

The basophiles in the above group, though showing numerical decrease when compared to the "fertile" groups, reveal intense activity of production and secretion, characterised by moderate to heavy staining and granulation, prominent Golgi apparatus and large, delicate nuclei (Fig. 115).

The two types of acidophiles, described by Gilmore *et al.* (1941) and others, were encountered in all animals. However, no proportional counts of these were made, as numerous intermediate forms were observed and these cells were merely regarded as different stages of activity of the alpha cells, such as described by Severinghaus (1939). It is agreed with the above authors that the crimson cell is indicative of active production and/or secretion.

In a close study of the glands of these 25 animals not a single mitotic figure was observed among any of the three cell types. This is in agreement with the observations of Severinghaus (1939), who states that mitoses are rare in the adult gland, so that any shift in the cell proportions must usually be regarded as a transition of one cell type to another. On the other hand, Wolfe and Chadwick (1936) quoted earlier, observed in rats under oestrogen stimulation, an increase in acidophiles through active mitoses, while Baker and Everett (1944) observed similar changes under stimulation with diethylstilboestrol.

#### I. EPIPHYSIS.

Whether the pineal body is an organ with definite endocrine functions is a subject which is still largely controversial. Nelson (1939) states that there is little morphological evidence in favour of the endocrine character of the pineal, and that the calcareous concretions (brainsand) which occur in it are probably of no endocrine significance. Werner (1942) is in agreement with this statement.

Saphir (1934) found that the pineal of humans contains an oestrogenic substance.

Rowntree *et al.* (1936) injected pineal extracts in successive generations of rats and found that this leads to dwarfism associated with early bodily development and marked precocity in gonadal development. Since then Einhorn and Rowntree (1939) carried out pinealectomy of parent rats for six successive generations and found no appreciable influence on weight, rate of development or age of sexual maturity. Similar results were obtained by Anderson and Wolfe (1934), Sullens and Overholser (1941) and Jager and Heil (1935).

Quinlan (1929) found no change in weight, macroscopic or histological appearance of the epiphysis in sterile cattle.

Trautmann (1934) in describing the structure of the pineal in the bovine, states that no physiological involution after puberty is evident. Von Kup (1936) found that castration before maturity in pigs caused pineal hypertrophy.

Desogus (1933) observed that during pregnancy in the bitch the pineal gradually underwent involution which became most marked at parturition and during the puerperium.

Table XXV, (Appendix II) shows the dimensions and weights of the epiphyses of the experimental animals. Although the average weights of these organs in the nymphomaniac and functionally sterile animals are slightly higher than in the "fertile" and pregnant animals, this difference is not considered significant and may be explained on the basis of higher body-weight in the former two groups.

No correlation could be found between the macroscopic and histological appearance of the epiphysis and the sexual conditions encountered, and it is concluded in agreement with the majority of workers that the physiological significance of this organ is still obscure.

#### J. THYROID.

Severinghaus (1939) discusses the relationship between the thyroid and the anterior pituitary, and finds that the acidophiles decrease after thyroidectomy and increase with hyperthyroidism, while a similar correlation does not appear to exist in the case of the basophiles, there being an increase in these cells in both conditions in rats.

Werner (1942) remarks that in hypothyroidism the metabolism of all tissues is slowed down and in hyperthyroidism it is accelerated. It is, therefore, conceivable that either of these conditions may affect the function of the pituitary and gonads or the receptivity of the genital organs to stimulation.

Freedman *et al.* (1935) found that thyroidectomy in rats was followed by prolongation of the sexual cycle in the di-oestrous phase and that thyroid feeding restored the normal duration and rhythm of the cycle.

Krupski (1921, *a*) remarks on the great individual variations in weight encountered in the bovine thyroid in relation to body weight and age. He observed a slight increase in weight of the gland during pregnancy and in animals suffering from cystic ovaries. He encountered struma colloidis in apparently normal cattle.

Quinlan (1929) observed a considerable increase in size of the thyroid in sterile cattle, but states that this apparent increase may be due to the fact that his studies were confined to well-grown Friesland, Shorthorn and Hereford cattle, which were compared to lower-conditioned cross-bred animals. He occasionally encountered struma colloidis in sterile cows, but also observed this condition in apparently healthy animals (Quinlan, 1928).

Del Vecchio (1937) observed an increase in weight of the thyroid in cows during pregnancy and while suffering from persistent corpus luteum.

In the present study the size and weights of the thyroids in the various animals are shown in Table XXV (Appendix II). No significant deviations in size and weight of the thyroid could be found in the sterile or pregnant animals, when compared to normal non-pregnant cows in the same experiment.

Significant changes were, however, observed on histological examination of these organs. In the normal, non-pregnant and pregnant animals, as well as those suffering from functional sterility, the epithelium lining the colloid follicles was found to be cuboid to flattened in shape and the cytoplasm of these cells contained few (if any) secretory granules and fat droplets, while the colloid appeared homogeneous and usually fairly strongly acidophilic in staining reaction.

In the nymphomaniac animals the cells were generally large, medium to high columnar, with swollen cytoplasm, heavily laden with fat globules and brownish pigment granules, while the colloid in some follicles showed vacuolation in the areas adjacent to the cells. In some cases there were papilliform epithelial proliferations which showed a tendency to the formation of secondary follicles, similar to that described by Quinlan (1928). Desquamation of cells into the colloid was frequently observed. The follicles in these cases were inclined to be small, while the colloid generally stained lightly acidophilic and was somewhat granular in appearance.

Maximow and Bloom (1938) state that "in general it is believed that the epithelium becomes very low when the gland is underactive and very tall and folded when the organ is overactive. There are many cases, however, in which the condition of the epithelium does not reflect the activity of the gland, so that a determination of the degree of functional activity of the organ cannot be made with certainty on the basis of a histologic examination alone." This statement is to some extent borne out by the findings in the animals in the present study. In the pregnant animals, when the gland is usually regarded as being in a state of increased activity, no change could be recognised in the appearance of the cells.

On the other hand, however, in the nymphomaniac animals the very marked cytologic changes observed are strongly suggestive of hyperactivity of the thyroid. These changes are probably in some way related to those observed in the anterior pituitary, the latter in its turn showing a close association with the functional and structural alterations in the ovaries.

#### K. THYMUS.

Although the thymus has for many years been classified as an endocrine gland, most endocrinologists have maintained a considerable degree of scepticism concerning its acceptance as such.

Anderson (1932), in reviewing the work on the relationship between the thymus and reproduction concludes that the normal age involution of the thymus is probably hastened by mating, pregnancy and lactation, that gonadectomy of young animals delays involution and that thymectomy or the administration of thymus gland or extract have no effect on reproduction.

Nelson (1939) states that, from a morphological point of view, there is little evidence to indicate that the thymus is an organ of internal secretion, and after reviewing the work on this gland concludes that the status of the thymus as an endocrine organ remains in doubt. This view is shared by Werner (1942).

Karras (1941) reports on the results obtained by one series of workers who observed hypertrophy of the testes and ovaries after thymectomy, while others find a decline in the growth of the gonads. He also observes that the activity of the thymus is prolonged after gonadectomy, either through retarded involution or hypertrophy and that the feeding or injection of thymus preparations leads to retardation of sexual development and degeneration of the germinal epithelium.

In the present study the animals were slaughtered at ages varying from 4 years 11 months to 10 years 1 month. In all cases an advanced degree of involution, up to almost complete disappearance was evident. No correlation could be established between the degree of involution of the thymus and the age of the subject, or between the morphology of the organ and the sexual condition of the animals.

#### L. PANCREAS.

Close scrutiny of the available literature has failed to reveal any relationship between the islets of Langerhans and the gonads.

In the present study no changes were observed in the gross or histological structure of this organ in the animals under various sexual conditions.

## M. ADRENALS.

That a positive relationship exists between these organs and the gonads has been recognised by most authorities. Witschi (1939) and Werner (1942) describe the abnormal masculinising influence of the adrenal cortex on the female genitalia and secondary sexual characteristics, the adreno-genital syndrome.

A fractional extract of adrenal cortex which maintained lactation in the adrenalectomised rat was obtained by Brownell *et al.* (1933). The name "cortilactin" was given to this extract.

Britton and Kline (1936) reported serious lactation deficiencies in rats after partial adrenalectomy and failure after complete removal of the adrenals. Extracts of adrenal cortex would, however, permit reproduction and lactation in such animals.

Hoffman (1937) found that the injection of aqueous extract of bovine adrenal into infantile rats stimulated follicular maturation and luteinisation and that this effect was enhanced by small doses of Prolan.

Krupski (1921) found that pregnancy and lactation in the bovine led to hypertrophy of the adrenals, while castration had the opposite effect. In cases of cystic ovaries he observed a marked increase in size and weight of the adrenals.

Quinlan (1929) observed a considerable increase in the size and weight of the adrenals in sterile cattle.

The measurements and weight of the adrenals of animals in the present study are shown in Table XXV (Appendix II). From these figures it will be noted that the glands in animals suffering from nymphomania are considerably larger and heavier than those in fertile non-pregnant and pregnant animals. The lowest values are those in the three functionally sterile animals. The enlargement of the adrenals in the animals with cystic ovarian follicles appeared to involve the cortex only, though separation of the cortex and medulla, in order to establish the proportional relationship of the components was not attempted.

Histological examination of the adrenals in the fertile non-pregnant animals revealed nothing unusual, apart from occasional fine lipid granules in the zona glomerulosa and fasciculata of the cortex, noted especially during the first half of the sexual cycle.

During pregnancy the lipid granulation is reduced, disappearing completely in most cases. In these animals some of the cells in the zona fasciculata and reticularis show deeply staining cytoplasm with small pycnotic nuclei.

In the functionally sterile cows, the cells in the zona glomerulosa and fasciculata show slight lipid granulation, as in the fertile non-pregnant animals, while pycnotic changes are observed similar to those seen in pregnant animals.

The nymphomaniac cows almost invariably showed large numbers of cells in the zona fasciculata and reticularis with deeply staining cytoplasm and pycnotic nuclei, while the cells of the glomerulosa and fasciculata were in many cases heavily laden with coarse and fine lipid granules.

In no case was any notable change observed in the medullary portion of the gland.

In view of the masculinising influence of adrenal cortical hyperplasia and tumour formation recognised in the human, the question arises to what extent

the male bodily configuration, the depth of voice and the changed attitude towards other animals, so characteristic of the nymphomaniac cow, are associated with the above macroscopic and histologic changes observed in the adrenal cortex of these animals.

#### V. DISCUSSION: DELAYED BREEDING IN BEEF HEIFERS IN RELATION TO STERILITY.

As has frequently been referred to in the preceding chapters, the subjection of 25 heifers to postponement of breeding up to ages varying from four years to five years eight months, led to sexual disturbances and sterility in a very high percentage of cases.

Only seven of these heifers can be considered to have bred successfully although the number of services which had to be given to establish pregnancy even in these cases was considered to be higher than the usual average observed in fertile herds. Furthermore, parturition was frequently complicated by dystocia and followed by still births, retained placenta and agalactia. These complications are considered to be the direct sequelae of delayed breeding associated with endocrine disturbances and structural and functional defects of the genital system.

In six animals conception invariably or occasionally terminated in abortion. In this group the number of services preceding fertilisation was significantly higher than in the animals mentioned above, while the majority of abortions occurred after three to five months gestation, without evidence of placentation having been successful.

