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STUDIES ON REPRODUCTION IN THE GOAT

V. PATHOLOGICAL CONDITIONS AND MALFORMATIONS OF THE GENITAL ORGANS OF THE GOAT*)

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The goat is a fertile animal. Besides the ewe, the goat is the one of our domesticated animals that is the easiest to impregnate. In Norway 95—98 % of all goats that are mated will become pregnant (*Lyngset 1966*). Malformations and other pathological conditions in the genital tract of the goat, with the exception of hermaphroditism, seem to be of little importance. Hermaphroditism, however, has not been without significance in goat breeding in this country and in several other countries.

Slaughterhouse material is suitable for the recording of the frequency of malformations of the genital organs and is used to a large extent, i.e. in the mare (*Arthur 1958*), the cow (*Lagerlöf 1939, Lagerlöf & Boyd 1953*), the pig (*Teige 1957*) and the sheep (*Gustafsson & Holmberg 1966*). On reviewing the literature no report has been found on a similar systematic investigation in the goat.

In the autumn of 1964 a study of the sex organs from goats, collected from the slaughterhouse, was commenced. The main object was to obtain a survey of the frequency of possible malformations and other pathologico-anatomical conditions in the genitalia of the female goat.

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MATERIAL AND METHODS

The organs were collected from a number of slaughterhouses in Norway. No information regarding the animals was available. Thus the reason for slaughtering is unknown. Immediately after exvisceration in the slaughterhouse the organs were deep-frozen and sent to the laboratory. The organs were partly examined immediately after reception or they were placed in the freezing room until the examination could take place. Prior to the examination the organs were thawed in cold water (5—10°C) and they were left in the water until they were examined. A total of 1020 organs were examined and of these 397 were from pregnant goats.

RESULTS

In Table 1 the pathological changes which were recorded in this material are presented.

Table 1. Defects and malformations of the genital organs of the goat.

	No. of observations	%
Ovarian cysts	24	2.4
Abscess in the ovary	1	0.1
Hypoplasia of the ovary?	1	0.1
Parovarian cysts	11	1.1
Cystic enlargement of the Fallopian tube	1	0.1
Corcscrew formed uterine horns	1	0.1
Hydrometra	3	0.3
Maceratio foeti	6	0.6
Metritis	6	0.6
Anastomosis between the vesica and the left uterine horn	1	0.1
Polyp in cervix	2	0.2
Tumour (Fibroma) in the vagina	1	0.1
Abscess in the vagina	1	0.1
Stricture of the vagina	1	0.1
Inflammation of the canals of Gartner	3	0.1
Hermaphrodites	6	0.6
Total no. of defective organs	69	6.8
Total no. of organs examined	1020	

Defects of the ovaries, bursae and tubes

Cysts were found in the ovaries in 24 organs (Fig. 1). In two organs cysts were discovered in both ovaries and in one of these

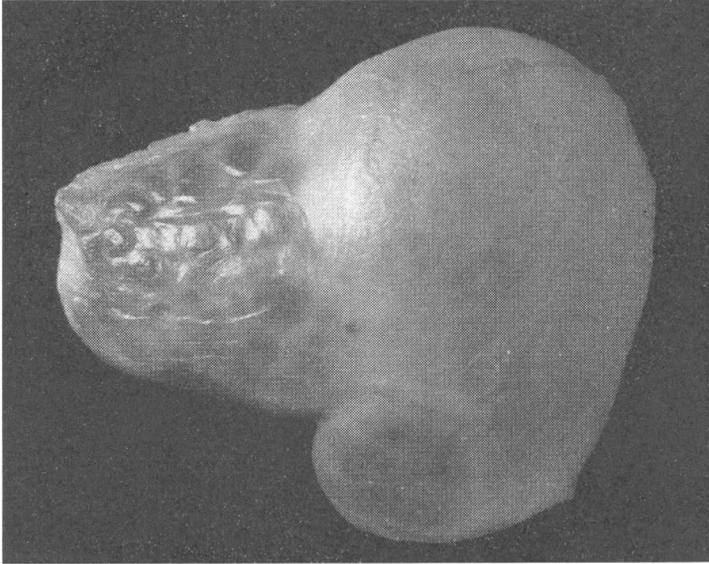


Figure 1. An ovarian cyst.

