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Approved For Release 2008/06/27 : CIA-RDP80T00246A005000240002-8

THE METHODS OF CREATING BREEDS OF DOMESTIC FOWLS IN THE USSR

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In the past the development of the poultry industry in Russia was based on the import of foreign poultry breeds and t their acclimatization. This was the longest period in the development of the poultry industry and it showed the impracticability of the given trend. Today of the numerous poultry breeds which were imported from abroad at different periods (a total of 64 breeds) only the Leghorn, Rhode Island and New Hampshire Chickens, the Pekin ducks and the Bronze turkeys have been preserved and are raised in the USSR.

This confirms the view expressed as far back as 1895 by I.I. Abozin, the founder of scientific poultry keeping in Russia, that in rearing foreign breeds their good qualities are somewhat impaired because the fowls are placed under climatic and maintenance conditions which differ from those under which they are created.

In the Soviet Union the development of the poultry industry proceeded along the path of the improvement of native fowls, the creation of new breeds and the further improvement, acclimatization and hibridization with local birds of foreign breeds which in the course of a number of years adapted themselves to the climatic and economic conditions of the country.

Certain Methods Employed in Breeding Poultry

The breeding of many domestic fowls is based on certain general methodological principles but at the same time, depending upon the demands made upon each of the future breeds, some of the applied methods are considerably modified and in some cases new original methods are employed.

Work is chiefly conducted on the creation and improvement of general-purpose chicken breeds.

In creating new breeds reproductive or complex reproductive crossing are made in most cases.

The principal characters according to which selection and choice of chickens for the crosses are conducted are as follows: egg laying, weight of eggs, weight of fowls, broodiness, livability reproductive properties, rate of feathering in chicks, early sexual maturity, high productivity for a period of many years, number of offspring, quality of meat, and resistance to certain diseases.

In creating and improving meat types of domestic fowls (greese, ducks, turkeys) selection and choice of parental forms is conducted with the aim of securing a breed which requires minimum costs for the production of one meat unit, gives maximum offspring per female and, in some cases, makes maximum use of the natural feed in water basins and pastures.

The Significance of External Conditions in Altering Heredity in Fowls

In breeding chief attenti n is paid to the influence of external conditions on the organism of the initial breeds taken for the cross and upon the resulting hybrids which are subsequently purebred.

The influence of certain external conditions on the changes in productivity and build of the fowls has been known long ago and confirmed in many researches. For instance, high temperature causes a drop in the weight of eggs, the development of a thinner egg shell (Benion and Warren, 1933; Conrad, 1939; Wearen and Schnepel, 1940; Kikavsky, 1952; Redikh, 1953), and a reduction of the live weight of the birds (Zelenskaya, 1948; Penionzhkevich, 1952; Ragab and Assen, 1953; Redikh, 1953).

Embryonic mortality of chickens in different geographical latitudes is due to differences in insolation (Penionzhkevich, 1941) and egg laying depends upon different conditions of illumination and temperature (Smetnev, 1940).

A number of researches show that the prolonged influence of external conditions on the organism of animals and birds not only alters their livability and productivity of the parents, but, what is particularly important, helps accumulate and fix these qualities in a number of generations in the offspring and, if under the action of external conditions metabolism is altered, the newly acquired properties become hereditary.

The well-known Russian scientist and zootechnician Kuleshov P.N. formulated the law of the fixing of properties in heredity as follows: "This law manifests itself in the fact that the characteristics of the organism acquired in the course of its life are the more persistently transmitted to the offspring the longer was the action of the causes that induced the changes.

Similarly, the more the acquired characteristics are transmited to the offspring the greater is the chance of their being preserved in the future generations".

Savelyev (1952) showed that prolonged field management helps create highly-productive chickens possessing great livability and better conversion of feed as compared with the control group of chickens kept in limited ranges. Exercises connected with the movements of the birds activated the development of the organism and certain internal organs (liver, heart, kidneys, ovaries). In adult birds and chicks kept in the fields these organs were heavier by 23-80 per cent. Later the offsprings of the chickens that had been kept either under the same conditions or in limited ranges were more productive and viable than chicks reared in the same conditions but originating from parents that had been kept for several years in a limited range.

The researches of Korepanova (1952) were conducted with the aim of studying the fifluence of two markedly contrasting feed rations on the hereditary variability of chickens. Both initial groups of Leghorn pullets were equalized in all respects. In order to exclude the influence of natural or artificial selection factors the maternal groups of each generation were made up only of closely related pullets along the maternal line. The ration for one group of experiment pullets was "Abundant" and for the other--"Lean". These rations remained unchanged in the course of four generations. The fifth generation of both experiment groups were gron under the same feeding conditions in order to check the extent of the hereditary fixation of the acquired changes. The difference in live weight in fifth generation pullets of both groups in autumn was in favour of the offspring obtained from the well-fed mothers--by 208.4 grams and at the age of one year--by 163.9 grams; as regards sexual maturity they were earlier by 16.2 days, in egg laying for a period of six months they produced by 42.1 more egg and the weight of eggs--was greater by 3.9 grams. All the above differences were biometrically valid. It is interesting to note that the well-fed pullets of the fourth generation acquired certain constitutional properties similar to those of the general-purpose type of chickens.

By employing different kinds of chicken feed containing vegetable and animal proteins in a number of generations Dinan (1951) found that the chicks and chickens of three generations which received the vegetable diet manifested deep changes in metabolism ahd an altered type of build.

The methodoof exterting an influence upon the initial breeds and later upon purebred birds by conditions of feeding and management is of great significance in creating new breeds.

In breeding the Russian White chicken besides grain and meal feed the rations included considerable amounts of potatoes, pumpkin, carrots, mangel and other juicy feed and also food containing natural vitamins. As a result the new breed developed a capacity for consuming a considerable amount of juicy feed which cuts the working costs of the products without causing a drop in the productivity of the birds. This method of feeding and field management were used in creating the Zagorsk general-purpose breed of chickens. In breeding the North Caucasian turkey hybrids were produced which were subsequently inbred and then the purebred fowls were kept in the pastures under conditions prevailing in the southern zone of the USSR for 9-10 months a year. The new duck breeds (Ukrainian, Black White-Breasted) were created on unlimited water areas with the utilization of a large amount of natural plant and animal feeds.

These methods led to a reduction in feeding costs and helped get highly productive vigorous fowls.

It should also be noted that selection of parental forms of the initial breeds from farms located in different climatic zones or where different methods of management were employed (Kushner and Kitayeva, 1953) and also the maintenance of males and females during the prebreeding period under different conditions and different feeding (Savelyev, 1953) exerted a favourable influence on the rise in livability and performance of the birds.

Concerning Certain Problems of Interbreed Crossing

The theory of hybridization proceeds from the precept that increased vitality and productivity of the offspring are the result of the fusion of biologically full value male and female sex cells possessing different qualities. The difference in the qualities of these cells creates the stimulus for the internal contradiction of the living body which is the cause of the high livability and productivity of farm animals and birds.

From our point of view the major points of the problem of hybridization which should be thoroughly studied today are the combination of breeds for pedigree and market purposes and the elaboration of methods of securing vegetative hybrids.

In the All-Union Poultry Breeding Research Institute work has been conducted for a period of several years on the problem of the inheritance of bharacters and the evaluation on this basis of the effectivity of single and reciprocal crosses.

In studying these problems we proceed from the fact that the parental forms exert an influence on their offspring with the participation of at least two major factors: a) nutrition during the embryonic period which is closely connected with the maternal organism and through it with the external environment; b) heredity which both the paternal and maternal organisms possess.

Among the authors working on the problem of the inheritance of different characters in domestic fowls mention should be made of Burov A.N. (cited according to Kushner, 1955) who conducted very convincing and contrasting, as regards live weight, crosses between Bantam, Rhode Island, Leghorn and Langshan chickens, Lebedev N.N. (1949), Lebedev N.N. and Libizov M.P. (1952) on the inheritance of live weight, vitality and hatchability; Moultrie, King and Cottier (1953), Morely and Smith (1954) on livability.

On the basis of these and many other researches we may conclude that such characters as live weight and viability of embryoes are inherited by the offspring primarily from the maternal organism.

These data are confirmed by researches conducted in the All-Union Poultry Breeding Research Institute by Savelyev I.K. (1952).

The works on the inheritance of resitance in chickens of different breeds and strains to infectious and helminthous diseases (Roberts and Card, 1926; Hutt, 1935, Sturkie, 1943, Champion, 1954 and others) have shown that in crossing males and females of both resistant and nonresistant strains the offspring proved to be resitant i.e. in this case the character is inherited in an equal degree from the maternal and the paternal line.

With the aim of experimentally checking the preferential inheritance of separate characters relating to the productivity of the fowls from the paternal and maternal organisms and determining the most effective combinations of parental forms for interbreed crosses corresponding investigations were conducted in the All-Union Poultry Breeding Research Institute.

In his experiments Savelyev (1953) employed hens and cocks fo four breeds for his single and reciprocal crosses: the Yurlov, Russian White, Rhode Island and New Hampshire chickens. The best indices for egg laying, early physiological maturity, and live weight were combined in hybrids obtained from by crossing cocks of the egg laying breed originating from highly productive mothers with hens of a heavier weight belonging to the general-purpose type. Hatchability was higher in the single crosses.

In L.V. Shakhonova's experiments with Russian White and Zagorsk chickens the incubating properties of the eggs in the single crosses was also higher then in reciprocal crosses: by 8.9

per cent of the number of incubated and by 2 per cent of the number of fertilised eggs.

The hybrid chicks from the reciprocal crosses approximate in live weight to the Zagorsk chicks of the general-purpose type while the hybrids of the single cross are more like the Russian White egg laying type of chickens in respect to this character.

Shakhnova's investigations show that body measurement indices and the size of the hybrids of the reciprocal cross are higher than those of the hybrids of the reciprocal cross are higher than those of the hybrids from the single cross, i.e. these indices like the live weight of the offspring are, influenced more by the maternal organism.

In dressing fowls and in anatomical studies it was found that the amount of meat and edible parts in hybrids of the single cross is greater than in Russian Whites by 12.7 per cent and in hybrids of the reciprocal cross by 21 per cent.

Thus, the production of superior quality hybrids in respect to the entire set of economic characters for market and breeding purposes depends upon the choice of initial breeds, individual selection cocks and hens belonging to groups with different types of productivity.

On the basis of experiments and the analysis of the work conducted by the breeding state farms which show the influence of the paternal and maternal organisms on the inheritance of separate economic characters reciprocal crossing may be recommended as the most effective (hens of the general-purpose type are crossed with cocks of the egg-laying type whose mothers were highly productive). In this case the offsprings as a rule possess a big live weight, good feed conversion, high egg-laying, early maturity and a good exterior inherited from the cocks and the hens. Only one character in these crosses, namely, hatchability is inferior.

Researches conducted in the Soviet Union on the production of vegetative hybrids whose heredity is altered by means of parenteral injection of blood and other tissues to recipients (Sopikov 1950, 1951, 1954, 1957; Ferdinandov 1952; Gromov and Feoktistov 1957) have shown that by repeated parenteral injections of blood taken from donors to another breed the altered characters can be fixed and made hereditary in the offsprings of the recipients; the liveability, fecundity and economic productivity and also resistance to diseases can be increased both in the recipients themselves and in their offspring.

This method has made it possible to create a new highly-productive general-purpose breed group of Leningrad White chickens which almost completely fail to brood (0.8-1% brooding hens) in contrast to other general-purpose breeds such as the Rhode Island, Plymouth Rock where the percentage of brooding hens reaches 14-20%.

A brief Description of the Breeds and Breed Groups of Domestic Fowls Created in the USSR

The territory of the Soviet Union includes different climatic zones--from the districts of eternal ice to the subtropics and the combination of external factors differs in the different climatic zones. That is why breeds of domestic fowls are created for the zone in which the birds manifest maximum productivity and livability.

Breeds of Different Fowls and the Zones of their Distribution in the USSR

Breeds	The Chief Zones of Distribution
Chickens	
Russian White	In all zones. In the USSR there are two populations: the northern heavy weight and the southern with a smaller live weight
Geese	
Big Grey	Central districts (central chernozem and nonchernozem zones) and the south.
Kholmogorsky	Districts of the center, the west, north and south.
Arzamassky	Central districts.
Pskovsky	Districts of the north-west and west.
Romensky	Districts of the south.
Shadrinsky	Districts of the Urals and Siberia.
Turkeys	
North Caucasian	Districts of North Caucasus and the south.

Breed Groups of Different Fowls and the Zones of their Distribution in the USSR

Breed Groups	Chief Zones of Distribution
Chicken	
Zagorsksky	Districts of the center, South, North Caucasus Southern Urals and Siberia.
Leningradsky	Districts of the North-West.

Kuchinsky	Districs of the center.
Moskovsky	Districts of the center and North Caucasus
Poltavsky	Districts of the south.
<u>Geese</u>	
Solnechnogorsky	Districts of the center.
Kaluzhasky	The same
Litovsky	Districts of the west.
<u>D u c k s</u>	
Zerkalny	Districts of the center, north-west abd west.
Ukrainsky	Districts of the south
Black White-Breasted	The same
Kubansky	Districts of the North Caucasus.
<u>Turkeys</u>	
Moskovsky	Districts of the center, north-west, Urals and Siberia.
Stalingradsky	Districts of the center
Black Tikhoretsky	Districts of North Caucasus and the south.

