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ARTIFICIAL INSEMINATION OF FARM ANIMALS IN THE USSR

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(Monograph)

1. History of A. I.

Horses

Early experiments of artificial insemination were done in Russia in 1893 by Lideman; by Izmailov, by Khelkhovski, Lund (1894); by Enisherlov (1896). In 1899 professor Iliya Ivanovich Ivanov experimentally worked out his method of A.I. and in 1907 he published his world-wide book "Artificial Fecun dation in mammals".

In 1908 I. Ivanov organized first courses for veterinariane on artificial insemination in horses, and this year is considered to be an afficial date of onset of A.I. practice in Russia. During 1908-1914 A.I. was used in more than 30 provinces of Russia, and for five years of 1910-1914 there were inseminated more than 7000 mares. After the first World War from 1922 the practice of A.I. in horses was renewed, and 10 years later, in 1932 in the ussr there were inseminated artificilly 182 000 mares.

C a t t l e

The first attempt was made by professor Iliya Ivanov in 1902, but in pre-revolutionary Russia it did not receive further development. Only in 1927-1930 I. Ivanov and his pupils were able to organize wide experiments, which served as a basis for A.I. practice in cattle in the USSR and in the whole world. This year Ivanov taught first 200 specialists, and in 37 State farms there were inseminated 19 817 cows. Artificial Inaemina-

tion began in the Collective farms in 1932, when there were inseminated 185 00 cows.

Sheep

First attempt was made by Ivanov in 1901, the second was made in 1910. Modern technique of A.I. in sheep was worked out in 1928 by I. Ivanov and his pupils, who carried out a large trial with 5271 sheep. Practical use of A.I. began from 1930, when 98 000 sheep were inseminated in 6 State farms.

Pigs

First trials of A.I. in pigs were conducted under the guidance of V.K. Milovanov in 1931. Investigations continued till 1959, and practical use developed in limited degree. From 1960 A.I. is widely empoying in practice of pig-breeding with hundred thousands females.

II Present Status of A.I. Practice

In 1962 in the USSR was artificially inseminated the following number of animalst there

	Number	% to total No. of females
Sheep and goats -	36 380 000	65
Cows -	18 680 000	65
Pigs -	580 000	-
Horses less than	100 000	-
Total	55 640 000	

In many republics and provinces of the Soviet Union A.I. is employed to all females; so in the Ukrainian SSR in 1962 there were artificially inseminated 87% of all cows, and in Kiev, Poltava province of the same republic there were inseminated 100% of cows. In the Kirghiz SSR is artificially inseminated 97% of all the ewes.

For A.I. there are used pedigree sires of Elite and Record

class, preferably progeny tested ones.

The percent of conception as a result of a single A.I. varies depending on natural and economic conditions and makes up an average:

Sheep - 83 (from 56 to 93)

Cows - 65 (from 55 to 87)

Pigs - 70 (from 58 to 94)

Final rate of conception is also subjected to strong variations owing to large variety of natural and economic conditions of different provinces of the USSR, and makes up an average:

Sheep - 88 (from 80 to 100)

Cows - 83 (from 70 to 100)

Pigs - 90 (from 75 to 100)

III. System of Carrying out A.I.

A.I. in the USSR is organized by the Government: Ministry of Agriculture of the USSR, on the grounds of works of the scientific research institutions, confirms instructions, methods, preparations, organizes production of necessary instruments and ma materials. In each of 15 Soviet Independent Republics its own Ministry of Agricultiral Production and Purchases organizes practic wo k, training of instructors and technicians of A.I., building of A.I. Stations and units, control of their work.

There are 4 kinds of A.I. centers in the USSR:

1. State Stations for pedigree breeding and A.I. are large organizations, serving from 20 to 150 thousand cows, to 100-300 tousand sheep, some thousand pigs and some number of horses. These stations are usually complex, e.g. serve all animals species and are organized in districts with many pedigree animals. They have trained selectionists for different animal species.

2. State A.I. Stations are also large organizations, working in the districts with unpedigree (commercial) herds. They

work on more easy cohe es of improvement of animals.

3. A.I. Stations in the State pedigree studs and experimental farms are organized for use the semen excess from outstanding stud males for surrounding state- and collective farms.

4. A.I. Co-operatives being organized by interested collective farms with practical and methodical help of the State, serve the collective farms' herds, payed share for organization of the station.

All kinds of stations collect and process semen and by means of their own motor-cars trnsport it to state- or collective farms. In their staff stations have specialists on semen collection and processing, but usually have no A. I. technicians. In 1962 in the USSR worked 1865 stations (of all mentioned kinds).

In all the state- and collective farms, being served by the above mentioned stations, there are organized units of A.I. Each unit works with semen received from the stations and serves all the animals of one or more farms. (As a rule, the state- and collective farms in the USSR have some hundred cows and some thousand sheep). Because of the severe climate in the USSR, for work with semen, for preparing of the instruments and for semen injections each unit must have necessary buildings, consisting of simple laboratory and manege for animals. In winter this housing is heated to temperature of 18-22° C, and in summer there are taken measures against excessive sun heating and dust penetration and other strong hygienic conditions. Each unit is managed by A.I. technician who is a worker of a state- or a collective farm.