organs there were two cysts in the right ovary. In another organ two cysts were found in the left ovary. In the goat a mature Graafian follicle measures 1.0 cm on the average. In the present material "follicles" larger than 1.2 cm were recorded as cysts. Twenty-seven cysts with a diameter of 1.2—3.7 cm, an average of 1.71 cm, were recorded. The cysts were shiny, with a bluish tinge, most often with a tense fluctuating consistency. Sometimes the cyst-wall was thick and gave the cyst a white-milky appearance (Fig. 1). In some cases they were more deflated and of a soft consistency. No luteinization of the cysts could be macroscopically detected. Of the 27 cysts, 16 or 59.3 % were in the right ovary.

In one of the organs the left ovary was very small. It was impossible to delimit it from the mesentery, bursa and the surrounding tissue. In the place where the ovary should have been, only a somewhat firmer, stringy formation which was diffused into the surrounding tissue could be felt.

In one case an abscess was found which seemingly lay outside the ovary but adherent to its capsule.

Cysts in the bursa and mesosalpinx were observed several times, in 11 organs in all (Fig. 2). The cysts were clear, thin-

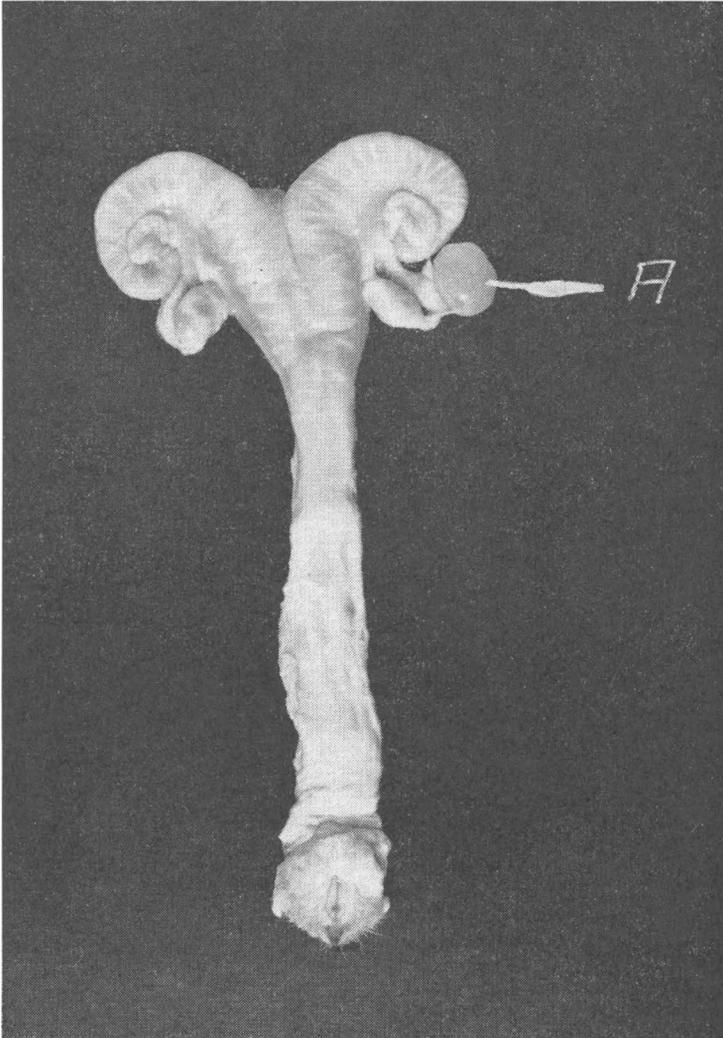


Figure 2. A parovarian cyst.

walled, very tense, hard and of a somewhat varying size from less than 1 cm in diameter up to 2--3 cm in diameter. As shown in Fig. 3, a cystic enlargement of the tube was also found.

