ON OVARIOTOMY IN SOWS; WITH OBSERVATIONS ON THE MAMMARY GLANDS AND INTERNAL GENITAL ORGANS.

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PART II.

IN a former paper¹ evidence was adduced that the black pigment frequently found in the mammary tissue of sows is not associated (at any rate directly) with the occurrence of heat. This evidence has since been supplemented by an examination of ten strips of bacon cut from the mammary region of ten different sows. These "belly pièces" were kindly sent to us by Messrs C. & T. Harris & Co. of Calne, to whom we are indebted. These pieces were taken in the ordinary course of business, in the belief that they were cut from sows on heat. All the strips were much discoloured by large quantities of black pigment, but only four of them showed any indication of increased vascularisation. These four were to some extent congested in the close neighbourhood of the mammary ducts, and were probably obtained from sows that were on heat at the time of killing; the other six showed no such indications.

That the existence of black pigment in the mammary region is not related (at any rate directly) to the occurrence of heat is further proved by observations upon young Berkshire pigs, which had never been in use. In eight of these, four of which were spayed, and four "open," mammary pigment in some abundance was found to occur. In four others, however (two "open" and two spayed), no pigment was found excepting for a minute trace in one.

Another Berkshire sow was killed in young, and one of the foetuses was preserved by Mr John Hammond, Government Research Scholar

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under the Board of Agriculture, who made histological preparations from the mammary region. Mr Hammond has kindly written for us the following account of his observations on this foetus, together with a note concerning his examination of a 7 weeks old pigling:

"The foetus in question (being out of a Berkshire sow showing no black pigment in her mammary glands) was examined for pigment. Sections were cut through the mammary region of the skin, and definite melanin granules were found in the rete mucosum. Further, the granules could be traced in places where the mucosum was seen dipping down to form the glands. In Fig. 1 the particles are shown to be following the course of the milk ducts, where at this stage they may be observed penetrating the dermis.

"Sections were also cut from the glands of a 'Large-Black' sow 7 weeks old. These show the pigment granules in the lower layers of cells in the rete mucosum of the skin, the colour being more intense at the bottom of the papillae. The hair follicles also showed black granules, being more intensely pigmented than the skin. In this case again the pigment granules could be seen following the course of the ducts from the nipple downwards to the gland. In the cells of the milk ducts the pigmentation was not so intense as in the cells of the glandular portion. These facts suggest that the pigment is a product of the metabolic activity of these cells, and that it is formed in greatest quantities where active growth is taking place.

"It is possible that the cells containing these granules increase at puberty and during pregnancy, or at such other times as the mammary gland hypertrophies, and so give rise to the pigmented condition which is seen in many cases over large areas in the mammary region of the adult sow."

If Mr Hammond's suggestion should prove to be correct, it provides an additional reason for spaying to those already put forward. This is a matter now under investigation.

It is interesting to note that whereas the foetuses (or at any rate one of them) contained mammary pigment, none was to be found in the pregnant mother. The non-occurrence of pigment in the mammary tissue either in this sow or in the piglings referred to above, indicates the possibility of breeding strains of Berkshire or of other coloured pigs in which there would be no melanic pigment in the bacon cut from the mammary region. The manner in which the presence or absence of this pigment is inherited is a point which requires investigation.

Imperfect Spaying.

In our former paper we gave expression to the suspicion that faulty operating was not altogether uncommon in the ordinary process of spaying sows for commercial purposes. This opinion we based largely on the fact, so frequently asserted, that some spayed sows behaved as though they were "open." We are now in a position to give definite information upon this point.

Through the courtesy of Mr Morris Wright of Whitton, Ipswich, who buys largely in the Ipswich district, two young sows were procured for us. They were both said to have been operated upon, but nevertheless were found to be behaving as if "open." These two sows (A and B) were under observation at the University farm for five and eight weeks respectively, and were found to behave as follows:

Case A showed signs of typical oestrus recurring at the normal intervals. At one of these periods this sow was put with the boar, and after considerable trouble, though possibly not more so than often happens with a normal sow mated for the first time, copulation took place. Six days after this service the sow was slaughtered and her viscera examined. The left ovary, the left Fallopian tube and the left half of the uterus were found to be present normally developed (Fig. 4). Numerous Graafian follicles in various stages of maturation were seen in the ovary, while the horn of the uterus had obviously undergone great hypertrophy since the date of the operation. No trace was found either of the right ovary, tube or uterine horn, which had evidently been removed completely. The position of junction of the right horn with the left was indicated by a scar, and there was a trace of the original wound made at the time of operation on the outside skin of the body.

Case B. Oestrus in this case was much less definite than in the former. Though the general appearance was unmistakable, swelling and congestion were less pronounced, the period was much lengthened, and there seemed to be no certainty about the date of recurrence. Notwithstanding that she was put with the boar on several consecutive days on which she showed signs of heat, in fact every day until all signs had disappeared, she resolutely refused his attentions. Some days after visiting the boar this sow was slaughtered and her viscera examined. The uterus was entirely absent. The right ovary also had evidently been completely extirpated along with the right Fallopian tube, but the left ovary with ripening follicles and large cysts (possibly formed from follicles) was found to be present (Fig. 5). The left Fallopian tube was absent.

