agricultural Animals and Zoohygiene. The hygiene of pasturing animals. Moscow.

96. RATNER, L. S. 1949 (VIEV) Virucidal effect of the parotid gland on the pathogen of foot-and-mouth disease (Autoreport). Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, No. 3:73. Moskva, Modgiz.

97. GOLOSHCHAPOVA, Yu. N. 1950 Foot-and-mouth disease(aphthae epizootica). Spravochnik Veterinarogo Vracha (Handbook of practical doctor), Moscow, pp 38-41.

98. VYSHELESSKII, S. N., TERENT'EV, F. A. 1954 Foot-and-mouth disease. Special epizootiology. p 181-195. Moskva, Sel'khozgiz.

99. SHABANOV, A. N., KOLESNIKOV, N. V. 1954 Foot-and-mouth disease (aphthae epizooticae). Medical Handbook for Surgeon s Assistants, Chapter II, p.204. Moscow.

100. POLYAKOV, A. A. 1954 USSR work on transmission of veterinary infectious diseases by rats. Veterinariia, 31(8):--. Moscow.

101. GOLOSHCHAPOV, IU.N., POLIAKOV, A. A. 1954 Instructions for the control of foot-and-mouth disease. Collection of leading material on veterinary medicine, 2:200-209. Moskva Gos. izd-vo sel'skhoz. lit-ry.

102. GOLOSHCHAPOV, IU. N., POLIAKOV, A. A. 1954 Instructions concerning the vaccination of cattle with the virus of the foot-and-mouth disease. Collection of leading material on veterinary medicine, 2:209-211. Moskva Goz. izd-vo Sel'skhoz. lit-ry.

103. GOLOSHCHAPOV, IU. N., POLIAKOV, A. A. 1954 On the carrying out of control measures against foot-and-mouth disease on meat combines and slaughteries. Collection of leading material on veterinary medicine, 1:276-277. Moskva Gos. izd-vo Sel'skoz. lit-ry.

104. NOVAEV, N. N. 1955 (First Beshkent MTS, Kashka-Daria) Course of the foot-and-mouth disease in sheep of karakul breed. Karakulevodstvo i zverovodstvo, 8(5):53. Moskva Izd-vo. Min. Sovkhozov SSSR.

105. LUCHIN, I. I., KUZ'MINA, N. I. 1955 New method for disinfection of raw hides infected with foot-and-mouth disease. Legkaia Promyshlennost, 15(5):39-40.

106. ZHDANOV, V. M., KRICHEVSKIY, A. M. 1955 Infectious Diseases of Man, Section III, Moscow. pp 261-263.

107. No author. 1956 For the leading veterinary science, which is closely connected to life. Veterinaria, 33(2):3-8. Moskva. Min. S-Rh. SSSR.

108. VECKENSTEDT, A. 1956 On the tenacity of the foot-and-mouth disease virus in plankton. Archiv fuer Experimentelle Veterinaermedizin, 10(4):517-534. Leipzig.

109. REVO, M. V. 1956 Viruses and Virus Diseases of Agricultural Animals. Preface, p. 9. Kiev, Gosudarstvennoe izdatel'stvo sel'skokhoziaistvennoi literatury Ukrainskoi SSR.

110. DIL'BAZI, G. I. 1956 "Furacillin" in veterinary practice. Veterinaria, 33(5):60-61.

111. ZHITENKO, P. V. 1956 On the stability of the foot-and-mouth disease virus in blood and meat, and on the sanitary value of slaughter products from animals stricken with foot-and-mouth disease. Moskovskaia Veterinarnaia Akademiia, Trudy, 17:120-123. Moskva-Kuz'minki.

112. BUNIN, K. V. 1956 Foot-and-mouth disease (aphthae epizooticae). Course of infectious diseases. Moscow. pp 362-365.

113. YEGOROV, P. I., BUSALOV, A. A., KRAKOV, B. A., MASHIKOVSKIY, O. D., KUDRYAVTSEV, M. A. 1956 Foot-and-mouth disease (Aphthae epizooticae), Handbook of the Practical Doctor. Moscow. pp 1069-1071.

114. No author. 1956 In the USSR Ministry of Agriculture. Veterinariia, 33(10):90-93. Moskva. Izd'vo Min. S.-Kh. SSSR.

115. No author. 1956 Through the Soviet Union. Veterinariia, 33(8):93-96

116. No author. 1956 In the USSR Ministry of Agriculture. Veterinariia, 33(9):87-90.

117. AMPITEATROV, F. A. 1956 Eradication of foot-and-mouth disease in the initial stage. Moskva, Gos. Izd-vo S-kh. literatury, 31p.

118. FILIPPOVICH, S. M. 1957 (Kazakh Scientific Res. Institute, Branch of VASKhNIL) Modifiability of foot-and-mouth disease virus. Investigations of the modifiability of typical properties of foot-and-mouth disease virus. Veterinariia, 34(4):45-49.

119. ABUZAROV, KH. G., SALAVATOV, R. SH. 1957 Biothermical pits to replace animal cemeteries. Veterinariia, 34(7):79-80. Moskva Min. S-Kh. SSSR.

120. MASIUKOV, A. V. 1957 (Krasnodar Krai NIVOS) Post-foot-and-mouth disease cardiac asthma in cattle. Veterinariia, 34(7):41-43. Moskva Min. S.-Kh. SSSR.

121. STEPANIAN, G. G. , AVAKIAN, S. L. 1957 (Erevan' Zooveterinary Inst.) Treating with natural gastric juice of dogs post-foot-and-mouth disease complications in agricultural animals. Veterinariia, 34(7): 45-47. Moskva Min. S.-Kh. SSSR.

122. PETERSON, K. 1957 Complications in foot-and-mouth disease and measures to prevent them. Veterinariia, 34(7):44-45. Moskva Min. S-Kh. SSSR.

123. No author. 1957 In the USSR Ministry of Agriculture. Veterinariia, 34(8):93. Moskva Izd-vo Min. S-Kh. SSSR.

124. SHUBIN, V. A. 1957 (VIEV) Pathological histology of malignant foot-and-mouth disease in cattle. Veterinariia, 34(8):30-32. Moskva Izd-vo Min. S.-Kh. SSSR.

125. BOIKO, A. A. 1957 (Main Vet. Admin., USSR Ministry of Ag.) Some results of the work in the year 1956 and the tasks of the veterinary specialists for the second year of the sixth five-year-plan. Veterinariia, 34(1):3-9. Moskva Izd-vo Min. S.-Kh. SSSR.

126. TIULEN'KOVA, M. F. 1957 At the Scientific-Technical Council of the USSR Ministry of Agriculture. Veterinariia, 34(4):90-92. Moskva Min. S.-Kh. SSSR.

127. NOGINA, V. T. 1957 (Novosibirsk NIVOS) Typing of foot-and-mouth disease virus by using serums of cattle which had been sick. Veterinariia, 34(4):50-54. Moskva Min. S.-Kh. SSSR.

128. MOZGOV, I. E. 1957 (VASKhNIL) Veterinary measures for liquidation of basic diseases of agricultural animals. Vest. Sel'skokhoz. Nauki, 2(9):80-97. Moskva Izd. M. S.-Kh. SSSR.

129. VYSHELESSKII, S. N., KALUGIN, V. I. 1957 Achievements of epizootiology for the past 40 years. Veterinariia, 34(9):8-26. Moskva, Izd-vo Min. S.-Kh. SSSR.

130. KOLIAKOV, IA. E. 1957 (Moscow Vet. Acad.) Forty years of veterinary microbiology in the USSR. Veterinariia, 34(11):40-51. Moskva Izd-vo Min. S-Kh. SSSR.

131. REVO, M. V. 1956 Forward. Virusès and Virus Diseases of Agricultural Animals, p 3-5. Kiev, Gosudarstvennoe izdatel'stvo Sel'skokhoziaistvennoi literatury Ukrainskoi SSR.

132. ARIFDZHANOV, K. A., VOINOV, S. I. 1956 Intracutaneous use of the VIEV anti-foot-and-mouth disease vaccine. Uzbekskii Nauch.-Issled. Vet. Inst. B. Nauch.-Tekh. Inform. 1956(1):3-8. Tashkent, Gosudarstvennoe Izdatel'stvo Uzbekskoi SSR.

133. ZORABIAN, L. I., POGOSIAN, L. S., MARUTIAN, E. M., MANUKIAN, Z. K., STEPANIAN, E. D., SHAGINIAN, E. G., KHANBEGIAN, R. A. 1956 Some observations during a foot-and-mouth disease epizootic. Armianskii Nauch.-Issled. Inst. Zhivotn. i Vet. Trudy., vol. 1. Veterinariia, (9): 35-41. Erevan. Izdatel'stvo Glavnogo Upravleniia Nauki Ministerstva Sel'skogo Khoziaistva Armianskoi SSR.

134. SHELKOVIY, G. T. 1957 (Stalinskaya Oblast Vet.-Bact. Lab.) The effect of drug-induced sleep on the course of foot-and-mouth infection in guinea pigs. Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, 28(9):66-67.

8. APPENDICES

APPENDIX A

INSTITUTES AND INVESTIGATORS

in

FOOT-AND-MOUTH DISEASE RESEARCH
and
VACCINE AND VIRUS PRODUCTION

INSTITUTES AND INVESTIGATORS

in

FOOT AND MOUTH DISEASE RESEARCH and VACCINE AND VIRUS PRODUCTION

Information on these installations and investigators was gleaned from three sources:

a. Author's location as given on the article. This information is often fragmentary.

b. References in the text of the article. It is not uncommon to find a group of investigators mentioned by name, but not identified as to location. The names are grouped in the text as having all done related work in a particular field. Even though the location of one investigator in a group may be known, the text is often phrased in such a way that one cannot feel justified in making the inference that the others are located at the same establishment. In fact, one gets the impression that such a lack of identification is intentional. A bibliography is rarely supplied, and has, in only several instances given any assistance. However, those workers who are repeatedly cited, and thus presumed outstanding in their field, have for the most part been pinpointed.

c. A Directory of Medical and Biological Research Institutes of the U. S. S. R., 1958. Compiled by David P. Gelfand, Russian Scientific Translation Program, Scientific Reports Branch, Division of Research Services, National Institutes of Health, Education and Welfare, Washington 14, D. C. Public Health Service Publication No. 587.

The Directory admits to being incomplete, but still lists over 700 institutes. They are arranged alphabetically by the names of the cities where the institutes are located. However, subject and name indices enable one to assemble the names of institutes engaged in Veterinary Medicine and Animal Husbandry, Immunology, and Virology. Unfortunately, the Directory does not give any specific reference to those institutes dealing primarily in foot and mouth disease. So, unless the activity is very obviously in some other field, the institutes in these three categories have been included as a matter of interest, in Part I of this Appendix.

It is stated in the Preface to the Directory that:

"As a rule, institutes in outlying areas are identified by the name of the cities, oblasts (krays), or republics in which they are located.

"The situation is more complex in the case of the major centrally-located institutes of Moscow, Leningrad, Kiev, and Kharkov. Such complexity is due not only to the presence there of various jurisdictions--such as those of the Academy of Sciences, USSR; Academy of Medical

Sciences, USSR; Academy of Sciences, Ukrainian SSR; Ministry of Health, USSR; and Ministry of Health, RSFSR;--but also to the fact that the name construction of the institutes varies in accordance with their importance in the general complex. Thus:

All-Union Institute of..
Central Institute of..
Central State Institute of..
Institute of..
State All-Union Institute of..
State Institute of..
(Republic) Institute of..

"Generally speaking, the adjective 'All-Union' or 'Central' in the name of an institute implies the existence of affiliates in outlying areas under its jurisdiction. Thus:

"The All-Union Institute of Experimental Veterinary Medicine in Moscow has under its direct jurisdiction the Kalinin Oblast Affiliate.

"Organization among the institutes is rather fluid. There are frequent changes in subordination and even more frequent changes in composition and emphasis. Sometimes an institute is eliminated, its functions and purpose being absorbed somewhere else."

A. L. Skomorokhov (1956)[84] states that after the October Socialistic Revolution, a Foot and Mouth Disease Laboratory was organized at the State Institute of Experimental Veterinary Medicine (GIEV), location not cited, and was headed at that time by S. N. Vyshelesskii. From P. P. Vishnevskiy (1947)[93] we learn that the GIEV was replaced in the 1930's by Foot and Mouth Disease Laboratories organized at the All-Union Institute of Experimental Veterinary Medicine (VIEV) Leningrad, Kazakh and Omsk (NIVI) Scientific Research Veterinary Institutes. Perhaps the following decree quoted from L. S. Ratner (1938)[4] refers to this change.

"By the decree of the Main Veterinary Administration, USSR Narkomzem (People's Commissariat for Agriculture), No. 136, of June 2, 1938, a laboratory for the study of foot and mouth disease has been newly organized in the All-Union Institute of Experimental Veterinary Medicine.

"The methodical commission of VIEV has approved, for study in the laboratory in 1938, two principal themes on the problem of specific prophylaxis of foot and mouth disease:

"a) search for the methods of active immunization against foot and mouth disease;
"b) futher perfection of the methods of obtaining and using the serum of convalescents.

"The work of the laboratory on the indicated themes has begun, and the experiments on small laboratory animals have been arranged.

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

"By this same order, Main Veterinary Administration, USSR Narkomzem, has charged the All-Union Institute of Experimental Veterinary Medicine with the construction of an experimental base for the study of foot and mouth disease on Lisii Island, Vyshnevolotskii raion, Kalinin Oblast."

N. I. Leonov, and V. A. Alikaev (1946)[11] in their detailed article, define the All-Union Institute of Experimental Veterinary Medicine as being the largest and oldest scientific research veterinary establishment of the Union. "It was created on the basis of the decree of the RSFSR Council of People's Commissars, signed by V. I. Lenin in 1919, on the base of the Veterinary Laboratory, Ministry of Internal Affairs, as a scientific center for development of the problems of the fight against epizootics."

At the start of the "Great Patriotic War" (World War II), personnel numbered 380 persons. "The institute had 20 departments and laboratories, an experiment station for the study of deer disease (in Izhma on the Pechora), an experiment station for the study of foot and mouth disease (on the Island 'Lisii' in Kalinin oblast) and the Leningrad Piroplasmosis Station."

"The basic tasks of the institute: a) research work in the field of veterinary science and, primarily, in the field of the fight against infectious and protozoan diseases of animals; b) methodological direction of scientific work of peripheral NIVI and NIVOS (Scientific Research Veterinary Institutes and Experimental Stations); c) consultation with central and local governmental organs and agricultural organizations on the problems of sanitary improvement of animal husbandry, and fulfillment of individual operative missions of the Main Veterinary Administration, USSR People's Commissariat for Agriculture (Narkomzem); d) training of scientific workers and increasing the qualification of veterinarians."

During the World War II the staff of VIEV was seriously depleted by military obligations of the personnel. With the approaching front line the branches in Leningrad and Kalinin oblasts were dissolved and VIEV was evacuated to the Omsk NIVI where the work continued, though in reduced volume. The military occupied the institute's quarters in the environs of Moscow (in Kiz'minkakh) until late 1944. But in mid-1942 the rehabilitation of the institute in the environs of Moscow was begun, and continued during subsequent years. "The work... of the experiment base on the study of F&M disease (in Kalinin oblast) has been expanded."