Defects of the uterus and cervix

Hydrometra was recorded in three cases (Fig. 4). In all of them the organ was of a pale pinkish colour, thin-walled and contained a thin, clear, pale yellow fluid. The fluid volume was

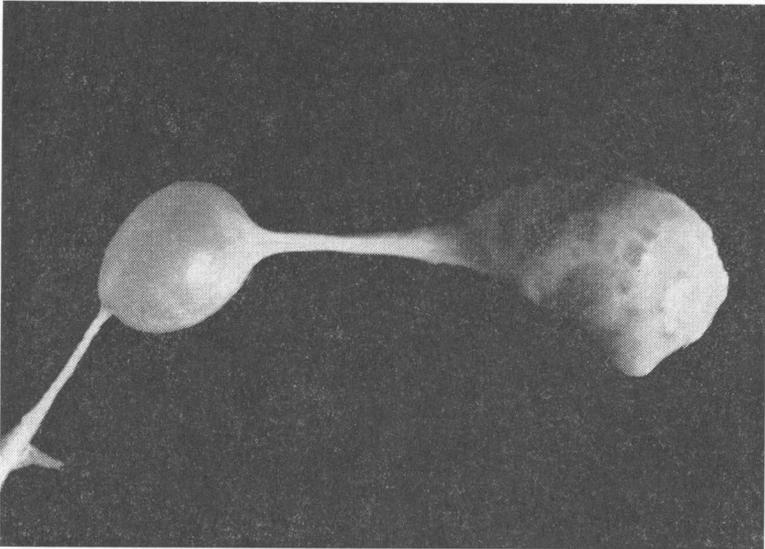


Figure 3. A cyst in the Fallopian tube.

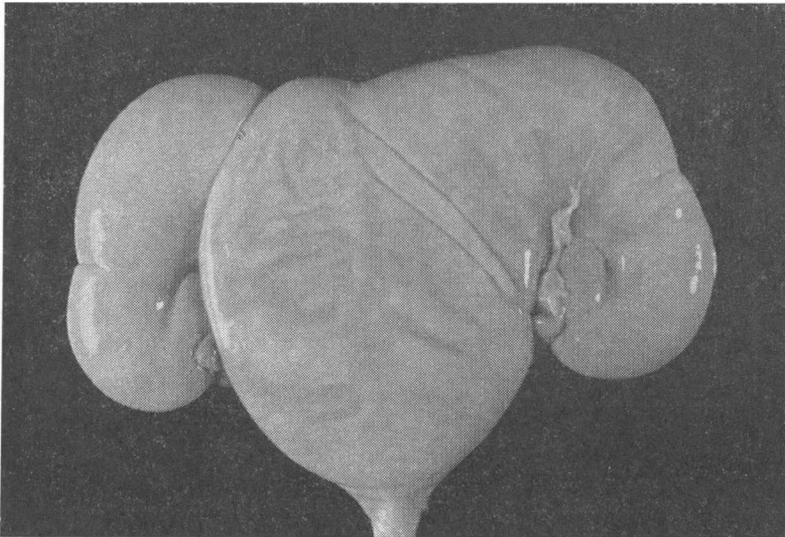


Figure 4. A case of hydrometra.

measured in one case and was found to be about 2.3 l. No remnants of foetuses or foetal membranes could be observed in any of the cases. In one case the caruncles were large. The ovaries had been removed from the organ in two cases, but were present

in the third and contained one large follicle and two active corpora lutea. In none of the organs could be demonstrated any obstruction or occlusion of the cervix, or parts of the organ lying posterior to it, which could be responsible for the fluid retention in the uterus.

