

قسم الولادة وأمراضها والتلقيح الصناعي وقسم الباثولوجيا
دراسة عن نسبة انتشار حالات التفويت الجنسى بين الجاموس
فى قرى محافظة أسسيوط فى ج. م. ع والتغيرات الرحمية
الهستوباثولوجية التى تصاحب مثل هذه الحالات

دكتور م. النجار - دكتور م. الشرى

الملخص

قام الباحثان بعمل دراسة عن مدى انتشار ظاهرة التفويت الجنسى بين الجاموس
فى بعض قرى محافظة أسسيوط . وقد وجد أن هذه النسبة وصلت الى ٢٢% . وقد تمكن
الباحثان من أخذ عينة من رحم الحيوانات الحية التى تعانى من هذه الظاهرة وتم دراسة
التغيرات الهستوباثولوجية التى تحدث فى الرحم وقد تبين أنه من بين التغيرات الرحمية
التي تؤدى الى هذه الظاهرة هى اما التهاب الرحم النزلى أو الحاد أو الضمور الرحمى .

وقد ناقش الباحثان أيضا أهمية أخذ عينة من الرحم من الحيوانات الحية فى تشخيص
مثل هذه الحالات وتحديد مدى صلاحية تلك الحيوانات من الناحية التناسلية .

فصل اول در بیان احوال و حال
و در بیان احوال و حال
و در بیان احوال و حال
و در بیان احوال و حال

*Department of Obst., Gynea. and A.I. and Dept. of Pathology,
Fac. of Vet. Med., Assiut Univ.*

Head of Dept. Prof. Dr. M. Abdel Rauf.

INCIDENCE AND PATHOLOGICAL CHANGES IN ENDOMETRIAL
BIOPSY OF THE REPEAT BREADERS BUFFALOES
IN ASSIUT PROVINCE EGYPT.

(With 8 figures and 1 table)

By

M.A. El-Naggar and M.I. El-Sherry

(Received at 6 - 6 - 1974)

SUMMARY

The incidence of repeat breeders among buffaloes in Assiut province was found to be 22%. By modification of the "Hauptner" biopsy instrument, it was possible to obtain a representative of endometrial sample.

The pathological changes found to be responsible for repeat breeding in buffaloes were chronic catarrhal endometritis, acute catarrhal endometritis and endometrial atrophy.

The evaluation of the biopsy sample for the histopathological diagnosis as well as for the determination of the reproductive prognosis of buffalo cows was discussed.

INTRODUCTION

Infertility among cattle and buffaloes constitutes a large problem and results in considerable economical loss all over the world. In the A.R.E. the economical loss ; resulting from infertility of cattle and buffaloes was found to be about 214. 900 Egyptian pounds (BARR 1963).

Repeat breeding represent a significant problem among the numerable causes of infertility. Studying the enumeration of animal population done in Egypt in 1952, RAKHA (1958) concluded that 55% of mature buffalo cows were irregular breeders. An approximate data, during the period from 1952 to 1956, was given by the National Research Council at Bahtim, Egypt which found that 40% out of 3000 bufaloes were irregular breeders. This percentage (40%) was also recorded in the Egyptian governmental farms by LUNDGREN (1956).

EL-DESSOUKI (1952) and ROBERTS (1971) had reviewed the causes of repeat breeding in cattle and found that it may be due to either failure of fertilization or to early embryonic death. Defective or delayed ovulation, superovulation, degenerated or ruptured ovum and inflammatory conditions of the oviduct are responsible causes for failure of fertilization. The early embryonic death is caused by several factors : congenital or genetic defect, abnormal ova or embryos, diseased or infected fertilized ova or embryo and abnormal lethal environmental conditions of the endometrium due to inflammatory, hormonal or nutritional causes.

Uterine inflammation as a cause for repeat breeding occupied the highest percentage in comparison with the incidence of other causes. BRUCE (1954) gave on 45% of incidence, AFANASJEVS (1972), 65% and CUPPS (1973), 55%.