It is suggested that in these cases delayed breeding, with consequent non-interruption of the sexual cycles over a period of years, led to a state of "fatigue" or exhaustion of anterior pituitary function with failure of this organ to produce and secrete luteinising hormone (L.H.). This is evidenced by the histological appearance of the acidophilic cells.

The following explanation is offered in support of this theory:— normally the duration of the oestrous cycle in bovines is 21 days. This cycle consists of a comparatively brief follicular phase, followed by a much longer luteal phase. During the follicular phase, lasting only a few days and terminating in maturity of the follicle, the secretion of anterior pituitary follicle stimulating hormone (F.S.H.) reaches its height. Before its termination the luteal phase commences and soon results in ovulation and corpus luteum formation, the growth of the latter reaching its height at about the middle of the di-oestrous phase of the cycle, after which regression commences. During this period of ovulation, luteal growth and regression, active secretion of L.H. from the anterior pituitary takes place and reaches its lowest ebb at the commencement of the following follicular phase.

From the above it is evident that, whereas the secretion of F.S.H. is interrupted by a long period of inactivity, L.H. secretion occurs almost continuously throughout the ovarian cycle. It is therefore conceivable that a state of pituitary exhaustion of L.H. can occur. In this connection also the work of Zeckwer (1944), quoted previously on parabiotic rats should be borne in mind.

In the majority of animals an advanced degree of endometrial atrophy and degeneration was observed; the atrophy of disuse? (Quinlan, 1929). This results in improper or complete lack of placentation during pregnancy. The placenta, being an important source of progesterone, as suggested by Browne *et al.* (1939),

normally relieves the corpus luteum of its function as gestation and development progresses. It is suggested that in the animals under discussion this function is disturbed or precluded due to placental hypoplasia.

It is well known that in the human and equine the chorion is an important source of gonadotropin. Whether this is also the case in the bovine remains to be proved. Be this as it may, the intimate association between the maternal and foetal placenta is lacking in these animals and it is suggested that this gives rise to interference of placental function, both as regards metabolic interchange and production of internal secretions.

Thus the corpus luteum, receiving inadequate quantities of gonadotropic substance from the anterior pituitary as well as from the placenta, is forced to premature regression. Under these circumstances and while placental progesterone is not forthcoming, abortion appears to be the inevitable result.

This theory is further substantiated by the following observations:-- (a) abortion occurred during the earlier stages of pregnancy and (b) expulsion was preceded or immediately followed by oestrus, indicating that even prior to abortion the quantity of progesterone present was insufficient to inhibit the liberation of pituitary F.S.H. and consequent follicular maturation.

In the functionally sterile animals (i.e. those failing to conceive in spite of the occurrence of normal sexual cycles) a combination of several factors is probably responsible for the infertility. Endometrial atrophy precludes an adequate supply of nutriment to the fertilised ovum and implantation of the embryo. This results in early death of the zygote (Laing, 1945), with or without disturbance of the sexual cycle. If the cycle continues undisturbed, as was the case in at least three of the experimental animals, this leads to further pituitary exhaustion more particularly of L.H., as explained earlier.

The liberation of inadequate quantities of L.H. leads to early regression of the corpus luteum and reduction of the inter-ovulatory period, thus accelerating the sexual cycle which, in its turn, leads to further L.H. depletion and so a vicious cycle becomes established. Eventually the L.H. titre is insufficient to effect rupture of the mature follicle and formation of corpus luteum. The mature follicle continues to produce follicular hormone, thus causing prolongation of oestrus.

Eventually the process of follicular cyst formation is complete and the syndrome of nymphomania commences. As long as the process of formation of new cysts continues the symptoms of prolonged oestrus prevail with consequent profound, irreversible changes in the structure of the genital tract.

The whole picture produced is one which closely resembles that described by many authors, quoted previously, in various small laboratory animals subjected to prolonged hyperoestrogenisation. The "endometritis chronica catarrhalis cystica" described in the older veterinary literature thus appears to be in a large proportion of cases, if not in every instance, a condition resulting from endocrine disturbances rather than from inflammatory changes. In view of this it is suggested that a careful distinction be drawn between primary endometritis chronica catarrhalis cystica and the endometrial changes observed in association with nymphomania, when inflammatory conditions can be excluded. For the latter condition the term "Metropathia hyperoestrogenica cystica" is suggested.

The cytological picture of the nymphomaniac anterior pituitary conveys the impression of actively producing acidophilic cells, the release of hormone (L.H.)

from which appears to be inhibited. Normally the release of L.H. from the pituitary is stimulated by follicular hormone, yet in these cases, for some unknown reason, the liberation of luteinising hormone is inhibited. The basophilic cells appear active, but depleted, with consequent depletion of F.S.H. and this in its turn precludes further follicular maturation. The existing cystic follicles show ample evidence of degeneration of the granulosa and theca interna cells, up to a point where these structures disappear completely and a fibrous cyst filled with fluid remains. Production of follicular hormone ceases and the final picture is that of anaphrodisia.

It is thus evident that the phenomena encountered during the course of the present investigations, namely that of abortion, functional sterility, nymphomania and finally anaphrodisia may be regarded merely as stages in the train of endocrine disturbances initiated by the postponement of breeding beyond the age of sexual maturity.

## VI. SUMMARY.

(1) Twenty-five beef heifers were subjected to delayed breeding up to ages varying from four years to five years eight months.

(2) Observations on body-weights, age of sexual maturity, the periodicity and duration of oestrus and the results of mating are recorded.

(3) Seven heifers bred successfully, while the remainder showed extensive disturbances in sexual activity.

(4) The changes occurring in the genital tract during the normal sexual cycle and during pregnancy are described.

(5) Profound functional and structural changes were observed in the genitalia of the majority of animals, leading to abortion, functional sterility, nymphomania and anaphrodisia.

(6) Correlative macroscopical and histological changes were observed in the anterior pituitary, thyroid and adrenals of normal and affected animals.

(7) The genesis of sterility in relation to delayed breeding in the light of the structural and physiological alterations observed, is discussed.

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## INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

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INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

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## APPENDIX I.

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In order not to encumber the text matter with rather lengthy descriptions of each individual case, the sex history, clinical observations, post mortem and histological examination of the genitalia and endocrine organs are assembled in the form of protocols. The diagnosis of all changes encountered will be found at the end of each description.

The cases will be dealt with in the numerical order in which they were placed throughout the experiment.

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### GROUP A COWS.

Cow No. 6292 (FIG. 65).

*Date of birth:* 31.7.1934. *Birth weight:* 70 pounds.

For body weights see Table I, Appendix II.

#### *Sex History.*

*Age at first oestrus:* 627 days (20·6 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: One long period of 42 days, otherwise normal.

3-4 years: One short period of 9 days, otherwise normal.

4-5 years: Normal.

5-6 years: Normal.

6-7 years: Three long periods of 95, 33 and 33 days respectively, otherwise normal.

7-8 years: One short period of 15 days, otherwise normal.

8-9 years: Calved, no oestrus shown.

9-10 years: One long period of 44 days, otherwise normal.

*Age of first service:* Five years, eight months.

*Pregnancies:* (Table XXI, Appendix II). First: 11 services. Aborted after 152 days gestation.

Second: 3 services. Aborted after 40 days gestation.

Third: 6 services. Calved at full term, 261 days. Parturition prolonged due to uterine inertia and absence of the normal relaxation of the genital passage. Suffered from paresis of the hindquarters for 5 months subsequent to parturition. Showed normal sexual activity for 14 months subsequently, but no further services given.

#### *Clinical Observations.*

Genitalia normal.

*Slaughter Data.*

*Age when slaughtered:* 10 years 1 month.

*Live weight:* 1,190 pounds.

*"Dressed" weight:* 690 pounds.

*Percentage "dressed" weight:* 58·0.

A few small fat necrosis tumours are present in the abdominal and pelvic adipose tissue, not involving the genitalia.

*Sex condition.*—Slaughtered 15 days after showing normal oestrus.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

*Vulva.*—Length, 11 cm. Width (between commissures), 10 cm. Bartholin glands and ducts show nothing unusual. Mucosa pale pink and moist.

*Histological.*—Epithelium low, cells packed closely, stroma compact, showing slight lymphocytic infiltration. The superficial stratified squamous layer shows slight cornification.

*Vagina.*—Length, 23 cm. Width, 5 cm. Gärtner's canal on the left side is obliterated; on the right side it is patent. The mucosa is pale pink and moist.

*Histological.*—The epithelium (Fig. 4) is low and stratified, the deeper layers consisting of well-defined polyhedral cells. The superficial layer consists of flattened cells, while some areas show a few swollen goblet cells. The stroma is dense and shows slight lymphocytic infiltration.

*Cervix.*—Length, 10 cm. Width, 5 cm. Thickness of wall, 2 cm. The os projects 2 cm. into the vagina and admits one finger. The cervix is firm and the canal patent. The mucosa is pale pink and moist.

*Histological.*—The glandular epithelium (Fig. 16) is cuboid to low columnar and the nuclei are pale, oval and basally situated. The stroma is dense and a few lymphocytes are present.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness of Wall.</i>
	Cm.	Cm.	Cm.
Body.....	2	4	1
Left Cornu.....	22	4·5	0·9
Right Cornu.....	24	5·0	0·8

The mucosa is pale yellowish pink in colour and moist. The cotyledons are distinct. The left horn contains a few cysts up to 0·5 cm. in diameter, involving the mucosa and filled with clear, colourless mucoïd fluid. Others contain caseous material, consisting of inspissated mucus and cellular debris. The muscular layers appear normal.

*Histological.*—The surface epithelium and that of the glands is low columnar, with large, dark, oval nuclei, basally situated. The lumina of the glands are small and contain little secretion. The stroma of the cotyledons is dense while that of the intercotyledonary areas is moderately oedematous and congested. The cysts are lined by flattened epithelium and filled with pale pink granular secretion. The muscular and vascular layers are normal.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	Cm.	Cm.
Left.....	21	0.3
Right.....	20	0.2

The tubes are macroscopically normal.

*Histological.*—The epithelium is moderately high, pseudo-stratified and ciliated (Fig. 80). The individual cells are narrow with large, oval, pale, centrally situated nuclei. The stroma is dense and avascular. The muscular coats are normal.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	4.5	3.0	2.0	14.5
Right.....	3.8	2.5	1.8	7.0

The *left ovary* contains a corpus luteum of the last ovulation (15 days previous), 2.5 cm. in diameter, pale orange in colour with flesh-coloured apex and a central cavity, 1 cm. in diameter, filled with clear straw-coloured fluid. A mature Graafian follicle, 1.3 cm. in diameter and several smaller follicles are present, as well as traces of older corpora lutea.

The *right ovary* shows several follicles in various stages of maturity up to 1 cm. in diameter, and traces of older corpora lutea.

*Histological.*—Both ovaries are normal. Figure 101 shows the wall of a normal, almost mature, follicle with its various layers clearly defined.

*Total weight of genitalia:* 570 grams.

*Mammary Glands.*—The majority of alveoli and ducts are moderately developed and non-secretory. The larger ducts contain some secretion. The stroma consists of a large proportion of connective tissue.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2.5	1.2	1.3	2.2

*Anterior lobe.*—Proportional cell count: Alpha cells, 34.1; beta cells, 11.4; and chromophobes, 54.5 per cent.