Below we give a brief description of the new breeds and breed groups of donestic fowls that are widespread in the USSR.

C H I C K E N S

<u>Russian White</u> breed by utilizing reproductive crossing of Leghorns with local Russian chickens. In creating this breeds, selection and choice of parental pairs were conducted in such a way as to conbine high egglaying and big egg weight with greater live weight of the fowls, good fertility and livability.

In the USSR they are widespread. On the best breeding farms the average egglaying is 180-200 eggs a year. On the State farm

"Krasny Kut", Saratov Region, the average egglaying of 20 thousand chickens anounts to 208 eggs a year.

The record hen No. 6868 laid 330 eggs in one year weighing on the average 60 grams, the live weight of the hen being 2.4 kilograms. Hen No. 617, which set a record in productivity for a period of several years, laid 1057 eggs in the course of 5 years with an average weight of 62 grams; the live weight of the hen is 2.4 kilogram.

<u>The Kuchinsky Jubilee</u> chicken was bred on the pedigree poultry state farm "Kuchinsky", Moscow Region, by utilizing conplex reproductive crossing of the following breeds: Local Livensky, New Hanshire, Rhode Island, Australorp and White Plymouth Rock. The hen's plumage is yellow, the cock's-dark red (black breast). The average egg laying on the Kuchinsky State Farm is 200.2 eggs per laying hen. The record hen No. 2005 laid 285 eggs in one year with an average weight of 61 grams; the live weight of the chicken is 3.10 Kilograms.

Zagorsky (<u>general purpose type</u>) bred in the All Union Poultry Breeding Research Institute by utilizing conplex reproductive crossing of Yurlov, Russian White, New Hampshire and Rhode Island chickens. There are two varieties as regards plunage colour and form of conb: white with a rose conb and salnon-coloured with a single conb. The egg-laying of the pedigree group chickens of the All-Union Poultry Breeding Research Institute (Zagorks, Moscow Region) is 201 eggs. The record hen No. 7800 laid 243 eggs in one year weighing 58 grams on the average; the live weight of the hen--3 kilograms.

Leningradsky White heavy weight general-purpose type of chickens, nonbreeding, created by means of the transfusion of blood from Australorps to Leghorns in the course of four generations. Beginning with the fifth generation the fowls were purebred without transfussion of blood. The average egg laying on the "Bolshevik" State Farms, Leningrad Region was 182 eggs per hen; live weight of the chickens is 2.7--3.2 kilograms.

Moskovsky chickens bred by utilizing crosses of Yurlov chickens with New Hampshires and Brown Leghorns. Adult birds and chicks were kept under the climatic conditions of the Moscow Region with its long cold winters. The average egg laying at the Bratsevo Poultry plant was 200 eggs, weight of the hens 2.7 kilograms and cocks--3.5 kilograms. A record hen laid 240 eggs.

GEESE

Large grey bred on the poultry state farms "Borki", Kharkov Region and "Arzhenka", Tambov Region by utilizing reproductive crossing of Ronen and Toulouse geese. The average live weight of the females is 6 kilograms and that of the ganders 7.8 kilograms. The average egg laying is 50 eggs.

Solnechnogorsky geese were bred on the "Barezki" State Farm, Solnechnogorsk District, Moscow Region, by utilizing complex reproductive crossing of Kholnogori, Chinese and Toulouse geese. The average weight of the females is 6 kilograms andof the ganders 7.8 kilograms. Average egg laying--40 eggs. The record goose No. 470-60 laid 71 eggs a year, her live weight was 7.4 kilograms.

Kalushsky geese bred by utilizing the crosses of Tulsky geese with local varieties bred in the Kaluga Region. The fowls manifest the best correlation of skeleton and muscles (1:4).

In a number of regions of the Soviet Union (Gorgky, Chernigov) hybrids of the local varieties and the chinese geese are bred in large quantities. In these hybrids are conbined high egg-laying (70-120 eggs a year) and a big live weight (6-7 kilograns).

DUCKS

Zerkalny ducks bred by utilizing complex reproductive crosses of local ducks raised in the Moscow Region with Pekin and Khaki-Campbells. Average live weight--e kilograms, average egglaying 128 eggs. The record duck No. 1167 laid 185 eggs. Her live weight was 3.1 kilograms.

Ukrainsky ducks bred at the Ukrainian Poultry Breeding Experiment Station by utilizing the initial crossing of local grey ducks with wild drakes in order to increase the feed conversion properties of the offspring. They actively utilize the natural feed of the ponds: 2-2.5 feed units are spent per kilogram of increment in weight. Very unexacting. The record duck No. 1314 (live weight 4.2 kilograms) laid 225 eggs.

Black White-Breasted ducks bred by utilizing reproductive crossing of local Ukrainian Black White-Breasted ducks with Pekins and Khaki-Campbells. 2-2.5 feed unit are spent per kilograms of increment in weight. The record duck No. 10-8363 (live weight 3.2 kg) laid 225 eggs.

T U R K E Y S

North Caucasian bred in the Stavropol Territory by utilizing the reproductive crossing of the local Caucasian turkey with Bronze and Brood-Breasted Bronze fowls. They pasture well. The average weight of the turkey hens is 6.0 kilograms and of the cocks 12.1 kilograms. The record hen No. 751 (live weight 7.5 kilograms) laid 121 eggs.

The Moscovsky turkey bred in the central zone of the USSR by utilizing complex reproductive crossing of local White turkeys, White Dutch, White Beltsville and local Bronze turkeys raised in tne Moscow Region with the North Caucasian and Bronze Broad-Breasted (Bronze variety). Average live weight of the turkey hens 6.6 kilograms and of the cocks 12.6 kilograms. The record white hen No. 499 (live weight 7.8 kilograms) laid 139 eggs.

Black Tikhoretsky turkeys. The turkey hens are of average weight and the quality of the meat is high (good correlation between flesh and skeleton, edible and inedible parts). Their reproductive properties are good. Average weight of the hens is 4.6 kilograms and of the cocks 8.5 kilograms. Record hen No. 3797 (live weight 4.6 kilograms) laid 98 eggs.

The report is illustrated with lantern slides of the breeds and breed groupt of fowls.

SUMMARY

of the report by Professor E. E. Penionzhkevich, D. Sc., on "The Methods of creating breeds of Domestic fowls in the USSR"

In the Soviet Union new breeds of poultry after prolonged tests of the breeding and commercial poultry farms are approved of by the Ministry of Agriculture. New breeds that are still in the process of their making, testing and mass reproduction are called breed groups until they are approved of by the Ministry.

One of the major demands made upon a breed is the presence of a sufficiently large stock of fowls which makes it possible to conduct creative selection andchoice of parental pairs inside the breed for its further improvement.

In the USSR within a period of 40 years 8 breeds of different types fo fowls (the White Russian chicken; the Large Grey, Kholmogorsky, Arsmassky, Pskovsky, Romensky, Shadrinsky geese; and North Caucasian Turkeys) and 15 breed groups: have been improved and created: Pervomaisky, Zagorsky, Leningradsky, Kuchinsky, Moskovsky and Poltavsky chickens; Solnechnogorsky, Kaluzhsky and Litovsky geese; White Moskovsky, Zerkalny, Ukrainsky, Black White-Breasted and Kubansky ducks; Moskovsky, Black Tikhoretsky and Stalingradsky turkeys.

The principle stages in creating breeds are:

1/ Choice of parental pairs from different breeds for crossing;

2/ Selection and choce of pairs for the cross among the interbreed hybrids possessing the desired characters and productivity.

Directional rearing, feeding and management of fowls of the new breed group; the fixing of useful hereditary properties in each subsequent generation;

3/ The creation of highly productive strains and families, intestrain crossing with the simultaneous action of external conditions upon the organism;

4/ If necessary in the process of creating breeds crosses to add "new blood" are employed at the later stages.

The creation of poultry breeds for the different zones is major conditions for ensuring high livability and good breeding properties in the fowls. For this purpose one (or several) of the initial breeds used for the cross must be a native. New productive and breeding properties are obtained in the fowls by means of directional action of the complex of external conditions especially during the period of the organ's development, which not only promote higher productivity of the initial forms but the prolonged action of which ensures the accumulation of these new useful properties in the subsequent generations.

In crossing initial forms the preferential inheritance of separate characters from the paternal and maternal organisms is taken into account. The method of producing vegetative hybrids by means of parenteral injections of blood and other tissues into recipients is also employed.

A condition of paramount importance for the creation of highly productive poultry breeds is selection and choice of parental pair, according to individual tests andthe obtaining of a maximum number of foosprings from them, which is easily accomplished in the Soviet Union where there are large pedigree poultry farms working according to a unified plan.

REFERENCES

ABOZIN I. I., Poultry Breeding. The Poultry Yard on Russian Debriyan Publishers, 1895.

GROMOV A. M., FEOKTISTOV P. I., Altering Heredity in Chickens by means of Blood Transfusion. Moscow, 1957.

DIMAN, V. K., Protein Nutrition as a Factor of the Functional and Morphological Changes in the Organism. Thesis. Timiryazev Agricultural Academy in Moscow, 1951.

ZELENSKAYA K. V., Kholmogori Geese and their Significance in the Development of Home Geese Breeding. Trudi nauchno-issledovatelskogo Instituta Ptitsevodstva, vol. 20, 1948.

KULESHOV P. N., Theoretical Works on Pedigree Livestock Breeding, Moscow, 1947.

KUSHNER Kh. F. and KITAYEVA O. N., New Experimental Data on the Problem of Related and Nonrelated Breeding of Chickens. Trudi Instituta Genetiki Akademii Nauk SSSR, vol. 20, 1953.

KUSHNER Kh. F., The Genetical Bases of Breeding Work in the Poultry Industry. Trudi Instituta Genetiki Akademii Nauk SSSR, vol. 22, 1955.

KIKAVSKY L. D., A Zootechnical and Biological Analysis of the Age and Seasonal Changes in Productivity of Chickens. Trudi Nauchno-Issledovatelskogo Instituta Ptitsevodstva, vo. 22, 1952.

KOREPANOVA G. Ya., The Inheritance of Changes in Chickens Under the Influence of Conditions of Feeding. Zhurnal "Agrobiología", No. 2, 1952.

LEBEDEV N. N., Influence of Conditions of Feeding, Management and the Method of Selecting Parental Pairs of Animals upon the Effectiveness of Industrial Crosses. Trudi Pushkinskoy Laboratorii Razvedenia Selskokhoz. Zhivotnikh, issue 3, 1949.

LEBEDEV N. N. and LIBIZOV N. P.. Crossing and Double Mating in Market Livestockbreeding, Selkhozgiz, 1952.

PENIONZHKEVICH E. E., Changes in Embryonic Mortality of Chickens in Different Geographic Latitudes. Doklady Akademii Nauk SSSR, vol. XXXII, No. 8, 1941.

PENIONZHKEVICH E. E., Increasing Productivity and Improving Breeding Properties of Domestic Fowls. Trudi Nauchno-Issledovatelskogo Instituta Ptitsevodstva, Vol. 22, 1952.

PENIONZHKEVICH E. E., The Means and Methods of Improving Native Poultry. Trudi Nauchno-Issledovatelskogo Instituta Ptitsevodstva, vol. 23, 1953

PENIONZHKEVICH E. E., SAVELYEV I.K. and CHMUTOVA A. P., The new Zagorsky Breed Group of Chickens. Trudi Vsesoyuznogo Nauchno-Issledovatelskogo Instituta Ptitsevodstva, vol. 25, 1953.

SMETNEV S. I., Breed Testing of Leghorn and Rhode Island Chickens, Sbornik Nauchno-Issledovatelskogo Instituta Ptitsevodstva, 1940.

SMETNEV S.I., NIKULITSKY I.N., Work on the Creation of the Moscow Breed Group of Chickens. Abstracts of Reports of the Timiryazev Agricultural Academy in Moscow, issue XVII, 1953.

SOPIKOV P.N., A New Method of Vegetative Hybridization of Birds by Means of the Transfusion of Blood. Zhurnal "Priroda", No.IO,1950.

SOPIKOV P.N., Transmission of Hereditary Properties by Transfused Blood. Zhurnal "Agrobiologia", No.6, 1951.

SOPIKOV P.N., Altering Heredity and Increasing Vitality of Animals by Means of Parenteral Injection of Blood and other Tisses to Recipients. Trudi Vsesoyuznogo Nauchno-Issledovatelskogo Instituta Ptitsevodstva, vol. 25, 1957.

SOPIKOV P.N., The Alteration of Heredity by Means of Parenteral Injection of Blood, Zhurnal "Agrobiologia", No.6, 1954.

SEREBRYAKOV A.S., Methods of Breeding Work with Russian White Chickens, Moscow, 1957.

SAVELYEV K.K., Prolonged Field Management of Chickens as a Method of Improving their Productivity and Heredity. Trudi Nauchno-Issledovatelskogo Instituta Ptitsevodstva, vol. 22, 1952.

SAVELYEV I.K., Increasing the Productivity and Viability of Yurlov

Chickens in Cases of Closely-Related Breeding. Trudi Nauchno-Issledovatelskogo Instituta Ptitsevodstva, vol. 23, 1953.