The problem of repeat breeding was handled out by TANABE and CASIDA, 1949 ; CHRISTIAN, ULBERG and CASIDA, 1951 ; CASIDA, 1953 ; TANABE and ALMQUIST, 1953 ; KIDDAR, BLACK, WILTBANK, ULBERG and CASIDA, 1954 ; and BEARDEN, 1954 ; GRADEN, and OLDS, 1962 ; and BHOSREKAR, 1973 either through clinical observations or experimentally by inseminating heifers and slaughtering them at different intervals for examination of the ova and the implanted embryos.

ROBERTS (1971), in his interesting review, draw a conclusion that more histopathological studies will have to be performed on this phase of the problem to arrive at a definite and authoritative answer.

The use of uterine biopsy have enabled the investigators to have a full representative picture of the endometrial morphology and its cyclic changes during life (SKJERVEN 1956). The first attempt to investigate the changes in the endometrium that may interfere with conception and therefore results in failure of implantation was done by BRUCE, 1952 & 1954 ; KAMPLE-MACHER, 1952 & 1954 ; ADLER, 1952, & 1954 ; MINOCHA, MARION, GIER and MACHON, 1964 and LEONTIDIS, 1968. These authors together with AFANASJEVS (1972) had searched materials which were obviously showing clinical deviation in the genital tract. The condition is still more difficult in those animals showing repeat breeding without manifesting any clinical deviation and could not be clinically recognized.

The aim of this work is to demonstrate the incidence of repeat breeders among the buffalo cows in Assiut Province and by using uterine biopsy, to investigate the histopathological changes of the endometrium that may be responsible for failure of conception and embryonic death.

During the period from October 1972 to May 1974, the Ambulatory clinic of the Dept. of Obst. and Gynaec. Faculty of Vet. Med., Assiut University had visited 20 villages regularly every week in Assiut Province. Among the buffalo cows suffering from infertility, repeat breeding were recorded.

Information concerning the breeding history of each individual case including the age, number of previous parturition, date and condition of last parturition, date of last service, frequency of cycles and character of oestral mucous were recorded.

Clinical examination of the genital organs was performed by rectal palpation of the cervix, uterine horns and the ovaries. Vaginal examination was also done. Animals showing any abnormal discharge from the vagina or with an apparent lesion in the genital organs were not included in this study.

Endometrial biopsy samples were taken by means of uterine biopsy instrument released by "Hauptner" West Germany. The punching ends were modified by the authors into sharp cutting ones*. Trials to take biopsy specimens with the original punching blunted end biopsy instrument "Hauptner" was not representative as the samples were mostly composed of desquamated cells and mucous. These samples were discarded.

The external genitalia was washed then wiped clean by a piece of cotton. The sterile biopsy instrument was inserted into the vagina and is then guided into the cervix by means of a gloved lubricated hand into the rectum. The inner probe of the instrument is pushed forward, so that a fold of the endometrium is hold in this space, by pressing it with the hand inside the rectum ; it is then pulled again backward. The biopsy instrument is then taken away. The biopsy sample was taken only during the oestrus phase of the cycle.

Samples taken were preserved in 10% neutral buffered formaline. Embedded in paraffin according to MERKOLOF (1969) for embedding biopsy material. Sections of 7 μ . thickness were stained by H & E for histopathological review.

* This was kindly performed at the Dept. of Mechanics, Faculty of Engineering, Assiut University.

RESULTS

Table (1) shows that out of 915 buffaloes gynaecologically examined at different villages of Assiut Province, 193 animals (22%) were irregular and regular repeat breeders. The irregular breeders represented 83.5%, while those repeat breeder with regular occurring cycles constitute 16.5%. The high percent of repeat breeding was observed at Abnub village where it reaches 72%. The lowest percent (9.6%) was recorded at Beni Sanad. The average (22%) was represented in Doronka, Mousha, Naslet Bakour and El-Zawia. Modification of the biopsy instrument from punching, into sharp cutting end enabled us to obtain endometrial specimens completely representative for the status of the endometrium including the epithelium lining, stroma and uterine gland.

