

SELECTED ARTICLES

PRELIMINARY WORK ON THE ARTIFICIAL INSEMINATION OF LIVE STOCK IN PALESTINE*

THE two main systems of agriculture in present-day Palestine are remarkable for their extreme diversity. On the one hand is the Arab peasant, whose agricultural practices have remained essentially unchanged for twelve centuries; and on the other the Jewish colonist, whose methods are the quintessence of modernism. Strange as it may seem, these two diverse cultures have something in common, for both have contributed to the development of the animal-breeding technique known as artificial insemination. In very early times the Arabs are known to have applied it in the breeding of their horses, whilst the Jewish settlers of to-day are developing the same method along modern lines with a view to organizing its application as a routine practice in the breeding of dairy cattle, and perhaps in the breeding of all classes of stock. The former instance is of historical interest only, the latter work forms the subject of this paper.

During recent years, interest in the possibilities of artificial insemination in Palestine was first aroused as the result of a trial conducted by Dr. M. Sturman, veterinary practitioner, in 1932. Three cows, which were infected with contagious abortion, were inseminated with sperm collected by the "sponge" method. Although one of the cows became pregnant, the work was discontinued at that time on account of inexperience and a lack of proper instruments. In August, 1934, a further trial was undertaken by Dr. H. Fox, veterinary practitioner, who worked with cattle, sheep, and goats at the Government Stock Farm, Acre, and in the Jewish group-settlements in the Valley of Esdraelon. Twenty-five animals were inseminated, 14 of which became pregnant, and 19 healthy young were born. The comparatively low rate of pregnancy in this case (56 per cent.) was attributed to the lack of modern equipment, in the absence of which the unsatisfactory "sponge" method of sperm collection was again used. Twelve cows which had been unsuccessfully treated for chronic sterility were inseminated in December of the same year, and 3 of these conceived and gave birth to normal calves at term. A further 6 healthy cows were inseminated in January, 1935, and 3 of these became pregnant. So far artificial insemination had been purely an experiment and

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there appeared little likelihood of its being applied to practical stock-breeding in Palestine. At this point, however, a situation arose which gave advocates of the method a chance to prove its genuine value.

In the autumn of 1935 there was a serious outbreak of infectious vaginitis among the dairy cows in the Ain Harod area. The valuable stud bulls contracted balanitis and breeding had to be stopped. Moreover, it soon became apparent that treatment would take a long time, and meanwhile stock-owners were likely to suffer considerable losses from the absence of pregnancy. An examination of the infected cows revealed the fact that in most cases the internal sex organs were normal. If semination could be effected, therefore, pregnancy was likely to result, in spite of the inflamed condition of the vagina. This hypothesis was tested by introducing a healthy bull of the native breed. The bull was allowed to cover 10 of the infected cows, and 8 of these became pregnant after the first service. As was to be expected, the bull contracted balanitis and became unfit for further breeding. In any case it was realized that the progeny of local bulls were not likely to grow into dairy stock of the desirable type, and the problem was to find a method by which pure-bred bulls could be used without exposing them to infection. A solution was found in the technique of artificial insemination.

Dr. Fox started to work in December 1935, and by the following February 52 cows had been inseminated. An artificial vagina of the "Cambridge" pattern was used for sperm collection, and semen collected in this way was found to be purer and more concentrated than that obtained by the "sponge" method. Of the healthy cows inseminated, 83 per cent. became pregnant; among the infected cows the corresponding percentage was 50, whilst 7 heifers, each of which was given a single insemination, all conceived. Artificial insemination had proved to be effective in combating sterility and also in checking the spread of infectious vaginitis, for no fresh cases of the disease occurred.

By this time the settlers were beginning to interest themselves in the economic advantages of the method, for among these settlers, more strikingly, perhaps, than among the farmers of any other country, to hint at a possibility of reducing costs, and thereby of increasing profits, is all the stimulus which is necessary to launch an immediate inquiry. It was obvious that if artificial insemination were adopted as a routine breeding-method, the number of herd sires could be considerably reduced, and corresponding savings could be effected in the expenditure previously incurred on their maintenance. These savings were not, however, likely to be sufficient to warrant the employment of a full-time veterinary surgeon to conduct the insemination work, and it was therefore arranged that cows in heat should be collected in the evening from the surrounding settlements and brought for insemination to the local veterinary practitioner.

In order to test the practicability of artificial insemination on a comparatively large scale, an experiment was planned to last for one year, during which half of the cows in a given area were to be served in the usual way, and the other half were to be artificially inseminated. This work was begun in August, 1936, under the supervision of Dr. Sturman. By the end of July 1937, 226 cows had

each been given a single insemination, and 51·3 per cent. had become pregnant. During the same period 172 cows were served in the natural way, and 49·4 per cent. of these conceived. The detailed results are given in the table on the next page.

It will be observed that during the first few months of the experiment a higher percentage of settling was obtained by natural service than from artificial insemination, but as the operators improved in skill, it was found that artificial insemination gave the higher percentage of pregnancies. Even so, the results obtained by this method compare unfavourably with those realized in similar experiments in other countries. This was due, in a large measure, to the use of unreliable clinical material. Of the 111 cows which were inseminated but did not conceive, 60 were found to be suffering from diseases of the internal sexual organs, and a further 9 were completely sterile. If these 69 cows are eliminated from the calculation, the rate of pregnancy following artificial insemination rises to 68·6 per cent., a far more satisfactory figure. Furthermore, it must be remembered that the work was carried out under the most primitive conditions, by inexperienced men, and with only the bare essentials of equipment. An example will serve to illustrate the effect of external conditions upon the results obtained.

Comparison of Percentage Fertility resulting from Natural Service and from Artificial Insemination.