The *alpha cells* show degranulation of the cytoplasm and a large proportion have pycnotic nuclei. Their Golgi apparatus is not prominent (Fig. 107).

The *beta cells* show deeply staining, closely packed granules, giving the cytoplasm an almost homogeneous appearance. The proportion of pycnotic to large delicate nuclei is about equal. The Pars intermedia and nervosa show nothing unusual.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1.5	0.7	0.5	0.2

The epiphysis contains a few minute corpora arenacea only, otherwise shows nothing unusual.



*Thyroid*.—Left lobe,  $7 \times 5 \times 1.5$  cm. Right lobe,  $6 \times 4.5 \times 1$  cm. Length (including isthmus) 20 cm. Weight, 44 grams. Macroscopically normal.

*Histological*.—The majority of follicles are large, filled with normal colloid and lined with cuboid to flattened epithelium, the cytoplasm of which contains a few minute fat droplets towards the free edge.

*Thymus*.—Almost completely involuted, shows nothing unusual.

*Pancreas*.—Normal.

*Adrenals*.

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	5.5	3.5	2.0	17
Right.....	5.0	3.5	3.0	15

Both adrenals contain a few minute lipid granules in the cytoplasm of the zona glomerulosa. Otherwise normal.

#### *Diagnosis.*

Endometrial retention cysts, of no significance in the causation of sterility. Animal sexually active and fertile.

Cow No. 6358 (FIG. 47).

*Date of birth*: 6.10.1934. *Birth weight*: 77.5 pounds.

For body weights see Table I, Appendix II.

#### *Sex History.*

*Age at first oestrus*: 583 days (19.2 months).

*Subsequent oestrous periods*: (Table II-XX, Appendix II).

1-2 years: One short period of 15 days, otherwise normal.

2-3 years: One short period of 9 days, otherwise normal.

3-4 years: One long period of 38 days (double cycle), otherwise normal.

4-5 years: Normal.

5-6 years: Normal.

6-7 years: One short period of 16 days, and one long period of 44 days (double cycle), otherwise normal.

7-8 years: Two long periods (41 and 31 days) otherwise normal.

8-9 years: Normal.

*Age at first service*: 5 years 6.6 months. Served at every subsequent oestrus over a period of 2 years 8 months; total services, 46.

*Pregnancies*: None.

#### *Clinical Observations.*

Examination per rectum reveals a small, firm cervix; firm, infantile uterus and normal ovaries. The fallopian tubes are not palpable. Vestibule and vagina narrow; examination per vaginam not possible. Mammary glands and teats moderately developed, containing a small amount of secretion.

*Slaughter Data.*

*Age when slaughtered:* 8 years 2 months.

*Live weight:* 1,590 pounds.

*"Dressed" weight:* 1,066 pounds.

*Percentage "dressed" weight:* 67.

*Sex condition:* Slaughtered 11 days after showing normal oestrus.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

*Vulva.*—Length, 9 cm. Width, 7 cm. Bartholin glands and ducts are normal. The mucosa is pale pink and moist.

*Histological.*—The epithelial cells are large, especially those of the middle layer. The superficial squamous cells are undergoing cornification. A few lymphocytes are present in the stroma.

*Vagina.*—Length, 23 cm. Width, 5.5 cm. Gärtner's canals are patent. Immediately anterior to the meatus urinarius there is a fibrous band, 0.5 cm. thick, covered with mucosa, stretching from the floor of the vagina to its roof, dividing the canal into two equal halves (Fig. 49). The mucosa in the region of the band is somewhat hyperaemic. (This animal showed haemorrhage from the vulva on some occasions after service.)

*Histological.*—The epithelium (Fig. 3) of the vagina is low, stratified. The cells are small, with darkly staining nuclei and cytoplasm. There is intense lymphocytic infiltration of the epithelium and sub-epithelial stroma. The stroma is dense and avascular.

*Cervix.*—Length, 9 cm. Width, 3.5 cm. Thickness of wall, 1.5 cm. The os projects 2 cm. into the vagina and allows the passage of a thin probe only. The cervix is firm and the canal patent. The mucosa is pale pink and covered with clear, tenacious, dry, straw-coloured mucus, similar to that forming the cervical plug in pregnant animals.

*Histological.*—The glandular epithelium is cuboid to low columnar with small, darkly staining basal nuclei. The lumina of the glands contain acidophilic secretion. The stroma is dense.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thicknes.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>of Walls</i>
			<i>Cm.</i>
Body.....	2.5	4.0	0.6
Left Cornu.....	18.0	3.0	0.7
Right Cornu.....	19.0	3.0	0.7

The mucosa is reddish in colour and shows a number of cysts up to 1 cm. in diameter, filled with clear colourless fluid. Only traces of the cotyledons are visible.

*Histological.*—The surface epithelium and that of the glands is high columnar, with dark, basal nuclei. The lumina of the glands are moderately distended with secretion. The cotyledons are represented by small, non-glandular areas

with oedematous and congested stroma. The cysts are lined by flattened epithelium and filled with slightly granular, acidophilic secretion. The muscular layers are normal.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	Cm.	Cm.
Left.....	23	0.2
Right.....	21	0.2

The tubes are macroscopically normal.

*Histological.*—The epithelium is low columnar, ciliated, with large central nuclei. The epithelial surface shows minute globules of cytoplasm, extruded from the underlying epithelial cells and in some cases still attached to the latter by a thin strand. Some nuclei are also thrust out and appear to be lying free on the surface. These structures give the surface a serrated appearance. The stroma is dense and the muscular coats are normal.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	3.5	2.0	1.8	8
Right.....	3.8	4.0	2.5	11.6

The *left ovary* contains Graafian follicles up to 1 cm. in diameter and some old corpora lutea. The stroma shows nothing unusual.

The *right ovary* contains the corpus luteum of last ovulation (11 days previous), 2.5 cm. in diameter, with a central cavity, 1 cm. in diameter, filled with clear, straw-coloured fluid. Graafian follicles in various stages of maturity, up to 1.3 cm. in diameter are also present, as well as traces of older corpora lutea. Figure 100 shows a normal ovum with portion of the cumulus oophorus from one of the larger follicles in the right ovary.

*Total weight of genitalia:* 330 grams.

*Mammary Glands.*—The alveoli are moderately well developed and contain a small amount of secretion. The ducts show hyperplastic epithelial outgrowths. There is a small proportion of fibrous tissue in the stroma.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2.0	1.5	1.4	2.7

*Anterior Lobe.*—Proportional cell count: Alpha cells, 54.2; beta cells, 8.4; chromophobes, 37.4 per cent.

The majority of *alpha cells* are deeply stained with small, closely packed granules. Many cells show partial degranulation and pycnotic and large delicate nuclei are present in about equal proportions. The Golgi are indistinct. (Fig. 115.)

The *beta cells* show deeply staining, closely packed granules and prominent Golgi apparatus. The majority have large, rounded nuclei with a delicate chromatin network. The intermediate and posterior lobes show nothing unusual.

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1·3	0·6	0·6	0·3

Contains a fairly large number of corpora arenacea, otherwise nothing unusual.

*Thyroid.*—Left lobe, 6 × 4 × 1 cm. Right lobe, 6 × 5 × 1 cm. Length (including isthmus) 18 cm. Weight, 30 grams. Macroscopically normal.

*Histological.*—The follicles are normal in size with cuboid epithelium, the cytoplasm of which contains a few fat droplets. Some follicles show epithelial desquamation.

*Thymus.*—Involution fairly advanced. Tissue normal.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	4·5	3·3	1·0	9·5
Right.....	3·4	3·5	2·0	9·2

Macroscopic and histological examination: normal.

*Diagnosis.*

Persistence of the median walls of the Müllerian ducts, in the form of a fibrous band stretching across the vagina. This is of no consequence. Cystic degeneration and atrophy of the endometrium, including the cotyledons. Infantile uterus. Functional sterility.

Cow No. 6362. (FIG. 58.)

*Date of birth:* 23.10.1934. *Birth weight:* 53 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 545 days (17·9 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II.)

1-2 years: Periods irregular, varying from 15 to 44 days.

2-3 years: One short period of 8 days, otherwise normal.

3-4 years: At first normal; towards the end of the fourth year irregular short periods (4-14 days) occur.

4-5 years: Periods very irregular (4-65 days), with prolonged spells of continuous oestrus up to 24 days duration.

5-6 years: Similar to above.

6-7 years: One long period only of 245 days.

7-8 years: No oestrus shown.

*Age at first service:* 5 years 5·6 months, and periodically thereafter, until coitus refused.

*Pregnancies:* None.

#### *Clinical Observations.*

Coarse neck and shoulders, depression of back in lumbar region, tucked up abdomen, elevation of the root of the tail, relaxation of the sacro-sciatic ligaments which is to some extent masked by adiposity (Fig. 59). The voice is deep and bull-like and the animal bellows and paws the ground when let out of the stable. In the beginning she readily stood for service, but later refused coitus, she herself mounting the bull and her companions.

The teats are large and the udder is well-developed yielding several pints daily of milk-like secretion. (Fig. 58.) Examination per rectum reveals a small, firm cervix, an atonic, infantile uterus and bilateral large cystic ovaries. The vestibule is narrow, examination per vaginam being impossible.

#### *Slaughter Data.*

*Age when slaughtered:* 7 years 10·6 months.

*Live weight:* 1,475 pounds.

*"Dressed" weight:* 910 pounds.

*Percentage "dressed" weight:* 61·7.

*Sex condition:* Anaphrodisia.

#### *Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

(Fig. 60.)

*Vulva.*—Length, 7·5 cm. Width, 6·5 cm. Bartholin glands normal. Mucosa purplish pink, moist.

*Histological.*—Epithelial cells swollen with slight cornification of the superficial squamous layer. There is moderate infiltration of lymphocytes, plasma cells and polymorphonuclear leucocytes into the epithelial layer and stroma. The latter is congested and oedematous.

*Vagina.*—Length, 25 cm. Width, 6 cm. Gärtner's canals patent. Mucosa bright pink in colour and slightly swollen, covered with a fair amount of slightly opaque, tenacious mucus.

*Histology.*—The epithelial layer is much folded (Fig. 11) and the superficial cells are swollen with lightly staining, finely granular cytoplasm and fairly large pale nuclei. In the deeper layers the cells are smaller, polyhedral, with oval, darkly staining nuclei. The stroma is congested and oedematous, while the epithelial layer and stroma both show moderate infiltration with lymphocytes and neutrophiles. These are probably responsible for the slight opacity of the mucus described above.

*Cervix.*—Length, 7·5 cm. Width, 2·7 cm. The os is small and barely projects into the vagina; it admits a thin probe only. The cervix is firm and the canal patent, while transverse folds are indistinct. The mucosa is pale pink in colour and covered with a thin layer of slightly opaque, yellow mucus.

*Histological.*—The epithelium is high columnar, swollen, with small dark, elongated, basally situated nuclei. There are a few lymphocytes present in the moderately oedematous stroma.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>of Wall.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>
Body.....	2	4	0·7
Left Cornu.....	19	3	0·6
Right Cornu.....	17	3	0·5

The mucosa is pale greyish pink in colour, studded with numerous cysts, from pinhead to 2·5 cm. in diameter (Fig. 60), light grey in colour, semi-transparent. The larger cysts extend through the entire thickness of the uterine wall and are clearly visible under the serosa as semi-transparent elevations. The cotyledons are represented as greyish yellow slight elevations, much reduced in size.