The condition found in Case A is probably explained in view of the method of carrying out the operation. We reproduce, through the kindness of Mr J. G. Runciman, M.R.C.V.S., in Fig. 6 the sketch of a uterus which was torn in such a way as, in the hands of an unskilful operator, would have led to the retention of one horn of the uterus together with the corresponding ovary. As the occurrence of imperfect spaying is a matter of no inconsiderable importance from the economic standpoint, it is perhaps pertinent to give an account of the operation, and describe how this accident is liable to take place.

Ovariectomy on the pigling is performed in two positions. In one case the sow is laid flat on her right side with the left hind leg drawn slightly back; in this position the animal is held by an assistant. In the other case the operator, standing upright, swings the young sow by the left leg, puts his right foot on the left side of the neck and slightly arches the body of the sow by bending it across his left leg, thus bringing the left side of the abdomen rather more forward; the surgeon leaning forward to operate. In both cases the drawing back of the left hind leg stretches the flank and abdominal muscles on the left side. The next part of the operation consists in shaving the hair off a small area of skin situated close up to the loin, immediately in front of the thigh. It is in this area that the stab is made through the abdominal wall, admitting the index finger and the withdrawal of the "bed." The stab is made close up to the *loin* about half an inch in front of the ilium. The abdominal wall is pierced by means of a one-edged bistoury in a vertical direction. The blunt edge of the knife is uppermost when the stab is made, or in other words, the back of the blade is against the lumbar muscle. The stab when made by a good operator is only sufficiently extensive to admit of the introduction of one finger into the abdominal cavity. The finger is introduced directly after this incision is made, and the "bed" (*i.e.* the uterus together with the Fallopian tubes) secured by a hooking movement of the finger. Sometimes the middle of one horn of the uterus is all that is at first secured; under delicate manipulation this, in the form of a small contorted, worm-like tube, is generally drawn out through the incision, the rest of the uterus following. It is to be remarked that normally the infantile ovaries remain attached to the horns of the uterus by means of the broad ligament, and so are withdrawn from the body cavity along with them. Occasionally, more especially if the manipulation is not very carefully done, the traction which is needed to draw out the horn of the uterus first seized is so great as to lead to its tearing off, leaving

the rest of the organ behind in the body cavity. This appears to be the way in which imperfectly de-sexed animals are produced in the hands of careless or ignorant operators. Under such circumstances as those described the proper course is to begin again, reintroduce the finger, regrasp the uterus, a matter often of no small difficulty, and extract whatever remains of the organs referred to. The whole internal generative tract beyond the vagina should now be excised. It should be remarked that the division ought to be made externally, *i.e.* the knife is not to be introduced into the body cavity. The tear above referred to should be avoided, for owing to the position of the right uterine horn in the body cavity it is very difficult to reach it with the finger when once it has been severed from the left horn.

Though it so happens in the case illustrated (Fig. 6) that the right horn was the first part removed, Mr Runciman tells us that in his experience the left is usually the one likely to be torn away through this accident. The traction on the organs should be very gentle till the bulk of the uterus is secured; in fact it is safer when only one horn has been secured to draw it between the index and second fingers rather than between the index and the thumb.

Summary of Practical Conclusions.

Black pigment is very frequently, but not invariably present in the mammary tissue of Large-Black, Berkshire and other dark-coloured sows. It is stated that the presence of this pigment (apart altogether from the question of the pigs being "on heat") renders the bacon less saleable, owing to its discoloured or "seedy" appearance¹. If this is the case, it ought to be possible to remedy this fault, by breeding from individuals in which this pigment is absent, and so building up a strain of increased commercial value.

If on the other hand it be the case that the presence of black pigment is not in itself objectionable, but that the changes in the mammary area due to the occurrence of heat are what are not desired, the remedy is to be sought in spaying, a practice which must be carried out on a sufficient scale and be efficiently performed. That imperfect spaying (in which one, or a part of one, ovary is left behind, while the bed is wholly or partly removed) sometimes happens is shown by the facts described in this paper.

¹ This matter has now (July 9th, 1913) been further investigated and will be treated of again in a future paper.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

The expenses of the investigation described in this paper have been very largely defrayed by a grant made by the Development Commissioners through the Board of Agriculture and Fisheries.

DESCRIPTION OF PLATE.

FIG. 1. Section through developing mammary tissue of foetal pig showing pigment granules in the rete mucosum and in places where this layer is seen dipping inwards to form the glands.

FIG. 2. Transverse section through duct of nipple of Large-Black sow showing pigment in the epithelial cells.

FIG. 3. Longitudinal section through same.

FIG. 4. Left ovary, tube, and horn of uterus found remaining in sow which was supposed to have been spayed (Case A in text). Much reduced.

FIG. 5. Left ovary with large cysts found in sow which was supposed to have been spayed (Case B in text). Reduced.

FIG. 6. The two horns of a uterus which had been accidentally almost completely severed in the operation of spaying (A, the point where the tear had been made. See text).