FERDINANDOV V.V., The Search for Methods of the Vegetative Hybridization of Animals. "Uspekhi Sovremennoi Biologii, vol. XXXIV, issue 2, 1952.

SAVELYEV I.K., The influence of the paternal and maternal organisms on the offspring in cases of inter-breed crossing of chickens. Trudi Nauchno-issledovat. Instituta Ptitsevodstva, v.23, 1953.

BENION N.Z. and WARREN D.C., Temperature and its Effect on Size in the Domestic Fowl. Poultry Science, v.12, No.2, 1933,

CONRAD K.H., The Effect of High Temperature on the Blood Calcium of Laying Hen. Poultry Science, v.18, 1939.

CHAMPION L., The Inheritance of Resistance to Cecal Coccidiosis in Domestic Fowl. Poultry Science, v.33, No.4, 1954.

H U T T F.B., On the Physiological Basis to Salmonella Pullorum of the Fowl. Amer. Naturalist, v.69, p.66, 1935.

MORLEY F.H. and SMITH, A Comparison Between Reciprocal Crosses of Austraiorp and White Leghorns. Animal Breeding Abstracts, v.22, p.250, 1954.

HOULTRIE I., KING D., and COTTIER G., Influence of Heterosis and Maternal Effects on Viability in an Interstrain Cross of White Leghorns. Poultry Science, vol. 32, p.935, 1953.

ROBERTS E. and CARD L., The Inheritance of Broodiness in Domestic Fowl. Proc. 5-th Worlds Poul. Congress V.2, p.353, 1933.

RAGAB M.H. and ASKER A.A., Effect of Atmospheric Temperature on Egg Weight and Yield in Fayoini and Baladi Fowl. Poultry Science, V.32, No.6, 1953.

WARREN D.C. and SCHNETZEL H.L., The Effect of Air Temperature on Egg Shell Thickness in the Fowl. Poultry Science, v.19, No. 1, 1940.

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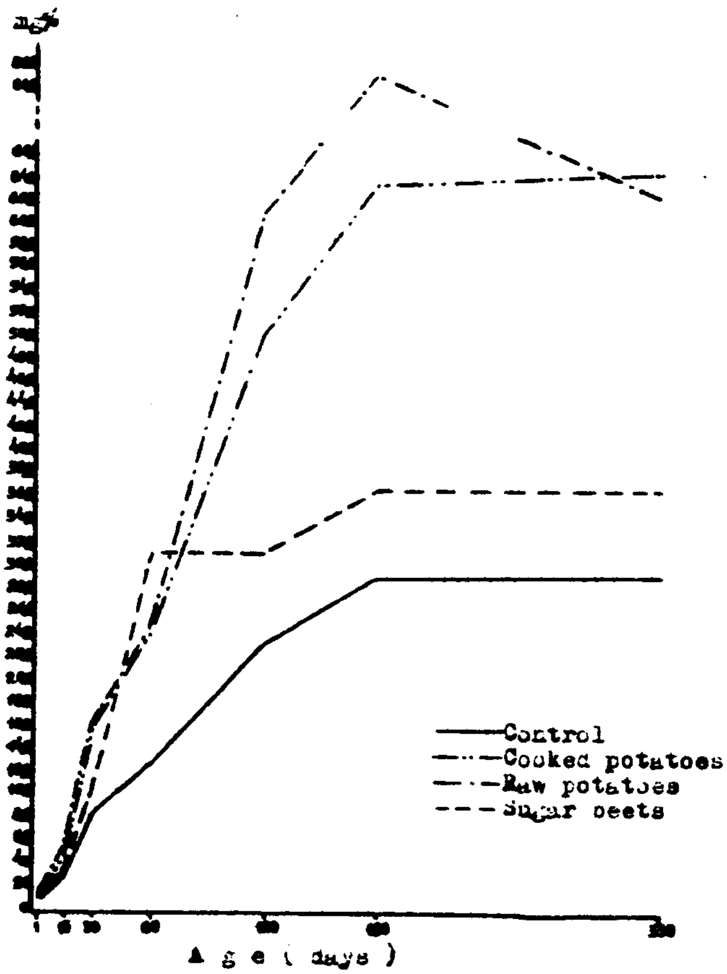
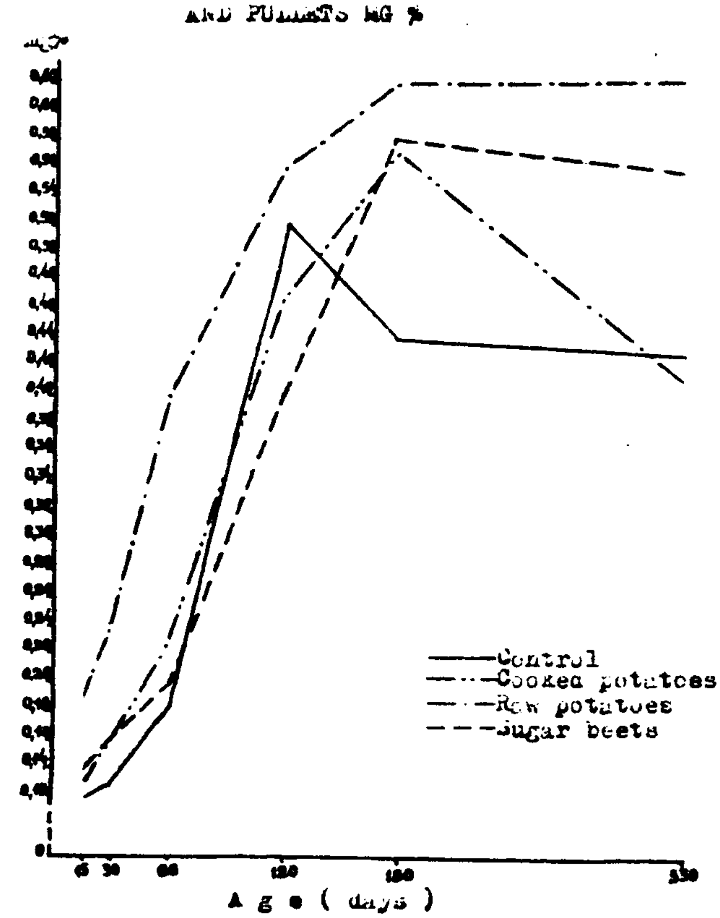
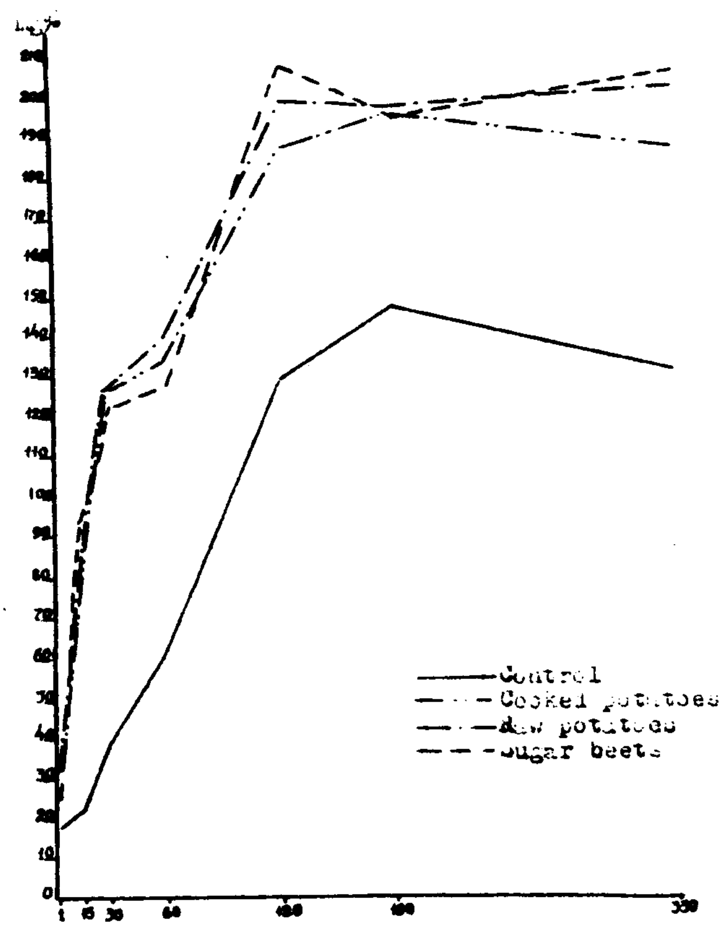
GLYCOGEN CONTENTS IN LIVER OF CHICKENS AND PULLETS, MG %



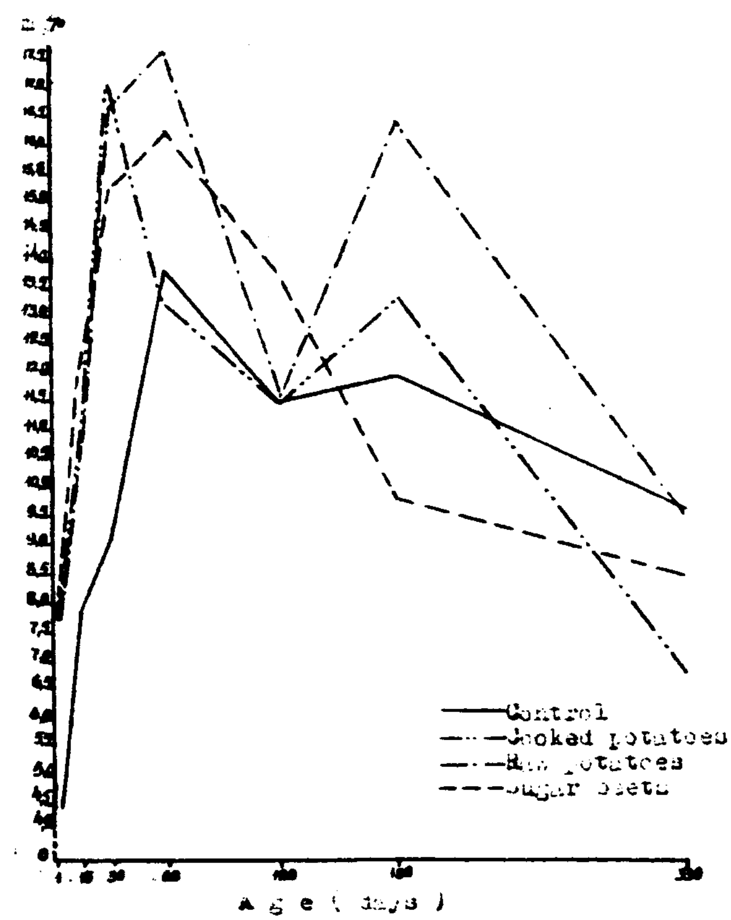
ASCORBIC ACID CONTENTS IN BLOOD OF CHICKENS AND PULLETS MG %



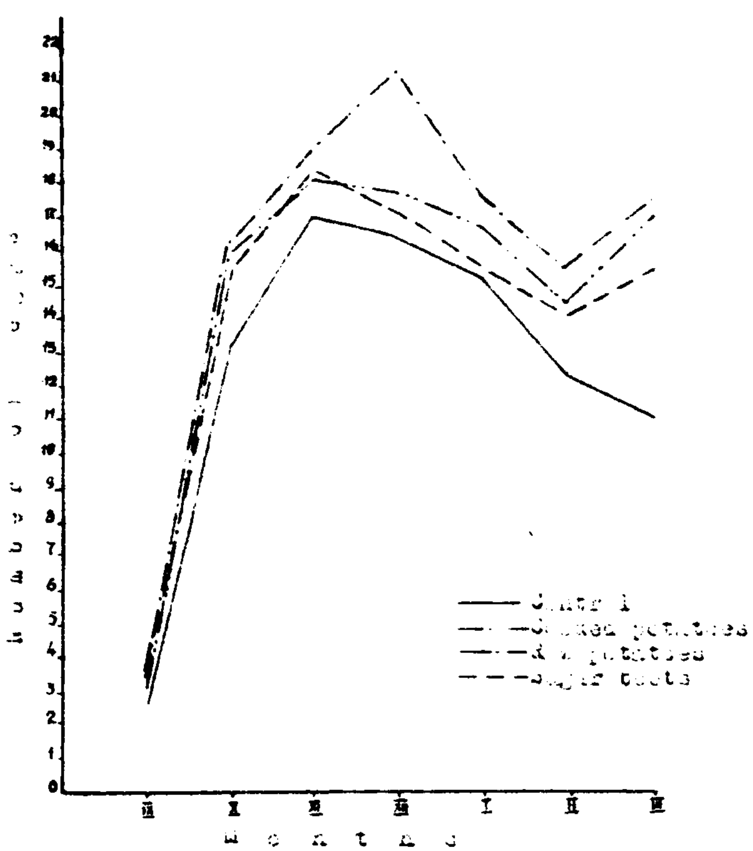
SUGAR CONTENTS IN BLOOD CHICKENS AND PULLETS IN MG %



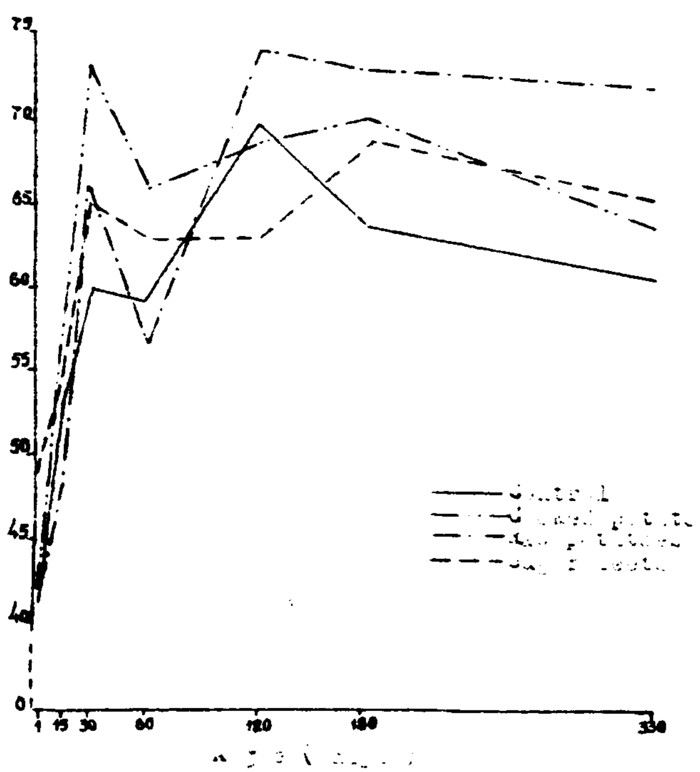
GLYCOGEN CONTENTS IN BLOOD OF CHICKENS AND PULLETS, MG %



AVERAGE EGG PRODUCTION IN AUTUMN-WINTER PERIOD (EGGS PER HEN)



