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Reply: In reply to Mr. Ward I would point out that I have a faulty strain that won't carry on simply because there is no laying capacity there at all. One pullet laid six eggs last year, and the fertility was also low in the male. They have been treated exactly the same as the others, and it looks as though in this case there is a genetic factor or factors which are harmful and not the kind that should be concentrated by inbreeding.

Mr. Ward: In speaking of the value of the progeny test as against normal selection based on phenotype, the point was made by Dr. McMahon this morning that the inheritance value was very low. There may be some confusion here in that published work on inheritance in dairy cattle in New Zealand deals with inheritance based only on the female - that is a selection advantage of 15 to 20%. For selection from both male and female there is reason to double that advantage, giving a figure say, about 30 to 35%. Probably inheritance is not quite as low as has been suggested, and if we were to do more carefully controlled work with cattle we would probably arrive at a situation such as Mr. Nielsen has achieved in so short a period.

Dr. L.R. Richardson: I have been most impressed by the crossing of two, what would appear to be, distinct types which one might consider as being held in their normal lines on an endocrinological basis. The comment on distinguishing sex has come up and I was wondering whether reference has been made to Guericke's work in 1933 in South Africa where it appeared that repressed colour might be brought to the surface by thyroid and other gland feeding. I thought there might be something here to assist in early checking on the progeny.

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Summary of Paper on

THE CATTLE PITUITARY GLAND IN RELATION TO OVARIAN  
DYSFUNCTION.

by

E.G. Bassett: Ruakura Animal Research Station: Animal  
Research Division N.Z. Department of Agriculture

Comparison of the pituitaries of pregnant, non-pregnant and physiologically sterile cows was undertaken in view of current theories as to endocrine control of ovarian function. It did not seem unreasonable to suppose that cows suffering from ovarian dysfunction of the two main types - cystic follicles and cystic corpora lutea - might show some associated pituitary abnormalities. While the cause of these conditions is unknown, the dependence of normal follicle and normal corpus development on specific follicle stimulating and luteinising hormones from the pituitary immediately suggests some pituitary dysfunction as a possible prior state.

Some evidence as to this possibility has been presented. The increased pituitary weight in cattle suffering from cystic follicle over pregnant and non-pregnant cows as well as those with cystic corpora lutea is suggestive. The decrease in the percentage of basophils in the anterior lobes of the pituitaries of both types of sterile cows, is still more suggestive in view of the frequently postulated function of the basophil cell. It will be noted that the castrate male - non breeding - also showed decrease in the proportion of basophils. Finally, the presence of so-called 'pockets' of a hyaline colloid-like substance in the anterior lobe of 60 per cent of the cows suffering from ovarian dysfunction is of special interest in this

connection. The fact that these bodies were not observed in the glands from the remaining sterile animals should be considered in relation to the equally important fact that only a few saggital sections in the median plane have been examined. One steer gland showed a single small 'pocket' of the same type.

While a relationship between ovarian and pituitary dysfunction to the extent of both macroscopic and histological changes in the pituitary is thus advanced as a theory, the data in support thereof is admittedly inconclusive. It is sufficiently suggestive, however, to warrant further investigation.

#### DISCUSSION

Count Wodzicki: This paper approaches, in quite a new way, a series of problems which are closely akin to several important aspects of animal production, one the problem of sterility. I was privileged to see this work during its growth, and would like to congratulate Mrs. Bassett on her excellent piece of research work. Also, I would like to here mention some of the technical difficulties that are normally encountered by anybody who commences histological work, especially on pituitaries - pituitaries in cattle present special obstacles. The slides which we have all seen are proof of how well these obstacles have been overcome. A most interesting item is the presence of the colloids, and I think that Mrs. Bassett has proved that the allegations of some of the previous workers can no longer be taken into account. What interested me most was the question of the relationship between changes in pituitaries and ovarian dysfunction; in other words is the ovarian dysfunction a primary or rather a secondary phenomenon? Could this relationship between dysfunction of the pituitary and of the ovary be followed more closely? One other point which was not and could not be covered in Mrs. Bassett's pioneer survey was the close examination of the pituitaries of bulls. I am sure that this will be done in the work to follow this paper - I believe that when all three forms - cows, steers and bulls - can be investigated and compared, we will get a better grasp of the subject. I sincerely hope that means will be found to continue this pioneer study and its practical bearing on present cattle breeding problems.

Reply: I hope there has been no confusion in general between the colloid cysts found by yourself and Dr. McMeehan between the cleft of the gland and the very much smaller colloid bodies found by myself. Do you mean, was there some other possible cause of sterility present in the animal as well?

Count Wodzicki: I thought that perhaps it is not out of the question that there may be a dysfunction of the ovaries that may be responsible. It is not always related to the pituitaries.

Reply: Further work will, of course, be undertaken in this respect.

Miss M.P. Bartrum: I was not quite clear whether it was a relative or an absolute production in the physical cells in the sterile cows.

Reply: They are worked out on the percentage basis.

Count Wodzicki: I would like to know whether the cysts found by Dr. McMeehan and myself between the lobes of the pituitary would be regarded as pathological or could they be considered as normal?

Reply: They are not present in all glands from all animals by any means, but they did not seem to be confined to any particular type of animal, because they were found in some sterile animals and in glands from some pregnant animals, so no conclusion can be drawn as yet. The original investigation of the large number of glands in which these were found was done at a large Freezing Works so there was no absolute correlation.