"During the years of the Patriotic War the scientific work of the VIEV consisted chiefly in:

"a) Search for the most effective and technically simple methods of the fight against the most dangerous epizootics (including foot and mouth disease).

"b) Search for substitutes for scarce drugs under war circumstances;

"c) Study of the methods of the fight against sterility of animals by utilizing chemical and biological stimulants;

"d) Study of the possibilities of utilizing sapropel in animal husbandry;

"e) Carrying out special works of defensive character."

"In addition, VIEV continued the earlier broadly expanded work on methodological direction of the scientific activity of peripheral NIVI and NIVOS."

Among the many valuable works listed as having been achieved during the War years it was proposed that the sera of animals recovered from foot and mouth disease be used on farms for preventive and medicinal inoculations of the young stricken with this disease.

Leonov and Alikaev continue:

"The scientific workers of NIVI and NIVOS work on probation in the VIEV annually; they receive consultation on the programs of thesis works and on drawing them up, and defend their Bachelor and Doctoral dissertations.

"The VIEV practices widely the interlocking of its scientific work with the work of NIVI and NIVOS, enlisting them into the performance of extensive tests for the development of the experiments being carried out in the institute.

"The following are the basic tasks of VIEV for the coming years:

"a) Scientific development and practical realization, in shortest possible time, of preventive inoculations against brucellosis of cattle and sheep, foot and mouth disease, equine encephalomyelitis, fowl plague;

"b) Search for the most ideal methods of the fight against equine infectious anemia;

"c) Broad complex work on exposure of the causes of sterility of agricultural animals, and development of the measures on reduction of losses in livestock breeding as a result of sterility and idleness on the part of the mother population;

"d) Inclusion of NIVI and NIVOS into the joint, with VIEV, scientific development of more important projects;

"e) Generalization and publication of scientific works of all veterinary scientific research establishments and veterinary colleges, for which is necessary the publishing of a scientific journal or proceedings of VIEV;

"f) Generalization and utilization of foreign experience in the field of veterinary science and contiguous scientific disciplines, making these scientific data available to the peripheral veterinary establishments, and in order to do this it is imperative to resume the operation of the Bureau of Foreign Experience, VIEV, and to publish a reference journal."

The organization and relationship of several of the larger institutes has been clarified by Dr. C. D. Van Houweling, Assistant Administrator, Agricultural Research Service, U. S. Department of Agriculture in a talk entitled "Veterinary Medicine in the USSR" presented before the National Livestock Sanitary Association, Miami, Florida, November 5, 1958 after a recent tour of the USSR. He states:

"Veterinary medical activities in the Soviet Union are guided and controlled by the central government in Moscow through the Veterinary Collegium of the Ministry of Agriculture. It might be called the policy-making body. Each republic also has its Veterinary Collegium and Ministry of Agriculture, responsible to Moscow.

"Second in power to the Collegium is the Academy of Agricultural Sciences. It has six departments. One of these, Animal Husbandry and Veterinary Science, has supervisory jurisdiction over three of the largest veterinary research institutes in the Soviet Union. They are the All-Union Institute of Experimental Veterinary Medicine (known as VIEV), the All-Union Research Institute of Veterinary Sanitation and Ectoparasitology, and the All-Union Institute of Helminthology. Each of the 15 republics has one or more republic research institutes, the number determined by the size of the republic and the livestock population."

Ia. E. Koliakov (1957)[130] states that "there is a wide net of inter-raion veterinary laboratories in the USSR at the present time, and there are many scientific-practical establishments in the republics and oblasts headed by the All-Union Institute of Experimental Veterinary Medicine." S. N. Vyshelesskii and V. I. Kalugin (1957)[129] mention VIEV as one of the largest institutes, along with the State Scientific-Research Institute of Veterinary Preparations (location unknown) and the Ukrainian Institute of Experimental Veterinary Medicine at Kharkov.

M. F. Tiulen'kova (1957)[126] reports that malignant foot and mouth disease epizootiology and foot and mouth disease virus immunobiology and mutation are studied at: VIEV, Uzbek NIVI, Tadzhik Institute of Animal Husbandry and Veterinary Medicine, Novosibirsk NIVOS, "and others". She also reports that the Veterinary Section (of the Ministry of Agriculture) announced that major work in search for specific methods of prophylaxis and for their improvement, and also studies of the FMD virus were carried out by VIEV, UzNIVI, Kazakh NIVI, GNKI (probably State Scientific Control Institute), UIEV?, Novosibirsk NIVOS, Kirgiz and Tadzhik Institutes of Animal Husbandry and Veterinary Medicine.

M. F. Tiulen'kova (1957)[126] states further that "major work" was accomplished by the All-Union Trust of the Biological Industry and by its enterprises; the Kashintsev, Kursk and Sumsk Bioplants, and the Alma-Ata and Azerbaidzhan Biocombines. In 1956 the Kursk Bioplant started manufacture of components for foot and mouth disease complement fixation reaction.

The Kursk Biofactory (possibly the same as above) is reported by S. R. Didovets (1956)[79] to be engaged in VIEV vaccine production. IA. E. Koliakov (1957)[130] states that "the main task (of VIEV) was the development of an effective vaccine." The Novosibirsk NIVOS[44,69], Uzbek NIVI[44], and the Ukrainian Institute of Experimental Veterinary Medicine[81] are all engaged in vaccine production. The Kazakh NIVI, Branch of VASKhNIL is reported in 1956[107] to be the main institute preparing vaccine. Their method of vaccine production differs from the VIEV method.

From IA. E. Koliakov (1957)[130] it is learned that the biopreparations are standardized and controlled by the State Scientific-Control Institute of Veterinary Preparations and also by special controllers on Bioplants.

It is of interest to note that in all the articles reviewed no mention is made of the work on foot and mouth disease being carried on at the two island institutes, Lisii and Gorodomlia, both in Kalinin oblast. Only articles dealing with their official opening[2,4] are available.

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

APPENDIX A

Part I

INSTITUTES

of

VETERINARY MEDICINE AND ANIMAL HUSBANDRY

of the U. S. S. R. *

ALMA-ATA. Capital of Alma-Ata Oblast and of Kazakh SSR.

** D18 Kazakh Scientific Research Institute of Zootechnics and Veterinary Medicine
Alma-Ata, Kazakh SSR
Arychnaya ul., 46

D18a Chair of Epizootiology
Head: Prof. M. I. Ivanov

ASHKHABAD. Capital of Ashkhabad Oblast and Turkmen SSR.

D26 Institute of Animal Husbandry
Academy of Sciences, Turkmen SSR
Ashkhabad, Turkmen SSR
Director: N. V. Donchenko, Candidate in Agricultural Sciences

D32 Turkmen Scientific Research Institute of Animal Husbandry and Veterinary Medicine
Ministry of Agriculture, Turkmen SSR
Ashkhabad, Turkmen SSR

BAKU. Capital of Azerbaidzhan SSR

D46 Azerbaidzhan Scientific Research Institute of Animal Husbandry
Kirovabad, Az SSR

D52 Azerbaidzhan Scientific Research Veterinary Experimental Station
Baku, Az SSR

BLAGOVESHCHENSK-NA-AMURE. Primorskiy Kray, RSFSR.

D62 Primorskiy Kray Scientific Research Veterinary Experimental Station
Blagoveshchensk-na-Amure, Primorskiy Kray, RSFSR

---

* Source: A Directory of Medical and Biological Research Institutes of the U. S. S. R., 1958. Compiled by David P. Gelfand, Russian Scientific Translation Program, Scientific Reports Branch, Division of Research Services, National Institutes of Health, U. S. Department of Health, Education and Welfare, Washington 14, D.C. Public Health Service Publication No. 587.

** This is the number assigned to the institute in the Directory. The prefix "D" attached to differentiate from other number series.
Institutes are arranged alphabetically by the names of the cities where located.

CHIMKENT. Capital of So. Kazakhstan Oblast, Kazakh SSR.

D68 South Kazakhstan Scientific Research Veterinary Experimental Station
Chimkent, So. Kazakhstan Obl., Kazakh SSR
Director: S. P. Il'inov

CHKALOV. Capital of Chkalov Oblast, RSFSR.

D73 Chkalov Oblast Veterinary Experimental Station
Chkalov, RSFSR

DZHAMBUL. Capital of Dzhambul Oblast, Kazakh SSR.

D81 Veterinary Bacteriological Laboratory
Dzhambul, Kazakh SSR

IRKUTSK. Capital of Irkutsk Oblast, RSFSR -- transportation, industrial and administrative center for Eastern Siberia.

D110 Irkutsk Scientific Research Veterinary Experimental Station
Irkutsk, RSFSR

KALININ. Capital of Kalinin Oblast, RSFSR

D114 All-Union Institute of Experimental Veterinary Medicine
Kalinin Oblast Affiliate
Kalinin, RSFSR

KALININGRAD. Formerly Königsberg, East Prussia (Ceded to the USSR after WW II).

D115 Kaliningrad Scientific Research Veterinary Experimental Station
Kaliningrad, USSR

KAUNAS. Capital of Kaunas Oblast, Lithuanian SSR.

D119 Lithuanian Academy of Veterinary Medicine
Kaunas, Lithuanian SSR
Ul. Tilnele, 18

KAZAN. Capital of Tatar ASSR, RSFSR.

D125 Kazan State Scientific Research Institute of Veterinary Medicine
im. N. E. Bauman
Kazan', Tatar ASSR

KHARKOV. Capital of Kharkov Oblast, Ukrainian SSR.

D136 Khar'kov Institute of Zootechnics and Veterinary Medicine at Lozovenki
Khar'kov, Ukr. SSR
Director: M. I. Kniga

D136a Chair of Anatomy of Agricultural Animals
D136b Chair of Anatomy and Physiology of Agricultural Animals
D136c Chair of Parasitology and Invasionary Diseases
D136d Chair of Physiology
D136e Chair of Veterinary-Sanitation Consultation Service

D151 Ukrainian Institute of Experimental Veterinary Medicine
Ministry of Agriculture, Ukr. SSR
Khar'kov, Ukr. SSR
Pushkinskaya ul., 89
Director: I. A. Artyukh

KHERSON. Capital of Kherson Oblast, Ukrainian SSR.

D158 Kherson Oblast Laboratory of Veterinary Bacteriology
Kherson, Ukr. SSR
Head: Fnu Karyakin

KIEV. Capital of Kiev Oblast, Ukrainian SSR.

D160 Academy of Sciences, Ukrainian SSR
Kiev, Ukr. SSR
President: A. V. Palladin

D160a Department of Agricultural Sciences. Chief: P. A. Vlasyuk
D160b Department of Biological Sciences
D160c Section of Animal Husbandry

D192 Ukrainian Institute of Experimental Veterinary Medicine
Kiev, Ukr. SSR

D192a Division of Zoohygiene

KRASNODAR. Capital of Krasnodar Kray, RSFSR.

D212 Krasnodar Kray Veterinary Bacteriological Laboratory
Krasnodar, Krasnodar Kray, RSFSR
Director: V. M. Isaakov

D213 Krasnodar Scientific Research Veterinary Experimental Station
Krasnodar, Krasnodar Kray, RSFSR

KURSK. Capital of Kursk Oblast, RSFSR

D218 Kursk Scientific Research Veterinary Experimental Station
Kursk, RSFSR

D218a Division of Protozoology and Helminthology
Chief: A. Ya. Raydalin

LENINGRAD. Capital of Leningrad Oblast, RSFSR.

D242 Leningrad Institute for the Advanced Training of Veterinary Physicians
Leningrad, USSR
Mokhovaya, 15

D263 Leningrad Institute of Veterinary Medicine
Leningrad, USSR
Chernigovskaya ul., 5

D263a Chair of Histology and Embryology
Head: Prof. Z. S. Katsnel's son

D267 Leningrad Oblast Laboratory of Veterinary Bacteriology
Leningrad, USSR
Director: V. P. Zhitnikov, Veterinary Physician

L'VOV. Capital of L'vov Oblast, Ukrainian SSR.

D294 L'vov Institute of Zootechnics and Veterinary Medicine
L'vov, Ukr. SSR

D294a Chair of Normal Physiology

MAKHACH-KALA. Capital of Daghestan ASSR, RSFSR.

D300 Institute of Animal Husbandry
Daghestan Affiliate, Academy of Sciences USSR
Makhach-Kala, Daghestan ASSR, RSFSR

MINSK. Capital of Minsk Oblast and of Belorussian SSR.

D306 Institute of Animal Husbandry
Academy of Sciences, Belorussian SSR
Minsk, Belorussian SSR

D306a Division of Epizootiology. Head: Goncharov
D306b Laboratory for the study of Brucellosis and Tuberculosis

D319 Belorussian Scientific Research Veterinary Experimental Station
Minsk, Belorussian SSR

MOSCOW. Capital of the USSR, also of the RSFSR, and of Moscow Oblast.

D356 All-Union Scientific Research Institute of Animal Husbandry
Moscow, USSR
Ul. 8-go Marta, 3

Laboratory of Biochemistry. Head: Prof. V. V. Koval'skiy

D362 All-Union Institute of Experimental Medicine im. A. M. Gor'kiy
Moscow, USSR

D362a Division of the Physiology and Pathology of the Sense Organs
Head: N. I. Grashchenkov, Active Member, Academy of Medical Sciences, USSR.
D362b Laboratory of Foot-and-Mouth Disease

D363 All-Union Institute of Experimental Veterinary Medicine
Moscow, USSR
Director: N. I. Leonov
Acting Director: V. A. Alikayev
Note: An affiliate of this Institute is located in Kalinin, RSFSR.

D363a Division of Physiology
D363b Division of Protozoology

D368 All-Union Institute of Polar Farming and Animal Husbandry
Moscow, USSR

D369 All-Union Institute of Veterinary Ectoparasitology, Mycology, and Sanitation
Moscow, USSR
Zvenigorodskoe Shosse, 9

D371 All-Union Scientific Research Laboratory of Veterinary Sanitation and Disinfection
Moscow, USSR
Director: A. A. Polyakov

D401 Central Scientific Research Laboratory for the Breeding of Fur-Bearing Animals.
Moscow, USSR

D451 Moscow Institute of Zootechnics and Veterinary Medicine
Moscow, USSR
Listvennichnaya Alleya, 13

D463 Moscow Zoo-Veterinary Academy
Ministry of Higher Education, USSR
Moscow, USSR
St. Veshnyaki, M.-Ryazanskoy Zh.-d, pos. Kus'minki
Prorector: Prof. S. I. Afonskiy

D463a Chair of Epizootiology
D463b Chair of Operative Surgery
D463c Chair of Parasitology
D463d Chair of Pathological Physiology
D463e Chair of Pathology and Therapy of Internal Diseases
Head: Prof. L. A. Fadeyev
D463f Chair of Pharmacology
D463g Chair of Physiology of Agricultural Animals
D463h Faculty for the Advanced Training of Veterinary Physicians and Zootechnicians
D463i Faculty of Veterinary Medicine
D463j Laboratory of Microbiology

D472 State Scientific Control Institute of Veterinary Preparations
Moscow, USSR
Director: Prof. Ya. R. Kovalenko

NAR'YAN-MAR. Nenets Nat'l Okrug, Arkhangel'sk Oblast, RSFSR.