HEMOGLOBIN CONTENTS IN BLOOD OF CHICKENS AND HENS IN %



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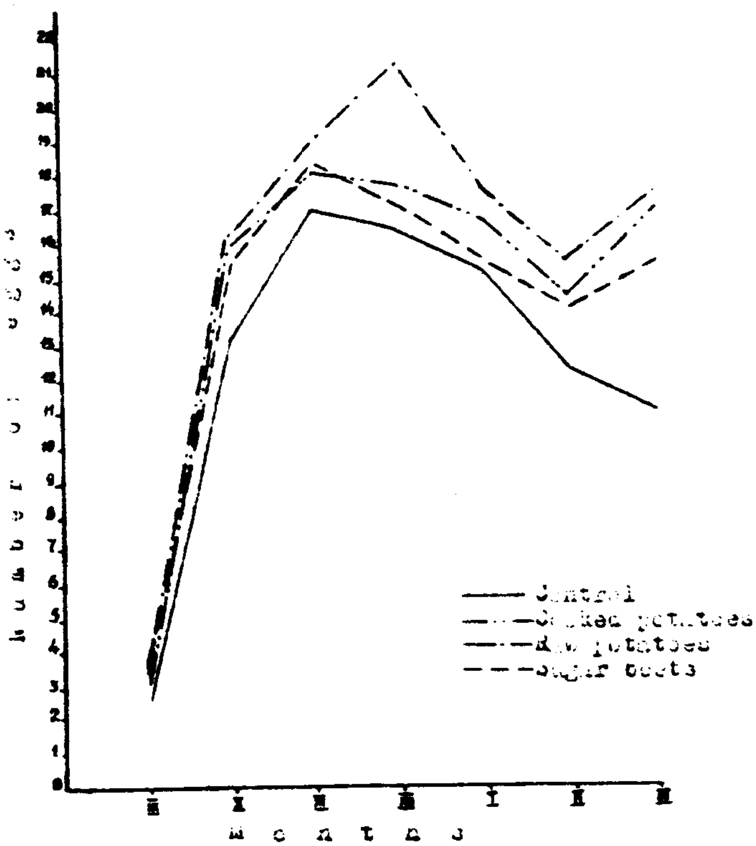
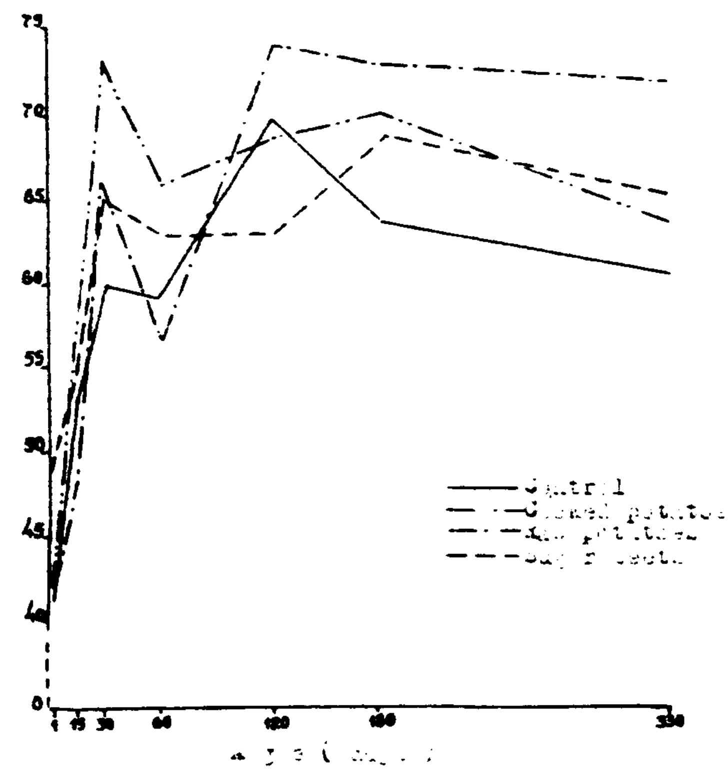
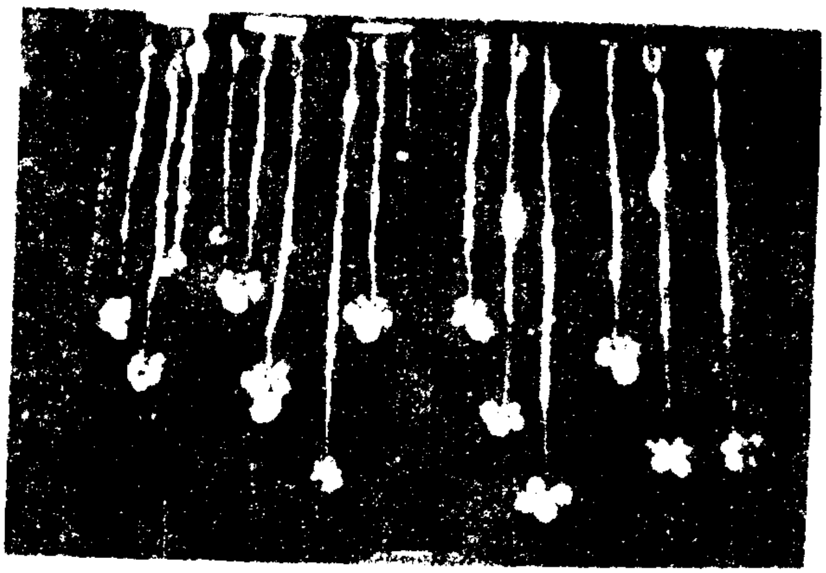
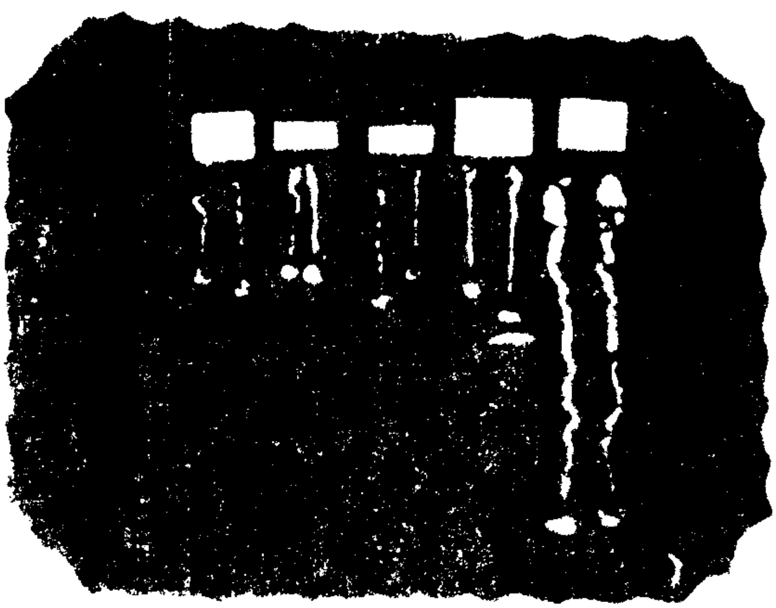


HAEMOGLOBIN CONTENTS IN BLOOD OF CHICKENS AND HENS IN %







THE ALTERATION OF CERTAIN PROPERTIES AND CHARACTERS IN FOWLS BY MEANS OF PARENTERAL TRANSFUSION OF BLOOD AND THEIR FIXATION IN THE OFFSPRING

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The problem of altering heredity in animals is of great significance in biological science. As is known, environmental conditions are one of the major factors influencing these changes. Many scientists in their works dating from the end of the XVIII century to our days acknowledged the unity of the organism and its conditions of life. This principle we find in the works of J. Lamarck (18), Ch.Darwin (9), K.A.Timiryasev (32), I.V.Michurin (21).T.D. Lysenko (19), I.E.Glushchenko(7) and others.

Today the scientists of the Soviet Union and other countries employ different methods in order to alter the hereditary characteristics of animals; the transplantation of ovaries and testes (I,22,23,36,39), the transplantation of fertilized and unfertilized ova (10, II, I2,I4,I7,23,25,27,28), the substitution of the yolk and egg white in incubating eggs of domestic fowls (2,3,13,20,24,26,33,35,36, 38), the parabiosis of organisms in embryological and postnatal periods(4,6), repeated systematic parenteral transfusions of blood (5,8,15,29, 30,31,33) and also the injection of sperm,testes and ovaries (31).

REFERENCES

I. BARISHNIKOV I.A., ZAX M.G. and PAVLOV S.F., The influence of the Maternal Organism on the colour of the Coat of Rabbits under the Conditions of the Transplantation of Ovaries. Izvestia Akademii Nauk SSSR, ser. biol. 1950. No.6.

2. BOGOLUBSKY S.I. The influence of Altered Embryonic Nutriment on the Postnatal Development of Animals. Trudi Pushkinskoi Nauchno-Issledovatelskoi Laboratorii Razvedenia Selskokhozaistvennikh Zhivotnikh, 1949. iss. 3.

3. BOGOLUBSKY S.I., The influence of the Substitution of Albumen in Incubating Eggs on the Colour of the Plumage of Chickens and their Offspring, Ibid., 1952, iss.5.

4. BORYACHOK-KIZHNIK, G.V. Experiments in Vegetarive Hybridization of Animals. Zhurnal Obshchei Biologii, 1952. vol.XII, No.4.

5. BRATANOV, K. Vegetative Hybridization of Birds. Izvestia Akademii Nauk SSSR. ser. Biol., 1954, No.1.

6. GASHEK M., Problems of Vegetative Hybridization and the Transplantation of Tissues in Warm-Blooded Animals. Zhurnal Obshchei Biologii, 1955. vol.XVI, No.5.

7. GLUSHCHENKO I.E. Vegetative Hybridization of Plants, M. 1948.

8. GROMOV A.M. and FEOKTISTOV P.I. The Alteration of Heredity in Chickens by Means of Blood Transfusion. Ptitsevodstvo, 1956, No.15.

9. DARWIN CH. The Origin of the Species (Russian edition). Selkhozgiz, 1952.

10. KVASNITSKY A.V., Experiments in Transplanting Egg Cells from One Animal to Anothe. Sovetskaya Zootekhniya, 1949, No.1

11. KVASNITSKY A.V., Experiments in the Interbreed Transplantation of Egg Cells, Sovetskaya Zootekhniya, 1951. No.1

12. KRASOVSKAYA O.V., Transplantation of Rabbit Eggs into the Uterus of Another Animal. Archiv. Anatomii, Histologii i Embryologii, 1936. vol.15, issue 2.

13. KUZNETSOV L.R., Vegetative Hybridization of Birds, Priroda, 1954, No.4.

14. KURBATOV A.D., Experiments in the Interbreed Transplantation of Fertilized Egg Cells in Rabbits. Trudi Pushkinskoi Nauchno-Issledovatelskoi Laboratorii Razvedenia Selskokhozaistvennikh Zhivotnikh, 1950, issue 4.

15. KUSHNER, Kh.F., The Infuence of Metabolic Factors on the Heredity of Animals, Agrobiologia, 1957, No.I.

16. LOPIRIN A.I., LOGINOVA N.B. and KARPOV P.L., Experiments in the Interbreed Transplantation of Embryoes in Sheep, Sovetskaya Zootekhniya, 1950, No.8.

17. LOPIRIN A.I., LOGINOVA N.B. and KARPOV P.L., The Influence of the Maternal Organism on Changes in the External Appearance of Lambs in Cases of Interbreed. Transplantation of Embryoes. Symposium on the Biological Foundations of Increasing the Productivity of Animal Industry. Academy of Science of the USSR, Publishing House, 195?.

18. LAMARCK,J. , The Philosoply of Zoology, vol.I.

19. LYSENKO T.D., Agrobiologia, Selkhozgiz, 1952.

20. MASHTALER, G.A., The Influence of an Alien Egg White on the Development of the Bird.Doklady Akademii Nauk SSSR, 1950. vol. 21,3.