The six cases which in Table 1 are characterized as metritis, are cases where an inflammatory condition in the uterus was macroscopically obvious. The uterine mucous membrane was injected, thickened, often greatly miscoloured and there was a collection of pus in the uterine cavity.

Macerated foetuses were found in six cases. In most of the cases the maceration was so progressed that only bony remnants remained in the uterus. On one occasion a long bone (left tibia), 0.58 cm at the smallest diameter, was found. In some cases the maceration was not complete and soft parts were also present in the uterus.

In one case a corkscrew twisting of both uterine horns was observed. This twisting was complete and impossible to unwind.

An anastomosis between the bladder and the uterus was observed in one case. The bladder and left uterine horn were adhering for a length of 4 cm. There was a canal 2 cm long and 0.4 cm in diameter between the uterus and the bladder so that there was a definite communication between the cavities of the two organs. Two pieces of bone approximately 2 cm in diameter lay in the uterus and two pieces, about 1 cm in diameter, in the bladder. The bone pieces were thin, brittle and greyish-brown in colour.

In two cases polypous formations were observed protruding from the cervix.

Defects of the vagina and external genitalia

A neoplasm protruding from the dorsal vaginal wall was demonstrated in one case (Fig. 5). The tumour was semispherical with a diameter of 3.5 cm. It was necrotic on top and of a very firm consistency. On histological examination, carried out by Prof., dr. med. vet. R. Svenkerud, it presented the picture of a fibroma.

In one case a stricture of the vagina was observed. There was a marked narrowing about the middle of the vagina and cranially to this stricture there was a moderate dilatation of the vagina.

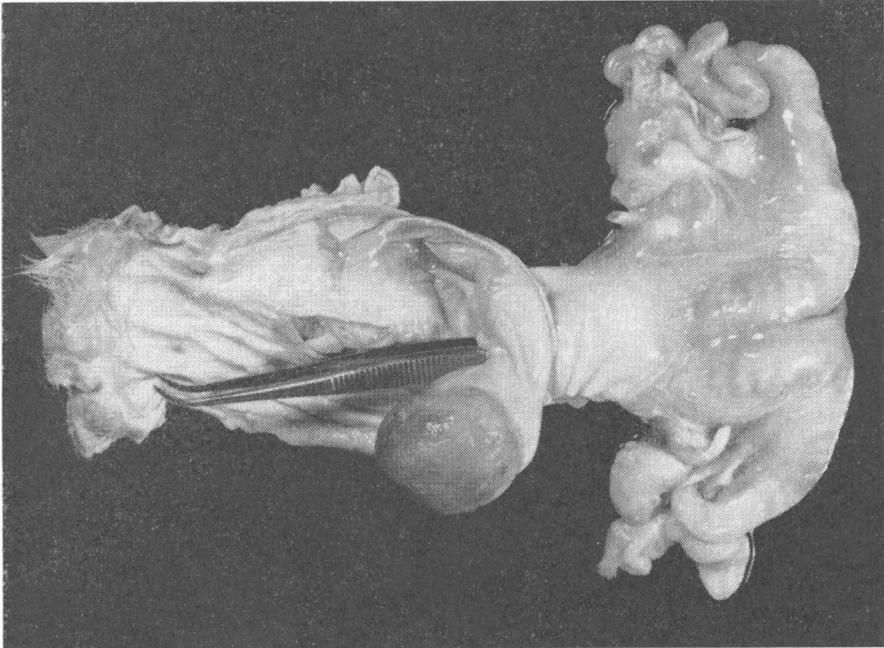


Figure 5. A fibroma in the vagina.

An inflammation of the vagina with a peri-vaginal abscess was observed. The abscess was about 4 cm in diameter and contained a thick, yellowish-green pus. A canal led from the abscess out into the lumen of the vagina.