D474 Nar'yan-Mar Reindeer Experimental Station
Nar'yan-Mar, Nenets Nat'l Okrug
Arkhangel'sk Oblast, RSFSR

NOVOCHERKASSK. Rostov Oblast, RSFSR.

D475 Novocherkassk Institute of Zootechnics and Veterinary Medicine
Novocherkassk, Rostov Oblast, RSFSR
Ul. Prosveshchenia, 126

NOVOSIBIRSK. Capital of Novosibirsk Oblast, RSFSR, and industrial center of Western Siberia.

D484 Novosibirsk Scientific Research Veterinary Experimental Station
Novosibirsk, RSFSR

D484a Novosibirsk Oblast Veterinary Bacteriological Laboratory
Director: Shat'ko

OMSK. Capital of Omsk Oblast, RSFSR

D499 Omsk Oblast Experimental Station of Animal Husbandry
Omsk, RSFSR

D502 Omsk Scientific Research Institute of Veterinary Medicine
Ministry of Agriculture, USSR
Omsk, RSFSR
Ul. V Armii, 59

PERM. (Recently Molotov). Capital of Perm Oblast, RSFSR.

D508 Perm Oblast Laboratory of Veterinary Bacteriology
Perm, RSFSR
Director: S. N. Ostashev

PUSHKINO. E. Central Moscow Oblast, RSFSR

D516 Pushkino Scientific Research Laboratory of Agricultural Animal Breeding
Pushkino, RSFSR

RIGA. Capital of Latvian SSR

D523 Institute of Zootechnics and Zoohygiene
Academy of Sciences, Latvian SSR
Riga, Latvian SSR

ROSTOV-ON-THE-DON. Capital of Rostov Oblast, RSFSR.

D534 Rostov Oblast Veterinary Scientific Research Experimental Station
Rostov-on-the-Don, RSFSR

SAMARKAND. Capital of Samarkand Oblast, Uzbek SSR.

D540 Samarkand Institute of Zootechnics and Veterinary Medicine
Samarkand, Uzbek SSR
Bul'var Gor'kogo, 17.

SARATOV. Saratov Oblast, RSFSR.

D546 Saratov Institute of Zootechnics and Veterinary Medicine
Saratov, RSFSR
V. Sadovaya, 20

SEMIPALATINSK. Capital of Semipalatinsk Oblast, Kazakh SSR

D550 Semipalatinsk Institute of Zootechnics and Veterinary Medicine
Semipalatinsk, Kazakh SSR

SIMFEROPOL'. Capital of Crimea, RSFSR.

D558 Crimean Scientific Research Veterinary Experimental Station
Simferopol, Crimea, RSFSR

SMOLENSK. Capital of Smolensk Oblast, RSFSR.

D560 Smolensk Institute of Zootechnics and Veterinary Medicine
Smolensk, RSFSR

D563 Smolensk Scientific Research Veterinary Experimental Station
Smolensk, RSFSR
Director: N. A. Koznov

STALINABAD. Capital of Tadzhik SSR.

D567 Institute of Animal Husbandry
Academy of Sciences, Tadzhik SSR
Stalinabad, Tadzhik SSR

STALINGRAD. Capital of Stalingrad Oblast, RSFSR.

D575 Stalingrad Oblast Veterinary Bacteriological Laboratory
Stalingrad, RSFSR

STAVROPOL'. Capital of Stavropol' Kray, RSFSR.

D586 Stavropol' Kray Scientific Research Veterinary Experimental Station
Stavropol', Stavropol' Kray, RSFSR.

TALDY-KURGAN. Capital of Taldy-Kurgan Oblast, Kazakh SSR.

D606 Taldy-Kurgan Oblast Veterinary-Bacteriological Laboratory
Taldy-Kurgan, Kazakh SSR
Director: G. A. Kolomakin

TALLINN. Capital of Estonian SSR.

D608 Institute of Animal Husbandry and Veterinary Medicine
Academy of Sciences, Estonian SSR
Tallinn, Estonian SSR

TASHKENT. Capital of Uzbek SSR.

D634 Uzbek Scientific Research Institute of Veterinary Medicine
Tashkent, Uzbek SSR

TBILISI (Tiflis). Capital of Georgian SSR.

D644 Georgian Institute of Zootechnics and Veterinary Medicine
Tbilisi, Georgian SSR
Director: Prof. I. F. Kvesitadze, Doctor of Veterinary Science

D645 Georgian Scientific Research Veterinary Experimental Station
Tbilsi, Georgian SSR

TROITSK. Chelyabinsk Oblast, RSFSR.

D669 Troitsk Institute of Veterinary Medicine
Troitsk, Chelyabinsk Oblast, RSFSR

UFA. Capital of Bashkir ASSR, RSFSR.

D675 Bashkir Scientific Research Veterinary Experimental Station
Ufa, Bashkir ASSR, RSFSR

ULAN-UDE. Capital of Buryat-Mongol ASSR, RSFSR.

D678 Buryat-Mongol Institute of Zootechnics and Veterinary Medicine
Ulan-Ude, Buryat-Mongol ASSR, RSFSR
Ul. Kalandarshvili, 18

D679 Buryat-Mongol Scientific Research Veterinary Experimental Station
Ulan-Ude, Buryat-Mongol ASSR, RSFSR

VITEBSK. Capital of Vitebsk Oblast, Belorussian SSR.

D694 Vitebsk Veterinary Institute
Vitebsk, Belorussian SSR

D694a Chair of Biochemistry
D694b Laboratory of Pathological Physiology

VORONEZH. Capital of Voronezh Oblast, RSFSR.

D703 Voronezh Institute of Zootechnics and Veterinary Medicine
Voronezh, RSFSR

D703a Chair of Pathological Anatomy

D705 Voronezh Oblast Scientific Research Veterinary Experimental Station
Voronezh, RSFSR

YEREVAN. Capital of Armenian SSR.

D722 Armenian Scientific Research Institute of Zootechnics and Veterinary Medicine
Yerevan, Armenian SSR
Ul. Nalbandyana, 128

D722a Chair of Biochemistry
D722b Chair of Epizootiology
D722c Chair of Veterinary-Sanitation Consultation Service
Head: Prof. L. A. Arutyunyan

D723 Institute of Animal Husbandry
Ministry of Agriculture, Armenian SSR
Yerevan, Armenian SSR

D723a Division of Pathophysiology and Pathoanatomy
D723b Laboratory of Toxicology

ZHITOMIR. Capital of Zhitomir Oblast, Ukrainian SSR.

D739 Zhitomir Oblast Veterinary Bacteriological Laboratory
Zhitomir, Ukr. SSR.

INSTITUTES of IMMUNOLOGY of the U. S. S. R.*

GOR'KIY. Capital of Gor'kiy Oblast, RSFSR.

** D99 Gor'kiy Scientific Research Institute of Vaccines and Sera
Gor'kiy, RSFSR
Director: A. A. Golubev

KAZAN. Capital of Tatar ASSR, RSFSR.

D123 Kazan Scientific Research Institute of Vaccines and Sera
Kazan, Tatar ASSR
Director: N. A. Nemshilova, Candidate in Medical Sciences

KHABAROVSK. Capital of Khabarovsk Kray, RSFSR (formerly Dal'ne-Vostochnyi Kray)

D130 Khabarovsk Scientific Research Institute of Vaccines and Sera
Ministry of Health, USSR
Khabarovsk, Khabarovsk Kray, RSFSR
Ul. Shevchenko, 4
Director: A. M. Krupnikova

D130a Division of Measles
Chief: L. I. Gur'yanova

KHAR'KOV. Capital of Kharkov Oblast, Ukrainian SSR.

D139 Khar'kov Scientific Research State Institute of Vaccines and Sera im. I. I. Mechnikova
Khar'kov, Ukr. SSR - Pushkinskaya ul., 14
Director: G. P. Cherkas, Candidate in Biological Sciences

D139a Division of Anaerobic Microorganisms. Chief: M. R. Nechayevskaya
D139b Division of Viruses. Head: G. P. Cherkas, Candidate in Biol. Sciences
D139c Laboratory of Scarlet Fever. Chief: B. Ye. Gres-Edelman

---

* Source: A Directory of Medical and Biological Research Institutes of the U. S. S. R., 1958. Compiled by David P. Gelfand, Russian Scientific Translation Program, Scientific Reports Branch, Division of Research Services, National Institutes of Health, U. S. Department of Health, Education and Welfare, Washington 14, D. C. Public Health Service Publication No. 587.

** This is the number assigned to the institute in the Directory. The prefix "D" attached to differentiate from other number series in this article.

Institutes are arranged alphabetically by the names of the cities where located.

LENINGRAD. Capital of Leningrad Oblast, RSFSR.

D238 Institute of Experimental Medicine
Academy of Medical Sciences, USSR
Leningrad, USSR
Kirovskiy Pr., 67/71
Director: D. A. Biryukov, Corresponding Member, Academy of Medical Sciences, USSR.

Subdivisions include 12 Divisions, 9 Laboratories, 1 Museum
D238g Division of Microbiology and Immunology. Head: Prof. V. I. Ioffe
D238-1 Division of Virology. Head: A. A. Smorodintsev

D262 Leningrad Scientific Research Institute of Vaccines and Sera
Ministry of Health, USSR
Leningrad 22, USSR
Ul. Akademika Pavlova, 9
Director: M. P. Belov
Scientific Consultant: Prof. A. V. Ponomarev

D262a Department of Biochemistry
D262b Laboratory of Rickettsioses

MAKHACH-KALA. Capital of Daghestan ASSR, RSFSR.

D302 Daghestan Institute of Vaccines and Sera
Makhach-Kala, Daghestan ASSR, RSFSR

D302a Laboratory of Droplet-borne Infections
Director: N. A. Likhvar

MOSCOW. Capital of the USSR, also of the RSFSR, and of Moscow Oblast.

D405 Central State Scientific Control Institute of Sera and Vaccines im. L. A. Tarasevich
Ministry of Health, USSR
Moscow, G-2, USSR
Sivtsev-Vrazhek, 41
Director: S. I. Didenko

D405a Division of Anaerobic Microorganisms
D405b Division of Antibiotics and Bacteriophage
D405c Division of Nutrient Media
D405d Division of Sera
D405e Division of Viruses
D405f Laboratory of Antituberculosis Preparations
D405g Laboratory of Biochemistry
D405h Laboratory of Diagnostic Preparations
D405i Laboratory of Especially Dangerous Infections
Head: Prof. M. P. Pokrovskaya
D405j Laboratory of Histology
D405k Laboratory of Nutrient Media
D405l Laboratory of Poliomyelitis and Influenza
D405m Laboratory of Vaccines
D405n Museum of Cultures

D437 Moscow Institute of Epidemiology, Microbiology and Hygiene
Ministry of Health, RSFSR
Moscow, K-6, USSR
Uspenskiy per., 12
Director: M. G. Kashtanova
Scientific Director: Prof. V. A. Chernokhvostov

D437a Division of Biochemistry
D437b Division of Children's Droplet-borne Infections
D437c Division of Epidemiology
D437d Division of Immunology
D437e Division of Intestinal Infections

D450 Moscow Institute of Vaccines and Sera im. I. I. Mechnikov
Moscow, USSR
Ul. Cheryshevskogo, 44
Director: A. P. Muzychenko
Scientific Director: Prof. V. A. Chernokhvostov

D450a Division of Enteric Diseases. Head: Ye. D. Ravich-Birger
D450b Division of Serology
D450c Division of Virology
D450d Laboratory of Aerobic Sera
D450e Laboratory of Anaerobic Sera
D450f Laboratory of Biochemistry
D450g Laboratory of Diphtheria Anatoxin
D450h Laboratory of Gamma-Globulin
D450i Laboratory of Immunology. Chief: Prof. V. A. Chernokhvostov
D450j Laboratory of Nutrient Media
D450k Laboratory of Polyvaccines
D450l Laboratory for the Purification and concentration of Sera
D450m Laboratory of Tetanus Anatoxin
D450n Laboratory of Viral Sera

ODESSA. Capital of Odessa Oblast, Ukr. SSR.

D488 Odessa Institute of Epidemiology and Microbiology im. I. I. Mechnikov
Odessa, Ukr. SSR
Ul. Pastera, 5
Director: N. D. Anina-Radchenko
Note: Now known as Odessa Institute of Vaccines and Sera im. Mechnikov

D488a Laboratory of Dry Bacterial Preparations
D488b Laboratory of Live Cultures

PERM. (Recently Molotov). Capital of Perm Oblast, RSFSR.

D506 Perm Scientific Research Institute of Vaccines and Sera
Ministry of Health, USSR
Perm, RSFSR
Ul. Revolyutsii, 56
Director: A. P. Kobl'skiy
Scientific Director: Prof. G. V. Peshkovskiy

Continued next page

D506 Perm Scientific Research Institute of Vaccines and Sera continued

D506a Division of Epidemiology
Chief: M. O. Podgayskaya, Candidate in Medical Sciences
D506b Laboratory of Experimental Research
D506c Laboratory of Virology. Head: A. V. Pshenichnov

STAVROPOL'. Capital of Stavropol' Kray, RSFSR.

D584 Stavropol' Scientific Research Institute of Vaccines and Sera
Stavropol', Stavropol' Kray, RSFSR
Ul. Khetagurova, 24
Director: V. M. Kruglikov

D584a Division of Brucellosis
D584b Division of Epidemiology
D584c Division of Microbiology
D584d Laboratory of Pathogphysiology
D584e Laboratory of Virology

TASHKENT. Capital of Uzbek SSR; also capital of Tashkent Oblast.

D626 Tashkent Scientific Research Institute of Vaccines and Sera
Ministry of Health, USSR
Tashkent, Uzbek SSR
Director: A. B. Inogamov
Scientific Director: Prof. N. I. Khodukin

TBILISI. Capital of Georgian SSR.

D657 Tbilisi Institute of Vaccines and Sera
Ministry of Health, Georgian SSR
Tbilisi, Georgian SSR
Director: A. K. Bokuchava
Scientific Director: Prof. V. S. Antadze

TOMSK. Capital of Tomsk Oblast, RSFSR

D665 Tomsk Scientific Research Institute of Vaccines and Sera
Tomsk, RSFSR
Ul. Timiryazeva, 7
Director: Prof. T. D. Yanovich
Scientific Director: Prof. S. P. Karpov

D665a Laboratory of Rickettsial Diseases

UFA. Capital of Bashkir ASSR, RSFSR

D677 Ufa Institute of Vaccines and Sera im. I. I. Mechnikov
Ministry of Health, USSR
Ufa, Bashkir ASSR, RSFSR
Director: U. S. Yenikeyeva
Scientific Director: Prof. I. I. Mel'nikov

INSTITUTES

of

VIROLOGY and RICKETTSIAL DISEASES

of the U. S. S. R. *

ALMA-ATA. Capital of Alma-Ata Oblast and of Kazakh SSR.

** D1 Academy of Sciences, Kazakh SSR
Alma-Ata, Kazakh SSR
President: K. I. Satpaev

Subdivisions (1 Council, 5 Divisions)
D1c Division of Microbiology and Virology

D12 Kazakh Institute of Epidemiology, Microbiology, and Hygiene
Alma-Ata, Kazakh SSR
Ul. Pastera, 32
Director: Z. A. Roshchina

D12a Division of Hygiene
D12b Laboratory of Microbiology
D12c Laboratory of Virology

ARKHANGEL'SK. Capital of Arkhangel'sk Oblast, RSFSR.