21. MICHURIN I.V., Selected Works, Selkhzgiz, 1948.

22. NOVIKOV,B.G., Experiments in the Vegetative Hybridization of Birds. On the Biology of the Development of Domestic Fowls. Academy of Sciences of the Ukrainian SSR. 1953.

23. PAVLOV E.F., Inheritance of Colour in Chickens under the Conditions of the Reciprocal Transplantation of Ovaries. Izvestia Akademii Nauk Armyanskoi SSR. 1951. vol. IV, No.10.

24. RUGYAVICHUS,G.,A. Hybrid of a Chicken and a Duck. Referativny Zhurnal, 1955, No.5.

25. SARKISYAN S.M., The Influence of the Transplantation of Fertilized Rabbit Egg Cells on the Live Weight of the Developing Transplantas. Trudi Akademii Nauk Armyanskoi SSR. 1947. No.10.

26. SLAVCHEV, G., Vegetative Hybnids obtained from a Turkey and a Chicken of the Leghorn Breed,Referativny Zhurnal, serv.biol., 1954, No.10.

27. SEREBRYAKOV P.N., KRASHENINIKOVA,A.I.,Experiments in the Interbreed transplantation of Fertilized Egg Cells in Rabbits, Sovetskaya Zootekhniva,1957. No.I.

28. SOKOLOVSKAYA I.I., Is Vegetative Hybridization Possible in Animals,Karakullevodstvo i Zverovodstvo,1949. No.2.

29. SOPIKOV P.M. , A New Method of Vegetative Hybridization of Birds by Means of the Transfusion of Blood, Priroda, 1950, No.10.

30. SOPIKOV P.M., Transmission of Hereditary Properties by Transfused Blood. Agrogiclogia, 1951. No.6.

31. SOPIKOV P.M., The Alteration of Hereditary by means of Parenteral Injection of Blood. Agrobiologia.1954,No.5

32. TIMIRYASEV K. A., Selected Works. Selkhozgiz, 1948.

33. FERDINANDOV V.V. ,The Search for Methods of the Vegetative Hybridization of Animals. Uspekhi Sovremennoy Biologgii, 1952. vol.XXXIV, iss.2

34. BENOIT JACQUES,LEROV PIERRE,VENDRELI COLETTE,VENDRELI ROBERT, Tes mutations somatiques dirigces sontalles possibles chez les Oiseaux? Comptes rendus des Séances de L'Academie des Sciences,tome 244,N.18,1957.

35. BORZEDOWSKA B., The Influence of Another Breed Albumen upon Hereditary Nature of Birds. Pamietnik Institutu Zootechniki w Polsce.Krakow, 1955.

36. BOUGES L., Successful Experiments in the Modification of the Embryonic Nourishment of the Chicken.Proceed.of the 4-th World's Poultry Congr., July 22-30,1930.

37. CASTLE W.E., a PHILIPPS, On Germinal Transplantation in Vertebrates.Carnegie Institute Washington,Publicat, 1911, 144.

38. CHURY L. and SVEC R., Vegetatige Hybridization in Animals, Animal Breeding Abstracts, 1955, v.23, Nr.2.

39. GUTHRIE C.D., Further Results of Transplantations of Ovaries in Chickens, J. exp.zool., 1908, v.5.

Since 1948 we have been studing changes in hereditary properties and characteristics induce artificially by the parenteral injection of blood.

Material and Methods.

Experiments on the changes in heredity by means of parenteral injection of blood were conducted with purebred Leghorn and Australorp chickens raised at the Leningrad Somatic Hereditary Laboratory of the Base-Farm of the All-Union Poultry Breeding Research Institute.

The recipients and the donors of these breeds possess contrasting morphological characteristics.

The donors were Australorps (imported from the USA in 1946) .They belong to the table (meat-egg) type. Their feathers are black, and the bill and legs are slate-coloured, lobes are red and egg shells are pink. The meat is of good quality. The average weight of the hens is 2.5-3 kilograms and of the cocks -- 3-3.5 kilograms.

The recipients were Leghorns acclimatized in the USSR (they have been bred in the country for scores of years). This is an egg-producing breed. Gheir feathers are white. The bill, legs and the iris of the eye are yellow. The lobes and egg shells are white. The average weight of the hens is I.6-I.8 kilograms and of the cocks--2-2.5 kilograms.

Contrasting characters and properties were chosen in the recipients and donors in order to get as a result of repeated blood injections more clearly defined morphological changes and new properties.

All the experiment young chickens--the recipients and also the chickens in the control were chosen on the principle of analogy.

The experiment and the two control groups were placed under the same conditions of nutrition and maintenance.

Blood was injected into the recipients according to a method we elaborated (29,30,31).

Th the aim of altering the hereditary properties and characters parenteral injections of the blood of Australorps to Leghonrs were unfertaken undet the conditions of intrabreed mating of the latter. The chickens of the first control group were not injected, those of the second control group were injected with the blood of donors belonging to a different strains of the same breed. The blood was introduced by means of intravenous (into the inferior brachial vein) and intramuscular (into the breast muscles) injections.

In the experiment groups and in the second control group the blood of the donors was transfused to the recipients 2.5 months before egg-laying period twice a week at the rabe of 2.5-3 ml per kilogram of live weight. Additional injections of blood were performed in the same way in the course of 2.5 months during the period of collecting eggs for incubation.

During the first preparatory period (before the collection of eggs for incubation) each recipient was injected with 100 ml of blood on the average, or 55 ml per kilogram of live weight. An equal amount of blood was injected during the final period, i.e. when eggs were collected for incubation.

Injections were performed during these two periods in order that:

I/ nucleproteids and their ingredients DNA and RNA and other vital ingredients of the donor's blood might be included into the process of assimilation and metabolism (together with analogous ingredients of the recipient) and thus build qualitatively new molecules of the recipients's somatic and sex cells;

2/ in the process of fertilization a qualitatively new embryo might develop;

3/ the assimilated substances of the donor's blood which participated in the forming of the egg might in the process of metabolism be included into the building of the developing embryo's cells.

R e s u lt s

As a result of the injection of blood of the Australorps into Leghorns a larger amount of erythrocytes and hemoglobin appeared in the latter and their egg-laying and reproductive capacity increased as compared with the control --- a sign of greater vitality.

In the experiment group 96.2 per cent of the eggs were fertilized, in the first control group--- 94.3 per cent and in the second control group --95 per cent.

In the experiment group 76.2 per cent of the eggs hatched, in the first control group--72.I per cent and in the second control group -- 74.I per cent. In the experiment group 95.5 per cent of the chicks survived, in the Ist control group--94.3 per cent and in the second control group--95.2 per cent.

These data show that intra-and interbreed blood transfusions promote better fertilization and hatching and increase the viability of the chicks.

Of the 154 chicks obtained in the experiment group 22 had single black fluffs in their down and the adult chickens had single black, grey and white feathers with black specks (fig.1) Some of the experiment chickens also manifested an altered colour of the foot scales and bill. Their lobes were white with red specks on the white background and their feet were yellow with slate-coloured specks. The colour of the iris was somewhat changed

The colour of the egg shell in the experiment group varied from white and pinkish-white to pink.

In the first control group 140 chicks were hatched and in the second group--146. In the offspring of both groups there were no deviations from the typical Leghorn feathers and colour of the lobes, feet, bill, iris or egg shell.

In the experiment group the growth and weight of the chicks were better than those of the control groups (see table I and 2)

No external changes were observed in some of the offspring of the recipients, but their productivity and reproductive capacity were improved. Inbreeding had no deleterious effect upon the offspring. This shows that internal changes occurred in these individuals and that their vitality increased. When mated with each other or with purebred Leghorn cocks forms with altered feather colour and other external changes appeared in the second generation even without additional injection of alien blood. This can be evidently explained by the accumulation of nucleoproteids and other substances of the injected blood in the recipient which cause changes in hereditary properties and characters. Changes which arise under the corresponding conditions developed in the offspring in the process of onto-and phylogenesis.

Attention is attracted to the tendency toward an increase in variability in the phylogenetic line beginning with the second generation. This made it possible for us to elaborate a method of intensifying changes in different properties and characters by means of repeated (from generation to generation) injections of blood of a different heredity.

When the blood of Australorps was injected to Leghorns (from generation to generations) in the second and subsequent generations the number of offsprings with altered properties and characters grew larger and the intensity of the chances increased. In the sscond generation there were indiviruals with white and with black-speckled plumage (fig.2), in the third generation --with white, black-speckled, light ash, dark grey and black plumage with a few white feathers (fig.3) and in the fourth generation the plumage was bladk (fig.4) like that of the donors.

Table I.

Average body measurements of experiment and control Chickens at the age of seven months (in cm.).

Group	Sex	Body Measurements: Body length	pelvis width	breast-bone length	femur length	tarsus length	metatarsus length
Experim. Leghorn +Australorp blood	♀	22.6	8.8	11.0	9.3	13.5	9.3
	♂	25.6	9.7	13.2	10.2	15.1	11.2
First Control (no inject.)	♀	19.8	7.3	8.7	8.1	10.9	8.0
	♂	22.5	8.3	10.2	8.5	12.3	8.6
Second Control (Leghorn +blood of a diff. strain Leghorn).	♀	20.5	7.7	9.3	8.6	11.3	8.3
	♂	23.3	8.8	10.9	9.0	12.8	9.0

Table 2.

Indices of the average live weight of experiment and control chickens (in grams)

Group	Sex	Age in days: I	30	60	90	210	365
Experim. Leghorn +blood of Australorp.)	♀	40.7	231.3	564.6	1040.6	1962.0	2541.6
	♂	40.8	297.5	686.5	1199.0	2436.0	3140.5
Ist control (no inject.)	♀	37.8	206.4	490.7	792.0	1501.5	1801.0
	♂	38.4	226.0	539.2	996.0	1896.5	2180.0
2nd control Leghorn+blood of Leghorns of different strain	♀	38.0	216.4	530.0	652.3	1570.0	1880.4
	♂	38.5	230.2	558.1	1020.0	1958.6	2265.0

At the same time there were individuals among the offspring with the characters of white Leghorns in colour of the lobes, feet, feathers, etc. However, it should be noted that the cells and organs of some of these individuals were larger and their live weight higher than that of the Leghorns in the control group. There were also forms among the offspring with mixed characters of the recipients and the donor.

Besides that, the intensification of changes in hereditary properties and characters of the offspring was expressed in the following. For instance, the colour of the feet changed from yellow (characteristic of Leghorns) to slate-coloured (characteristic of Australorps), that of the lobes changed from white (Leghorns) to red (Australorps) and the egg shell-from white (Leghorns) to pinkish-white and pink (Australorp).

The changes in properties also manifested themselves in increased vitality, resistance to diseases, higher productivity, greater reproductive capacity, more rapid growth, elimination-of the harmful effects of inbreeding, changes in external appearence and increased live weight (fig.5).

Further work was subsequently conducted with the offspring to create new breed groups of the Leningrad white, black-speckled and black chickens.

In breeding the Leningrad white chickens the blood of the Australorps was repeatedly injected into the initial Leghorns and into the next two generations of the recipient's offspring.

As a result chickens were obtained with big live weight, high productivity and black feathers in their white plumage. Later breeding work was conducted in order to create a highly productive breed group with white plumage. By conducting selection and choosing parental pairs in this direction we created the Leningrad white chicken. With other groups of chickens selection is condhcted not only to increase productivity but also to get black-speckled and black plumage.

The fixing of useful properties in heredity is accomplished by purposedful selection and choice of parental pairs on condition of inbreeding, good nutrition, proper maintenance of the reproducing flock and the training of young. In this way was created the heavy weight (table) Leningrad white, black-speckled and black breed groups of chickens.

These breed groups are raised at the Leningrad base of the All-Union Poultry Breeding Research Institute and on the pedigree state poultry farms "Bolshevik" of the Leningrad Region. On this farm the reproducing flock of Leningrad white chicken numbers more than two thousand heads.

The plumage of the Leningrad chickens is white, they possess a simple comb, a long body, broad chest, abundant fluff and feathers, their meat is of good quality, The fowls are well-adapted to local conditions. Among the good properties of the breed is the absence of the hatching instinct in the hens in contrast to many table breeds. The weight of the hens is 2.5-4 kilograms and that of the cocks--3-4 kilograms. The average egg productivity in 1957 was 172 egfs per laying hen. The average weight of the eggs was 60-65 grams.

In 1955 and 1956 the Leningrad white hens were exhibited at the All-Union Agricultural Exhibition where 6 hens and one cock received certificates of the first degree.

We also obtained altered properties and characters in the recipient's offspring as a result of intra-and interspecific repeated injections of blood into chickens, turkeys, geese and ducks.

In cases of repeated (from generation to generation) injections of blood from distant species, such as the transfusion of goose blood to purebred Leghonrns or the injection of duck's or rabbit's blood, some of the offsprings manifested various deviations from normal type in plumage, feet colour, etc., however morphological changes resembling the characters of the donor were absent.

In cases of repeated interspecific injections (from generation to generation) of bronze turkeys' blood to purebred Leghonrs in the first two generations some of the offspring manifested coloured feathers the design of which resemble that of the donors while in the third and fourth generations (evidently as result of the approximation of the different species) certain microscopic changes appeared resembling the characters of the donor in design, colour of plumage, slate-coloured feet and specks on the egg shell (fig.6,7).