A thickening of Gartner's ducts was found in three cases. They protruded clearly and lay like strings in the bottom of the vagina. The content was yellow to more yellowish-green in colour and the consistency was thick fluid, almost pasty.

In six cases deviations from the normal sex apparatus which indicated hermaphroditism were found. On exvisceration two of these organs had been amputated just caudally to the cervix in such a way that it was impossible to determine the appearance of the external genitalia. One organ was apparently entirely normal with the exception of the gonads. In the three remaining organs, in addition to the changes in the gonads, a marked hypertrophy of the clitoris was observed. A more detailed description of hermaphroditism in the goat will be given in a later paper.

In some cases the only change found in the genitalia was a

hypertrophy of the clitoris. Normally the clitoris protrudes only slightly from the fossa clitoridis and should not be visible between the lips of the vulva. In the cases mentioned the clitoris measured up to 3 cm in length.

DISCUSSION

Out of a total of 1020 organs examined in this material, 69 were found with pathological changes of one form or another. These made up 6.8 % of the total material. An earlier investigation, based on information obtained from goat breeders, disclosed that about 4.0 % of the goats are removed because of sterility (*Lyngset* 1966). In a material of 502 organs from sheep *Gustafsson & Holmberg* (1966) found a frequency of malformations and other pathological changes of 6.4 %. There was, as mentioned, no information available regarding the organs discussed here, so that the reason for slaughtering the animals is not known. The age of the animals is therefore not recorded. It was discovered previously that advanced age made up about 20 % of the reasons for eliminating the goats (*Lyngset* 1966). It is possible that the age distribution among the animals included in this material is inclined to be rather high as compared to the age distribution in the goat population as a whole.

The occurrence of malformed foetuses does not appear to be especially large in the goat. There were 552 foetuses recorded in the organs from the pregnant goats. In one foetus a malformation of the left foreleg was observed. The leg was normal in appearance proximally to the elbow joint, while distally to the joint it was much smaller than normal. Among 234 kids, where it was possible to identify the sex, four hermaphrodites were discovered (*Lyngset* 1968b).

The frequency of ovarian cysts is high in this material and makes up 2.4 % of the total material and over $\frac{1}{3}$ of all the pathological changes recorded. In their material from sheep *Gustafsson & Holmberg* found a frequency of cysts of only 0.6 %. According to this it would appear that the frequency of ovarian cysts is somewhat higher in the goat than in the sheep. It is possible that some of the cases here recorded as cysts may be within the normal range of the size of Graafian follicles and thus some of the discrepancy with the figures of the sheep can be explained.

Cystic corpora lutea were also recorded in a number of cases. Since the investigation was not especially directed towards these, only about half of the material is included in this study. Normally, in a large number of corpora lutea, a cavity with a somewhat varying diameter, from a small crack to a hole 2—4 mm in diameter, will be found. No standpoint will be taken here as to the borderline between normal and pathological as far as this cavity is concerned. Neither will the significance of cystic corpora lutea be further discussed. In about half of the material 30 cases were recorded where a cystic transformation of the corpus luteum had clearly taken place. The thickness of the cyst walls varied from 0.5—2 mm.

Histological examination was unfortunately not undertaken in the case which is described and which is listed under hypoplasia of the ovary in Table 1. It is therefore impossible to say whether hypoplasia of the ovary was present. Hypoplasia of the ovaries in the goat does not appear to have been described. This ovary was a great deal different from the others seen; although these ovaries were small, they were, nevertheless, well defined and well confined organs.

Other pathological conditions in the ovaries were not demonstrated. Tumours were not recorded. Ovarian tumours are very rare in the goat, aside from the description of a large granulosa cell tumour (*Lyngset* 1963). It has not been possible to find any special mention of ovarian tumours in the goat in the literature.