D22 Arkhangel'sk Scientific Research Institute of Epidemiology, Microbiology and Hygiene
Arkhangel'sk, RSFSR

D22a Laboratory of Microbiology
D22b Laboratory of Parasitology
D22c Laboratory of Virology

ASHKHABAD. Capital of Ashkhabad Oblast and Turkmen SSR.

D28 Institute of Epidemiology, Microbiology, and Hygiene
Ministry of Health
Ashkhabad, Turkmen SSR
Pervomayskaya ul., 137 Continued next page

---

* Source: A Directory of Medical and Biological Research Institutes of the U. S. S. R., 1958. Compiled by David P. Gelfand, Russian Scientific Translation Program, Scientific Reports Branch, Division of Research Services, National Institutes of Health, U. S. Department of Health, Education and Welfare, Washington 14, D. C. Public Health Service Publication No. 587.

** This is the number assigned to the institute in the Directory. The prefix "D" attached to differentiate from other number series.

Institutes are arranged alphabetically by the names of the cities where located.

D28 Institute of Epidemiology, Microbiology, and Hygiene continued

Subdivisions (5 Divisions, 2 Laboratories, 7 Sections)
D28g Laboratory of Virology and Rickettsial Diseases

LENINGRAD. Capital of Leningrad Oblast, RSFSR

D246 Leningrad Scientific Research Institute of Epidemiology, Microbiology, and Hygiene im. Pasteur
Ministry of Health, RSFSR
Leningrad, USSR
Ul. Mira, 12-A
Director: N. P. Ivanov

D246a Division of Transmissive Infections and Zoonoses. Head: K.N. Tokarevich
D246b Division of Virology. Head: Prof. A. A. Smorodintsev
D246c Laboratory of Biochemistry
D246d Laboratory of Droplet Infections. Head: N. N. Rubel'
D246e Laboratory of Influenza
D246f Laboratory of Intestinal Infections. Head: Ye. M. Novgorodskaya
D246g Laboratory of Leptospirosis. Head: K. N. Tokarevich
D246h Laboratory of Rickettsiosis. Chief: Prof. K. N. Tokarevich

L'VOV. Capital of L'vov Oblast, Ukrainian SSR.

D290 L'vov Scientific Research Institute of Epidemiology, Microbiology, and Hygiene
L'vov, Ukr. SSR

D290a Laboratory of Rickettsial Diseases. Chief: G. S. Mosing
D290b Laboratory of Wound Infections
D290c Section of Sanitation and Hygiene

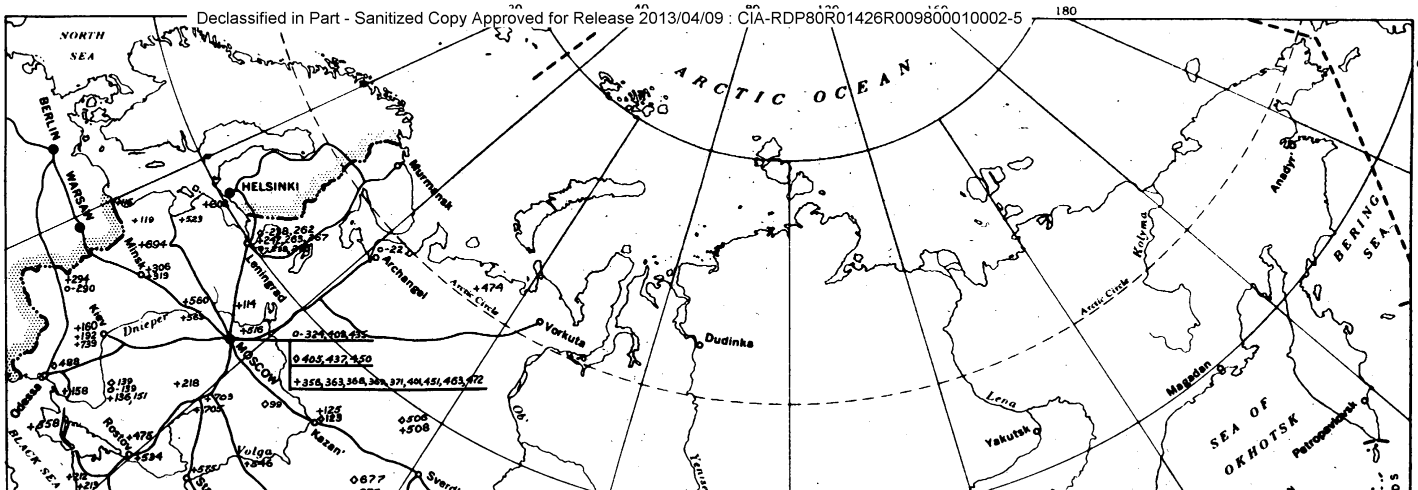
MOSCOW. Capital of the USSR, also of the RSFSR, and of Moscow Oblast.

D408 Institute of Epidemiology and Microbiology im. Honorary Academician N. F. Gamaleya
Academy of Medical Sciences, USSR
Moscow, 182-D, USSR
Shchukinskaya ul., 33
Director (Jan.'54): Prof. G. V. Vygodchikov
Present Director: Prof. P. A. Vershilova
Deputy Production Director: Stepanchenok

Subdivisions: (2 Cabinets, 1 Department, 20 Divisions, 15 Laboratories)
D408i Division of Epidemiology. Head: Prof. I. I. Yelkin
D408w Division of Virology. Head: Prof. Zil'ber
D408-2c Laboratory of the Epidemiology of Transmissive Infectious Diseases
D408-2f Laboratory of Immunology. Head: Prof. K. T. Khalyapina

D435 Institute of Virology im. D. I. Ivanovskiy
Academy of Medical Sciences, USSR
Moscow, USSR
Baltiyskiy pos., 13
Director: Prof. P. N. Kosyakov

D435a Clinic of Influenza. Head: Prof. F. G. Epshteyn
D435b Division of the Epidemiology of Grippe and Acute Catarrhs of the Upper Respiratory Tract. Head: Prof. V. M. Zhdanov
D435c Division of General Virology
D435d Division of the Natural Foci of Viral Infections
D435e Division of the Pathology of Viral Infections
D435f Division of the Polyseasonal Viral Infections
D435g Laboratory of Biochemistry. Head: Prof. V. I. Tovarnitskiy
D435h Laboratory of Encephalitides. Head: Prof. Ye. N. Levkovich
D435i Laboratory of General Virology. Head: R. M. Shen, Doctor of Medical Sci.
D435j Laboratory of Hepatitis and Virology of Tumors.
Head: Prof. A. K. Shubladze, Doctor of Medical Sciences
D435k Laboratory of Measles
Chief: Prof. P. G. Sergiyev, Active Member, Academy of Medical Sciences, USSR
D435l Laboratory of Ornithoses
D435m Laboratory of Rabies. Head: R. M. Shen, Doctor of Medical Sciences
D435n Laboratory of Viral Diagnostics
D435o Laboratory of Virus Encephalitides. Head: Prof. A. K. Shubladze
D435p Laboratory of Virus Mutations



UNION OF SOVIET SOCIALIST REPUBLICS

Location of Institutes dealing with Veterinary Medicine and Animal Husbandry, Immunology, Virology and Rickettsial Diseases as listed in A Directory of Medical and Biological Research Institutes of the U. S. S. R. 1958. Compiled by David P. Gelfand, Russian Scientific Translation Program, Scientific Reports Branch, Division of Research Services, National Institutes of Health, U. S. Department of Health, Education and Welfare, Washington 14, D. C. Public Health Service Publication No. 587.

Base 12040 10-51

APPENDIX A

Part II

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

INSTITUTES

dealing with

FOOT-AND-MOUTH DISEASE*

ALMA-ATA. Capital of Alma-Ata Oblast and of Kazakh SSR.

F1 Agricultural Administration
Alma-Ata Oblast
Alma-Ata, Kazakh SSR.

Senior Veterinary Inspector: A. S. Fedorovich (T123)

Veterinary Department
A. N. Shiriaev, Head (T123)
K. I. Evdokimov, Veterinary Pel'dsher (T123)

F2 Alma-Ata Biocombine, of the
All-Union Trust of the Biological Industry (T126)
Alma-Ata, Kazakh SSR

F3 Alma-Ata Zooveterinary Institute (See D18)(T115)
Alma-Ata, Kazakh SSR

M. I. Ivanov: Superintendent of Chair of Epizootiology

F4 Ministry of Agriculture and Supplies of the Kazakh SSR (T55)
/Alma-Ata, Kazakh SSR/

V. I. Len'kov

F5 Scientific Research Veterinary Institute
Kazakh Affiliate of All-Union Academy of Agricultural Sciences
imeni V. I. Lenin (VASKhNIL)
/Alma-Ata, Kazakh SSR/

Foot-and-Mouth Disease Laboratory

A. M. Baiadinov	N. N. Gizitdinov	O. S. Nikonova
N. N. Doronin	V. I. Kindiakov	A. P. Rumiantsev
S. M. Filipovich	V. I. Len'kov	A. S. Rushchits

*1. Source: Translated Russian articles. Number in parentheses refers to source article as listed in Section 7, References (Prefix "B" indicates author's address in bibliography as source. Prefix "T" indicates reference found in text of that numbered article).
2. The Directory number is referred to in instances of probable duplicate listing. This number has a "D" prefix.
3. The institutes are arranged alphabetically by the names of the cities where they are located, similar to the organization of the Directory.
4. Information presumed by this author is enclosed in brackets / /.

F6 Scientific Research Veterinary Experiment Station (B5)
/Alma-Ata, Kazakh SSR/

Foot and Mouth Disease Laboratory

N. N. Doronin
V. I. Kindiakov

BAKU. Capital of Azerbaidzhan SSR.

F7 Azerbaidzhan Agricultural Institute (T27)(D46?)
Kirovabad, Az SSR

K. M. Safarov

F8 Azerbaidzhan Biocombine of the
All-Union Trust of the Biological Industry (T126)
/Baku, Az SSR/

F9 Kirovabad Veterinary Polyclinic (B110)
Kirovabad, Az SSR

G. I. Dil'bazi

BARNAUL. Capital of Altai Kray, RSFSR

F10 Altai Veterinary Experimental Station (T55)
/Barnaul, Altai Kray, RSFSR/

S. G. Poplaukhin

BELAYA TSERKOV. Ukraine SSR.

F11 Belaya Tserkov Agricultural Institute
Belaya Tserkov, Ukr. SSR.

Skomorokhov

CHILIK. Kazakh SSR

F12 Chilik Inter-Raion Veterinary Bacteriological Laboratory (T123)
Alma-Ata Oblast
/Chilik, Kazakh SSR/

M. N. Malygin: Head, Disinfectional Detachment

F13 Kolkhoz imeni Stalin (T123)
Chilik Raion
/Chilik, Kazakh SSR/

M. Sarlybaev

CHIMKENT. Capital of So. Kazakhstan Oblast, Kazakh SSR.

F14 Illück Experiment Base (T107) /Illück taken to be Ilich/ (D68?)
/Ilich, So. Kazakhstan Oblast
Kazakh SSR/

DZHAMBUL. Capital of Dzhambul Oblast, Kazakh SSR.

F15 Sverdlovsk MTS (T126)
Dzhambul'sk Oblast
Dzhambul, Kazakh SSR

V. A. Chaldyk

FERGANA. Uzbek SSR

F16 Fergana Oblast Veterinary Bacteriological Laboratory (B39)
Fergana, Uzbek SSR

I. B. Vagin: Director

FRUNZE. Capital of Frunze Oblast and Kirgiz SSR.

F17 Kirgiz Institute of Animal Husbandry and Veterinary Medicine (T126)
Frunze, Kirgiz SSR.

KALININ. Capital of Kalinin Oblast, RSFSR.

F18 Foot and Mouth Disease Institute of the People's Commissariat for Agriculture (T2)
Island of Gorodomlia in Lake Seliger near Ostashkov
Ostashkov, Kalinin Oblast, RSFSR

A. L. Skomorokhov

F19 Lisii Island, Organized by VIEV (T4)(D114?)
Situated in Vyshnevolotskii Reservoir
Vyshnevolotskii, Kalinin Oblast, RSFSR

D. P. Molchanov
L. S. Ratner

KARAGANDA. Capital of Karaganda Oblast, Kazakh SSR.

F20 Karaganda Sovkhoz
/Karaganda, Kazakh SSR/

IA. E. Vasilets
S. M. Ovchinikov

KAZAN. Capital of Tatar ASSR.

F21 Scientific Research Veterinary Institute (T12)(D125?)
Kazan, Tatar ASSR.

M. Kh. Riabov

F22 Veterinary-Bacteriological Laboratory (B119)
Ministry of Agriculture
Tatar Autonomous SSR Republic
/Kazan/, Tatar ASSR.

Kh. G. Abuzarov: Director

KIEV. Capital of Kiev Oblast and the Ukrainian SSR

F23 Kiev Veterinary Institute (T1)(D192)
Kiev, Ukr. SSR

M. V. Revo
N. I. Gorban

KIEV or KHAR'KOV. Ukrainian SSR.

F24 Ukrainian Institute of Experimental Veterinary Medicine (T81)(D151 orD192)

E. Andreev
I. N. Doroshko
A. M. Govorov
I. I. Kulesko

F25 Republic Veterinary-Bacteriological Laboratory (T79)

D. I. Antonenko
G. F. Bondarenko
S. R. Didovets', Head
A. V. Gvozdov
V. E. Ledin
A. A. Levits'kii
B. P. Satsiuk
A. I. Zagurs'kii

F26 Veterinary Administration (T79)
Ministry of Agriculture
__________, Ukr. SSR

Same Personnel as F25

KRASNODAR. Capital of Krasnodar Kray, RSFSR

F27 Krasnodar Kray Scientific Research Veterinary Experimental Station (B120) (D213)
Krasnodar, Krasnodar Kray, RSFSR

A. V. Masiukov

KRASNOIARSK. Capital of Krasnoiarsk Kray, RSFSR.

F28 Krasnoiarsk Scientific Research Veterinary Experimental Station
Krasnoiarsk, Krasnoiarsk Kray, RSFSR

KURSK. Capital of Kursk Oblast, RSFSR

F29 Kursk Biofactory (79)
Kursk, RSFSR

F30 Kursk Bioplant of the (B126)
All-Union Trust of the Biological Industry
Kursk, RSFSR

LENINGRAD. Capital of Leningrad Oblast, RSFSR

F31 Leningrad Scientific Research Veterinary Institute (T93)(See D263)
Leningrad, RSFSR

Dobrotvorskaya
Lavrovskiy
V. A. Nikolaev
N. R. Semushkin (deceased)
R. A. Tsion

F32 Leningrad Swine-Raising Trust (T55)
Leningrad, RSFSR.

L'VOV. Capital of L'vov Oblast, Ukrainian SSR.

F33 L'vov Veterinaro-Zootechnical Institute (B59)
L'vov, Ukr. SSR.

N. V. Meshkov
E. F. Kochetova

MINSK. Capital of Minsk Oblast and of Belorussian SSR.

F34 Academy of Science (B98)
Belorussian SSR
/Minsk/, Belorussian SSR.

S. N. Vyshelesskii

F35 Institute of Animal Husbandry (T55)(D306)
Academy of Sciences, Belorussian SSR
/Minsk/, Belorussian SSR.