Our new method of altering the properties and characters in poultry by repeated parenteral injections of the blood of donors possessing a different heredity has been confirmed in the experiments of other investigators.

For instance, V.V. Ferdinandov (33) injected the blood of the white Voronezh chicken to ducks and geese. As a result of the experiments in the offspring of the recipients the colour of the plůmage and bills was changed.

K.Bratanov (Bulgaria,5) injected the blood of turkeys to chickens of the Leghorn breed. In the first generation offspring of the recipients there were individuals with single black feathers. The experiment chicks weighed more than the controls.

A.M.Gromov and P.I.Feoktistov (8) injected the blood of Australorps (first group), turkeys (second group) and guinea fowls (third group) to Leghorns.

The first generation offspring of the recipients in all three groups and a bigger live weight than in the control groups; in the first group by 219.6 grams for the cockerels and 225 grams for the pullets; in the second group by 201 grams for the cockerels and 193 gram s for the pullets; and in the third group 173 grams for the cockerels and 272 grams for the pullets.

Among the offspring of the recipients of the three experiment groups in some chicks the colour of the feathers was altered (in 20 out of 370 chicks in the first group, in 5 out of 112 chicks in the second group and in 24 out of 63 chicks in the third group). In the control group and in the group where the blood of the same breed was injected sudh changes were not observed.

The experiments of Gromov and Feoktistov, like our own, show that parenteral injections of alien blood into recipients from generation to generation intensify the changes in hereditary properties and characters in the second, third and fourth generations.

Kh.F.Kushner (15) injected the blood of wild ducks to Leghorns. Out of 45 chicks thus obtained 8 had single pigmented spots in their plumage.

When the blood of New Hampshires was injected into Leghorns 20 out of 90 chicks obtained from the recipients had single coloured feathers in their white plumage.

The experiments chickens at the age of five months weighed more than the controls (cockerels by 161.2 grams and pullets by 196.3 grams.)

In 1957 the French scientist Jacques Benoit, Pierre Lerov, Colette Vendreli, Robert Vendreli (34) applied the method of parenteral repeated injections of DNA isolated from erythrocytes of the blood of one strain of ducks into recipients of a different strain and obtained changes in hereditary properties and characters.

In data of these experiments confirmed the fact we established (29,30,31) that it is possible to change hereditary properties and characters by the method of parenteral injections of blood the erythrocytes and leukocytes of which contain nucleoproteids DNA, RNA and other vital substances which in the process of development metabolism go to build up qualitatively nwe somatic and sexual cells.

Summary

As the results of our experiments conducted in 1948-1958 (29,30,31) it was found that repeated parenteral injections of blood and other tissues (testes, ovaries, spleen,liver,etc.) from donors of a different breed or from phylogenetically more distrant forms, especially if they are performed from generation to generation, induce diverse changes in hereditary properties and characters in the recipients and their offspring.They are different because in these cases the course of the biophysical, biochemical, enzymatic and biological processes varies in the organism of the recipient.

Depending upon the direction in which these processe develop in the organism of the recipient distrubances of former correlations may occur, the conservation of heredity may be destabilized, the requirements for the injected substances may be increased in the organism and adaptive changes in metabolism may take place. As a result different qualitative changes are produced in the somatic cells (and in sex cells) which lead to the alteration of hereditary properties in the recipients and their offspring.

The diversity of changes in the properties and characters proceeds in different directions, including the appearence of individuals which resemble their closer or more distant kin. However, depending upon compatibility and favourable combining or incompatibility or noncombining of the substances injected from the donor with the substances of the recipient new properties appear in the recipient and its offspring with or without

the appearance of the hereditary properties and characters of the donor.

The injection of tissues (blood, etc.) of a donor into a recipient of the same species (intrastrain and intrabread injections) meets the requirements of compatibility and acceptible combining in the process of assimilation and mutual assimilation of substances.

The combining of some properties and characters as the result of the injection of tissues, blood of the same species occrus, in our opinion, on the basis of compatibility, combining and selective mutual assimilation of plastic substances, nucleoproteids and their composite parts(DNA and RNA) as well as other vital organic ingredients of cells of the recipient and the donor tissues. These processes develop in correspondence with biophysical, biochemical, enzymatic and biological regularities.

In injecting tissues (blood and others) to recipients belonging to a different species (especially animals capable of mating) the ingredients of cells, molecules and their composite parts may be less capable of combining and mutually less acceptible or altogether incompatible and incapable of mutual assimilation so that the combination of even certain characters is difficult to accomplish and can be done only on the basis of approximation by means of repeated injections of the implant from generation to generation.

On the basis of our experiments we consider that the development of properties and characters resembling those of the donor does not occure when the recipient and the donor belong to different genera or even more distantly related groups because the nucleaoproteid molecules (and their composite parts (DNA,RNA) and other substances of the donor and the recipient are antagonistic and incapable of combining and mutuqlly assimilating each other.

When a recipient is injected with an antigen of tissues (blood,etc.) of animals belonging to a different species, genus or more distant group antibodies are formed in its organism as a complement which we assess by the positive reactions of ring-precipitation. In such cases new proteins appear in the recipient of the antigen-antibody type and new adaptive properties are formed

The combining of even some of the hereditary properties or the recipient and donor in our opinion cannot take place so long as there exist incompatibility-antogonism, and inability to mutually combine and mutually assimilate molecules (and their parts) of the implant, recipient and donor, Here it is important to mention that the closer the phylogenetic (but not geographical) kinship of the animals the easier it is to obtain by means of the injection of tissues the disired combination and uniting of properties of the donor (improver)and the recipient, and also a better combination of economically useful properties in the offspring.

The obtained results of the alteration of hereditary properties and characters by means of repeated parenteral injections of recipients with the blood of donors possessing a different heredity show that not only sex cells but also somatic cells of the living body contain substances influencing metabolism and hereditary disposition of the animal.

The method of repeated injections of the recipient with the blood of selected improver-donors, especially from generation to generation, makes it possible to alter hereditary properties and characters.of animals in a given direction.

Besides that, this method makes it possible to increase animals vitality, reproductive capacity, productivity and resis_tance to diseases, to acelerate growth and also to eliminate the harmful consequencesw of inbreeding.

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dmc.

Fig. 1 Cock No. 136 (first generation). Single black feathers in its white plumage.

Fig. 2 Hen No. 165 (second generation). Numerous black feathers in its plumage.

Fig. 3 Cock No. 4749 (third generation) Black plumage with a small number of white feathers on the back and wings. Slate-coloured feet. The external acquired characters of the cock resemble the Australorp donor.

Fig.4 Hen No.105 (fourth generation) Black plumage.Feet and bill slate-coloured.The acquired characters of the hen--colour of the plumage, feet, bill and external appearence resemble the Australorp donor.

Fig.5 Left: hen No.KL 446 of the Leghorn breed. Live weight 1840 gr.

Right: Leningrad white hen No.KB 2284. Live weitht 4050 gr.

Fig.6 The wing of a third generation chicken.The design of the feathers resembles that of a turkey.

Fig.7 Left: an egg of a third generation hen. The egg shell specks resemble those of a turkey's egg.Right: an egg of purebred Leghorn hen.

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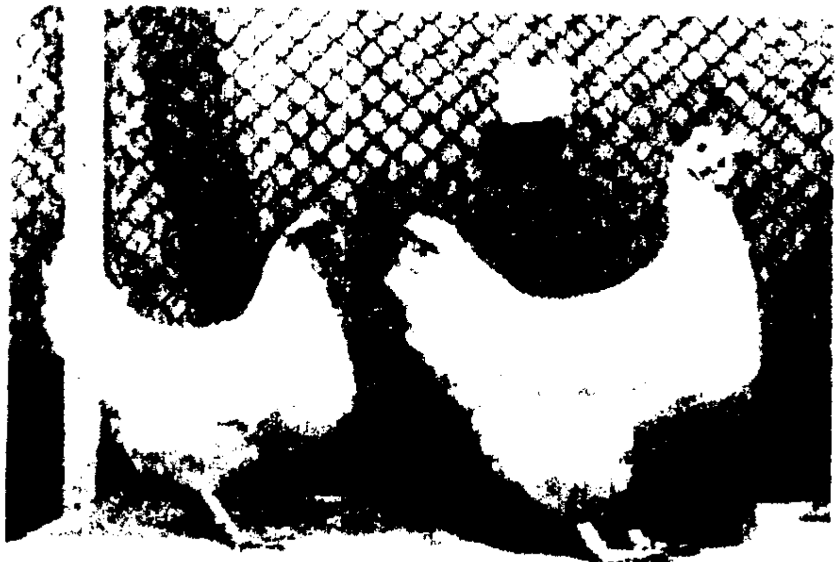

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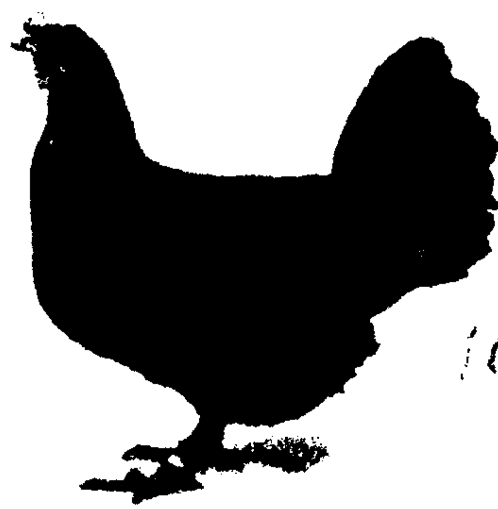

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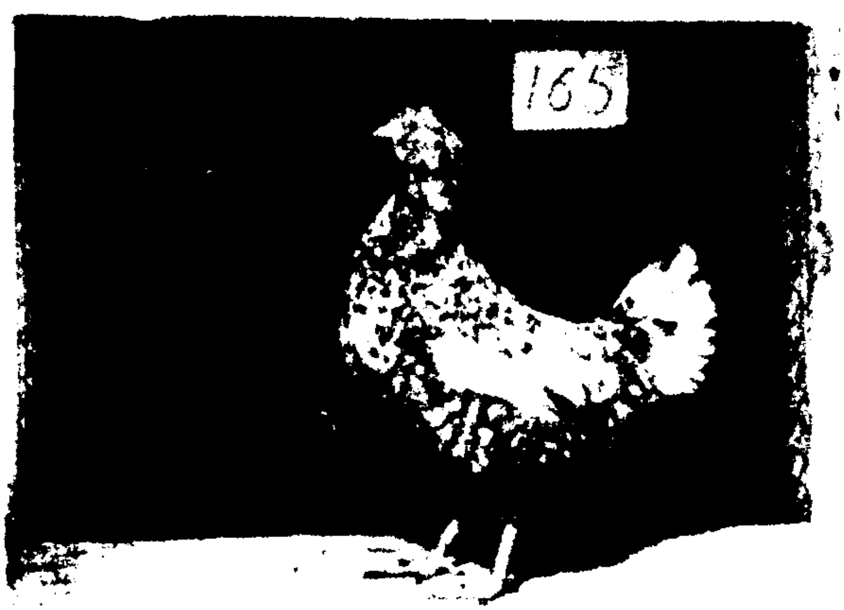
165

MODIFICATIONS RESULTING FROM INJECTIONS OF GREY GUINEA-FOWL IN THE WHITE LEGHORN HEN

PRELIMINARY NOTE

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The work of every cross-breeder consists in improving the qualities of a race by the addition of characters derived from another race.

The means employed are sexual crossings between different races and selection.

On the other hand, it has, until lately, seemed impossible to transmit to following generations, characters acquired during the development of an animal.

As a result of different studies, the problem of the heredity of acquired characters - principal point of the debate opened on evolution, in the last century, by Lamarck and Darwin - has once again come to the fore.

On this subject, we must mention, amongst others, the recent researches of Benoft (1), Bratanov (2), Keuchner (3) Novikov (4), Sopikov (5), for the animal kingdom.

Amongst the results obtained by these scientists are some which do not accord with certain classical theories of genetics; they have sometimes given rise to scepticism. As Lerner (6) suggests, therefore, it would be desirable to reexamine these studies.

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Within the frame-work, on the transmission of axquired characters, undertaken by one of us, we tried to cause in the animal, by somatic ways, modifications which will be found in the offsprings.

For this purpose, we have, for the following reasons, chosen blood as a modifying agent: it is in changing the environment in which the plants live that scientists have modified them profoundly. Having been inspired by these facts and transposing them into the animal kingdom (whilst taking into consideration the particularities of the latter), we have endeavoured to modify the internal environment of the animal organism, in this case: the blood. As a modifying agent, we also chose the blood: for one reason, because it is the internal environment characteristic of a given animal, and, for another reason as it is a complex biological envifonment partaking in multiple ways of different metabolic processes. In fact, in the beginning of this experiment, we did not wish to stick to a single determined factor, considering that the ways by which heredity is formed are largely unknown.

MATERIAL AND METHOD

We have chosen intentionally, animals of different species: The White Leghorn hen of pure race (a breed providing every guarantee of selection) and the grey guinea-fowl, so as to avoid any doubt on the origin of the modifications obtained. We experimented with 45 Leghorn females and 10 Leghorn males; finally obtaining 36 laying-hens.

