THE DISTRIBUTION OF EMBRYOS IN INTERSEX PIGS

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There are several reports of pregnancy in intersex pigs (Følger, 1932; Schmied, 1941; Albertsen, 1951; Petersen, 1952; Smidt, 1962; Hulland, 1964; van Logtestijn, 1968; Cox, 1968) but only four workers appear to have slaughtered intersexes during pregnancy (Table 1). During the course of experiments which have involved the slaughter of about 200 Large White × Landrace pigs at known times after mating, three intersexes have been encountered. Two of these were pregnant at slaughter and the other had previously borne a litter.

None of the pigs showed any external signs of their condition. In each case, the ovary appeared normal and was on the left. In two pigs, the right gonad was an ovotestis and in the other (BG), only testicular tissue was present. The ovarian portion of the ovotestis was roughly hemispherical in shape. Other

TABLE 1
REPRODUCTIVE DATA OF INTERSEX PIGS DESCRIBED IN THE LITERATURE

Author	Corpora lutea in the ovary	No. of embryos in uterine horn with:	
		Ovary	Testis
Følger (1932)	15	4	4
Smidt (1962)	9+†	1	5
van Logtestijn (1968)	7	0	1
Cox (1968, personal communication)	19	0	—*

* Embryonic remains at tubal end of horn.

† Counted from the photograph—ovulation rate was not given.

TABLE 2
REPRODUCTIVE DATA OF THREE INTERSEX PIGS

Pig	Size of previous litters at birth		Age of pregnancy at slaughter (days)	Ovulation rate (left gonad)	No. of embryos in:		Length of horn (cm)		Diameter of ovarian portion of ovotestis (mm)
	First	Second			Left horn	Right horn	Left	Right	
BG	10	—	—	—	—	—	—	—	—
WB	9	14	10	12	1*	15	170	40	8
WG	—	—	19	8†	3	4	110	89	20

* Near cervical end of horn.

† Including a cystic corpus luteum.

observations and measurements of their reproductive tracts are given in Table 2. As only twelve corpora lutea were found following dissection of the ovary of WB, it is probable that ovulation of polyovular follicles had occurred.

Samples of the reproductive tracts were fixed in formol saline and selected parts were processed, sectioned and stained by the method of Scofield (1969). The testicular tissue was composed of seminiferous tubules separated by large amounts of interstitial tissue. The lumen of the tubules was narrow and lined by Sertoli-like cells and there was no evidence of spermatogenesis. Except for the absence of spermatozoa, the epididymides appeared normal. The ovarian portion of each ovotestis was separated from the testicular tissue by a thick connective tissue layer. Both normal and atretic follicles at various stages of development were present but there was no evidence of ovulation having occurred. There also appear to be no reports in the literature of ovulation occurring in the ovarian part of an ovotestis. The distribution of embryos in relation to the corpora lutea was of particular interest. In no previously recorded cases, nor in the present work, has the number of embryos in the horn associated with the functional ovary (left side) exceeded that in the other horn and, in the majority, a larger number of embryos was found in the horn ipsilateral to the testis or ovotestis. In pregnant intersex pigs in which the length of the uterus has been recorded, the horn ipsilateral to the testis was always shorter than the contralateral horn, despite the greater number of embryos found in the former (Følger, 1932; Smidt, 1962—measured from the photograph, Cox, 1968; see also Table 2). Asdell (1942) considered that the development of accessory reproductive organs is influenced by the nature of the gonadal tissue on the same side.

In the normal pig, where there is inequality in the number of ovulations between the ovaries, the embryos tend to distribute themselves evenly between the uterine horns (Corner, 1921; Warwick, 1926; Weseloh & Smidt, 1967). This process probably occurs by the time of implantation as there is very little post-implantation mortality (Perry, 1954; Perry & Rowlands, 1962). From the observations on intersex pigs, it may be inferred that the testis interferes ipsilaterally with the normal pattern of transuterine migration of the embryos.

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REFERENCES

- ALBERTSEN, K. (1951) Hermafroditisme hossvin. *Nord. VetMed.* **3**, 849. *Anim. Breed. Abstr.* **20**, 1167.
 ASDELL, S. A. (1942) The accessory reproductive tract in mammalian true hermaphrodites, an effect of position. *Am. Nat.* **76**, 75.
 CORNER, G. W. (1921) Internal migration of the ovum. *Bull. Johns Hopkins Hosp.* **32**, 78.
 COX, J. E. (1968) A case of a fertile intersex pig. *J. Reprod. Fert.* **16**, 321.
 FØLGER, A. F. (1932) A case of hermaphroditism with pregnancy in a pig. *Acta path. microbiol. scand. Suppl.* **11**, 143.
 HULLAND, T. J. (1964) Pregnancy in a hermaphrodite sow. *Can. vet. J.* **5**, 39.
 PERRY, J. S. (1954) Fecundity and embryonic mortality in pigs. *J. Embryol. exp. Morph.* **2**, 308.
 PERRY, J. S. & ROWLANDS, I. W. (1962) Early pregnancy in the pig. *J. Reprod. Fert.* **4**, 175.
 PETERSEN, W. W. (1952) So-hermafrodit, der har faret friegange. *Dansk. Maanedskr. Drylaeg.* **62**, 343. *Anim. Breed. Abstr.* **21**, 312.

- SCHMIED, W. (1941) Fruchtbare Hermaphroditismus beim Schwein. *Wien. tierärztl. Mschr.* **28**, 519.
- SCOFIELD, A. M. (1969) An improved method for eosin staining of formalin-fixed specimens. *J. med. Lab. Technol.* **26**, 102.
- SMIDT, D. (1962) Einige Beobachtungen über das Vorkommen von Zwittern beim Schwein. *Zuchthyg. FortpflStör. Besam. Haustiere*, **6**, 371.
- VAN LOGTESTIJN, J. G. (1968) Graviditeit van een hermafrodiete zeug. *Tijdschr. Diergeneesk.* **93**, 523.
- WARWICK, B. L. (1926) Intra-uterine migration of ova in the sow. *Anat. Rec.* **33**, 29.
- WESELOH, E. VON & SMIDT, D. (1967) Beobachtungen zur transuterinen Wanderung der Embryonen bei veredelten Landschweinen und Miniaturschweinen. *Züchtungskunde*, **39**, 371.