Month.	Natural Service.			Artificial Insemination.		
	No. of cows Served.	No. of resulting Pregnancies.	Settling Percentage.	No. of cows Inseminated.	No. of resulting Pregnancies.	Settling Percentage.
1936.						
August	24	12	50·0	26	8	30·8
September	19	8	42·2	18	5	27·7
October	25	11	44·0	21	7	33·3
November	26	10	38·5	30	14	46·5
December	29	15	51·7	36	20	53·3
1937.						
January	23	15	65·2	34	23	67·6
February	26	14	53·8	27	15	55·5
March	—	—	—	7	6	85·7
April	—	—	—	10	7	70·0
May	—	—	—	2	1	50·0
June	—	—	—	4	3	75·0
July	—	—	—	11	7	63·6
Total	172	85	49·4	226	116	51·3

In the 226 inseminations performed in this experiment, the operations of sperm collection and insemination were carried out in one building; and the resulting settling percentage was 51·3. The corresponding percentage for 69 cows inseminated in outlying settlements, in which the two operations could not be performed in one building, was 42·6. This difference can only be attributed to the adverse effect of momentary exposure of the semen to the sun's rays or to a sudden change of temperature. With regard to the effects of the inexperience of the operators, it will be observed that the average settling

percentage obtained was 25 per cent. higher in the second than in the first three months of the work, whereas the settling percentage for natural service remained more or less the same throughout. Similarly with regard to equipment, it was found that sperm collected in the artificial vagina gave an average increase in fertility of 20 per cent. over that collected by the antiquated "sponge" method.

In all the work performed so far, undiluted semen has been used. The normal practice has been to make a single injection of 1 c.c. of the fresh material as soon as possible after collection. The results obtained, although not entirely satisfactory, were nevertheless sufficiently encouraging to warrant a recent extension of operations to include three additional colonies. No sound experimental work on the technique of dilution, or on the possibilities of the conservation and transport of semen, have yet been undertaken in Palestine. It is clearly desirable that this experimental work should precede, and its results form the basis of, any attempt to introduce artificial insemination on a practical scale. With this end in view, the necessary equipment has been assembled, and it is expected that experimental work on the dilution, storage, and transport of sperm will soon be undertaken.

In Palestine the method of artificial insemination offers many advantages; these may be considered from a veterinary, a breeding, and most important, from an economic point of view. From the veterinary standpoint the method offers the possibility of inseminating cows suffering from diseases of the external sexual organs, such as infectious vaginitis, and from anatomical defects of these organs, such as stricture of the uterine os. In general infections, for example in contagious abortion, the losses which result from the impracticability of natural service in such circumstances may be avoided, since artificial insemination is possible without endangering the health of the sire. On account of this fact, too, the method is likely to prove of value in Palestine in controlling the spread of dourine (an equine trypanosomiasis).

The advantages to the breeder are well recognized. The likelihood of conception is increased, and a considerable economy of spermatozoa is effected, because the semen is deposited directly into the cervix of the uterus. Further, since potent sperm may be transported to a distance, the field of usefulness of a valuable sire is greatly extended, and the breeder may avail himself of a greater choice of males. The development of the technique of dilution and micro-insemination permits of an enormous increase in the number of young which may be sired in the lifetime of a single outstanding male.

As an example of a field in which these advantages are likely to find practical application, mention may be made of the development of the breeding of Karakul sheep in Palestine. The native Palestinian sheep is closely related to the Karakul, and pure-bred Karakul rams were imported from Germany and Rumania in 1934 for crossing on the local ewes with a view to the production of Karakul lamb-skins. The pelts of both first-cross and second-cross lambs have proved to be highly satisfactory and are likely to realize good prices on the London market. In Palestine, however, sheep are kept primarily for milk production, and the success or failure of the experiment depends upon the milk-yield of the crossbred ewes, a matter which is now under investigation at

the Government Stock Farm. There are indications that the milk-yield will be satisfactory, and should this prove to be the case, the only remaining difficulty is that of procuring a sufficient number of pure-bred Karakul sires for breeding. Even if a sufficient number were available, the cost of imported pure-bred rams is prohibitive, and a practical solution to this problem lies in rapidly increasing the number of pure-bred Karakul stock already in the country by the method of artificial insemination.

From the economic point of view, the main advantage of artificial insemination lies in the possibility of reducing the number of sires and of reducing thereby the cost of production of progeny. The figures given in the foregoing table will serve to illustrate this point. Three mature bulls had to be kept in order to perform 172 natural services in a period of 7 months. One hundred and ninety-two artificial inseminations required only 81 ejaculations from one bull, and even so the quantity of semen obtained was far in excess of actual requirements. It is safe to assume that with better organization at least 250 cows could be inseminated with the undiluted semen obtained from a single bull in the course of a year. Since in natural service it is necessary to keep one bull to serve every 50 cows, it will be realized that artificial insemination offers the immediate possibility of reducing the necessary number of bulls by 75 per cent. The services of the average pure-bred bull used in calf-production cost approximately £50 per annum. This sum is made up of depreciation, interest on capital outlay, cost of feeding, labour, and other charges. Each bull sires about 50 calves in the course of a year, and the cost of the breeding service is, therefore, roughly £1 per calf. When the method of artificial insemination is employed each bull becomes the potential sire of 250 calves per year, and the cost of breeding per calf is reduced to 4s. (plus a small charge for the service of a skilled operator). If sperm-dilution is practised, the number of calves sired by a single bull in the course of a year may be increased one hundred fold. Such considerations lead one to envisage a Palestine Stock-Breeding Service which would have as its basis a country-wide network of artificial insemination stations. Technical obstacles there are none; the difficulties are those of organization.

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