P. P. Gerasimovich

F36 Veterinary Administration
Ministry of Agriculture
Belorussian SSR
/Minsk/, Belorussian SSR

MOSCOW. Capital of the USSR, also of the RSFSR, and of Moscow Oblast.

F37 All-Union Academy of Agricultural Sciences named after V. I. Lenin
/VASKhNIL/
/Moscow, USSR/

A. M. Dobrokhotov
Golubev
Kazakov
Kochetkov
Mochalov
I. E. Mozgov
S. N. Muromtsev
Roshchin
A. L. Skomorokhov

F38 All-Union Institute of Experimental Veterinary Medicine (VIEV)(T64)(D363) /Moscow, USSR/

Director: IA. R. Kovalenko

A. V. Akulev	N. M. Komarov	A. V. Nikolaev
K. A. Arifdjanov	A. A. Kudriavtsev	N. M. Preobrazhenskii
A. I. Bobir	T. S. Lavrova	V. A. Sergeev
Goloshchapov	N. I. Leonov	G. T. Shelkevyi
A. I. Golubev	A. K. Liapustin	Ye. A. Sokolova
V. N. Gribanov	K. M. Malinin	V. A. Shubin
V. E. Karnoova	M. I. Mikheev	F. A. Terent'ev
I. I. Kazanskiy	D. P. Molchanov	S. N. Vyshelesskiy
		T. P. Zhernosek

F39 Foot and Mouth Disease Laboratory Veterinary Medicine (VIEV) (D363) All-Union Institute of Experimental /Moscow, USSR/

N. I. Leonov, Director 1956
L. S. Ratner, Head, 1941; Supt., 1957

S. N. Gribanov	L. P. Sirotkin
A. N. Shabanov	V. T. Tashmukhametov
Siretkina	G. I. Voinov

F40 Moscow Agricultural Academy named for K. _. Timiriasev (B47) Moscow, USSR

Dept. Zoohygiene and Veterinary Science

N. I. Grigor'eva

F41 Moscow Chemicotechnological Institute of the Meat Industry (T55) Moscow, USSR.

D. M. Teternik

F42 Moscow Interoblast Trust of Livestock Fattening (B58) Moscow, USSR

V. G. Dukatsenko

F43 Moscow Veterinary Academy (T61)(D463?) Moscow, USSR

IA. E. Koliakov
N. I. Sereda

F44 USSR Ministry of Agriculture
Main Veterinary Administration
/Moscow, USSR/

Head: A. A. Boiko (B125)

USSR Ministry of Agriculture (continued)
Main Veterinary Administration
/Moscow, USSR/

F44a Main Administration of Animal Husbandry
Veterinary Division of the Zoo-technical Soviet

IV. N. Glavzhivupra: President

F45 USSR Peoples Commissariat for Agriculture
Main Veterinary Administration
/Moscow, USSR/

Laktienov: Chief
S. M. Shevchenko

F46 Scientific-Industrial Laboratory of the (T83)
Ministry of Sovkhozes, RSFSR
/Moscow, USSR/

A. N. Shabanov

F47 Scientific Productional Laboratory (B80)
Ministry of Sovkhozes, RSFSR
/Moscow, USSR/

N. I. Leonov: Director

F48 State Scientific-Control Institute of Veterinary Preparations (B82c)(D472)
/Moscow, USSR/

V. N. Syurin: Director
M. A. Babich
P. M. Bazylev
N. V. Likhachev

NOVOSIBIRSK. Capital of Novosibirsk Oblast, RSFSR

F49 Novosibirsk Scientific Research Veterinary Experimental Station (D484)
Novosibirsk, RSFSR

V. T. Nogina
K. I. Plotnikov
A. A. Sviridov

ODESSA. Capital of Odessa Oblast, Ukr. SSR.

F50 Odessa Agricultural Institute
Odessa, Ukr. SSR.

P. A. Fed'ko

OMSK. Capital of Omsk Oblast, RSFSR.

F51 Omsk Oblast Agricultural Administration
Veterinary Department
/Omsk, RSFSR/

V. I. Lapin

F52 Omsk Veterinary Institute (See D502)
/Omsk, RSFSR/

RYAZAN'. Ryazan Oblast, RSFSR.

F53 Ryazan' Agricultural Institute (T55)
/Ryazan, RSFSR/

A. L. Skomorokhov

SAMARKAND. Capital of Samarkand Oblast, Uzbek SSR.

F54 Samarkand Oblast Agricultural Administration (T126)
Veterinary Department
Samarkand, Uzbek SSR

F. M. Liubich, Head

SARATOV. Saratov Oblast, RSFSR

F55 Saratov Zooveterinary Institute (T126)(D546)
Saratov, RSFSR

T. A. Bystrova

STALINABAD. Capital of Tadzhik SSR

F56 Tadzhik Institute of Animal Husbandry and Veterinary Medicine (D567)
Stalinabad, Tadzhik SSR

D. F. Zaikin

SVERDLOVSK. Sverdlovsk Oblast, RSFSR

F57 Sverdlovsk Scientific Research Veterinary Experiment Station
Sverdlovsk, RSFSR

N. Zhukov

TALDY-KURGAN. Capital of Taldy-Kurgan Oblast, Kazakh SSR

F58 Veterinary Bacteriological Laboratory (D606)
Taldy-Kurgan Oblast
Taldy-Kurgan, Kazakh SSR

G. A. Kolomakin: Director

TALLINN. Capital of Estonian SSR.

F59 Veterinary Administration
Estonian SSR
Tallinn, Estonian SSR

V. I. Zav'ialov: Head

TARTU. Estonian SSR

F60 Tartu Serum Laboratory
Tartu, Estonian SSR

L. ĬAnov

TASHKENT. Capital of Uzbek SSR, also capital of Tashkent Oblast.

F61 Uzbek Scientific Research Veterinary Institute (D634)
/Tashkent/, Uzbek SSR

A. A. Arifdhanova: Director
K. A. Arifdzhanov
S. I. Voinov

F62 Uzbek Scientific Research Veterinary Experiment Station
/Tashkent/, Uzbek SSR

G. V. Burkser: Deputy Director
A. A. Raevskii

TBILISI (Tiflis). Capital of Georgian SSR

F63 Scientific-Experimental Veterinary Institute (D644?)
Ministry of Agriculture
/Tbilisi/, Georgia SSR

G. G. Bedenashvili

TULA. Tula Oblast, RSFSR

F64 Veterinary Department
Agricultural Administration
Tula Oblast
/Tula/, RSFSR

P. E. Kolryn
Romanchenko

ULAN-UDE. Capital of Buryat-Mongol, ASSR, RSFSR

F65 Buriat-Mongol Veterinary Experiment Station (D679?)
/Ulan-Ude/, Buriat-Mongol ASSR, RSFSR

M. I. Totushin: Director

VORONEZH. Capital of Voronezh Oblast, RSFSR

F66 Veterinary Experiment Station (D705)
Voronezh Oblast
/Voronezh/, RSFSR

Gladkev

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

VOROSHILOVGRAD. Capital of Voroshilovgrad Oblast (Donbas), Ukr. SSR

F67 Sovkhoz "Krasnoarmeets"
Lozno-Aleksandrovskii Raion
Voroshilovgrad Oblast
Donbas, Ukr. SSR

V. V. Mikhailovskii

YEREVAN. Capital of Armenian SSR

F68 Armenian Institute of Animal Husbandry and Veterinary Medicine (D722 or D723)
/Yerevan, Armenian SSR/

V. S. Gazarian

INSTITUTES WHICH COULD NOT BE LOCATED

F69 (T126) All-Union Trust of the Biological Industry and its enterprises:
Bioplants
Kashintsev
Kursk
Sumsk

Biocombines
Alma-Ata (F2)
Azerbaidzhan (F8)

F70 (T26) TsGNKI (Central State Scientific Research Clinical Institute)

F71 (B121) Erevan' Zooveterinary Institute

S. L. Avakian

F72 (T84) GIEV (State Institute of Experimental Veterinary Medicine)

Blazhevich
A. A. Dorofeev
A. A. Kudriavtsev
A. L. Skomorokhov
Vyshelesskiy

F73 (T27) Institute of Foot and Mouth Disease (as of 1952)

A. Ya. Baydalin
O. K. Peshekhonova
K. H. Popova
L. S. Ratner
V. Z. Sakvarelidze
A. L. Skomorokhov
P. Solov'yev

F74 (T81) "Former" Foot and Mouth Disease Institute (as of 1956)

Babich
V. V. Krasovskii
N. E. Lavrovskii
Lipatov
S. D. Ovsiamikov
Popov
K. A. Popova
A. L. Skomorokhov: Head

F75 (T27) Institute of Foot and Mouth Disease of the NIVI

N. A. Khomenko

F76 (B49) Institute named for I. I. Mechnikov

L. I. Maiorova
A. P. Ryzhov

F77 (B104) First Beshkent MTS
Kashka-Dar'ia Oblast

N. N. Novaev: Senior Veterinary Surgeon

F78 (B80, B83) Order of Lenin Clinical Hospital, Infectious Diseases Branch

S. I. Ratner: Scientific Director
G. N. Gubin
R. P. Komolova
G. P. Korolev
A. N. Shabanov

F79 (T55) Scientific-Practical Veterinary Laboratory of the Ministry of Sovkhozes, RSFSR. (See F46, F47)

F. A. Terent'yev

F80 (T126) Scientific-Research Institute of the Extreme North (FMD in reindeer)

F81 (B134) Stalinskaya Oblast Veterinary-Bacteriological Laboratory

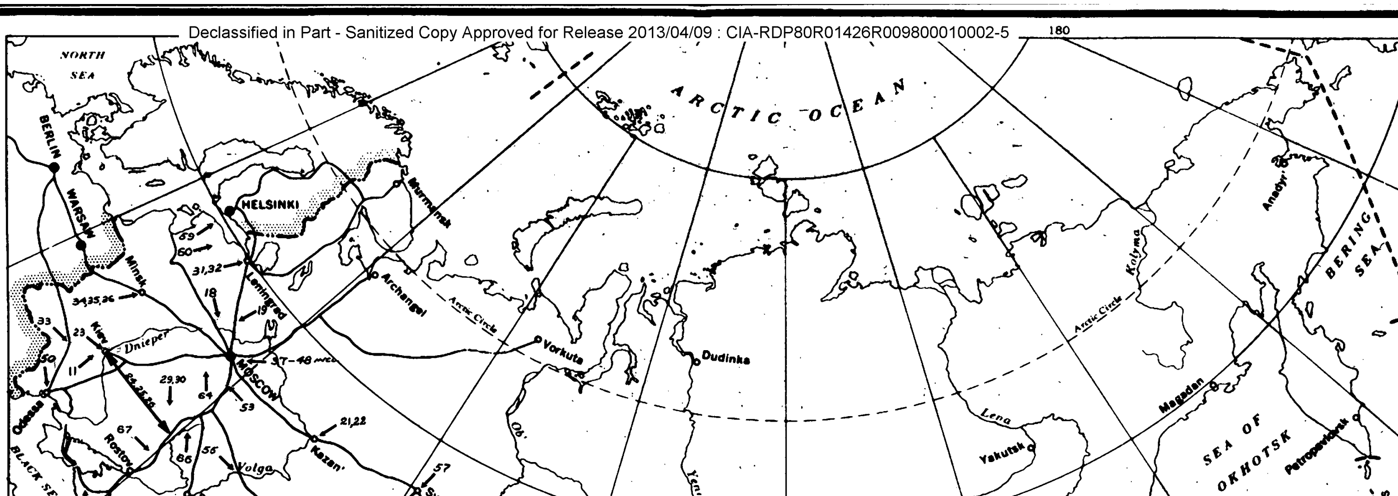
G. T. Shelkoviy

F82 (T17) Ul'ianovo Agricultural Institute

T. Kostina

F83 (T132) Uzbekskii Nauch.-Issled. Vet. Inst. B. Nauch.-Tekh. Inform. /Uzbek Scientific Research Veterinary Institute and Biological Scientific Technical Information?/

F84 (T126) Sumsk Bioplant - All-Union Trust of Biological Industry (See F69)



UNION OF SOVIET SOCIALIST REPUBLICS

Boundary of U.S.S.R. Railroad, (selected)

LOCATION OF INSTITUTES DEALING WITH FOOT AND MOUTH DISEASE

Information obtained from Russian articles.

Base 12040 10-51

APPENDIX B

SOURCES OF REFERENCES

SOURCES of REFERENCES *

1. Archiv fuer Experimentelle Veterinaermedizin
   (Archive of Experimental Veterinary Medicine)

2. Collection of Leading Material on Veterinary Medicine, Moscow

3. Gosudarstvennoe Izdatel'stvo Sel'skokhoziaistvennoi Literatury, Moscow
   (State Publication of Agricultural Literature, Moscow)

4. Gosudarstvennoe Izdatel'stvo Sel'skokhoziaistvennoi Literatury Ukrainskoi SSR.
   (State Publication of Agricultural Literature, Ukr. SSR)

5. Izdatel'stvo Ministerstva Zemledeliia Soiuza SSR.
   (Publication of Ministry of Agriculture, USSR)

6. Karakulevodstvo i zverovodstvo (Karakul Sheep and Animal Husbandry)

7. Klinicheskaia Meditsina (Clinical Medicine)

8. Legkaia Promyshlennost (Light Industry)

9. Moskva, Izdatel'stvo Ministerstva Sel'skoge Khoziaistva SSSR.
   (Publication of the Ministry of Agriculture, SSSR, Moscow)

10. Nauka i Zhizn' (Science and Life)

11. Opredelitel Virusov Cheloveka i Zhivotnykh
    (Description of Viruses of Man and Animals)

12. Opredelitel Virusov Zhivotnykh i Cheloveka
    (Description of Viruses of Animals and Man)

13. Referativnyy Zhurnal, Biologiya (Reference Journal, Biology)

14. Sotsialistichne Tvarinnitstvo (Socialist ______________)

15. Sovetskaia Veterinariia (Soviet Veterinary Medicine)

16. Sovhoznye Agroplakaty (Sovkhoz Agroposters)

17. Tashkent, Gosudarstvennoe Izdatel'stvo Uzbekskoi SSR.
    (State Publication of Uzbek SSR, Tashkent)

18. Tierarztliche Unschau (Veterinary Review)

---

* Note: The titles are translated primarily for meaning, and may not necessarily be literal translations.

Veterinariia is the major source of journal reference.

19. Trudy Armenianskii Nauch.-Issled. Inst. Zhivotni. i. Vet.
(Works of the Armenian Scientific Research Institute of Animal Husbandry and Veterinary Medicine)

20. Trudy Gosudarstvennoge Instituta Eksperimental'noi Veterinarii
(Works of the State Institute of Experimental Veterinary Medicine)

21. Trudy Gosudarstvennyi Nauchno-Kontrol'nyi Institut Veterinarnykh Preparatov, Ministerstva Sol'skoge Khoziaistva SSSR.
(Works of the State Scientific Control Institute of Veterinary Preparations, Ministry of Agriculture, SSSR.