Pathological conditions of the salpinx and bursa were observed in a number of cases. Cysts in the bursa and mesosalpinx occur relatively frequently and next to ovarian cysts are the most common disorder in the present material. The significance for fertility is difficult to state, but according to the localization of the cysts it appears that they don't necessarily have any bearing on reproductivity. Inflammatory conditions with possible thickening of the tubes were not observed. The cause of the observed cystic distension of the tubes could be an ascending inflammation with secondary occlusion of the lumen. Otherwise disorders in the tubes and bursa appear to occur relatively seldom in the goat. Bursal adhesions or cases where the bursa had surrounded and grown into the ovaries were recorded in some cases. It is difficult to decide whether these adhesions consistently influence reproductivity. In one case the ovary was com-

pletely enveloped in the bursa, but an ovulation had taken place and the goat was pregnant (*Lyngset* 1968a). Naturally it can not be excluded that the ovary and bursa had adhered after conception.

Judging from the frequency found in this material, disorders of the salpinx and bursa do not seem to play the same part in the goat as, for example, in the cow (*Moberg* 1954, *Dawson* 1958). A probable explanation is that the ovaries in the goat are not available for clinical examination and neither therefore are they exposed to manipulation with massage and enucleation of the corpus luteum.

No bacteriological examination of the organs was undertaken in this study as the material was little suited for such examination. The cases characterized as metritis are those where it was macroscopically apparent that an inflammatory condition was present in the uterus. In some cases in addition to these there was a suspicion of metritis, and bacteriological and histological examination of the organ would probably have verified the diagnosis. Metritis in the goat, as in other domesticated mammals will result from several causes. *Küst & Schaetz* (1953) claim that on examination of slaughterhouse organs from non-pregnant goats it is very common to find cases of metritis or various degrees of catarrh in the uterus.

As to the pathology of the anastomosis between the bladder and the uterus which has been described several possibilities are conceivable. A rupture of the left uterine horn has probably occurred in connection with a birth with secondary fusion with the bladder and development of an anastomosis. The goat has become pregnant again and the distention of the uterus has opened the preformed canal between the bladder and uterus. It is conceivable that urine has entered the uterus and affected the foetus which has succumbed and undergone maceration. Therefore bony remnants were found in both the uterus and the bladder. Anastomosis between the uterus and colon have previously been described (*Wells* 1952).

The mentioned polyps have most probably hampered passage through the cervical canal. *Keusch* (cited by *Honeker* 1951) report a case with a cherry-sized tumour in the cervix with resulting sterility.

Disorders of the vagina and external genitalia seldom occur. The described neoplasm in the vagina has probably been the

cause of sterility since it apparently totally blocked the external uterine os.

With the exception of hermaphroditism, malformations of the genital organs appear to occur relatively seldom in the goat. Nor do other disorders appear to be especially common. Ovarian cysts seem to be the only disorder which influences the reproductivity of the goat.