In 1962 in the USSR there were 90 000 A.I. units. Techniciane are recruited from the members of the collective farms or the workers of the state farms, and trained at special courses, from 1 to 3 months. The courses are carried out in the best A.I. stations and units. Among technicians women are not less than men.

In the training program not less than 50% of hours are practical studies on semen biology, anatomy and physiology of reproductive system, insemination technique and methods of pregnancy diagnosis.

Animal number of females inseminated by one sire averages 1500 cows, about 600 sheep, over 200 swines. Best progeny tested sires indeminate: bull - 5000 - 6000 cows; ram - over 10 000 ewes (World Record in 1957-1958 was 18 414 lamb from one ram in the season).

Charge for A.I. consists of: a) fee for semen to stations from 60 copecks to 1 rouble 50 copecks (e.g. from 67 c to 1 $ 67 c for one bull semen dose; b) payment for technician's work (on the state - or collective farms), which makes up about 1 rouble (1$ 11 c) for one cow.

IV. A.I. Technique (for each species)

1. Semen collection

A basic method of semen collection in all species of mammals is the artificial vagina, the so-called "Russian" type. Modern artificial vaginae are made not in rubber, but in synthetic transparent material. If necessary, there are used different types of electroejaculators (with electronic frequency generators, electric battery, inductors, vibrators etc.).

Frequency of collection: from bull and boar one collection - in 2-3 days, from ram - 2-4 times per day (if necessary, to 10 times, from stallion - one time per day or rare.

2. Semen examination

There are usually investigated: a) Volume of semen(ml); b) sperm concentration (6billion/ml) with haemocytometers or photoelectrocolorimeters; c) Sperm motility by visual estimation of sperm number with progrssive movement in tenths of

the whole; or by objective methods - by counting in haemocytometers only motionless spermatozoa in % to total; d) Semen resistance (R) by Milovanov's method; e) Per cent of eosin negative sperms by Morosov's method; f) Semen vitality by Milovanov.

3. Semen Preservation.

In the USSR there are three types of media for semen dilution: a) Extendors for semen dilution without storage are simple mixtures of isotonic: sugar solution of glucose, fructose and saccharose and salt solution of phosphate, sulphate, tartrate and citrate.

b) Protectors for semen preservation are extendors with addition of protective substances: egg-yolk, antibiotics, weak acids, glycerole etc

c) Implementors are media extendors or protectors with physiologically active substances ("implements"), having an effect on inseminated female, for example, oxytocin, carbocholine, mucinase etc.

Antibiotics (penicillin and streptomicin) are used in doses from 300 to 500 units in ml of media.

Degree of dilution: for bull semen is from 8 to 50 times (in experiments - up to 300 times), for ram - from 2 to 10 times. The temperature of dilutor is 25-30° C.

Temperature of semen storage: for bull is (usually) 0° and 5-15° C (with mediums containing organic acids); for ram is from 0° to 5° C; for boar is from 10 to 15° C, or 0°.

The period of preservation without freezing is about 2-3 days.

4. Injection of semen.

The site of deposition is a cervix in a cow and a sheep, an uterus body in a swine and a mare.

Semen volume and number of sperms introduced: in cows - 1 ml (from 20 to 200 million sperms); in sheep - 0.05-0,1 ml (from 40 to 100 million sperms); in swines - 1 ml per 1 kg of body weight (from 2,5 to 10 billion sperms); in mares - from 2o to 40 ml (1-2 billion sperms).

Instruments for injections; in cows - a special glass syringe with a long (450 mm) canule and two-branches metal speculum, discarded polystyrene pippetes and polyethylene gloves; for sheep - a semi-automatic syringe with a magazine for 20 doses, a removable canule and two-branches metal speculum; for swines - a polyethylene or a rubber catheter and a polyethylene or a glass pneumatic injection device; in mares - an ebonite catheter and a glass syringe.

5. Preparation and use of frozen semen.

The degree of dilution is from 10 to 25 times.

Final glycerole concentration - 7-8 %.

Equilibration time with glycerole - 3-4 hours.

Rate and a method of temperature fall is from 0° to -10° C - 0.5° per a minute, from 10 to -40° C - 2° per a minute; below 40° it may be quickly.

Concentration of stored frozen semen is not less than 20 billion active sperms/ml.

Vessels for semen storage are glass ampules, polyethylene ampules, polystyrene pippetes.

Thawing temperature is different; more frequent is use a room temperature.

Time from thawing to semen use is not more than 6 hours.

The scale and purpose of frozen semen use consist in insemination of some tens thousand cows a year, long-distance transportation of the best sire semen, especially of valuable pedigree sires (within the USSR it is up to 11 000 km), and also in international exchange.