We injected the blood of guinea-fowl, drawn ascepti-cally, into chickens four days after they were hatched. These injections were given every four or five days, first of all a subcutaneously and then intra-peritoneally. The quantity of blood injected was increased gradually from 0,5 to 5 cc in terms of the weight of the animal. During the first six months of our experiments, that is to say up to the time of ferti-lization, each animal received, on an average, about 150 cc of blood. Artificial insemination was employed so that each hen received a mixture of sperm from all the cocks.

We bred at the same time a control group composed of 25 female and 8 male Leghorns from the same breed.

RESULTS

The results published below deal with the animals experimented upon (Fo) and on the first generation (F1) 15 days old at that time.

We ascertained in Fo:

1) A different aspect of the comb: on an average, the comb of the hens experimented upon, is more developed than the comb of the control group; the comb of the cocks is not only more developed but also falls in 90 % of the cases; with these animals the comb is smoother than with the control group.

2) Different colouring of the eggs: In contrast to the white eggs of the control group, we observed a beige-rose pigmentation reminiscent of the more or less darker eggs of the guinea fowl. This coloring never occurs in the eggs of pure Leghorns. Out of 528 we found 128 coloured eggs in this way.

Furthermore, the shell of certain eggs is speckled and, in this way, resembles the shell of the guinea-fowl. It is always the same hens (9 out of 36) which lay the coloured eggs.

We ascertained in F1 :

1) a delay in hatching: a notable number of chicks were hatched after a delay of up to 4 days (the usual length of incubation of hens' eggs is 21 days and that of guinea-fowl 28 days).

2) a modification in the pigmentation of the beak and claws : the normal yellow pigment of the Leghorn disappears, and in 25 % (12 out of 48) of the cases, the beak and claws take on a grey-rose colour.

3) a modification in the size of the claws: the meta tarsus and especially the tibial-matatarsal and metatarsal-phalangeal joints are thicker than in those of the control animals, and, in this way, resemble those of a ghuinea-fowl.

4) The down has a different aspect: the down of the chicks is more ruffled compared to that of the control animals. The colour is less yellow and later taked on a drab white colour.

CONCLUSION

The observations we have just stated appear of sufficient interest to justify further experiments in order to elucidat upon the new problems which they pose.

1) Will the modifications which appeared in the first generation be intensified or attenuated and if so in which way? Will new modifications be manifested in the course of the development of animals? What will have upon F1 the application of the same treatment of injections?

2) Will new characters become hereditary? How many generations of hens would have to be treated so as to obtain this result?

3) Do the male and the female have equal roles in the transmission of acquired hereditary characters or does only one have a predominant influence?

4) What will be the effect of the treatment on the fertility at the time of interspecific cross-breedings?

We think that the results we shall obtain will make a contribution in opening new ways enabling the improvement of known races and the creation of new ones.

SUMMARY

The aim of this experiment has been to transmit hereditarily the characters acquired during one generation.

For this, white Leghorns (male and female) have been injected, intra-peritoneally, with the blood of grey guinea-fowls.

The results deal with the generation treated (Fo) and the following generation (F1) 15 days old.

In Fo, it is observed, in relation to the control hens, a different aspect of the comb of the male and female Leghorns. There is a different colouring of the eggs resembling the coulour of the guinea-fowl eggs.

In F1 it is observed, in the experimented animals, that there is a delay in hatching of up to four days. There is also a modification in the pigmentation of the beak and claws as well as in the size of the claws. We note also differencies in the down.

The work is continued in order to resolve different problems relative to the transmission of acquired characters. The authors think that by this way new roads will be opened enabling existing races to be improved and new ones to be created.

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R E F E R E N C E S.

1. Benoit J., Leroy P., Vendrely C. et Vendrely R. C.R. Acad. Sc. 1957, 244, 2320-21; 1957, 245, 448-51.
2. Bratanov K. Isvestia Akademy Sc., 1954, 53-8, No. 1
3. Kouchner K.F. Agrobiology, 1957, 19-35, No. 1
4. Novikov P.A. Works of the Zoology Institute of the Acad. Sc. Ukraine, 1953, 3-34.
5. Sopikov P. Agrobiology, 1954, 36-45, No. 6
6. Lerner I.M. Experiantia, 1957, No. 3, 135-36.
7. Mathon C.Ch. and Stroun M. VIIIth International Congress of Botany.
8. Stroun M. Contribution a l'étude du développment des céréales, Ed. Lechevalier, Paris, 1956.

1% of Body wt up to 500 grams
Sec every 4-5 days

a

b

c

d

Fig. 1 The eskeleton of the original wingless bird. The Humerus of left side is imperfect, on the right side it is vestigial.

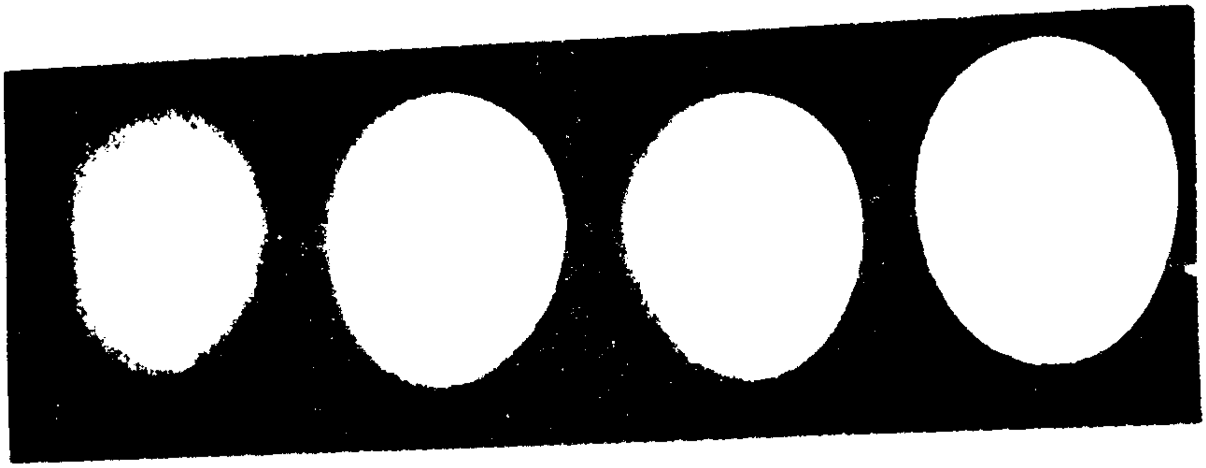

PHOTO II : Eggs
EXTREME LEFT: GUINEA-FOWL; CENTRE: EXPERIMENTED ANIMAL;
EXTREME RIGHT: CONTROL ANIMAL

PHOTO III : Claws
LEFT: GUINEA-FOWL; CENTRE: EXPERIMENTED ANIMAL;
RIGHT: CONTROL ANIMAL

PHOTO IV: BEAK
LEFT: GUINEA-FOWL; CENTRE: EXPERIMENTED ANIMAL;
RIGHT: CONTROL ANIMAL

PHOTO I: COMB
LEFT: EXPERIMENTED ANIMAL
RIGHT: CONTROL ANIMAL

AGE FACTOR IN POULTRY BREEDING

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The problem of the optimal age structure of breeding stock of poultry up till now cannot be considered as a solved one. Recommended at present ratio: 55% of pullets (the first year production) and 45% of older hens, usually, is not followed. In the majority of poultry farms in this country, as well as in other countries, pullets constitute 80-85% of the whole live stock. This fact may be accounted for not only by higher egg production of pullets, but also by a reduced at present life period of early matured highly productive strains of hens, which necessitates almost entire annual rennovation of the flock. This, inevitably, is connected with a great number of eggs needed for incubation and with considerable expeditures for the breeding of a new flock of pullets. The solution of this essential problem of modern poultry science must be sought, to our mind, not only in the fields of economics and zootechnics but in that of biology, which deals with age changes in an animal, effect of age on reproduction, development of the organism and heredity.

Exactly from this standpoint Soviet poultry-breeders and biologists, such as Larionov (1933-1957), Bukraba (1936), Diakov (1939), Kikavsky (1951-1952), Anorova (1951-1957), Baranovskaja (1954), Pigarev (1957), carried out a series of investigations, on the results of which the present communication is based.

The question about the changes in hen's organism with age required the most immediate answer. Inspite of the fact that the weight of hens undergoes seasonal changes and considerable individual variations, it may be stated, that the growth of the present-day highly productive hen is completed only at the age of two years. Therefore, the first cycle of egg laying (in pullets) takes place when general growth of the bird is not completed yet (see also Atwood, 1928). According to our findings based on vast practical data, the average weight of pullets ("Russian White") at the egg-laying season is only 88.5% of that of elder hens, in the same stage of reproduction cycle. Here, we come across with a very interesting, from biological point of view, phenomenon: sexual maturity (puberty) in an immature soma. It should be noted, that this phenomenon, which is so typical for many domestic animals, is not limited to the difference in the whole body weight only, but comprises also differences in skeleton, muscles, gastro-intestinal and excretory organs, as well as certain endocrine organs (thymus, thyroid and parathyroid glands, hypophysis). Besides, hemoglobin content in blood, gas metabolism etc., vary as well (see also Turner, 1948). Here, consequently, we deal with age changes in the organism as a whole. These changes, naturally, cause definite modifications in reproduction.

There is a considerable number of works dedicated to the problems dealing with the changes in egg-production with age. Among them are: Kempster (1921), Brody, Kempster and Henderson

(1923), Jull (1928), Atwood (1928), Hall and Marble (1931), Clark (1940). However, most of these papers refer to comparatively short period: usually to the first two or three years of fowl's life, and with exception of the two world mentioned last, fail to investigate the fowl's productive period as a whole, which hinders the adequate biological estimations of the occuring changes. For this reason we thought it worthwhile to study a new the age changes in egg production (and other characteristics) in hens beginning from the moment when the first egg was laid till the time of complete sterility.

The experiments were carried out at the Moscow University Zoological Station poultry farm. Egg laying was studied in the same hens ("White Leghorns") kept in similar conditions and without zootechnical selection (culling) during 10 years (1944--1953). The keeping of the experimental fowl (at the beginning of the test 300 hens) included the regulated light regime which was accomplished with the help of electric light and light darkening devices. In result, the duration of the light-day, irrespective of the natural calendar, was as follows:

In the first quarter (January-March) - 12 hours

In the second quarter (April-June) - 12 hours

In the third quarter (July-September) - 14 hours

In the fourth quarter (October-December)-10 hours

In winter the temperature inside poultry houses was maintained not lower -5°.

Egg laying of the fowl was registered by means of trap nests; each egg was weighed separately.

These observations enabled to reveal changes in egg production and in egg weight during the whole life of the fowl (see Table I).

Table I

Changes in egg production of hens whith age

Age (years)	Average annual egg production (number of eggs)	Egg weight (in gr.)
1	160,3	56,9
2	153,3	58,9
3	146,3	58,8
4	92,7	56,2
5	88,2	55,6
6	80,6	54,5
7	54,0	53,9
8	23,8	53,9
9	0,5	14,0
10	-	-

The above data show definite changes in egg production with age, which could be revealed only as a result of lengthy observations. We have established, that egg-laying is particularly high during the first three years wit comparatively insignificant decline, which is in part compensated by larger egg weight. Later, during the subsequent three years, the gg-laying decreases being approximately at the same level, the egg weight, decreasing as well. The third period is characterized by sharp drop of egg-laying untill complete sterility.

Maximum weight of eggs (see the Table I) is achieved on the 2nd and 3rd year of hen's life, i.e. When i'ts growth is coming to an end. Variations in egg weight during short time intervals (30 - and 10 - days periods) show that the first egg laying cycle differs from the subsequent cycles not only by average egg weight but by dynamics of egg size changes as well. The weight of eggs laid by pullets, starting from the minimum weight eggs, gradually increases in the course of the year, whereas elder hens begin their laying cycle with egg of larger weight, the same as that at the end of the previous year. This can be explained by considerable under-development of sexual organs in young pullets in comparison with elder hens, who reached their full growth. Comparison between ovaries and oviducts weights in hens ("Russian White") of various age show that these organs of pullets, inspite of their high egg laying, are underdeveloped as compared with those of elder fowl (see Table 2).

Table 2

The weight of ovaries and oviducts of 8 - and - months - - old hens (in grams)

Weight	8 months pullets	20 months hens
Ovary	23,9	46,4
Oviduct	29,5	51,4

The continuation of the general growth, as well as the growth of organs of intensively laying pullets, cause vitamin balance tension which results in vitamin deficiency of the egg yolk (see Table 3).

Table 3

Contents of vitamin A and carotinoids in eggs laid by hens of different ages (micrograms in one gram of yolk)

Contents in yolk:	Pullets	Hens
Vitamin A	6,12	8,90
Carotinoids	10,55	15,65

Thus, Intensive work of repordUctive system in under-developed organism, tension of vitamin balance, metabolism processes, etc. inveitably result in excessive wear of pullet's organism (see **Table** 4).