The pathological alterations observed in eight cases ; taken by such a way ; and incriminated as being a cause for repeat and irregular breeding was summarised as follows :

ENDOMETRIAL ATROPHY : This condition included two cases from Mankabad village. Case number (1) was two and a half years buffalo heifer, and case number (2) was five years buffalo cow. Both showed three occurring cycles with failure of conception.

Although the majority of the lining epithelium was absent, but low cuboidal or flattened cells were covering some parts. The C.T. stroma was moderately oedematous, the fibers were separated apart and infiltrated by few number of polymorph nuclear leucocytes. Individual erythrocytic extravasation was observed. The uterine glands were few in number, small in size, and lined by low cuboidal cells. In some acini the lining epithelial cells were desquamated in the lumen and mixed with few polymorphs (Fig. 1). In the five years old buffalo cow, the atrophied glands were accompanied by periglandular fibrosis (Fig. 2).

ACUTE CATARRHAL ENDOMETRITIS : These conditions included four cases. Case number (3) was six years old buffalo cow with four previously occurring irregular cycles from Mankabad village. Case number (4) & (6) was seven years old with three irregular cycles from Doronka village. Case number (5) was ten years old with three irregular cycles from Abutig village.

The endometrial lining was the usual pseudostratified columnar ciliated cells. Few cells showed proteinous glandular dystrophy. The fibers of the endometrial stroma were widely separated and infiltrated by polymorph nuclear leucocytes, mononuclear cells and lymphocytes. Large phagocytic cells were

observed among the infiltrating cells. Some areas the C.T. stroma showed disorganization and disintegration of the C.T. fibers with basophilic amorphous substances in between. Erythrocytic extravasation varies among cases. It may be few individual erythrocytes infiltrating in the C.T. stroma or it may reach to a focal or diffuse areas of extravasation (Fig. 3).

Although the uterine glands proliferated to the normal size and number, in correspondance with the oestrus stage of the cycle ; but their lining epithelium showed the picture of vacuolar proteinous dystrophy (Fig. 4). The lining epithelium of some acini were desquamated into the luminae. The desquamated cells were mingled with leucocytes.

CHRONIC CATARRHAL ENDOMETRITIS : This condition include two cases. Case number (7) was a five years old buffalo with two regular cycles from Doronka village and case number (8) was eight years old buffalo cow with nine irregular cycles from Mankabad village.

The lining epithelium in this condition was pseudostratified ciliated columnar. The cells all over showed moderate vacuolations, but in some parts they were greatly swollen with very light granulated and vacuolated cytoplasm. In some areas metaplasia of some parts to stratified squamous epithelium was detected. Few lymphocytic infiltration was superimposed on the lining epithelium (Fig. 5).

The C.T. stroma of the endometrium was greatly distended with oedematous fluid showing several foci, patchy and diffuse extravasation of erythrocytes. The lamina was infiltrated by considerable amount of lymphocytic cells. Polymorph nuclear cells and few eosinophils were also detected. In focal areas periglandular fibrosis was observed and infiltrated by few leucocytes. The uterine glands showed the severe picture of mucous dystrophy (Fig. 6).

Although few uterine glands were more or less normal and corresponding with the oestrus stage of the cycle yet, the majority of the uterine glands were lined by so greatly swollen cells that the luminae of the glandular acini were totally obliterated and the boundaries were lost. The cytoplasm of the cells was highly granulated and vacuolated. Desquamation of the cells into the luminae of the glandular acini were observed. Few lymphocytes were superimposed on the glands.