22. Trudy Institut Veterinarii, Kazakhskii filial Vsesoiusnoi Ordena Lenina Akademii Sel'skokhosiaistvennykh Nauk imeni V. I. Lenina
(Works of the Institute of Veterinary Medicine of the Kazakh Affiliate of VASKhNIL - All-Union Academy of Agricultural Sciences named in honor of V. I. Lenin)

23. Trudy Moskovskaia Veterinarnaia Akademiia
(Works of the Moscow Veterinary Academy)

24. Trudy Vaesoiuznoge Instituta Experimental'noi Veterinarii (VIEV)
(Works of the All-Union Institute of Experimental Veterinary Medicine)

25. Uzbekskii Nauch.-Issled. Vet. Inst. B. Nauch.-Tekh. Inform.
(Uzbek Scientific-Research Veterinary Institute (Biology?) Scientific-Technical Information)

26. Vest. Sel'skokhoz. Nauki (Journal of Agricultural Science)

27. Vestnik Sol'skokhoziaistvennoi Nauki Veterinariia
(Journal of Agricultural and Veterinary Sciences)

28. Veterinaraia Microbiologiia (Veterinary Microbiology)

29. Veterinariia (Veterinary Medicine)

30. Veterinarnyi Entsiklopedicheskii Slovar (Veterinary Encyclopedic Dictionary)

31. Voprosy Ekon. (Economic Problems)

32. Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii
(Journal of Microbiology, Epidemiology and Immunobiology)

APPENDIX C

WORKERS

in Foot-and-Mouth Disease

and Related Fields

WORKERS

in

FOOT AND MOUTH DISEASE

and

RELATED FIELDS*

ABUZAROV, Kh. G. Director of the Veterinary-Bacteriological Laboratory of the Tatar Autonomous SSR Republic, Ministry of Agriculture. B119, F22.
AFONSKIY, S. I. Prof. Prorector, Moscow Zoo-Veterinary Academy, Moscow, USSR. D463.
AKULEV, A. V. All-Union Institute of Experimental Veterinary Medicine. B64, F38.
ALENKOVICH, A. A. Chief, Veterinary Administration, Ministry of Agriculture, Belorussian SSR. B60.
ALIKAEV, V. A. Candidate of Veterinary Sciences. B11, T116.
ALIKAYEV, V. A. Acting Director, All-Union Institute of Experimental Veterinary Medicine, Moscow, USSR. D363.
ALIVERDIEV, A. A. B34
AMPITEATROV, F. A. Professor, Doctor of Veterinary Sciences. B117.
ANDREEV, E. Ukrainian Institute of Experimental Veterinary Medicine. T81, F24.
ANINA-RADCHENKO, N. D. Director, Odessa Institute of Epidemiology and Microbiology im. I. I. Mechnikov. D488.
ANTADZE, V. S. Professor. Scientific Director, Tbilisi Institute of Vaccines and Sera, Georgian SSR. D567.
ANTONENKO, D. I. Veterinary Surgeon, Veterinary Administration and Republic Veterinary-Bacteriological Laboratory, Ministry of Agriculture, Ukr. SSR. T79, F25, F26.
ARIFDHANOVA, A. A. Director, Uzbek Scientific Research Veterinary Institute. T44, T126, F61.
ARIFDJANOV, K. A. All-Union Institute of Experimental Veterinary Medicine. T63, F38.
ARIFDZHANOV, K. A. Candidate of Veterinary Sciences, Uzbek Scientific Research Veterinary Institute. T44, T55, T126, B132, F61.
ARTYUKH, I. A. Director, Ukrainian Institute of Experimental Veterinary Medicine, Khar'kov, Ukr. SSR. D151.
ARUTYUNYAN, L. A. Professor. Head, Chair of Veterinary-Sanitation Consultation Service, Armenian Scientific Research Institute of Zootechnics and Veterinary Medicine, Yerevan, Armenian SSR. D722c.
AVAKIAN, S. L. Erevan' Zooveterinary Institute. B121, F71.

---

* Letter prefixes to numbers refer to:

B - Bibliography number in Section 7, References, indicating authorship.
D - Institute where worker's name is listed as found in the <u>Directory of Medical and Biological Research Institutes of the U. S. S. R.</u> See Appendix A, Part I.
F - Institute concerned with Foot and Mouth Disease as obtained from Soviet articles. See Appendix A, Part II.
T - Text reference in article so numbered in References, Section 7.

BABICH. Collaborator with A. L. Skomorokhov. T81, F74.
BABICH, M. A. Professor, "GNKI" (Possibly Gosudarstvennogo Nauchno-Kontrol'nogo Instituta Veterinarnykh Preparatov - State Scientific Control Institute of Veterinary Preparations). T126, F48.
BAIADINOV, A. M.(or N.) Junior Scientific Coworker, Kazakh Scientific Research Veterinary Institute, Branch of All-Union Academy of Agricultural Sciences imeni V. I. Lenin. B46, B32, F5. Collaborator with V. I. Kindiakov, T84.
BAIDALIN, A. IA. Scientist or student at GIEV*. T84.
BAYDALIN, A. YA. Institute of Foot and Mouth Disease, 1952. T27, F73.
BANNOV, A. T. Veterinary Department of the Krasnoiarsk Agricultural Krai Administration. B68.
BASHENIH, V. A. Leningrad. B89.
BAZYLEV, P. M. Candidate of Veterinary Sciences, B66. Gosudarstvennyi Nauchno-Kontrol'nyi Institut Veterinarnykh Preparatov, Ministerstva Sol'skoge Khoziaistva SSSR, T66. State Scientific-Control Institute of Veterinary Preparations, B82c, F48.
BEDENASHVILI, G. G. Ministry of Agriculture, Georgia SSR, Scientific-Experimental Veterinary Institute. B19, F63.
BELOGORSKII, M. A. B3.
BELOV, M. P. Director, Leningrad Scientific Research Institute of Vaccines and Sera. D262.
BIRYUKOV, D. A. Corresponding Member, Academy of Medical Sciences, USSR. Director, Institute of Experimental Medicine, Academy of Medical Sciences, USSR, Leningrad. D238.
BLAZHEVICH. GIEV* (1920). T27, F72.
BOBIR, A. I. (Bobyr, A. IA.) All-Union Institute of Experimental Veterinary Medicine. T63, B65, F38.
BOGOMOLOVA, DOCENT L. G. T26.
BOIKO, A. A. Head of the Main Veterinary Administration. Member of the USSR Ministry of Agriculture. B125, F44.
BOKUCHAVA, A. K. Director, Tbilisi Institute of Vaccines and Sera, Georgian SSR. D657.
BONDARENKO, G. F. Veterinary Surgeon, Veterinary Administration and Republic Veterinary Bacteriological Laboratory, Ministry of Agriculture, Ukr. SSR. T79, T84, B76, F25, F26.
BORISOVICH, F. Reviewer. B12.
BUNIN, K. V. Moscow. B112.
BURKSER, G. V. Candidate of Veterinary Sciences. Deputy Director, Uzbek Scientific Research Veterinary Experimental Station. T12, F62.
BUSALOV, A. A. Editor. B113.
BYSTROVA, T. A. Assistant at the Saratov Zooveterinary Institute. T126, F55.

CHALDYK, V. A. Former Senior Veterinary Surgeon of the Sverdlovsk MTS, Dzhambul'sk Oblast', Kazakh SSR. T126, F15.
CHERKAS, G. P. Candidate in Biological Sciences. Director, Khar'kov Scientific Research State Institute of Vaccines and Sera im. I. I. Mechnikova, Ukr. SSR. Also Head of Division of Viruses here. D139.
CHERKASSKII, E. S. Professor. T126.
CHERNOKHVOSTOV, V. A. Professor. Scientific Director, Moscow Institute of Epidemiology, Microbiology and Hygiene, D437. Scientific Director (D450) and Chief, Laboratory of Immunology (D450i), Moscow Institute of Vaccines and Sera im. I. I. Mechnikov.
CHIZHIKOV, N. V. Veterinarian. B42.

---

* GIEV - State Institute of Experimental Veterinary Medicine (in 1928).

DIDENKO, S. I. Director, Central State Scientific Control Institute of Sera and Vaccines im. L. A. Tarasevich, Moscow. D405.

DIDOVETS', S. R. Veterinary Surgeon. Republic Veterinary Bacteriological Laboratory, T79. Head, Veterinary Administration of Ukr. SSR Ministry of Agriculture, B79, T126, F25, F26.

DIL'BAZI, G. I. Candidate of Veterinary Sciences, Kirovabad Veterinary Polyclinic. B110, F9.

DOBROKHOTOV, A. M. Scientific Secretary, Veterinary Section, All-Union Academy of Agricultural Sciences imeni V. I. Lenin. B8, B44, B55, B56, F37.

DOBROTVORSKAIA, V. M. Scientist or student at GIEV. T84.

DOBROTVORSKAYA. Leningrad NIVI*. T93, F31.

DONCHENKO, N. V. Candidate in Agricultural Sciences. Director, Institute of Animal Husbandry, Ashkhabad, Turkmen SSR. D26.

DOROFEEV, A. A. GIEV. T70, F72.

DORONIN, N. N. Comrade. Foot and Mouth Disease Laboratory, Kazakh Scientific Research Veterinary Station, B5, T7. Kazakh Scientific Research Veterinary Institute, Branch of All-Union Academy of Agricultural Sciences imeni V. I. Lenin, T12, T27, F5, F6.

DOROSHKO, I. N. Ukrainian Institute of Experimental Veterinary Medicine. T81, F24.

DUBIANSKII, A. A. Scientist or student at GIEV. T84.

DUKATSENKO, V. G. Veterinarian. Moscow Interoblast Trust of Livestock Fattening. B58, F42.

EREMSEV, S. Z. Veterinarian. B48.

ERSHOV, V. S. Professor. Editor. B54.

EVDOKIMOV, K. I. Veterinary Pel'dsher. Veterinary Department, Alma-Ata Oblast' Agricultural Administration, Kazakh SSR. In 1957 awarded Badge "Excellent Worker of Socialistic Agriculture" for anti-foot and mouth disease measures. T123, F1.

FADEYEV, L. A. Professor. Head, Chair of Pathology and Therapy of Internal Diseases, Moscow Zoo-Veterinary Academy. D463e.

FED'KO, P. A. Ordinator, Odessa Agricultural Institute. B75, F50.

FEDOROVICH, A. S. Senior Veterinary Inspector, Alma-Ata Oblast Agricultural Administration, Kazakh SSR. In 1957 awarded Badge "Excellent Worker of Socialistic Agriculture" for anti-foot and mouth disease measures. T123, F1.

FILIPPOVICH, S. M. Scientific Associate. Kazakh Scientific Research Veterinary Institute, Branch of All-Union Academy of Agricultural Sciences imeni V. I. Lenin. B32, T55, B118, F5.

GAZARIAN, V. S. Professor. Armenian Institute of Animal Husbandry and Veterinary Medicine. T126, F68.

GERASIMOVICH, P. P. Candidate of Biological Sciences. Institute of Animal Husbandry, Academy of Sciences, Belorussian SSR. T44, T55, F35.

GINZBURG, I. V. B2.

GIZITDINOV, N. N. Student of the Graduate School, "Aspirant", B71. Kazakh Scientific Research Veterinary Institute, Branch of All-Union Academy of Agricultural Sciences imeni V. I. Lenin, T32, B82b, F5.

GLADKEV. Voronezh Veterinary Experimental Station. T7, F66.

---

*NIVI - Scientific Research Veterinary Institute.

GLAVZHIVUPRA, IV. N. President of Veterinary Administration, USSR Ministry of Agriculture, Main Administration of Animal Husbandry, Veterinary Division of the Zoo-technical Soviet. B30, T30, F44a.
GOLOSHCHAPOV. Candidate of Veterinary Sciences, T30. All-Union Institute of Experimental Veterinary Medicine, T11, F38.
GOLOSHCHAPOVA, IU. N. Editor. B101, B102, B103.
GOLOSHCHAPOVA, Yu. N. Editor, Moscow. B97.
GOLUBEV. Veterinary Section, VASKhNIL*. T128, F37
GOLUBEV, A. A. Director, Gor'kiy Scientific Research Institute of Vaccines and Sera, Gor'kiy, RSFSR. D99.
GOLUBEV, A. I. VIEV**. T61, F38.
GONCHAROV. Head, Division of Epizootiology, Institute of Animal Husbandry, Academy of Sciences, Belorussian SSR, Minsk. D306a.
GORBAN, N. I. Candidate of Veterinary Sciences, Kiev Veterinary Institute. B45, F23.
GOVOROV, A. M. Ukrainian Institute of Experimental Veterinary Medicine. T81, F24.
GRASHCHENKOV, N. I. Active Member, Academy of Medical Sciences, USSR, Head, Division of the Physiology and Pathology of the Sense Organs, All-Union Institute of Experimental Medicine im. A. M. Gor'kiy. D362a.
GRIBANOV, V. N. (I.) Candidate of Veterinary Sciences. All-Union Institute of Experimental Veterinary Medicine. B35, B36, B62, B65, T55, F38.
GRIBANOV, S. N. Foot and Mouth Disease Laboratory, VIEV. T27, F39.
GRIGOR'EVA, N. I. Post-Graduate Student, Dept. Zoohygiene and Veterinary Science, Moscow Agricultural Academy named for K. _. Timiriasev. B47, F40.
GUBIN, G. N. Professor. Infection Department of the Clinical Order of Lenin Hospital. B80, B78.
GVOZDOV, A. V. Veterinary Surgeon. Republic Veterinary Bacteriological Laboratory and Veterinary Administration, Ministry of Agriculture, Ukr. SSR. T79, F25, F26.

ĬANOV, L. Tartu Serum Laboratory. T44, F60.
IL'INOV, S. P. Director, South Kazakhstan Scientific Research Veterinary Experiment Station, Chimkent, Kazakh SSR. D68.
IL'INSKII, V. I. Moscow. T12.
INOGAMOV, A. B. Director, Tashkent Scientific Research Institute of Vaccines and Sera, Uzbek SSR. D626.
IOFFE, V. I. Professor. Head, Division of Microbiology and Immunology, Institute of Experimental Medicine, Academy of Medical Sciences, USSR, Leningrad. D238g.
ISAAKOV, V. M. Director, Krasnodar Kray Veterinary Bacteriology Laboratory, RSFSR. D212.
IVANOV, A. D. B77.
IVANOV, M. I. (Maksim Ivanovich) Professor. Superintendent of Chair of Epizootiology, Kazakh Scientific Research Institute of Zootechnics and Veterinary Medicine (Alma-Ata Zooveterinary Institute). "One of the greatest veterinary scientists-epizootiologists of the Kazakh SSR." in brucellosis. T115, D18a, F3.
IVANOV, M. M. Professor. T26.
IVANOV, N. P. Director, Leningrad Scientific Research Institute of Epidemiology, Microbiology and Hygiene im. Pasteur. D246.

---

* VASKhNIL - Vsezoyuznaya Akademiya Sel'skokhozyaystvennykh Nauk imeni V. I. Lenin. (All-Union Academy of Agricultural Sciences named after V. I. Lenin.)

** VIEV - Vaesoiuznoge Instituta Experimental'noi Veterinarii. (All-Union Institute of Experimental Veterinary Medicine).