*Histological.*—The surface epithelium and that of the glands is low columnar with large, lightly staining, central nuclei. In some areas the cells are swollen with basal nuclei and showing active secretion. Many gland lumina are distended with secretion and cellular debris. Cysts of various sizes with cuboid to flattened epithelial lining are present. The stroma is moderately oedematous and congested. All layers, including the muscular, are considerably reduced in width. The individual muscle fibres appear to be reduced both in size and in numbers.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	<i>Cm.</i>	<i>Cm.</i>
Left.....	22	0·3
Right.....	21	0·3

Macroscopically the tubes are normal.

*Histological.*—The epithelium is tall, columnar with small, elongated nuclei, situated basally, and lightly staining cytoplasm towards the free surface. Cilia are scant and completely absent in parts. The stroma is congested while the muscular coats are normal.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>	<i>Gm.</i>
Left.....	3·3	2·8	2·0	8·8
Right.....	5·0	4·0	3·0	14·8

The *left ovary* contains two small cysts, 1·7 and 2·5 cm. in diameter, thin-walled, semi-transparent.

*Histological.*—The walls of the cysts consist of hyalinised fibres of the theca externa, while all traces of theca interna and granulosa have disappeared. Several small follicles, up to 0·3 cm. in diameter, are also present. These all show degeneration in various stages of the lining cells and can no longer be regarded as normal.

The *right ovary* contains three cysts, 1·5, 3·0 and 3·5 cm. in diameter, respectively. One of these shows traces only of the theca interna (Fig. 97),

while the granulosa has disappeared. The theca externa appears normal. Another cyst shows vascularisation of the theca interna (Fig. 96), while traces only of degenerate granulosa cells are present on the inner surface. In the third cyst the granulosa and theca interna have disappeared, the fibrous externa only remaining. A few small follicles, similar to those above are present. They show numerous minute lipoid granules (staining with Sudan III) in the granulosa and theca interna. There are traces of a very old corpus luteum present.

*Total weight of genitalia:* 226 grams.

*Mammary Glands.*—The alveoli and ducts contain granular secretion and cellular elements. The epithelium is swollen, columnar. The glandular tissue is well-developed and there is a small proportion of fibrous and adipose tissue present in the stroma.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2·0	1·9	1·5	3·0

*Anterior Lobe.*—Proportional cell count: Alpha cells, 65·3; beta cells, 3·8; chromophobes 30·9 per cent.

The *alpha cells* are large, closely packed, containing large nuclei with a delicate chromatin network (Fig. 109). The Golgi apparatus is prominent. Few cells show degranulation and pycnotic nuclei.

The *beta cells* are of medium size, moderately granular, with large nuclei and prominent Golgi. The pars intermedia and nervosa are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1·2	0·6	0·6	0·2

Contains a large number of corpora arenacea distributed throughout the greater part of the organ, otherwise normal.

*Thyroid.*—Left lobe, 4·5 × 4 × 1 cm. Right lobe, 4·5 × 4·5 × 1 cm. Length (including isthmus) 19 cm. Weight 26·5 grams. Macroscopically normal.

*Histological.*—The follicles are small and contain a small amount of colloid. The epithelium is cuboid to low columnar with swollen cytoplasm heavily laden with fat globules and light brown granules. The colloid in some follicles is vacuolated adjacent to the epithelial lining. Desquamated epithelial cells are present.

*Thymus.*—Involution advanced, otherwise normal.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	6·0	3·8	1·8	18·1
Right.....	3·5	3·7	2·2	16·0

## INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

Many cells in the zona fasciculata and reticularis show a deeply staining cytoplasm and pycnotic nuclei. The cells of the zona glomerulosa and fasciculata show fair numbers of lipoid granules in the cytoplasm. The medulla is normal.

### *Diagnosis.*

Extensive endometrial cystic degeneration and advanced atrophy of the uterine mucosa, the cotyledons and the myometrium. Bilateral, large follicular ovarian cysts associated initially with pronounced symptoms of nymphomania and later with anaphrodisia and sterility. Infantile uterus.

Cow No. 6363. (FIG. 56.)

*Date of birth:* 25.10.1934. *Birth weight:* 61 pounds.

For body weights see Table I, Appendix II.

### *Sex History.*

*Age at first oestrus:* 564 days (18·5 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: Normal.

5-6 years: At first normal; later one period of 38 days with prolonged oestrus of 17 days duration.

6-7 years: One period only, of 236 days.

7-8 years: No oestrus shown.

*Age at first service:* 5 years 5·6 months, and on a few occasions subsequently until coitus refused.

*Pregnancies:* None.

### *Clinical Observations.*

Nymphomaniac characteristics, as described in Cow No. 6362, developed but to a lesser degree. She showed a slight inclination to mount a bull and her companions, but only accepted service on rare occasions.

The udder was moderately developed and up to 250 cubic cm. of thick, creamy secretion, resembling colostrum, could be expressed from the teats.

Palpation per rectum revealed a small, firm cervix, a soft and flabby uterus and bilateral large cystic ovaries. The tubes were not palpable. The vestibule was narrow and examination per vaginam was not possible.

### *Slaughter Data.*

*Age when slaughtered:* 7 years 10·3 months.

*Live weight:* 1,613 pounds.

*"Dressed" weight:* 1,000 pounds.

*Percentage "dressed" weight:* 62·0.

*Sex condition:* Anaphrodisia.



*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

(Fig. 57.)

*Vulva*.—Length, 6.0 cm. Width, 7.5 cm. Bartholin glands, normal. The mucosa is purplish pink in colour and moist.

*Histological*.—The epithelial cells are large with distinct cornification of the superficial squamous layer. There is moderate leucocytic and lymphocytic infiltration of the epithelial layer and stroma. The latter is slightly congested and oedematous.

*Vagina*.—Length, 25 cm. Width, 8 cm. The right Gärtner's canal, near the middle of the vagina, shows a beadlike string of small cysts, 2.5 mm. in diameter, filled with clear, gelatinous mucus. The canal on the left side shows a single cyst, 7 mm. in diameter, about 10 cm. posterior to the fornix. These cysts are visible as slightly raised, rounded areas under the vaginal mucosa. The latter is bright pink in colour, covered with a layer of pale yellow, slightly tenacious mucus.

*Histological*.—The cysts in Gärtner's canals are composed of multilocular cavities lined by cuboid to flattened epithelium, subdivided by septa consisting of thin strands of connective tissue containing blood vessels. The epithelial layer of the vaginal mucosa consists of stratified polyhedral cells, alternating in some areas with a much folded, single layer of swollen, high columnar cells with lightly staining, granular cytoplasm and basally situated, flattened, darkly staining nuclei. The stroma is congested and oedematous. The epithelial layer and the stroma are moderately infiltrated, with leucocytes.

*Cervix*.—Length, 8.5 cm. Width, 3.8 cm. The os is small and admits a thin probe only. The canal is patent but the transverse folds are not prominent. The mucosa is pale pink and covered with slightly opaque, tenacious mucus. Towards the uterine end there are two cysts, 7 mm. in diameter, in the mucosa. They are thin-walled, transparent and filled with clear, straw-coloured mucus.

*Histological*.—The cysts are lined by cuboid to flattened epithelium and enveloped in a fairly thick, fibrous capsule. The glandular epithelium (Fig. 21) is high columnar and swollen with small, dark, elongated, basally situated nuclei. There is mucus secretion present in the lumina. The stroma is moderately oedematous and congested and a few lymphocytes are present.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness of Wall.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>
Body.....	2.5	5.5	0.8
Left Cornu.....	26	4.0	0.4
Right Cornu.....	24	4.0	0.3

The uterus contains 20 cubic cm. of thin, slightly opaque, mucoid fluid. The mucosa is studded with numerous cysts, varying in size from pin-head to 4 cm. in diameter, (Fig. 57), the larger ones extending through the entire thickness of the uterine wall and plainly visible on the serosal surface as semi-transparent elevations. Traces of atrophied cotyledons are just visible here and there in amongst the cysts.

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

*Histological.*—The appearance (Fig. 29) is identical with that described in Cow No. 6362.

*Fallopian Tubes.*

	<i>Length.</i> Cm.	<i>Width.</i> Cm.
Left.....	18	0·2
Right.....	19·5	0·3

The tubes are macroscopically normal.

*Histological.*—The epithelium (Fig. 84) is tall, columnar, showing slight ciliation. The nuclei are small and centrally situated. Towards the base of the cells there are large vacuoles in the cytoplasm, which appear to force the nuclei towards the centre. The stroma is slightly oedematous and congested while the muscular coats appear normal.

*Ovaries.*

	<i>Length.</i> Cm.	<i>Breadth.</i> Cm.	<i>Width.</i> Cm.	<i>Weight.</i> Gm.
Left.....	3·8	2·7	2·2	11·3
Right.....	3·3	3·2	2·4	13·1

The *left ovary* contains a single large cyst, thin-walled, semi-transparent, 2·4 cm. in diameter. There are also several small follicles present up to 0·8 cm. in diameter.

*Histological.*—The large cyst shows a fibrous wall with no trace of theca interna or granulosa cells. Some of the small follicles appear intact, while others show varying degrees of degeneration of the theca interna and granulosa cells.

The *right ovary* contains a single, thin-walled cyst, 2·3 cm. in diameter and similar follicles as those described in the left ovary, up to 0·4 cm. in diameter.

*Histological.*—In the wall of the cyst the granulosa has disappeared, while the theca interna is vascularised (Fig. 93) and shows the presence of numerous minute lipoid granules, staining with Sudan III. The histological appearance of the follicles is similar to those described above. No recent corpora lutea are present in either ovary.

*Total weight of genitalia:* 395·5 grams.

A considerable proportion of this weight is contributed by the large amount of fluid present in the numerous endometrial cysts.

*Mammary Glands.*—The ducts are well developed and contain a small amount of secretion; the alveoli show moderate development and large swollen secretory cells. A fair proportion of fibrous and adipose tissue is present in the stroma.

*Pituitary.*

<i>Length.</i> Cm.	<i>Breadth.</i> Cm.	<i>Width.</i> Cm.	<i>Weight.</i> Gm.
2·5	1·7	1·4	3·2

*Anterior Lobe.*—Proportional cell count: Alpha cells, 59·2; beta cells, 3·9; chromophobes, 36·9 per cent.

The *alpha cells* are large with large delicate nuclei and very prominent Golgi apparatus. The cytoplasm is heavily granular.

The *beta cells* vary from moderately to heavily granular with large delicate nuclei and prominent Golgi.

The intermediate and posterior lobes are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1.7	0.4	0.4	0.2

There are no corpora arenacea present.

*Thyroid.*—Left lobe, 5.5 × 4.0 × 1.5 cm. Right lobe, 5.5 × 4.0 × 1.0 cm. Length (including isthmus), 23 cm. Weight, 31.0 grams. Macroscopically normal.

*Histological.*—The epithelial cells lining the follicles are low columnar, swollen and the cytoplasm is heavily laden with fat droplets and brown pigment granules. There are desquamated epithelial cells in the colloid.