TABLE 1 : Incidence of Repeat and irregular breeders among buffaloes in 50 villages belonging to Assiut Province

Frequency of cycles	Name of Villages																Total					
	Assiut	Mankabad	El-Hawatka	Beni Sanad	Doronka	Rifa	Moisha	Bakour	El-Masoudi	Nazlet Bakour	Manfalout	Kurkatis	Masrah	El-Zawia	Shob	Beni-Husseini		Abnub	Beni Magd	El-Gawli	Nageh-Riseek	
Number of animals exam.	47	122	54	52	68	25	46	65	36	25	23	38	82	40	36	17	36	46	25	32	915	
II			1			1	1						2		1			2		3		11
III					1		2					1	1	2		2						21
II	2	1			1			2					2				2		1	1		11
III	4	13	3	2	3		2	5	2	2	2	2	4	5	2	2	1	1	1			56
More than III	9	15	8	3	12	4	6	12	2	3	2	5			3	2	2	4				94
Total	15	34	16	5	17	4	11	20	4	5	4	8	9	9	6	6	5	7	4	4		193
Percentage	31.9	27.8	29.6	9.6	25	16	23.9	30.7	11.1	20.0	17.4	47.5	10.9	22.5	16.6	35.3	72.0	15.2	16.0	12.5		22 %

% of Repeat breeder × 22%

Repeat breeders = 193.

Total number of animals examined = 915

In the eight years old buffalo cow, uterine glands were hypertrophied and showed metaplasia of the lining epithelium into stratified squamous type. These glands were surrounded by an area of periglandular hyperplastic stromal tissue (Fig. 7). The stroma here was highly cellular and vascular, infiltrated by lymphocytes either diffuse or in focal aggregations. Few polymorphnuclear leucocytes and focal or diffuse extravasation were seen. Other uterine glands showed metaplasia of their lining epithelium and chronic oedema of the surrounding stroma. The infiltrated areas were scanty (Fig. 8).

DISCUSSION

The incidence of the repeat breeders among the buffaloes in Assiut Province, was found to be 22%. This data was found to be lower than that (55%) recorded by RAKHA (1958), or that (40%) recorded by the National Research Council at Bahtim, Egypt from 1952 to 1956 and also by LUNDGREN (1956) in governmental farms. In our opinion these relatively low incidence is due to the missrecording of the oestrus in animals partly due to the in-adequete knowledge of the owner about the reproductive behaviour of the animal and partly due to the silent course of oestrus which is commonly occurring among buffaloes ; especially, the incidence given by the aforementioned authors was recorded at governmental farms.

Modification of the "Hauptner" biopsy instrument from the punching into the sharp cutting end enabled us to obtain endometrial specimens completely representative to the status of the endometrium including the epithelial lining, stroma and the uterine glands. This instrument superexceeds the human curretes which proved to be unsuitable for the cow. Also it is advantageous than the two sharp scoops of ZURGILGEN (1948), in that it avoids punching of the tunica muscularis together with the endometrium. At the same time it has not the disadvantages of the instruments designed by MILLER (1951), that the surface epithelium was sometimes denuded and the endometrial glands showed artifcats. The tip of the instrument of SKJERVEN (1956) usually produces contusions of the tissues and artifacts in sections.

It was also observed, in our biopsy material, that even a small biopsy sample of pathologically altered endometrium is diagnostic because of the presence of pathological cell infiltrations of the stroma and the pathological alterations of the uterine glands.

The pathological alterations observed in our materials and are incriminated as a cause for repeat breeding was acute catarrhal endometritis, chronic catarrhal endometritis and endometrial atrophy. It is a well known fact that

inflamed endometrium is unfavourable media for the implantation of the fertilized ova and is one of the main factors of repeat breeding (BRUCE, 1954 ; AFANASJEVS, 1972 and CUPPS, 1973).

In acute inflammatory conditions of the endometrium, the inflammatory infiltrations of the stroma have to be evaluated with especial care in comparison with those infiltrative changes occurring in the oestral cycle. Polymorph-nuclear leucocytosis is a physiological finding during oestrus. The number of eosinophiles is lower in the later half of the cycle than in the first (WEBER, MORGAN and Mc NUTT, 1948 a). The polymorph nuclear leucocytosis is due to the oestrogenic effect and is associated with the high resistance to uterine infection observed in the follicular phase (BLACK, ULBERG, KIDDER, SIMON, Mc NUTT and CASIDA 1953 and SKJERVEN, 1956).