Table 4

Loss of hens at different ages, in %%
(after Kikavsky, 1952)

	The first year laying hens	The second year laying hens	The third year laying hens
Mortality for II months	5,5	2,1	3,1
Doss due to Zootechnical selection (culling)	62,5	50,6	51,9

It should be noted, that in most cases the loss of hens was caused by the deseases of reporductive organs (yolk peritonitis etc.), or by the deseases of gastro-intestinal tract. Thus, the precocious ageing of fowls is the reverse side of the modern practice selection of poultry, which for a long time has been based on the principles of high production and early maturity.

It is natural that this will inevitably affect the development (embryonic and postembryonic) and, subsequently, productivity and viability of progeny. This is just what actually happens.

Studies of this problem conducted by Soviet investigators comprise all developmental atages of the new generation, beginning with a newly laid egg.

Anorova (1957) found out that eggs laid by hens at different ages vary in the size of embryo disc. In pullet's eggs its diameter equale to 3.87 mm, whereas in eggs of the two--year old hen, it amounts to 4.61 mm. (standart error in both cases being 0.07 mm).

Moreover, the course of the development of embryo in eggs laid by hens of different ages also varies, especially on its early stages. During the first four days of incubation the development of embryos of younger hens is lagging behind considerably in comparison with that of the embryos of older hens. The differences may be observed in many respects, f.e., time of appearing blood insulas, mesoderm segmentation, growth of extremities and down, etc. Later, by the 12th day of incubation, these differences are less pronounced and by the end of the embryonic period they dissappear entirely. However, after the initial lagging behind, the embryogenesis in eggs received from pullet proceeds at a higher rate, affecting the general course of development.

Although the terms of hatching do not change, the weight of one-day-chicks from mothers of different ages considerably varies. Thus, one-day cicks received from pullets weight from 37.0 to 38.1 gr, whereas those received from two-year-old hens - from 40.1 to 42.8 gr. Both chicks differ not only in size but in their outward look as well: chicks from pullets are mor friable, less downed, less active. When mixed with other chicks, they are easy to sort out almost without mistake (Anorova and Peltzer, 1951).

Differences revealed in the process of embryonic development (comparing eggs from hens of different ages) tell on hatchability as well (see Table 5).

Table 5

Hatchability from eggs laid by hens of different ages (data of Bratzevo poultry farm, Moscow,) in % %

Hatchability from eggs	Pullets	Hens
Laid	46,1	52,2
Placed into incubator	84,2	82,7
Fertilized	90,6	92,7

The above Table contains also data (the first line) on chickens hatched versus the total number of laid eggs. Such estimation excludes the effect of culling of eggs before placing them into the incubator, which enabled us to reveal actual differences in qualities of eggs from hens of different ages. In should be noted, when determining the hatchability versus the number of eggs set into the hatchery, that the relationships here are complicated by the act, that in young hens the fertility of eggs is higher than in older ones. But since the per cent of hatched chicks is calculated versus the number of fertilized eggs, the result obtained is the same, i.e. the number of chicks hatched from the eggs of elder hens is larger.

It is known (Upp, 1928; Funk, Knadel and Callenbach, 1930) that when parents are of the same age, the difference in the live weight of one-day- old-chicks rapidly disappears with their growth (during four weeks). However, in our case, the higher rate of growth of chicks from elder parents preserved during the whole postembryonic period.

Table 6

Live weight of chicks and pullets received from parents of different ages (in germs)

Age of chicks and pullets in days	Average weight of chicks and pullets received	
	From pullets	From hens
24	135,8	158,0
144	1400,6	1486,0
334	1862,5	1901,0

In other experiments carried out at Tomilino poultry farm (Moscow region) the live weight of 5-months-old pullets, received from young mothers constituted 91.7-93.5% in relation to the weight of pullets, received from parents of elder age.

In accordance with more intensive general growth are the differences in size of organs (heart, liver, intestines etc.).

Viability of chicks varies too. Mortality among 10 days -old chicks from pullets already was higher that among the chicks of the same age received from elder hens: at three-months age the difference in preservation of both groups of chicks is-7-8%. It is noteworthy, that the same relationships in viability are presented in later periods of life, in mature birds. Thus, in one of our experiments the preservation of pullets received from younger hens was for the whole year 52%, whereas, the pullets from elder parents, being kept in the same conditions, were preserved up to 63.0%.

The sexual maturity (the moment of laying the first egg) in hens originated from different-age parents comes approximately at the same time. However, their egg production during the first year is, as a rule, higher in hens hatched from younger and, consequently, more productive parents. But in some cases, though, the difference is slight, if any (Baranovskaja, 1954).

Thus, summing up the foregoing, we may characterize the main age changes in the organism of the present-day highly productive hen as follows: a) increase of general dimensions (weight) of the fowl; b) decrease of egg production; c) increase of egg weight. As a result, young pullets differ from elder hens not only in one respect, but in a whole complex of distinguishing features. Pullets, for example, as compared with older hes, have smaller general dimensions, higher level of egg production and lower viability.

In what way all these differences tell on the progeny, above all, on the first generation? As we have stated already, the chicks originated from different-age parents, kept in similar conditions, differ from each other already in the first year of their life, just in the way their different-age parents do. Here we mena the relation only, but not the reservation of absolute parental features in progency. Nevertheless the fact is, that age changes of parents are inherited (though in a lesser degree) by progeny, or, in other words, heredity undergoes changes with age.

basing on the above stated biological data, let us consider now the practical question raised at the beginning of the present report, namely: Age structure of breeding flock of poultry.

It appears, that this question cannot be answered unless one of the most important problems of modern poultry farming is successfully solved; i.e., How to combine the already achieved high productivity with high level of viability of the fowl? though the average egg production in hens during the first three years (see Table 1) diminishes and then falls very considerably, still, at the Moscow University poultry famr, as well as at some other poultry farms in this country, there are some hens, and even families of hens ("Russian White") which are characterized by high egg- production preserved for many years (Korenev 1951, Serebriakov 1956, Shapovalov and Makhlupina 1956). Some hens continue to lay eggs for a number of year, egg production, in some cases, increasing with age. The duration of productive period of such hens considerably surpasses average figures for the whole flock, and sometimes continues during the entire second period (4-th, 5-th, and 6-th years of life) and even in the third period (Table 7).

Table 7

Duration of production periods and average annual egg production of "old" hens, (data from Kutchino poultry state farm, Moscow region)

Years of life	Hen's number: 46	613	206	2305	1331	2076	963	547
	Egg production							
1	114	189	178	150	169	190	210	232
2	121	235	183	209	207	210	240	247
3	188	'14	200	206	182	178	211	214
4	219	222	156	160	186	178	216	175
5	159	187	184	189	179	152	174	168
6	205	-	148	135	156	143	-	-
7	-	-	25	107	26	-	-	-
Total	1006	1047	1074	1156	1105	1051	1051	1036

The above figures show that in some hens high production is combined with high viability.

Since it has been established that form the eggs laid by hens on 3rd, rth, and even 5th year of their life a high per cent of healthy chicks may be hatched, it seems quite possible to breed genetic lines of "Russian White" hens with high egg production continuing for many years. In recent years the same problems have been studied by American investigators. (Lush, Lamoreux and Hasel, 1948, Roberston and Lerner, 1949, Hays 1949-54, Moultrie, King and Cottier, 1953).

The method of individual and family selection is certain to be a great help in future in growing highly productive fowl with durable life span and viability.

Besides, in view of the foregoing, we believe that one way more may be recommended to follow, i.e. mass selection on the basis of differential utilization of eggs laid by hens of different age.

For reproduction purposes the pedigree-poultry farms should incubate mainly eggs from elder hens, whereas the eggs received from young pullets should be used for commercial purposes only. This will inevitably result in higher viability of bird, lengthening of its productivity period and in improvement of economical prospects of the farm. As to farms producing eggs for the market, in particular those with cage layers, where the exploatation period is short, it is possible to keep young pullets in a breeding flock and to incubate eggs both from very young and elder parents. (Pigarev et al., 1957).

S U M M A R Y

The results of the study on the variations in egg production of hens with age are shown. The data obtained allow to establish a certain cyclicity in the course of these variations, and confirm the fact, that the first egg laying cycle proceeds in conditions of incompleted general growth. In this connection were investigated: the state of genital organs in young pullets and elder hens; size of embryonic disk in newly laid eggs; embryonal and post embryonal development, as well as, weight, productivity and viability of hens from different-age parents. The results obtained show the affect of age on heredity in fowl, which justifies our recommendations concerning the differential utilization of eggs received from different-age hens (for commercial purposes and for reproduction).

REFERENCES

1. ANOROVA P.S. a. S.O.PELTZER., Comparison of incubation quality of eggs laid by young pullets and by elder layers. J. Ptizevodstvo N 12, 1951, 15-17, in Russian.

2. ANOROVA P.S. Peculiarities of hen embryo development as a function of parents age. Proc. Ac. of Sci.USSR, 91,1953, 981-983., in Russian.

3. ANOROVA P.S., Parents age as a factor influencing post embryonic development and viability of progenies in fowl. Proc. Ac. of Sci.USSR, 100, 1955, 369-371., in Russian.

4. ANOROVA P.S., Peculiarities of early stages of embryonic development of eggs laid by hens of different ages. Proc. Ac. of Sci. 110, 1956, 494-494, in Russian.

5. ANOROVA P.S. Effect of age upon development, viability and egg production in fowl progeny. Abstract MGU, 1957, 1-12, in Russian.

6. ATWOOD, H., The variations in the weight and number of eggs and the weight of the "White Leghorn" fowl during the first two y ar of porducti-n. J. Poultry Sci.S., 1928, pp. 50-55.

7. BARANOVSKAYA T.I., Variations in egg production and pedigree qualities in hens with age. Abstract TSHA, 1954, 1-15, in Russian.

8. BRODY S., HENDERSON E.W. a. H.L. KEMPSTER. The rate of senescence of the domestic fowl as measured by the decline in egg production with age. Journ. Gen. Physiol. 6, 1923, pp. 41-45.

9. BUKRABA V.V., On the reproduction value of young pullets and elder hens. Kharkov, 1936, 1-20, in Russian.

10. CLARK T.B., The relation of production and egg weight to age in "White Leghorn" fowls. Poultry Sci. 19, 1940.

11. DIYAKOV A.B., Production qualities of old "White Leghorn" hens. J. Sov. Ptizevodstvo, N. 10-11, 1939, 15-17, in Russian.

12. FUNK E.M., KNADEL H.C. a E.W. CALLENBACH., Statistical Studies on the variations in the growth of "White Leghorns" and their significance. J. Poultry Sci. 9, 1930, pp. 157-163.

13. HALL G.O. a D.R. MARBIE., The relationship between the first year egg production and that of later year. Poultry Sci. 10, 1931.

14. HAYS F.A., Mortality rate relation to egg production. J. Poultry Sci., 28, 1949, pp 707-712.

15. HAYS F.A., Mortality rate and egg production of survivors. J. Poultry Sci. 32, 1953, pp. 1096-97.

16. HAYS F.A., Inheritance of viability of pullets in the laying house. J. Poultry Sci. 33, 1954, pp. 1107-09.

17. JULL M.A., Second-year production in relation to first-year egg-production in the domestic fowl. J. Poultry Sci. 7, 1928.

18. KEMPSTER H.L., Age as a factor in poultry breeding. Miss. Agr. Sfp. Sta. Bull. 179, 1921.

19. KIKAVSKY L.D. Zootechnical and biological analysis of age and season variations in egg production of "White Leghorn" hens. Abstract NIIP, 1931, 1-20, in Russian.

20. KIKAVSKY L.D., "Zootechnical and Biological analysis of age and Season variations in egg production of "White Leghorn hens", Thesis, NYYP, 22, 1952, 200-273.

21. KORENEV P.P. Kuchinsky, Selectional Poultry farm. J. Ptizevodstvo No. 9, 1951, 7-10.

22. LARIONOV V.F. a. A.P. PERDYSHEV., The Natural moulting and its relation to the egg-laying in the poultry. NYYP, 1, 1933, 1-45.

23. LARIONOV V.F., Moulting and its connection with reproduction in birds. Memoirs of MGU, 88, 1945, 1-95.

24. LUSH J.L., LAMOREUX W.F. a D.X. HASEL., The heritability of resistence to death in the fowl. J. Poultry Sci. 27, 1948, pp. 375-388.

25. MOULTRIE F., KING D.F., a. C.J. COTTIER., Fifteen years of selection for viability in "White Leghorns". Poultry Sci. 32, 1953. pp. 414-461.

26. PIGAREV N.V., MAKOGON L.A. a. N.V. NIKOLOTOVA., Reproduction of cage layers originated from young pullets. Abstract, V.N.I.I.P., 1957, 13, in Russian.

27. ROBERTSON A. a. I.M. LERNER., The heritability of all-or-none traits: viability of poultry. Genetics 34, 1949, pp. 95-411.

28. SEREBRIAKOV A.S., More attention to industrial forms of pouultry-breeding. J. Ptizevodstvo, No. 1, 1956, ? .-22., in Russian.

29. SHAPOVALOV N.M. a. A.G. NAKHLUNINA., Breeding the lines of "Russian White" hens. J. Ptizevodstvo, No. 1, 1956, 22-27., in Russian.

30. TURNER C.W., Effect of age and season on the thyroxin secretion rate of "White Leghorn" hens. Poultry Sci. 27, 1948.

31. U P P C.W., Egg weight, day old, chick weight and rate of growth in Rhode Island Red Chicks. Poultry Sci. 7, 1928, pp. 151-155.