KALUGIN, V. I. Assistant Professor, Candidate of Veterinary Sciences. B129.
KARNEEVA, V. E. Georgian SSR. T37.
KARNEYEVA, V. Ye. Candidate of Veterinary Sciences, VIEV. T55.
KARNOOVA, V. E. Scientific Collaborator, VIEV. B37, F38.
KARPOV, S. P. Professor. Scientific Director, Tomsk Scientific Research Institute of Vaccines and Sera. D665.
KARYAKIN, Fnu. Head, Kherson Oblast Laboratory of Veterinary Bacteriology, Ukr. SSR. D158.
KASHTANOVA, M. G. Director, Moscow Institute of Epidemiology, Microbiology and Hygiene. D437.
KATSNEL (Prof. Z. S. Katsnel's son). Head, Chair of Histology and Embryology, Leningrad Institute of Veterinary Medicine. D263a.
KAZAKOV. Veterinary Section of VASKhNIL. T128, F37.
KAZANSKII, I. I. Professor, VIEV, T55, B37, F38. Alma-Ata Oblast, T37.
KHALYAPINA, K. T. Professor. Head, Laboratory of Immunology, Institute of Epidemiology and Microbiology imeni Honorary Academician N. F. Gamaleya, Moscow. D408-2f.
KHANBEGIAN, R. A. B133.
KHODUKIN, N. I. Professor. Scientific Director, Tashkent Scientific Research Institute of Vaccines and Sera, Uzbek SSR. D626.
KHOMENKO, N. A. Scientist or student at GIEV, T84. Institute of Foot and Mouth Disease of theScientific Research Veterinary Institute, T27, F75.
KINDIAKOV (Kindyakov) V. I. Candidate of Veterinary Sciences. Foot and Mouth Disease Laboratory, Kazakh Scientific Research Veterinary Station, Kazakh NIVI,Branch of VASKhNIL. B5, T7, T12, B31, B32, T27, B46, T55, T81, T126, F5, F6.
KNIGA, M. I. Director, Khar'kov Institute of Zootechnics and Veterinary Medicine at Lozovenki, Khar'kov, Ukr. SSR. D136.
KOBYL'SKIY, A. P. Director, Perm Scientific Research Institute of Vaccines and Sera. D506.
KOCHETKOV. Veterinary Section of VASKhNIL. T128, F37.
KOCHETOVA, E. F. L'vov Veterinaro-Zootechnical Institute. B59, F33.
KOLESNIKOV, N. V. Editor. B99.
KOLIAKOV, IA. E. Professor, Honored Scientist of RSFSR. Moscow Veterinary Academy. B130, F43.
KOLOMAKIN, G. A. Director, Taldy-Kurgan Oblast Veterinary Bacteriological Laboratory, Kazakh SSR. B41, D616, F58.
KOLRYN, P. E. Head, Veterinary Department, Kaluga Oblast Agricultural Administration. T116, F64.
KOMAROV, N. M. Professor. VIEV. T55, T44, F38.
KOMOLOVA, R. P. Professor. Infectious Diseases Branch, Order of Lenin Clinical Hospital. B80, B83, F78.
KORNEEVA, V. E. Scientific Collaborator, VIEV. B37.
KORNEEVA, Z. I. Moscow. T12.
KOROLEV, G. P. Professor. Infectious Diseases Branch, Order of Lenin Clinical Hospital. B80, B83, F78.
KOROPOV, V. M. Professor. T116.
KOSITSINA, E. A. Krasnoiarsk NIVOS*. B85.
KOSTINA, T. Stalinist stipendiary, (Fifth course at the Veterinary Faculty), Ul'ianovo Agricultural Institute. T17, F82.

---

* NIVOS - Scientific Research Veterinary Experimental Station.

KOSYAKOV, P. N. Professor. Director, Institute of Virology im. D. I. Ivanovskiy, Academy of Medical Sciences, USSR, Moscow. D435.
KOVALENKO, IA.(Ya.) R. Professor. Director (1956), VIEV, T115, F38. Director, State Scientific Control Institute of Veterinary Preparations, Moscow, USSR, D472. B23, B24, B57.
KOVAL'SKIY, V. V. Professor. Head, Laboratory of Biochemistry, All-Union Scientific Research Institute of Animal Husbandry, Moscow, USSR. D356.
KOZNOV, N. A. Smolensk Scientific Research Veterinary Experiment Station, Smolensk, RSFSR. D563.
KRAKOV, B. A. Editor. B113.
KRASNENKOV, N. V. Veterinarian. B48.
KRASOVSKII, V. V. "Former" Foot and Mouth Disease Institute. Collaborator with Skomorokhov. T81, F74.
KRICHEVSKIY, A. M. B106.
KRIVOSHAPKIN, N. A. Veterinarian. B43.
KRUGLIKOV, V. M. Director, Stavropol' Scientific Research Institute of Vaccines and Sera. D584.
KRUPNIKOVA, A. M. Director, Khabarovsk Scientific Research Institute of Vaccines and Sera, Khabarovsk Kray, RSFSR. D130.
KUDRIAVTSEV, A. A. GIEV, T70. VIEV, T13, B13, F38, F72.
KUDRYAVTSEV, M. A. Editor. B113.
KULESKO, I. I. Ukrainian Institute of Experimental Veterinary Medicine. T81,F24.
KUZ'MIN, A. F. Assistant Professor. B75.
KUZ'MIN, V. V. B15.
KUZ'MINA, N. I. Veterinary Surgeon, B105.
KVESITADZE, I. F. Professor. Doctor of Veterinary Sciences. Director, Georgian Institute of Zootechnics and Veterinary Medicine, Tbilisi. D644.

LAKTIENOV. Comrade. Chief, Main Veterinary Administration, USSR Peoples Commissariat for Agriculture. T7, F45.
LAPIN, V. I. Veterinary Department of the Omsk Oblast' Agricultural Administration. B69, F51.
LAVROVA, T. S. Graduate Student, VIEV, T44, T55, F38.
LAVROVSKII. Collaborator with Skomorokhov. T81.
LAVROVSKIY. Leningrad NIVI. T93, F31.
LAVSOVSKII, N. E. Scientist or Student at GIEV. T81, T84, F74.
LEDIN, V. E. Veterinary Surgeon. Republic Veterinary Bacteriological Laboratory, and Veterinary Administration, Ministry of Agriculture, Ukr. SSR. T79, F25, F26.
LENKOV, V. I. Foot and Mouth Disease Laboratory of the Veterinary Institute, Kazakh Branch VASKhNIL, T27. Candidate of Veterinary Sciences. Ministry of Agriculture and Supplies, Kazakh SSR, T44, T55. F4, F5.
LEONOV, N. I. Professor. Director, Scientific Productional Laboratory of the Ministry of Sovkhozes of the RSFSR, B80, F47. Director(1956) of the Foot and Mouth Disease Laboratory, VIEV, T83, B80, F39. Director of VIEV, D363, B13, B11, F38.
LEONOV, I. I. B51.
LEVITS'KII, A. A. Veterinary Surgeon. Veterinary Administration, Ministry of Agriculture, Ukr. SSR. Also Republic Veterinary Bacteriological Laboratory. T79, F25, F26.
LIAPUSTIN, A. K. Candidate of Veterinary Sciences. VIEV. T61, B90, F38.

LIKHACHEV, H. P. Professor. Stalin Prize Winner. T26.
LIKHACHEV, N. V. Professor, Laureate of the Stalin Prize, B66. Gosudarstvennyi Nauchno-Kontrol'nyi Institut Veterinarnykh Preparatov, Ministerstva Sol'skoge Khoziaistva SSSR, T66. State Scientific-Control Institute of Veterinary Preparations, B82c, F48.
LIKHVAR, N. A. Director, Laboratory of Droplet-borne Infections, Daghestan Institute of Vaccines and Sera, Daghestan ASSR, RSFSR. D302a.
LIPATOV. Collaborator with Skomorokhov . T81, F74.
LIPATOV, G. I. B3.
LIUBICH, F. M. Head, Veterinary Department, Samarkand Oblast' Agricultural Administration of the Uzbek SSR. T126, F54.
LUCHIN, I. I. Engineer. B105.

MAIOROVA, L. I. Institute named for I. I. Mechnikov. B49, F76.
MALININ, K. M. Candidate of Veterinary Sciences, VIEV. B73, F38.
MALYGIN, M. N. Head, Disinfectional Detachment, Chilik Inter-Raion Veterinary Bacteriological Laboratory, Alma-Ata Oblast, Kazakh SSR. In 1957 awarded Badge "Excellent Worker of Socialistic Agriculture" for his anti-foot and mouth disease work. T123, F12.
MANAFOV, I. I. Candidate of Veterinary Sciences. T126.
MANUKIAN, Z. K. B133.
MARKOV, A. A. Editor. B91.
MARUTIAN, E. M. B133.
MASHIKOVSKIY, O. D. Editor. B113.
MASIUKOV, A. V. Candidate of Veterinary Sciences, Krasnodar Krai NIVOS, B120,F27.
MEL'NIKOV, I. I. Professor. Scientific Director, Ufa Institute of Vaccines and Sera im. I. I. Mechnikov, Bashkir ASSR, RSFSR. D677.
MESHKOV, N. V. Professor. L'vov Veterinario-Zootechnical Institute. B59,F33.
MIKHAILOVSKII, V. V. Senior Veterinarian. Sovkhoz "Krasnoarmeets", Lozno-Aleksandrovskii raion, Voroshilovgrad Oblast. T12, F67.
MIKHEEV (Mikheyev), M. I. Doctor of Biological Sciences, VIEV. T44, T55, F38.
MOCHALOV. Veterinary Section, VASKhNIL, T128, F37.
MOEHLMANN, H. Doctor. Riems Island Epizootic Research Institute, Friedrich Loeffler Institute. B87.
MOLCHANOV, D. P. Lisii Island, Vyshne-Volotskii Raion, Experiment Base for the study of Foot and Mouth Disease, B6, F19. VIEV, B13, F38.
MOSING, G. S. Chief, Laboratory of Rickettsial Diseases, L'vov Scientific Research Institute of Epidemiology, Microbiology and Hygiene, Ukr. SSR. D290.
MOZGOV, I. E. Professor. Active Member-Academician of Veterinary Section of VASKhNIL. V128, F37.
MUROMTSEV, S. N. Academician, Deputy Chairman of Veterinary Section of VASKhNIL. T44, T55, F37.
MUZYCHENKO, A. P. Director, Moscow Institute of Vaccines and Sera im. I. I. Mechnikov. D450.

NEMSHILOVA, N. A. Candidate in Medical Sciences. Director, Kazan Scientific Research Institute of Vaccines and Sera, Tatar ASSR. D123.
NEMTSOV, B. A. Veterinarian. B33a.
NIKOLAENKO. Comrade, Omsk Veterinary Institute. T7.
NIKOLAEV, A. V. Candidate of Chemical Sciences. VIEV. B37, F38.
NIKOLAEV, V. A. Professor. Leningrad NIVI. T44, T55, F31.
NIKONOVA, O. S. Kazakh NIVI, Branch of VASKhNIL. B31, B32, F5.

NOGINA, V. T. Scientific Collaborator, Novosibirsk Scientific Research Veterinary Station. B127, F49.
NOVAEV, N. N. Senior Veterinary Surgeon of First Beshkent MTS, Kashka-Daria Oblast. B104, F77.

OSTASHEV, S. N. Director, Perm Oblast Laboratory of Veterinary Bacteriology. D508.
OVCHINIKOV, S. M. Karaganda Sovkhoz. T12, F20.
OVSIAMIKOV, S. D. "Former" Foot and Mouth Disease Institute (1956). T81, F74.
OZEROV, A. V. Professor. Moscow. B94, B95.

PALLADIN, A. V. President, Academy of Sciences, Ukrainian SSR, Kiev, Ukr.SSR.D160.
PESHEKHONOVA, O. K. Institute of Foot and Mouth Disease (1952). T27, F73.
PESHKOVSKIY, G. V. Professor. Scientific Director, Perm Scientific Research Institute of Vaccines and Sera. D506.
PETERSON, K. Assistant. B122.
PINUS, A. B21.
PLOTNIKOV, K. I. Candidate of Veterinary Sciences. Novosibirsk NIVOS. B22,F49.
PLOTNIKOV, V. I. Novosibirsk (1951). T81.
PODGAYSKAYA, M. O. Candidate in Medical Sciences. Chief, Division of Epidemiology, Perm Scientific Research Institute of Vaccines and Sera. D506a.
POGOSIAN, L. S. B133.
POKROVSKAYA, M. P. Professor. Head, Laboratory of Especially Dangerous Infections, Central State Scientific Control Institute of Sera and Vaccines im. L. A. Tarasevich, Moscow. D405i.
POLIAKOV (Polyakov) A. A. Professor. Editor. Director, All-Union Scientific Research Laboratory of Veterinary Sanitation and Disinfection, Moscow, USSR. B40, T55, B100, B101, B102, B103, D371.
POLKANOV, M. I. Moscow. T12.
PONOMAREV, A. V. Professor. Scientific Consultant. Leningrad Scientific Research Institute of Vaccines and Sera. D262.
POPLAUKHIN, S. G. Altai NIVOS. T44, T55, B67, F10.
POPOV. Collaborator with Skomorokhov. T81, F74.
POPOVA, K. A. Scientist or student at GIEV, T84. Institute of Foot and Mouth Disease (1952), T27, F13. "Former" Foot and Mouth Disease Institute (1956), T81, F74.
PREOBRAZHENSKII, N. M. Candidate of Veterinary Sciences. VIEV. T61, B90, F38.
PSHENICHNOV, A. V. Head, Laboratory of Virology, Perm Scientific Research Institute of Vaccines and Sera. D506c.

RAEVSKII, A. A. Veterinarian. Uzbek Scientific Research Veterinary Experimental Station. B14. F62.
RATNER, L. S. Candidate of Veterinary Sciences. Lisii Island, Vyneshnevolotskii Raion, Kalinin Oblast, B4, F19. Head (1941), Foot and Mouth Disease Laboratory, VIEV, T27. Institute of Foot and Mouth Disease(1952), T27, F73. Superintendent of Foot and Mouth Disease Laboratory, VIEV(1957), T11, T126. B13, T30, B35, T55, B62, B65, B86, B91, B96, F39.
RATNER, S. I. Scientific Director, Infectious Diseases Branch, Order of Lenin Clinical Hospital named after S. B. Botkin. B80, B83, F78.
RAYDALIN, A. Ya. Chief, Division of Protozoology and Helminthology, Kursk Scientific Research Veterinary Experimental Station, Kursk, RSFSR. D218a
RED'KO, A. S. Veterinarian. B16, B43.

REVO, M. V. Professor, Kiev Veterinary Institute, T1, F23. Honored Worker of Sciences of the Ukrainian SSR. Doctor of Medical Sciences. Doctor of Veterinary Sciences. B78, B81, B109, B131.
RIABOV, M. Kh. Lecturer, Department of Pathological Physiology, Kazan NIVI, T12, F21.
ROHRER, H. Professor. Doctor. B108.
ROMANCHENKO. Chief, Veterinary Division, Tula Oblast. T44, T55, F64.
ROSHCHIN. Veterinary Section, VASKhNIL. T128, F37.
ROSHCHINA, Z. A. Director, Kazakh Institute of Epidemiology, Microbiology, and Hygiene, Alma-Ata. D12.
RUMIANTSEV, A. P. Junior Science Fellow, B72. Kazakh NIVI Branch of VASKhNIL, T12, T27, T82, B82a, F5.
RUMYANTSEVA, A. P. Veterinary Physician. Kazakh NIVI. T55.
RUSHCHITS, A. C. Kazakh Scientific Research Veterinary Institute. B9.
RUSHCHITS, A. S. Candidate of Biological Sciences. Foot and Mouth Disease Laboratory of Kazakh NIVI Branch of VASKhNIL. B38a, B70, T27, F5.
RYZHOV, A. P. Institute named for I. I. Mechnikov. B49, F76.