*Thymus.*—Not completely involuted and appears normal.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	6.5	4.5	1.8	22.5
Right.....	5.5	4.2	3.0	20.0

Numbers of cells in the zona fasciculata and reticularis show deeply staining cytoplasm and pycnotic nuclei. The cytoplasm of the cells of the zona glomerulosa and fasciculata is heavily laden with lipoid granules.

*Diagnosis.*

Retention cysts in Gärtner's canals, which are considered of no consequence. Extensive endometrial cystic degeneration and advanced atrophy of the uterine mucosa, the cotyledons and the myometrium. Bilateral large follicular ovarian cysts associated initially with nymphomania and later with anaphrodisia and sterility. Infantile uterus.

Cow No. 6423. (FIG. 63.)

*Date of birth:* 13.5.1935. *Birthweight:* 59 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 477 days (15.6 months).

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: Normal.

5-6 years: One short period of 5 days, otherwise normal.

6-7 years: One long period of 121 days, otherwise normal.

7-8 years: No periods.

*Age at first service:* 5 years.

*Pregnancies:* (Table XXI, Appendix II).

First: One service. Abortion occurred after 232 days gestation, complicated by dystocia due to malpresentation and retained placenta.

Second: Four services. Terminated with abortion after 97 days gestation. Twin foetuses with fresh, intact membranes.

*Clinical Observations.*

All services given subsequent to the second abortion failed to produce conception. Symptoms of nymphomania, accompanied by characteristic physical changes (Fig. 63), developed gradually, the cow mounting her companions and the bull but refusing to stand for coitus.

Examination per rectum and vaginam revealed a normal cervix and uterus, but bilateral large cystic ovaries. The tubes were not palpable.

The udder and teats were moderately developed and yielded a small quantity of thick, creamy secretion.

*Slaughter Data.*

*Age when slaughtered:* 7 years 3·7 months.

*Live weight:* 1,563 pounds.

*“Dressed” weight:* 990 pounds.

*Percentage “dressed” weight:* 63·3.

*Sex condition:* Anaphrodisia.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

(Fig. 64.)

*Vulva.*—Length, 10 cm. Width, 12 cm. Bartholin glands, normal. Mucosa bright pink in colour and moist.

*Histological.*—The epithelium and stroma show moderate leucocytic infiltration and slight cornification of the superficial squamous epithelial layer. The stroma is oedematous and congested.

*Vagina.*—Length, 21 cm. Width, 8·5 cm. Gärtner's canals are patent. The vaginal mucosa is slightly swollen, purplish pink in colour and covered with light yellow, slightly opaque mucus. A number of small cysts, 3-4 mm. in diameter, are present in the mucosa, with mucoid, milky white contents.

*Histological.*—The much folded epithelial surface of the mucosa consists mainly of clearly defined polyhedral cells, becoming slightly flattened near the surface and, in many areas, supporting a single layer of superficial swollen goblet cells. The stroma is very congested and oedematous. Both stroma and epithelial layers show moderate leucocytic infiltration. The cysts are lined by a single layer of flattened epithelial cells and the contents consist of epithelial and leucocytic debris mixed with slightly granular, acidophilic secretion.

*Cervix.*—Length, 10 cm. Width, 4 cm. The os is slightly ectopic and ragged and admits one finger. The cervix is firm and the canal patent. The transverse folds are not prominent. The mucosa is pale pink with dark greyish pigmented areas and is covered with a thin layer of slightly opaque mucus. There is a similar cyst to that described in Cow No. 6363 in the mucosa.

*Histological.*—The glandular epithelium is columnar and swollen, with small, dark, flattened, basally situated nuclei. The stroma is slightly congested and oedematous.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness of Wall.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>
Body.....	1.5	5.0	1.0
Left Cornu.....	19.3	3.0	0.7
Right Cornu.....	18.0	3.3	0.8

The mucosa is pale yellowish pink in colour and covered with a small quantity of clear, slightly tenacious mucus. The cotyledons are fairly prominent.

*Histological.*—The surface epithelium and that of the glands is low columnar. The lumina of the glands are small. Large, thick-walled blood-vessels are present in the stroma, especially in the areas representing the cotyledons. The stroma is moderately oedematous and congested. The muscular layers are apparently normal.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	<i>Cm.</i>	<i>Cm.</i>
Left.....	25	0.3
Right.....	26	0.3

Macroscopically the tubes are normal.

*Histological.*—The epithelium is tall columnar with scant ciliation. Cytoplasmic vacuolation, similar to that described in Cow No. 6363 was abundantly present in this case. The stroma is slightly congested and the muscular coats appear normal.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>	<i>Gm.</i>
Left.....	3.0	2.8	2.5	11.5
Right.....	4.0	3.3	2.5	18.5

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

The *left ovary* contains five semi-transparent cysts with diameters varying from 1.2 to 1.8 cm., three of which project well above the surface of the ovary. Immature follicles are visible in between the cysts which are separated from each other by thin septa of ovarian stroma.

The *right ovary* contains two cysts, 2.0 and 2.5 cm. in diameter respectively, and a number of immature follicles up to 0.8 cm. in diameter.

*Histological.*—The lining membrane of the larger cysts shows varying stages of degeneration, and in one cyst it is reduced to a single layer of cells (Fig. 98). It is impossible to state from the appearance of these cells whether they are remnants of the *granulosa* or *theca interna*. The *theca externa* in all cases appears intact. The smaller follicles appear normal, while the larger ones show early degenerative changes. The ovarian stroma is dense and fibrous, except in the immediate vicinity of the larger cysts where it is loose and oedematous. Traces of old *corpora lutea*, in the form of collections of lipid granules, may be seen in the Sudan III stained sections. Recent *corpora lutea* are, however, absent.

*Total weight of genitalia.*—312.5 grams.

*Mammary Glands.*—The alveoli and ducts are well developed, containing secretion with fat globules. The epithelial cells are swollen. There is a moderate proportion of fibrous and adipose tissue present.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2.4	1.4	1.3	2.2

*Anterior Lobe.*—Proportional cell count: Alpha cells, 62.5; beta cells, 3.0; chromophobes, 34.5 per cent.

The *alpha cells* are large, closely packed and heavily granular, many with pycnotic nuclei and hypertrophic Golgi apparatus.

The *beta cells* vary from moderately to heavily granular with large, delicate nuclei and prominent Golgi. A few have pycnotic nuclei.

The *pars intermedia* and *nervosa* appear normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1.3	0.5	0.4	0.2

Contains a moderate number of *corpora arenacea* otherwise normal.

*Thyroid.*—Left lobe, 5.5 × 4.0 × 1.2 cm. Right lobe, 5.0 × 4.5 × 1.1 cm. Length (including isthmus), 22 cm. Weight, 30 grams. Macroscopically normal.

*Histological.*—The epithelial cells lining the follicles are low columnar and the cytoplasm contains many fat droplets. Desquamated epithelial cells are seen in the colloid.

*Thymus.*—Almost completely involuted—normal.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	5.0	4.0	1.5	14.8
Right.....	4.5	3.3	2.3	12.5

Many cells in the zona fasciculata and reticularis have a deeply staining cytoplasm and pycnotic nuclei.

The cytoplasm of the zona glomerulosa and fasciculata cells are heavily laden with lipid granules.

*Diagnosis.*

Retention cysts in the vaginal and cervical mucosa which are of no consequence. Multiple, bilateral, large follicular ovarian cysts associated at first with nymphomania and later with anaphrodisia and sterility.

Cow No. 6442. (FIG. 48.)

*Date of birth:* 8.7.1935. *Birth weight:* 67 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 600 days (19.6 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: One long period of 37 days (double cycle), otherwise normal

3-4 years: Normal.

4-5 years: Two long periods of 28 to 29 days, otherwise normal.

5-6 years: Periods irregular, including two long periods of 38 and 43 days (double cycles).

6-7 years: Periods more regular. Three long periods of 81, 50 and 55 days (early abortions?).

7-8 years: Periods irregular, 22 to 50 days.

*Age at first service:* 5 years 0.6 months and regularly thereafter for 2 years 5 months; total services 25.

*Pregnancies:* None.

*Clinical Observations.*

This animal had a horizontal vulva (Fig. 51) which at times gave great difficulty with coitus, the bull having to be assisted with introduction of the penis. The vestibule was narrow, manual examination per vaginam being precluded. Examination per rectum revealed a number of hard fat necrosis tumours, up to 6 inches in length, in the pelvic adipose tissue but not involving the genitalia. The cervix was small and soft, while the uterus was infantile and firm. Ovaries functionally active and normal. Fallopian tubes not palpable.

The udder was moderately developed, the teats were small and contained no secretion.

*Slaughter Data.*

*Age when slaughtered:* 7 years 5·3 months.

*Live weight:* 1,550 pounds.

*“Dressed” weight:* 970 pounds.

*Percentage “dressed” weight:* 62·6.

Large fat necrosis tumours are present in the abdominal and pelvic fat, not involving the genitalia.

*Sex condition:* Slaughtered 24 days subsequent to final oestrus.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

(FIG. 50.)

*Vulva.*—Length, 9 cm. Width, 7 cm. Bartholin glands normal. Mucosa pale pink in colour and somewhat dry.

*Histological.*—The epithelial cells are closely packed with slight cornification of the superficial squamous layer. There is moderate leucocytic infiltration of the epithelium and stroma and the latter is dense and avascular.

*Vagina.*—Length, 19 cm. Width, 4 cm. There is a fibrous band stretching from the floor to the roof of the vagina (Fig. 50), identical to that described in Cow No. 6358. Gärtner’s canals, opening near the base of the above-mentioned band, are patent for a distance of about 12 cm. forward. Anterior to this they show the presence of a few semi-transparent cysts filled with straw-coloured, gelatinous secretion; these are similar to those described in Cow No. 6363. They are clearly visible under the vaginal mucosa, behind and on either side of the os (Fig. 50).

*Histological.*—The epithelial layer of the vaginal mucosa is low, the deeper cells being polyhedral and becoming flattened towards the surface. The stroma is dense and is moderately infiltrated with lymphocytes and neutrophiles, also involving the epithelial layer. Columnar mucus-secreting cells are absent.

*Cervix.*—Length, 12·5 cm. Width, 3·5 cm. The os projects 3 cm. into the vagina and admits a thin probe only. The cervix is slightly soft and the canal patent. The transverse folds are prominent. The mucosa is pale pink and covered with dry sticky mucus, resembling that of the pregnancy plug.

*Histological.*—The glandular epithelium is cuboid and the nuclei large and oval in shape. There is acidophilic mucus present in the lumina. The stroma is dense.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>of Wall.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>
Body.....	3	4	0·8
Left Cornu.....	18	3	0·6
Right Cornu.....	17	4	0·7

The mucosa is pale, brownish pink in colour, smooth and moist. A few cysts up to 1 cm. are present in the mucosa and the cotyledons are markedly



reduced in size. At the bifurcation of the cornua, the wall of the left horn contains a hard, circumscribed, egg-shaped swelling, 3.5 cm. in length (Fig. 50), clearly visible and palpable on the peritoneal surface. The swelling on section appears to involve the muscular layers, the cut surface being opaque greyish in colour and hard and fibrous in texture.

*Histological.*—The tumour involves the inner (circular) muscle layer and is composed of wavy bundles or whorls of smooth muscle fibres with a well-developed supporting fibrous connective tissue stroma.