It is difficult to discuss the pathological significance of neutrophiles. BRUCE (1952 & 1954) found that animals with slight endometritis became pregnant as easily as animals without white blood cells in the endometrium. As his investigations were carried out during oestrus, it is probable that the presence of white blood cells which were considered pathological were of a physiological nature. Only polymorph-nuclear infiltrations during the luteal phase of the cycle can therefore be hardly considered as physiological.

Endometritis can be diagnosed with more or less certainty if lymphocytes and plasma cells can be observed. BRUCE (1952) stated that the occurrence of these cells was less favourable for pregnancy than the occurrence of granulocytes. Although SKJERVEN (1956) found small numbers of lymphocytes in the normal endometrium but he stated that more general occurrence of these cells could probably be considered a pathological symptom and less favourable from a prognostic point of view.

So in our materials the presence of polymorph nuclear infiltration and eosinophiles is not pathognomonic for endometritis as our samples were taken during oestrus. Only the diffuse and focal aggregations of lymphocytes in the stroma can be considered reliable for the diagnosis of uterine inflammation.

The diagnosis is easier with the presence of uterine gland proteinous dystrophy, together with disintegration and disorganization of the C.T. fibers of the stroma and the presence of erythrocytic extravasation.

In chronic catarrhal endometritis the endometrial changes in the biopsy sample was more pathognomonic. Severe mucus dystrophy of the uterine gland ; desquamation of the lining epithelium, metaplasia of the glands with Periglandular fibrosis were the irreversable changes responsible for the failure of implantation. These findings are in correspondence with DAWSON (1954), AFANASJEVS (1972) and CUPPS (1973). Chronic oedema, haemorrhages, lymphocytic infiltrations and complete fibrosis of the stroma were also diagnostic, FRANK, SHALKOP, BRYMER and BERRY 1962, HARTIGAN, MURPHY, NUNN and GRITTEN, (1972) and CUPPS (1973).

Evidence of chronicity was well illustrated by the irreversable metaplasia of the surface epithelium into the stratified squamous type.

Endometrial atrophy in the adult buffalo cow seems to be of inflammatory origin, as indicated by the periglandular fibrosis of the stroma. But in heifers, this may be probably due to hormonal deficiency rather than to infection exposure. Neverthe less, the endometrium as it loses its secretory function is unfavourable for implantation.

In heifers the prognosis may be favourable by application of long course of oestrogenic treatment, but in the adult, the condition represents an irreversable changes with bad prognosis. This view about endometrial atrophy coincides with the results of STEVENSON (1965).

Unfavourable prognosis is also expected for those cases with chronic endometritis, as metaplasia of the surface epithelium and the uterine glands together with fibrosis of the stroma are unrepairable conditions. The case may differ in acute endometritis where the alterative components of the inflammation are mild and by application of suitable treatment the condition is hopeful.

In this manner the application of the endometrial biopsy is not only necessary to put a diagnosis for the symptomatic genital troubles but also to have a real picture needed for the prognosis of the case either it is worthy of treatment application or to be excluded from breeding.