SAFAROV, K. M. Azerbaydzhan Agricultural Institute, Kirovabad. T27, F7.
SAKVARELIDZE, V. Z. Institute of Foot and Mouth Disease (1952). T27, F73
SALAVATOV, R. Sh. Main Veterinary Surgeon, Musliumsk Raion, B119.
SARLYBAEV, M. Veterinary Surgeon, Kolkhoz imeni Stalin, Chilik Raion, Alma-Ata Oblast, Kazakh SSR. In 1957 awarded Badge "Excellent Worker of Socialistic Agriculture" for anti-foot and mouth disease measures. T123, F13.
SATPAEV, K. I. President, Academy of Sciences, Kazakh SSR, Alma-Ata. D1.
SATSIUK, B. P. Veterinary Surgeon. Republic Veterinary Bacteriological Laboratory, Veterinary Administration, Ministry of Agriculture, Ukr. SSR. T79, F25, F26.
SAVEL'EV, G. S. Moscow. T12.
SCHMIDT, W. Doctor. Goslar, Germany. B88.
SEMUSHKIN, N. R. Director of Leningrad NIVI. Died 1956. T115, F31.
SEREDA, N. I. Lecturer in Therapy, Moscow Veterinary Academy. T61, F43.
SERGEEV, V. A. VIEV. B86, F38.
SEROV, K. F. Main Veterinary Surgeon, Chilik Raion, Alma-Ata Oblast, Kazakh SSR. In 1957 awarded Badge "Excellent Worker of Socialistic Agriculture" for anti-foot and mouth disease measures. T123.
SHABANOV, A. N. Editor, B99. Chief Surgeon, Infection Department of the Clinical Order of Lenin Hospital named after S. B. Botkin, B80, F78. Professor, Chief physician, Scientific-Industrial Laboratory of the Ministry of Sovkhozes RSFSR and the Foot and Mouth Disease Laboratory of VIEV, T83. F39, F46.
SHAGINIAN, E. G. B133.
SHARABIN, I. G. Professor. T116.
SHAT'KO. Director, Novosibirsk Oblast Veterinary Bacteriological Laboratory, Novosibirsk, RSFSR. D484a.
SHELKEVYI (Shelkoviy), G. T. Aspirant, VIEV, T44, B61. Stalinskaya Oblast Veterinary Bacteriological Laboratory, B134. F38, F81.
SHEN, R. M. Doctor of Medical Sciences. Head, Laboratory of General Virology, Head, Laboratory of Rabies, Institute of Virology im. D. I. Ivanovskiy, Academy of Medical Sciences, USSR, Moscow. D435i, m.
SHEVCHENKO, S. M. Senior Veterinarian. Main Veterinary Administration, USSR People's Commissariat for Agriculture. T7, F45.

SHIRIAEV, A. N. Head, Veterinary Department, Alma-Ata Oblast Agriculture Administration, Kazakh SSR. In 1957 awarded Badge "Excellent Worker for Socialistic Agriculture" for anti-foot and mouth disease measures. T123, F1.
SHUBIN, V. A. Candidate of Veterinary Sciences, VIEV. B124, F38.
SHULIMOVA, E. S. Professor. B75.
SIRETKINA. Comrade. Foot and Mouth Disease Laboratory, VIEV, T7, F39.
SIROTKIN, L. P. Foot and Mouth Disease Laboratory, VIEV. T27. F39.
SIURIN, V. N. Candidate of Veterinary Sciences. Gosudarstvennyi Nauchno-Kontrol'nyi Institut Veterinarnykh Preparatov, Ministerstva Sol'skoge Khoziaistva SSSR. B66, B82c, F48.
SKOMOROKHOV, A. L. Professor, Doctor of Veterinary Medicine. GIEV (1928), T27, T70, F72. Head(1932), Island of Gorodomlia, Kalinin Oblast, T2, F18. Veterinary Section, All-Union Academy of Agricultural Sciences (Thesis,1937), T27, F37. Belaia Tserkev Agricultural Institute(1941), T7, F11. Institute of Foot and Mouth Disease (1952), T27, F73. Professor, Ryazan'SKhI, Ryazan' Agricultural Institute (1953), T44,T55, F53. Head, "Former" Foot and Mouth Disease Institute (1956), T81. B1, B21, B25, B27, B84, F74.
SKORIN, I. E. B29.
SMORODINTSEV, A. A. Head, Division of Virology, Leningrad Scientific Research Institute of Epidemiology, Microbiology, and Hygiene im. Pasteur, D246b. Head, Division of Virology, Institute of Experimental Medicine, Academy of Medical Sciences, USSR, Leningrad, D2381.
SOKOLOV, N. G. Moscow. T12.
SOKOLOVA, E. A. VIEV, B65, T91. F38.
SOLOV'YEV, P. Institute of Foot and Mouth Disease, 1952. T27, F73.
SOLUN, A. S. Professor. T116.
STARIKOV, V. G. Main Veterinary Surgeon, Kaskelensk Raion, Alma-Ata Oblast, Kazakh SSR. In 1957 awarded Badge "Excellent Worker of Socialistic Agriculture" for anti-foot and mouth disease measures. T123.
STEPANCHENOK. Deputy Production Director, Institute of Epidemiology and Microbiology im. Honorary Academician N. F. Gamaleya, Academy of Medical Sciences, USSR, Moscow. D408.
STEPANIAN, E. D. B133.
STEPANIAN, G. G. Erevan' Zooveterinary Institute. B121.
STEFANOVA, Ye. P. Candidate of Veterinary Sciences. T55.
SVIRIDOV, A. A. Candidate of Veterinary Sciences. Novosibirsk NIVOS. T44, B46a, B50, T55, F49.
SVIRIDOVA, A. A. Novosibirsk NIVOS. T69.

TASHMUKHAMETOV, V. T. Foot and Mouth Disease Laboratory, VIEV. T38a, F39.
TERENT'EV, F. A. Professor. Editor, B91. VIEV, B11a. Scientific-Practical Veterinary Laboratory of the Ministry of Sovkhozes, RSFSR, T55. B98,F38,F79.
TETERNIK, D. M. Professor. Moscow Chemicotechnological Institute of the Meat Industry. T55, F41.
TITOV, N. N. Doctor of Veterinary Science. B26.
TIULEN'KOVA, M. F. Reviewer. B126.
TOKAREVICH, K. N. Head, Division of Transmissive Infections and Zoonoses, Head, Laboratory of Leptospirosis, Head, Laboratory of Rickettsiosis, Leningrad Scientific Research Institute of Epidemiology, Microbiology and Hygiene im. Pasteur. D246a, g, h.
TOTUSHIN, M. I. Director, Buriat-Mongolian Veterinary Experimental Station. T126, F65.
TRUMM, A. I. Director, Leningrad Swine-Raising Trust. T55.

TSION, R.(P.) A. Professor, Doctor of Veterinary Sciences. Leningrad NIVI. B14, T55, T93, F31.
TSITSIN, N. V. Academician. T126.
TSVET, M. S. T62.
TVOROZHNIKOV. Veterinary Section, VASKhNIL. T128.

VAGIN, I. B. Director, Fergana Oblast Veterinary Bacteriological Laboratory. B39, F16.
VASILETS, IA. E. Karaganda Sovkhoz. T12, F20.
VECKENSTEDT, A. B108.
VERSHILOVA, P. A. Professor. Present Director, Institute of Epidemiology and Microbiology im. Honorary Academician N. F. Gamaleya, Academy of Medical Sciences, USSR, Moscow. D408.
VERTINSKII, K. I. Professor. T116.
VISHNEVSKIIY, P. P. Professor, Doctor. B93.
VLASYUK, P. A. Chief, Department of Agricultural Sciences, Academy of Sciences, Ukr. SSR, Kiev. D160a
VOINOV, G. I. Foot and Mouth Disease Laboratory, VIEV. T27, F39
VOINOV(Voynov), S. I. Candidate of Veterinary Sciences, Uzbek NIVI. T44, T55, B74, B72a, B132, F61.
VOROVICH, A. A. B33.
VYGODCHIKOV, G. V. Professor. Director (Jan.'54), Institute of Epidemiology and Microbiology im. Honorary Academician N. F. Gamaleya, Academy of Sciences, USSR, Moscow. D408.
VYSHELESSKII, S. N. Head, Original Foot and Mouth Disease Laboratory, GIEV, T84, T93, F72. VIEV, T27, F38. Professor, Active Member of the Academy of Science, Belorussian SSR, Honorary Academician of VASKhNIL, Honored Scientist of RSFSR, Doctor of Veterinary Sciences, B98, B129, F34.

WALDMANN, O. Professor, Doctor. Insel Riems b. Greifswald. B6.

YANOV, L. Tartu Serum Laboratory. T55.
YANOVICH, T. D. Professor. Director, Tomsk Scientific Research Institute of Vaccines and Sera, Tomsk, RSFSR. D665.
YEGOROV, P. I. Editor. B113.
YELKIN, I. I. Professor. Head, Division of Epidemiology, Institute of Epidemiology and Microbiology im. Honorary Academician N. F. Gamaleya, Moscow. D408i.
YENIKEYEVA, U. S. Director, Ufa Institute of Vaccines and Sera im. I. I. Mechnikov, Bashkir ASSR, RSFSR. D677.

ZAGURS'KII, A. I. Veterinary Surgeon. Republic Veterinary Bacteriological Laboratory, and Veterinary Administration, Ministry of Agriculture, Ukr. SSR. T79, F25, F26.
ZAIKIN, D. F. Scientific Collaborator. Tadzhik Institute of Animal Husbandry and Veterinary Medicine. T126, F56.
ZAL'TSMAN, L. B92.
ZAV'IALOV, V. I. Head, Veterinary Administration, Estonian SSR. T126, F59.
ZHDANOV, V. M. Professor. Head, Division of Epidemiology of Grippe and Acute Catarrhs of the Upper Respiratory Tract, Institute of Virology im. D. I. Ivanovskiy, Moscow, D435b. B52, B53, B106.
ZHERNOSEK (Zhornosek), T. P. Post-Graduate Student. VIEV. B38, F38.

ZHITENKO, P. V. Candidate of Veterinary Sciences. B111.
ZHITNIKOV, V. P. Veterinary Physician. Director, Leningrad Oblast Laboratory of Veterinary Bacteriology. D267.
ZHUKOV, N. Veterinarian. Sverdlovsk NIVOS. T12, F57.
ZIL'BER. Prof. Head, Division of Virology, Institute of Epidemiology and Microbiology im. Honorary Academician N. F. Gamaleya, Moscow. D408w.
ZORABIAN, L. I. B133.

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

APPENDIX D

GLOSSARY

Declassified in Part - Sanitized Copy Approved for Release 2013/04/09 : CIA-RDP80R01426R009800010002-5

Candidate	Candidate of Science in Veterinary Medicine. In addition to veterinarian's training, has had approximately 3 years of post graduate work, with most emphasis on research problems.
Doctor	Doctor of Science in Veterinary Medicine. In addition to veterinarians's training, has had approximately 7-8 years of post graduate work. This qualifies the recipient, in part, to full professorship on a teaching or research faculty.
Feldsher	Veterinary assistant with 3 years specialized practical training in a school of veterinary medicine.
GIEV	State Institute of Experimental Veterinary Medicine (in 1928).
GNKI	Gosudarstvennogo Nauchno-Kontrol'nogo Instituta Veterinarnykh Preparatov (State Scientific Control Institute of Veterinary Preparations).
Kolkhoz	Farmer owned cooperative
Krai	Territory - sometimes used synonymously with Oblast.
Narkomzen	Main Veterinary Administration, USSR People's Commissariat for Agriculture.
NIVI	Nauchno-Issledovatel'skiy Veterinarnyy Institut (Scientific Research Veterinary Institute)
NIVOS	Scientific Research Veterinary Experimental Station
Oblast	Region - sometimes used synonymously with Krai.
Raion	Interpreted variously to mean city or county.
RSFSR	Russian Soviet Federated Socialist Republic
Sovkhoz	State farm cooperative. Comprised mainly of confiscated property of large land owners.
UIEV	Ukrainian Institute of Experimental Veterinary Medicine
UzNIVI	Uzbek Scientific Research Veterinary Institute
VASKhNIL	Vsezoyuznaya Akademiya Sel'skokhozyaystvennykh Nauk imeni V. I. Lenin. (All-Union Academy of Agricultural Sciences named after V. I. Lenin).
Veterinarian	Five years of professional training in a school of veterinary medicine.
VIEV	Vaesoiuznoge Instituta Experimental'noi Veterinarii (All-Union Institute of Experimental Veterinary Medicine)
VOS	Veterinary Experimental Station
VSW	Vallee-Schmidt-Waldmann vaccine

The following is excerpted from the 1958 edition of the Encyclopedia Britannica, vol. 19, p 682 to assist the reader in obtaining a better overall picture of the organization of the country of Russia.

"The U. S. S. R. was formally organized on Dec. 30, 1922 and originally consisted of the Russian Soviet Federated Socialist Republic, the Ukrainian Soviet Socialist Republic, the Byelorussian S. S. R., and the Transcaucasian S. F. S. R. In 1924 it was decided that the Turkistan Autonomous Soviet Socialist Republic, a component part of the R. S. F. S. R., should be divided on a nationality basis and transformed into five component republics of the U. S. S. R. This process took 12 years to complete: Uzbekistan and Turkmenistan were officially admitted to the union in Jan. 1925, Tajikistan was admitted in Dec. 1929, and Kazakhstan and Kirghizia were admitted in Dec. 1936. In Dec. 1936, too, the Transcaucasian federation was dissolved and Georgia, Armenia and Azerbaijan became direct members of the union. To the above 11 republics five others were added during World War II, namely Karelia, Estonia, Latvia, Lithuania and Moldavia, the first being admitted in March, 1940 and the remaining four in Aug. 1940. On July 16, 1956, Karelia (Karelo-Finnish S. S. R.) was included into the Russian S. F. S. R. as the 13th A. S. S. R.

"In 1956 the R. S. F. S. R. included 13 self-governing towns; 53 regions or oblasti; 6 territories or krai (Krasnodar and Stavropol in Europe and Altai, Krasnoyarsk, Primorsky and Khabarovsk in Asia); 12 autonomous soviet socialist republics or A. S. S. R., namely Bashkiria, Chuvashia, Daghestan, Kabarda, Komi (Zyryania), Marii (Cheremisia), Mordvinia, North Ossetia, Tataria, Udmurtia (Votyakia), Buriat Mongolia and Yakutia; 6 autonomous regions or A. O., namely 2 in Europe (Adyghei and Cherkess) and 4 in Asia (Gorno-Altai, Jewish, Khakass and Tuva); and 10 national districts or N. O., namely 2 in Europe (Nenets or Samoyed and Komi-Permyak) and 8 in Asia (Yamalo-Nenets, Taimyr or Dolgano-Nenets, Khanty-Mansi or Ostyak-Vogul, Evenki or Tungus, Chukot, Koryak, Ust-Orda and Aghin."