The surface epithelium of the mucosa, as well as that of the glands, is moderately high columnar and actively secretory. Cystic glands in various stages are present, some extending into the inner muscular layer. The cotyledons show marked atrophic changes. The stroma is moderately oedematous and congested. The mucosa is much reduced in thickness, while the muscular layers appear normal.

#### *Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	Cm.	Cm.
Left.....	19	0.2
Right.....	20	0.2

The tubes are macroscopically normal.

*Histological.*—The left tube (Fig. 88) shows fibrosis and inflammatory cellular infiltration of the stroma and muscular coats. The mucosa has almost disappeared and the lumen is filled with necrotic cellular exudate. The right tube shows low, columnar, ciliated, non-active epithelium with a dense stroma.

#### *Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	4.0	3.0	2.5	8.5
Right.....	3.0	1.7	1.4	3.4

The *left ovary* shows a corpus luteum, oval in shape almost free on the surface of the ovary (Fig. 50), as well as three prominent follicles, 0.6, 1.0, and 1.2 cm. in diameter; the corpus luteum is that of the last ovulation, which was recorded 24 days before slaughter. Several older corpora lutea are present.

The *right ovary* shows a follicle, 0.9 cm. in diameter, as well as several smaller follicles and old corpora lutea.

*Histological.*—Both ovaries appear normal.

*Total weight of genitalia:* 300 grams.

*Mammary Glands.*—The alveoli and ducts are poorly developed, non-secretory. There is a large proportion of fibrous and adipose tissue in the stroma.

#### *Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2.3	1.2	1.1	1.9

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

*Anterior Lobe.*—Proportional cell count: Alpha cells, 57·8; beta cells, 11·0; chromophobes, 31·2 per cent.

The *alpha cells* are partially degranulated with pyknotic nuclei and indistinct Golgi apparatus. The cells are of medium size.

The *beta cells* stain deeply with closely packed granulation, large prominent Golgi. The nuclei are large and rounded with a delicate chromatin network. The intermediate and posterior lobes are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1·5	0·6	0·5	0·3

There are a large number of corpora arenacea present, otherwise normal.

*Thyroid.*—Left lobe, 5·5 × 5·0 × 1·0 cm. Right lobe, 6·0 × 5·0 × 1·0 cm. Length (including isthmus), 20 cm. Weight 40 grams. Macroscopically normal.

*Histological.*—The follicular epithelium is cuboid to flattened and a few fat droplets are present in the cytoplasm.

*Thymus.*—Advanced involution, otherwise normal.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	5·0	3·5	1·1	10·0
Right.....	5·0	3·2	1·8	9·0

Many cells in the zona fasciculata and reticularis show heavily staining cytoplasm and pyknotic nuclei. A few cells in the zona fasciculata contain lipid granules.

*Diagnosis.*

Horizontal vulva. Persistence of the median walls of the Müllerian ducts in the form of a fibrous band stretched across the vagina. This is of no consequence. Retention cysts in Gärtner's canals, which are of no consequence. Cystic degeneration and atrophy of the endometrium, including the cotyledons. Fibroleiomyoma of the left uterine horn. Chronic, left-sided salpingitis. Infantile uterus. Functional sterility.

Cow No. 6452. (FIG 66.)

*Date of birth:* 7.6.1935. *Birth weight:* 59 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 514 days (16·9) months.

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

- 3-4 years: One long period of 28 days, otherwise normal.  
4-5 years: Three successive long periods of 43, 44 and 44 days, respectively (double cycles?), otherwise normal.  
5-6 years: Two long periods of 43 and 42 days, respectively, otherwise normal.  
6-7 years: Normal.  
7-8 years: Normal.  
8-9 years: Normal.  
9-10 years: Normal.

*Age at first service:* 5 years.

*Pregnancies:* (Table XXI, Appendix II).

First: 3 services, terminated in abortion after 113 days gestation. Foetus and membranes fresh.

Second: 8 services, full term, 291 days. Calf still born, 52 pounds. Placenta retained.

Third: 1 service, full term, 283 days. Calf normal male, 64.5 pounds. Placenta retained.

Fourth: 1 service, full term, 264 days, twin female calves, 32 and 34 pounds, still born. Placenta retained.

#### *Clinical Observations.*

Normal oestrous periods occurred after the final calving, but no further services were given.

Genitalia normal.

#### *Slaughter Data.*

*Age when slaughtered:* 9 years 2.6 months.

*Live weight:* 1,050 pounds.

*"Dressed" weight:* 590 pounds.

*Percentage "dressed" weight:* 56.2.

*Sex condition:* Slaughtered 5 days after showing normal oestrus and 114 days subsequent to final parturition.

#### *Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

*Vulva.*—Length, 10 cm. Width, 7 cm. Bartholin glands normal. Mucosa pale pink and moist.

*Histological.*—The epithelium is of medium height and there are a few lymphocytes present. The stroma is slightly congested and oedematous.

*Vagina.*—Length, 22 cm. Width, 5 cm. Gärtner's canals obliterated. The mucosa is pale pink and covered with a thin layer of slightly tenacious mucus.

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

*Histological.*—The epithelial layer is high, consisting mainly of 6 to 7 rows of well-defined polyhedral cells (Fig. 2), with rounded pale, nuclei. The superficial layer is becoming flattened, with dark, pycnotic nuclei, the surface having a serrated appearance. There are very few mucus-secreting goblet cells present. Infiltrating lymphocytes are present in the epithelium and stroma. The latter is dense and avascular.

*Cervix.*—Length, 11 cm. Width, 4 cm. The os projects 3 cm. into the vagina and is slightly ragged, the caudal transverse fold being visible. The cervix is firm, the canal patent and admits one finger with ease.

*Histological.*—The glandular epithelium is moderately high columnar (Fig. 13), with small, oval, basally-situated nuclei. There is mucus present in the lumina. The stroma is moderately oedematous and congested and a number of lymphocytes are present.

*Uterus.*

	<i>Length.</i> Cm.	<i>Width.</i> Cm.	<i>Thickness of Wall.</i> Cm.
Body.....	2.5	5.0	1.0
Left Cornu.....	27.0	4.0	1.0
Right Cornu.....	27.0	4.0	1.0

Mucosa pale brownish pink and moist. Cotyledons prominent; muscular layers normal.

*Histological.*—The uterine wall presents a normal picture (Fig. 26). The surface and glandular epithelium is in a non-secretory phase, the stroma is fairly dense, the cotyledons prominent with large thick-walled blood-vessels. The muscular coats are well developed.

*Fallopian Tubes.*

	<i>Length.</i> Cm.	<i>Width.</i> Cm.
Left.....	15	0.2
Right.....	17	0.2

The tubes are macroscopically normal.

*Histological.*—The epithelium is moderately high, non-ciliated, columnar with basal nuclei (Fig. 77). The stroma is dense and the muscular coats normal.

*Ovaries.*

	<i>Length.</i> Cm.	<i>Breadth.</i> Cm.	<i>Width.</i> Cm.	<i>Weight.</i> Gm.
Left.....	4.0	3.0	1.5	9.3
Right.....	3.0	1.8	1.3	4.5

The *left ovary* contains the corpus luteum of last ovulation (5 days previous), 1.8 cm. in diameter and with a dark red, haemorrhagic apex. It also contains a Graafian follicle, 1.3 cm. in diameter. A few old corpora lutea and a number of immature follicles are visible.

The *right ovary* shows a few old corpora lutea and a number of immature follicles, up to 0.8 cm. in diameter.

*Histological.*—The corpus luteum and follicles appear normal. A few atretic follicles are present, one of which shows a degenerate ovum (Fig. 102).

*Total weight of genitalia:* 715 grams.

*Mammary Glands.*—The alveoli and ducts are well developed, showing slight secretion mixed with cellular elements. There is a small proportion of fibrous tissue in the stroma.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2·3	1·4	1·2	2·3

*Anterior Lobe.*—Proportional cell count: Alpha cells, 34·1; beta cells, 15·1; chromophobes, 50·8 per cent.

The *alpha cells* (Fig. 106) are deeply stained, heavily granular with pycnotic nuclei. Some have large delicate nuclei, less heavily granular cytoplasm and prominent Golgi apparatus.

The *beta cells* are small, lightly stained, many with pycnotic nuclei. They show degranulation of the cytoplasm and the Golgi apparatus is not prominent.

The *pars intermedia* and *nervosa* are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1·3	0·6	0·6	0·2

There are a large number of corpora arenacea, distributed throughout the greater part of the organ.

*Thyroid.*—Left lobe, 6·0 × 4·0 × 1·8 cm. Right lobe, 6·0 × 4·0 × 1·5 cm. Length (including isthmus), 19 cm. Weight, 30·0 grams. Macroscopically normal.

*Histological.*—The follicles are large with flattened epithelial cells containing many fat droplets.

*Thymus.*—Involution advanced.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	6·5	3·0	1·5	13·0
Right.....	5·0	3·5	1·7	14·0

There are a few lipid granules in the cytoplasm of the zona glomerulosa cells, otherwise nothing unusual.

*Diagnosis.*

Normal.

Cow No. 6495. (FIG. 40.)

*Date of birth:* 22.10.1935. *Birth weight:* 71 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 492 days (16·1 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: Normal at first; later periods very irregular and short (6 to 17 days), with prolonged duration of oestrus up to 13 days.

5-6 years: No periods.

6-7 years: No periods.

*Age at first service:* No service given; coitus refused after the age of five years.

*Pregnancies:* None.

*Clinical Observations.*

The animal's head, neck and shoulders are coarse (Fig. 40), there is a slight depression of the back in the lumbar region and elevation of the root of the tail. The sacro-sciatic ligaments are relaxed but this is masked to some extent by adiposity in this region. The voice is deep and bull-like. The cow mounts her companions and the bull, but refuses to stand for coitus.

Examination per rectum reveals a small, firm cervix and infantile, atonic uterus. Both ovaries are large and cystic. On slight manipulation a cyst in the left ovary ruptures, leaving the ovary small and collapsed. Examination two months later (i.e. 3 days before slaughter): Left ovary small and static; right ovary large and cystic. The vestibule is narrow and examination per vaginam is not possible.

The udder and teats are moderately developed, yielding 125 cubic centimetres of milky secretion.

*Slaughter Data.*

*Age when slaughtered:* 6 years 10·9 months.

*Live weight:* 1,573 pounds.

*"Dressed" weight:* 1,030 pounds.

*Percentage "dressed" weight:* 65·5.

*Sex condition:* Anaphrodisia.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

(Fig. 42.)

*Vulva.*—Length, 9 cm. Width, 7 cm. Bartholin glands normal. The mucosa is bright pink in colour, covered with a thin layer of clear, slightly tenacious mucus.

*Histological.*—The epithelium is of medium height with slight cornification of the superficial squamous layer. The stroma is slightly congested and oedematous and shows moderate leucocytic infiltration.

*Vagina.*—Length, 19 cm. Width, 7 cm. Gärtner's canals patent. Mucosa bright pink in colour with circumscribed purplish congested areas. The surface is covered with thin, slightly tenacious mucus.

*Histological.*—The epithelial layer is high, consisting of polyhedral cells supporting a superficial row of swollen goblet cells. Figure 8 shows a portion of the mucosa of the fornix. In this area the epithelium is non-stratified and consists of a single layer of columnar cells with basally situated, flattened nuclei, strongly resembling that of the cervical mucosa. The stroma is slightly oedematous and congested and there is extravasation of blood. It is moderately infiltrated with leucocytes, but not in the region adjacent to the cervix.