REFERENCES

- Arthur, G. H.*: An analysis of reproductive function of mares based on post-mortem examination. *Vet. Rec.* 1958, *70*, 682—686.
- Dawson, F. L. M.*: The diagnosis and significance of bovine endosalpingitis and ovarian bursitis. *Vet. Rec.* 1958, *70*, 487—493.
- Gustafsson, B. & O. Holmberg*: Post-Mortemundersökning av könsorgan från tackor med speciell hänsyn till förekomst av missbildningar. *Svensk Vet.-Tidn.* 1966, *18*, 432—436.
- Honeker, A.*: Die Krankheiten der Ziege. Verlag für Kleintierzucht. H. Welkerhaus, Dortmund 1951.
- Küst, D. & F. Schaetz*: Fortpflanzungsstörungen der Haustiere. Ferdinand Enke Verlag, Stuttgart 1953.
- Lagerlöf, N.*: Hypoplasi av könsorganen hos nötkreatur som orsak till ofruktsamhet. 5. Nord. Vet. Congr. Copenhagen 1939, 609—630.
- Lagerlöf, N. & H. Boyd*: Ovarian hypoplasia and other abnormal conditions in the sexual organs of cattle of the Swedish Highlandbreed. Results of post-mortem examination of over 6000 cows. *Cornell Vet.* 1953, *43*, 64—79.
- Lyngset, O.*: Stor ovarialtumor hos geit. *Medlemsbl. norske Vet.-foren.* 1963, *15*, 300—302.
- Lyngset, O.*: Fruktbarhet hos geit. *Medlemsbl. norske Vet.-foren.* 1966, *18*, 68—72.
- Lyngset, O.*: Studies on reproduction in the goat. I. The normal genital organs of the non-pregnant goat. *Acta vet. scand.* 1968a, *9*, 208—222.
- Lyngset, O.*: Studies on reproduction in the goat. IV. The functional activity of the uterine horns of the goat. *Acta vet. scand.* 1968b, *9*, 308—315.
- Moberg, R.*: Disease condition in the Fallopian tubes and ovarian bursae of cattle. *Vet. Rec.* 1954, *66*, 87—89.
- Teige, J.*: Congenital malformations of the Müllerian ducts and sinus urogenitalis in pigs. *Nord. Vet.-Med.* 1957, *9*, 609—629.
- Wells, E. A.*: Anastomosis between the large intestine and uterus in goats. *Vet. Res.* 1952, *64*, 639—640.

SUMMARY

1. An investigation was undertaken of a total of 1020 genital organs from goats with regard to malformations and pathological changes of the genital tract.
2. A total of 69 organs with some form of abnormality were recorded. These comprise 6.8 % of the total material.
3. Ovarian cysts were observed in 24 organs, or in 2.4 % of the total material. The size of the cysts varied from 1.2 to 3.7 cm in diameter.
4. Cysts in the ovarian bursa and mesosalpinx were recorded in 11 cases.
5. Three cases of hydrometra were observed.
6. Malformations of the foetus, with the exception of hermaphroditism, occur relatively seldom.

ZUSAMMENFASSUNG

*Untersuchungen über die Reproduktion bei Ziegen.**V. Pathologische Zustände und Missbildungen der Genitalorgane bei Ziegen.*

1. Eine Untersuchung von insgesamt 1020 Organen von Ziegen ist vorgenommen worden im Hinblick auf Missbildungen und pathologische Zustände in den Genitalorganen.
2. Im ganzen wurden 69 Organe mit irgendeiner Abnormität registriert. Diese machten 6,8 % des gesamten Materials aus.
3. Zysten in den Eierstöcken wurden in 24 Organen oder in 2,4 % des gesamten Materials festgestellt. Die Grösse der Zysten variierte von 1,2 bis 3,7 cm im Durchmesser.
4. Zysten in Bursa ovarii und Mesosalpinx wurden in 11 Fällen registriert.
5. Drei Fälle von Hydrometra wurden beobachtet.
6. Missbildungen der Früchte ausser Hermaphroditismus kommen relativ selten vor.

SAMMENDRAG

*Undersøkelser over reproduksjonen hos geit.**V. Patologiske tilstander og misdannelser av genitalorganene hos geit.*

1. Det er foretatt en undersøkelse av i alt 1020 organer fra geit med henblikk på misdannelser og patologiske forandringer i genitaltraktus.
2. I alt ble det registrert 69 organer med en eller annen abnormitet. Dette utgjør 6,8 % av hele materialet.
3. Cyster i ovariene ble iaktatt i 24 organer eller 2,4 % av hele materialet. Størrelsen av cystene varierte fra 1,2 til 3,7 cm i diameter.
4. Cyster i bursa ovarii og mesosalpings ble registrert i 11 tilfeller.
5. Tre tilfeller av hydrometra er iaktatt.
6. Misdannelser av fostrene foruten hermafroditisme forekommer relativt sjelden.

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