Mr. W.M. Webster: This is a subject which has interested me very much. One doubt that arises is, whether the cystic follicles or corpora lutea, (which Mrs. Bassett says are one of the two commonest causes of physiological sterility, if there is such a thing,) precede or follow these small colloid bodies in the anterior lobe. I raised that point because one does know that both cows which are temporarily sterile as a result of cystic corpora lutea or cystic follicles may later have become pregnant. Of course one cannot obtain a pituitary and section them while the animal is alive. One does wonder what is the link up between the two, assuming there is some connection between the two.

Reply: No-one knows that as yet. The present investigation is a pointer to that type of research. You have seen the results and can make your own deductions.

Dr. C.P. McMeekan: This question of Mr. Webster's has opened up a very fundamental aspect of this whole sterility problem. I would like to hear a few veterinary opinions. Are we still to accept the work of Nillson and others overseas that these conditions in the ovary are secondary to or followers of prior pathological infection, or are we to adopt the theory of the endocrinological school that such conditions originate in some endocrine disturbances in so far as the general reproductive mechanism is concerned. It is a problem that has quite a large number of practical applications quite apart from its specific interest to the sterility question. Presuming that the endocrine approach is sound, I think there is quite good reason to believe that such disturbances would originate in the pituitary, and in view of the very significant work of Stockard on dog breeding, there is equally very good reason to believe that there is a strong possibility of such conditions being inherited. The application of course is obvious. We have heard a little about artificial insemination during this conference. We are proposing to use over a large proportion of our cow population relatively few sires, selected dominantly on a production basis. It is obviously going to be possible for us to run our heads into a very dangerous noose if there happens to be a very close correlation between sterility and inheritance.

In that connection I have a little information myself which is giving me quite considerable cause for concern. Some of you know of Hammond's strain of inbred pigs. These pigs were established by him in the hope that he might be able to build up, in a farm animal, the equivalent of a Wistar Institute rat by permanent brother-sister matings. When I was in England I worked with these animals. When I returned to New Zealand Hammond gave me an opportunity of bringing back with me two sows and a boar. At the same time I had to select for Dr. Verges of the Argentine two sows and a boar and to select for Hammond to retain at Cambridge two sows and a boar. Due to a combination of circumstances I had to select these animals as immature individuals and not on a basis of progeny test. Hammond's pigs have gone on and in a recent letter he tells me he is still getting the same litter average of 13 pigs born that he was getting when he started the strain. Dr. Verges' pigs in the Argentine are also still going on with no fertility trouble. Mine have gone. Every sow went sterile after one or two litters, and on post mortem, the only condition which we could find was a very severe condition of cystic follicles. Practically the whole of the ovarian tissue was destroyed with large follicular cysts. Might

we not have there perhaps one of the first illustrations of how an inbred strain can disappear through inherited sterility, where we have been able to link up that disappearance with a particular physical condition of the ovaries.

Similarly I think Professor Riddet could give us an illustration of some interest on the cow side. I know, for example, that Hammond, who has closely followed a large number of individual cows in a fair number of herds in England over many years, is of the opinion that, while individual cows with cystic follicles can be treated, they are likely to recur at subsequent breeding times. We have this trouble in this country. It appears to be common in some of our strains of dairy cattle. Professor Riddet has at least a pointer in the fact that in one of his strains of Friesians he has had considerable difficulty with sterility of the cystic follicle type.

I would like some expression of opinion as to just what is the attitude at the present time in respect to these two types of sterility. Are they primarily pathological or primarily endocrinological, and if the latter, should we not be fairly careful, perhaps more careful than we are at the moment, in our rapid multiplication of specific strains by artificial insemination.

Mr. W.M. Webster: I would prefer to have heard the opinions of some of my colleagues. I am quite definitely of the opinion that the endocrinological type of sterility (which I think, incidentally, is a very much better definition than physiological sterility - is a disease entity, and I do not believe in many cases it succeeds a definite infection of the reproductive organs. I have done a good deal of bacteriological work on that phase of the sterility problem and it is definite, according to my results, that there is no link up between the cystic corpora lutea and the cystic follicles and any demonstrable infection of the reproductive organs. The old classical views of some European workers that they are a sequel to infection are ruled out. These are the main points on which I would like to express my opinion. I am in full agreement with Dr. McMeekan on the points to which he has drawn attention and the possible dangers of too close inbreeding which has to be borne in mind in the artificial insemination programme.

Professor W. Riddet: We have struck a patch of trouble. It so happens that the progeny of two bulls have given us trouble, one a Jersey and the other a Friesian. There would seem to be some link up in that condition and the condition just described. It will take some further investigation before we know where we are. The evidence is exceedingly suggestive!

Mr. J.J. Hancock: In 1938 in Norway workers tried to correlate the incidence of sterility of the type just described involving follicular cysts and corpora lutea cysts with such features as nutrition, high milk yield, and so on. The only significant results were that they found some daughters of some bulls were liable to be more sterile than daughters from other bulls, so it seemed to be a definitely inherited factor involved.

Dr. J.F. Filmer: Dr. McMeekan posed a question to which he very well knew the answer. He asked whether we should accept the infection hypothesis or the endocrine hypothesis. The answer is of course that we have to test them both. I think Mrs. Bassett is to be congratulated on helping to pioneer this particular phase of what is, of course, only a section of the work that is going on in regard to the whole breeding problem of dairy cattle in New Zealand. We are very fortunate in having a set-up in New Zealand which enables us to follow it through perhaps better than can be done in many countries. The artificial insemination set-up will increase this possibility