*Cervix.*—Length, 8 cm. Width, 4 cm. The os projects 2 cm. into the vagina and admits one finger with ease. The cervix is firm and the canal patent. At the junction of the cranial and middle thirds there is a thin-walled cyst, 7 mm. in diameter, similar to that described in Cow No. 6363. The mucosa is pale pink in colour and covered with thin, clear mucus.

*Histological.*—The glandular epithelium is high columnar, swollen and the nuclei are small, dark, flattened and basally situated.

The stroma is moderately oedematous and congested.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness of Wall.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>
Body.....	1·5	4·0	0·5
Left Cornu.....	15·0	2·5	0·3
Right.....	16·0	2·3	0·4

The mucosa is pale brownish pink in colour and moist. A number of cysts, pinhead to 1 cm. in diameter, are present in the mucosa. The cotyledons are atrophied and barely visible.

*Histological.*—All layers of the uterine wall show advanced atrophy (Fig. 28).

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	<i>Cm.</i>	<i>Cm.</i>
Left.....	14·0	0·2
Right.....	20·0	0·2

The tubes are macroscopically normal.

*Histological.*—The epithelium is tall columnar with scant ciliation. Cytoplasmic vacuolation, similar to that described in Cow No. 6363 is observed.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>	<i>Gm.</i>
Left.....	2·6	1·8	1·4	3·4
Right.....	4·5	3·0	2·5	17·0

The *left ovary* contains two cysts, 1 cm. in diameter and several immature follicles as well as traces of old corpora lutea.

*Histological.*—The wall of one cyst is completely fibrous (Fig. 99), the other showing the presence of an intact theca interna, while the granulosa is reduced to a single layer of degenerate cells the nuclei of which are undergoing pycnosis and coalescence into large, darkly staining globules of chromatin material. Some of these are freely suspended in the follicular fluid (Fig. 94). The immature follicles also show early signs of degeneration.

The *right ovary* contains three cysts, 2.8, 2.4 and 2.3 cm. respectively in diameter, and several immature follicles, as well as traces of very old corpora lutea. Recent corpora lutea are absent in both ovaries.

*Histological.*—Two of the cysts show traces only of degenerate granulosa and theca interna cells, while the third is completely fibrous. The smaller follicles appear normal while the larger ones show commencing degenerative changes.

*Total weight of genitalia:* 198.0 grams.

*Mammary Glands.*—The alveoli and ducts are fairly well developed and the epithelium is swollen and active secretory. The secretion contains numerous fat globules. There is a small proportion of fibrous and adipose tissue in the stroma.

#### *Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2.2	1.4	1.2	2.3

*Anterior Lobe.*—Proportional cell count: Alpha cells, 65.0; beta cells, 2.2; chromophobes, 32.8 per cent.

The *alpha cells* are closely packed, heavily granular with prominent Golgi apparatus. Many cells show pycnotic nuclei (Fig. 112).

The *beta cells* are moderately to heavily granular, with prominent Golgi. The *pars intermedia* and *nervosa* are normal.

#### *Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1.8	0.5	0.5	0.4

Contains a fair number of corpora arenacea and appears normal.

*Thyroid.*—Left lobe, 5.0 × 4.5 × 1.0 cm. Right lobe, 5.0 × 4.0 × 1.0 cm. Length (including isthmus), 20 cm. Weight, 29.5 grams. Macroscopically normal.

*Histological.*—There are many large follicles lined by cuboid epithelium which is heavily laden with fat droplets. The colloid contains many desquamated epithelial cells.

*Thymus.*—Apparently normal; involution advanced.

*Pancreas.*—Normal.



*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	5·0	3·5	1·4	14·0
Right.....	4·0	3·5	2·2	13·0

Many cells in the zona fasciculata and reticularis have deeply staining cytoplasm and pycnotic nuclei. There are numerous lipoid granules in the cytoplasm of the cells in the zona fasciculata.

*Diagnosis.*

Retention cyst in the cervical mucosa, which is of no consequence. Endometrial cystic degeneration and advanced atrophy of all elements of the uterine wall. Infantile uterus and cervix. Bilateral ovarian follicular cysts, associated with nymphomania, terminating in anaphrodisia.

Cow No. 6496. (FIG. 62.)

*Date of birth:* 22.10.1935. *Birth weight:* 79·5 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 466 days (15·3 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: Normal at first; at the age of 4½ years the periods suddenly became shorter (2-13 days), with prolonged duration of oestrus, up to 11 days.

5-6 years: No periods.

6-7 years: No periods.

*Age at first service:* No services given; coitus refused after the age of 5 years.

*Pregnancies:* None.

*Clinical Observations.*

The physical and psychological changes associated with nymphomania, as described in Cow No. 6495, commenced in this animal at the age of about 4½ years (Fig. 62).

Examination per rectum revealed a normal cervix, atonic uterus, normal in size and bilateral large cystic ovaries. The vestibule was narrow and examination per vaginam precluded.

The udder and teats were well developed, yielding 800 cubic centimetres of milk-like secretion.

*Slaughter Data.*

*Age when slaughtered:* 6 years 10·9 months.

*Live weight:* 1,458 pounds. "*Dressed*" weight: 958 pounds.

*Percentage "dressed" weight :* 65·0

*Sex condition:* Anaphrodisia.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

(Fig. 61).

*Vulva.*—Length, 12 cm. Width, 9 cm. Bartholin glands, normal. The mucosa is pink in colour and covered with tenacious mucus.

*Histological.*—The epithelium is swollen and there is no evidence of cornification. There is marked infiltration of lymphocytes and few neutrophils in the epithelium and sub-epithelial stroma. The latter is oedematous and congested.

*Vagina.*—Length, 23 cm. Width, 6·5 cm. Gärtner's canals patent. The mucosa is bright pink in colour becoming purplish pink towards the cranial end and covered with a fair quantity of clear, straw coloured mucus.

*Histological.*—The deeper layers of epithelium consist of polyhedral cells, supporting a superficial layer of columnar, mucus-secreting cells, abruptly alternating with single rows of swollen goblet cells (Fig. 10). The stroma shows moderate lymphocytic and neutrophilic infiltration, intense congestion and oedema.

*Cervix.*—Length, 10 cm. Width, 4·5 cm. The os projects 2 cm. into the vagina and admits one finger with ease. The mucosa is pale pink in colour and covered with a thin layer of slightly turbid, tenacious mucus. The transverse folds are prominent.

*Histological.*—The glandular epithelium (Fig. 23) is high, columnar and swollen. The nuclei are small, elongated and situated basally. There is mucus present in the lumina. The stroma is slightly congested and oedematous and there are a few lymphocytes present.

*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>of Wall.</i>
			<i>Cm.</i>
Body.....	3·5	4·5	0·6
Left Cornu.....	16·5	3·5	0·8
Right Cornu.....	18·0	3·5	0·8

The uterus contains about 20 cubic centimetres of clear, colourless mucoid fluid. The mucosa is pale pink in colour and contains numerous cysts up to 0·2 cm. in diameter. The apex of the right horn is distended by a cyst of 4·0×2·8 cm., plainly visible and palpable on the serosal surface (Fig. 61), involving all layers of the uterine wall and completely occluding its lumen. Cotyledons are not visible. The myometrium appears normal.

*Histological.*—The surface and glandular epithelium are low columnar and in a non-secretory phase. There is marked cystic glandular hyperplasia of the endometrium (Fig. 27), while the muscular layers are becoming atrophic.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	Cm.	Cm.
Left.....	22·0	0·2
Right.....	20·0	0·2

The tubes are macroscopically normal.

*Histological.*—The epithelium is tall, columnar ciliated, with basal nuclei (Fig. 86). The stroma is moderately congested and oedematous, while the muscular coats appear normal.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	3·5	2·5	2·2	7·7
Right.....	5·0	3·5	2·5	25·0

The *left* ovary contains a single large cyst, 2·3 cm. in diameter, and a few immature follicles up to 0·5 cm. in diameter.

*Histological.*—The cyst has a fibrous wall with complete absence of granulosa or theca interna cells. The larger follicles showed commencing pycnosis of the granulosa nuclei.

The *right* ovary contains three large cysts, 3·8, 2·3 and 2·4 cm. respectively in diameter and a few immature follicles up to 0·5 cm. in diameter.

*Histological.*—Two of the cysts show complete fibrous walls, while the third shows pycnosis of the granulosa and theca interna cells, the theca externa being intact (Fig. 95). The larger immature follicles also show commencing pycnosis of the granulosa cells. There is no luteal tissue evident in either ovary.

*Total weight of genitalia:* 339 grams.

*Mammary Glands.*—The alveoli and ducts are well developed and distended with secretion, containing some fat globules. The proportionate amount of connective and adipose tissue is small.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2·3	1·4	1·1	2·3

*Anterior Lobe.*—Proportional cell count: Alpha cells, 51·1; beta cells, 5·6; chromophobes, 43·3 per cent.

The *alpha cells* are closely packed, heavily granular with prominent Golgi apparatus. The *beta cells* are moderately to heavily granular with prominent Golgi.

The pars intermedia and nervosa are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1·4	0·6	0·6	0·2

Contains a few corpora arenacea, otherwise normal.

*Thyroid.*—Left lobe, 5.5 × 4.0 × 1.0 cm. Right lobe, 5.0 × 3.8 × 0.9 cm. Length (including isthmus), 25 cm. Weight, 25 grams. Macroscopically normal.

*Histological.*—A few of the larger follicles show papilliform epithelial proliferations, some of which are seen to form secondary follicles. The epithelium is high columnar and heavily laden with fat globules.

*Thymus.*—Involution is moderately advanced, apparently normal.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	5.2	3.2	1.4	12.3
Right.....	5.0	2.8	1.8	10.0

There is slight pycnosis of the nuclei of the cells in the zona fasciculata and reticularis, otherwise normal.

*Diagnosis.*

Endometrial cystic glandular hyperplasia. Ovarian follicular cystic degeneration, associated with nymphomania and terminating in anaphrodisia.

Cow No. 7045. (FIG. 67.)

*Date of birth:* 17.12.1935. *Birth weight:* 66 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 554 days (18.2 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Short period at commencement (14 days), otherwise normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: Normal, one short period of 14 days.

5-6 years: One long period (214 days), followed by a short period (15 days) and pregnancy.

6-7 years: No periods; pregnant.

7-8 years: No periods; pregnant, calved.

8-9 years: One period (90 days) followed by pregnancy.

*Age at first service:* 5 years.

*Pregnancies:* (Table XXI, Appendix II).

First: 6 services, full term, 282 days, normal parturition, female calf, 64.5 pounds (Fig. 67).

Second: One service, full term, 287 days, normal parturition, hypogalactia, female calf, 83 pounds.

Third: Two services, slaughtered on 183rd day of pregnancy.

*Clinical Observations.*

Genitalia normal.

*Slaughter Data.*

*Age when slaughtered:* 8 years 8·3 months.

*Live weight:* 1,330 pounds.

*“Dressed” weight:* 790 pounds.

*Percentage “dressed” weight:* 59·4.

*Sex condition:* Slaughtered on 183rd day of pregnancy.

*Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

*Vulva.*—Length, 14 cm. Width 12 cm. Right Bartholin gland contains an oval cyst, 3 cm. in length, filled with clear straw-coloured secretion. Duct apparently stenosed. Left gland normal. Mucosa pale pink in colour and covered with gelatinous mucus.

*Histological.*—The epithelial layer is thin and the cells are small and closely packed. The stroma is dense.

*Vagina.*—Length, 24 cm. Width, 5 cm. Gärtner's canals obliterated. The mucosa is pale pink in colour and covered with dry, gelatinous mucus.

*Histological.*—The epithelium is much folded and consists mainly of swollen goblet cells (Fig. 6), alternating with areas consisting of a thin layer of stratified polyhedral cells. The stroma is dense and shows moderate lymphocytic infiltration.

*Cervix.*—Length, 19 cm. Width, 7 cm. The os is much enlarged and projects 10 cm. into the vagina; it admits two fingers with ease. The canal is filled with the cervical plug of pregnancy and the mucosa is bright pink in colour.

*Histological.*—The glandular epithelium is high columnar and swollen, showing intense secretory activity. The nuclei are small, dark, elongated and basally situated. The lumina are distended with secretion, the branches of the glands being represented by folds projecting into the bulging lumen. The stroma is moderately congested and oedematous and there are few lymphocytes present.

*Uterus.*—On account of extreme distortion of the cornua through pregnancy, no measurements were taken. The uterus contains a well-developed foetus in the right horn. The membranes and cotyledons are normal.

*Histological.*—The surface epithelium is high columnar, the glands are distended and actively secretory. The muscular layers show great increase in thickness of individual muscle fibres. The mucosa is vascular and oedematous.

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	Cm.	Cm.
Left.....	17·0	0·2
Right.....	19·0	0·2

The right tube contains a cyst, 3 mm. in diameter (Fig. 89), filled with clear, straw-coloured fluid and occluding the entire lumen.

*Histological.*—The cyst is composed of multilocular cavities lined by flattened epithelium. On the one side, near the edge of the tube, there is a small section presenting the normal structure. The left tube is normal with low columnar epithelium and large, oval central nuclei. The surface is covered with minute globules of cytoplasm, which are extruded from the underlying cytoplasm and, in some cases, still attached to the latter by a thin neck or strand. Many nuclei are also thrust out and appear to be lying free on the surface. These structures give the epithelial surface an irregularly serrated appearance.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	4·0	2·0	1·2	5·0
Right.....	5·0	3·5	1·8	10·5

The *left ovary* contains numerous follicles in various stages of maturity.

*Histological.*—One of the larger follicles shows pycnosis of the nuclei of the granulosa cells (Fig. 103), very similar to that seen in the early stages of cystic follicles.

The *right ovary* contains a large, pale orange corpus luteum of pregnancy and a number of follicles which are histologically normal.

*Total weight of genitalia* : (Excluding foetus, membranes and fluids), about 7 Kilograms.

*Mammary Glands.*—The alveoli and ducts are well developed and contain a small amount of secretion. There is a moderate proportion of connective tissue in the stroma.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
2·2	1·1	1·0	1·7

*Anterior Lobe.*—Proportional cell count: Alpha cells, 58·2; beta cells, 9·0; chromophobes, 32·8 per cent.

Large numbers of the *alpha cells* are partially degranulated, the so-called “pregnancy cells”, while others are large, deeply staining and with prominent Golgi apparatus. Many of these cells have pycnotic nuclei.

The *beta cells* are present in all stages, from large, deeply staining cells with large, delicate nuclei and prominent Golgi apparatus, to small, degranulated cells with pycnotic nuclei.

The pars intermedia and nervosa are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1.5	0.5	0.4	0.2

The pineal body contains a moderate number of corpora arenacea and shows nothing unusual.

*Thyroid.*—Left lobe, 6.0 × 4.0 × 1.5 cm. Right lobe, 6.0 × 5.0 × 1.2 cm. Length (including isthmus), 22 cm. Weight, 35 grams. Macroscopically normal.

*Histological.*—The follicles are large with flattened epithelial lining, the cytoplasm of which is laden with fat droplets.

*Thymus.*—Involution advanced, shows nothing unusual.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	6.0	3.5	1.1	12.0
Right.....	6.0	3.0	2.0	12.0

There are a few pycnotic nuclei in the cells of the zona fasciculata and reticularis, while lipoid granules are visible in the cytoplasm of the zona glomerulosa and fasciculata cells.

*Diagnosis.*

Retention cyst in the right Bartholin gland, which is of no consequence. Retention cyst in right Fallopian tube, which had evidently arisen subsequent to fertilisation. Normal, right-sided pregnancy of 183 days.

Cow No. 7157. (FIG. 68.)

*Date of birth:* 2.3.1936. *Birth weight:* 58.8 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 458 days (15.0 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: One short period (4 days) towards the end of the fifth year, otherwise normal.

5-6 years: One long period (102 days), otherwise normal; pregnant.

6-7 years: Parturition followed by irregular long periods (43 to 59 days).

## INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

7-8 years: Irregular long periods (56 to 91 days), with normal periods at intervals.

8-9 years: As above; last two periods before slaughter accompanied by prolonged oestrus of 17 and 13 days duration.

*Age at first service:* 5 years 0·5 months.

*Pregnancies:* (Table XXI, Appendix II).

One only: 4 services, full term, 265 days, normal parturition, female calf, 54 pounds (Fig. 68).

### *Clinical Observations.*

Subsequent to parturition a total of 13 services was given over a period of two years without further conception taking place.

Developed symptoms of nymphomania thirty-seven days before slaughter, with bilateral cystic ovaries. Genital tract normal.

### *Slaughter Data.*

*Age when slaughtered:* 8 years 5·7 months.

*Live weight:* 1,525 pounds.

*“Dressed” weight:* 982 pounds.

*Percentage “dressed” weight:* 64·4.

*Sex condition:* Nymphomania.

### *Postmortem and Microscopic Examination of the Genitalia and Endocrines.*

*Vulva.*—Length, 8 cm. Width, 8 cm. Bartholin glands normal. Mucosa bright pink and moist.

*Histological.*—The epithelial layer is wide and the cells are swollen. There is slight cornification of the superficial squamous layer. The stroma is oedematous and congested and is moderately infiltrated with leucocytic cells.

*Vagina.*—Length, 25 cm. Width, 6 cm. Gärtner's canal on the left side is obliterated, while the right canal is patent. The mucosa is bright pink in colour and covered with a fair quantity of tenacious, slightly opaque, yellow mucus.

*Histological.*—The epithelial layer consists of nine to twelve rows of large, well-defined polyhedral cells, with a superficial layer of flattened cells. There are a few swollen goblet cells present. There is intense infiltration of neutrophilic and lymphocytic cells in the epithelium and stroma. The latter is moderately congested and oedematous.

*Cervix:* Length, 9 cm. Width, 4 cm. The os projects 3 cm. into the vagina and admits one finger with ease. The caudal transverse fold is visible. The canal is patent and the transverse folds are indistinct. The mucosa is pale pink in colour and covered with slightly tenacious, clear mucus.

*Histological.*—The glandular epithelium is high columnar, swollen with small, elongated, flattened nuclei, situated basally (Fig. 22). There is mucus present in the lumina. The stroma is moderately congested and oedematous and fair numbers of lymphocytes are present.



*Uterus.*

	<i>Length.</i>	<i>Width.</i>	<i>Thickness</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>of Wall.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>
Body.....	2·0	4·0	0·8
Left Cornu.....	26·0	4·0	0·8
Right Cornu.....	28·0	4·0	0·8

The mucosa is pale brownish in colour and moist. The cotyledons are prominent and the muscular layers are normal.

*Histological.*—The surface and glandular epithelium is low columnar and in a non-secretory phase. The stroma is moderately congested and oedematous.

*Fallopian Tubes.*

	<i>Length.</i>	<i>Width.</i>
	<i>Cm.</i>	<i>Cm.</i>
Left.....	19	0·2
Right.....	20	0·2

The tubes are macroscopically normal.

*Histological.*—The epithelium is high columnar with scant ciliation and basal nuclei (Fig. 87). The stroma is slightly congested and oedematous, while the muscular coats are normal.

*Ovaries.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>	<i>Gm.</i>
Left.....	5·0	4·0	3·0	28
Right.....	4·0	2·0	1·5	6

The *left ovary* contains a single large cyst, 3·8 cm. in diameter and traces of old corpora lutea. There are no follicles in the process of maturation visible.

*Histological.*—The cyst wall shows a degenerate granulosa layer and vascularisation of the theca interna (Fig. 92). Both layers contain a large number of lipid granules.

The *right ovary* contains a single cyst 1·5 cm. in diameter, and an old corpus luteum. No follicles are visible.

*Histological.*—The cyst presents a similar structure to that in the left ovary.

*Total weight of genitalia:* 515 grams.

*Mammary Glands.*—The alveoli and ducts are well developed and distended with secretion. There is a fair proportion of connective tissue in the stroma.

*Pituitary.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
<i>Cm.</i>	<i>Cm.</i>	<i>Cm.</i>	<i>Gm.</i>
2·3	1·6	1·4	2·7

*Anterior Lobe.*—Proportional cell count: Alpha cells, 48·4; beta cells, 8·3; chromophobes, 43·3 per cent.

INFLUENCE OF DELAYED BREEDING ON FERTILITY OF BEEF HEIFERS.

The *alpha cells* are closely packed and heavily granular, with prominent, in some cases hypertrophic, Golgi apparatus. Large delicate nuclei and pycnotic nuclei are about in equal proportion. "Islets" of alpha cells are present in the central basophilic area of the gland (Fig. 110).

The *beta cells* vary from lightly granular to heavily granular with prominent Golgi.

The pars intermedia and nervosa are normal.

*Pineal.*

<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
Cm.	Cm.	Cm.	Gm.
1.5	0.7	0.7	0.25

The pineal body contains a few corpora arenacea and presents nothing unusual.

*Thyroid.*—Left lobe, 5.0 × 4.0 × 1.0 cm. Right lobe, 6.0 × 4.0 × 1.0 cm. Length (including isthmus), 21 cm. Weight 34 grams. Macroscopically normal.

*Histological.*—The follicles are large and lined by flattened to cuboid epithelium, containing many fat droplets.

*Thymus.*—Almost completely involuted, shows nothing unusual.

*Pancreas.*—Normal.

*Adrenals.*

	<i>Length.</i>	<i>Breadth.</i>	<i>Width.</i>	<i>Weight.</i>
	Cm.	Cm.	Cm.	Gm.
Left.....	6.0	4.0	1.5	12.5
Right.....	5.5	3.0	1.2	10.0

Many cells in the zona fasciculata and reticularis have pycnotic nuclei and heavily staining cytoplasm. The cytoplasm of the cells in the zona glomerulosa and fasciculata are heavily laden with lipid granules.

*Diagnosis.*

Bilateral, large follicular ovarian cysts, associated with nymphomania.

Cow No. 7172. (FIG. 36.)

*Date of birth:* 10.4.1936. *Birth weight* 55 pounds.

For body weights see Table I, Appendix II.

*Sex History.*

*Age at first oestrus:* 540 days (17.7 months).

*Subsequent oestrous periods:* (Tables II-XX, Appendix II).

1-2 years: Normal.

2-3 years: Normal.

3-4 years: Normal.

4-5 years: Normal.