LITERATURE

- Adler, H.C.** (1952) : En Methode til diagnostisering of Vibrio fetus-Smitte laerende tyre.. Medle ms. bl. danske Dyrlaeg foren, **35** : 470.
- Adler, H.C.** (1954) : Vibrio fetus diagnosen hos tyren. Proc. VII. Nord. Vet. Cong., Oslo, 209.
- Afarasjevs, I.** (1972) : I. Endometrial biopst in infertile uterus : II. Microflora and pathological changes in the endometrium of infertile cows. Trudy latisskoi Se L'skokhoz-yaist-Vennoi Akademii, **58** : 84 - 100.
- Barr, M.A.** (1963) : Field investigations about infertility and sterility in cattle and buffaloes in the U.A.R. 4th Arab Ann. Vet. Congress Cairo, U.A.R. 333 - 340.
- Bearden, H.Z.** (1954) : Fertilization and embryonic mortality rates for bulls with histories of either low or high fertility in Artificial breeding. Thesis Cornell Univ. College of Agric. Ithaca, N.Y.
- Black, W.G., Ulberg, L.C., Kidder, H.E., Simon, J. McNutt, S.H. and Casida, L.E.** (1953) : Inflammatory response of the bovine endometrium. *Amer. J. Vet. Res.* **14** : 179.
- Bhosrekar, M.** (1973) : Investigation into the incidence and causes of repeat breeding in dairy cattle at National dairy research institute, Karnal (Haryana). *Indian Vet. J.*, **50** : 418 - 429.
- Brus, D.H.J.** (1952) : Biopsia uteri of cows. Rep. 2nd Int. Congr. *Phys. Anim. Reprod.*, Copenhagen, Vol. II, 175.
- Brus, D.H.J.** (1954) : Biopsia uteri haar betekenis bij de studie naar de oorzaken der steriliteit Van het rund. Diss. Utrecht.
- Casida, L.E.** (1953) : Fertilization failure and embryonic death in domestic animals, paper No. 448. Dept. of Genetics, Univ. of Wisc., Madison, Wisc., reprinted from "Pregnancy Wastage" by E.T. Engle (1953) by Charles C. Thomas Co., Springfield, Ill.
- Christian, R.E., Ulberg, L.C. and Casida L.E.** (1951) : The response of low fertility cows to insemination with semen from bulls of another breed, *J. Dairy Sci.*, **34** : 988.
- Cupps, P.T.** (1973) : Uterine changes associated with impaired fertility in the dairy cow. *J. Dairy Sci.*, **56** : 878 - 884.
- Dawson, F.L.M.** (1964) : Report to the government of Israel on bovine infertility. PPLO. Rome : Food and Agriculture Organization of the United Nations FAO/ETAP. Report No. 1829.
- El-Dessouki, F.** (1962) : Early embryonic mortality in bovine. Review. *J. Arab. Vet. Med. Assoc.*, **22** : 269 - 278.
- Frank, A.H., Shalkop, W.T. Bryner, J.H. and O'Berry, P.A.** (1962) : Cellular changes in the endometrium of vibrio foetus infected and non infected heifers. *Amer. J. Vet. Res.*, **23** : 1213 - 1216.
- Graden, A.P., O. Olds, C.R., Mochow and J.R. Rooney** (1962) : Causes of fertilization failure in repeat breeding cows. *J. Dairy Sci.*, **45** : 670.
- Hartigan, P.J., Murphy, J.A. Nunn, W.R. Griffin, J.F.T.** (1972) : An investigation into the causes of reproductive failure in dairy cows : II. Uterine infection and endometrial histopathology in clinically normal repeat breeder cows. *Irish Vet. Journal*, **26** : 245-247.
- Kampelmacher, E.H.** (1952) : Microbiological and histopathological examination of sterile cows. Rep. 2nd. Inst. Congr. *Phys. Anim. Rep.*, Copenhagen, Vol. II, 183.

- Kampelmacher, E.H., E.H.** (1954) : Een orienterend onderzoek omtrent de microbiologie en histologie van de uterus bij onvruchtbare runderen met behulp van een biopsie apparaat. Diss. Utrecht.
- Kidder, H.E., Black, W.G., Wiltbank, J.N., Ulberg, L.C., and Casida, L.E.** (1954) : Fertilization rates and embryonic death rates in cows bred to bulls of different levels of fertility. *J. Dairy Sci.*, **37** : 691.
- Leontidis, S.L.** (1968) : Histological and histochemical investigation of the bovine endometrium. Epistem. Epet. Kten. Skhol. Thessalon., **9** : 473 - 568.
- Lundgren, B.** (1956) : F.A.O. Report to the government of Egypt. Rome - Italy.
- Merkolof, G.A.** (1969) : Course for pathological techniques Medicina Leningrad, SSSR.
- Miller, J.G.** (1951) : A technique of endometrial biopsy in the bovine animal. *J. Amer. Vet. Med. Ass.*, **119** - 368.
- Minocha, H.C., Marion, G.B., Gier, H.T. and McMahon, K.J.** (1964) : An instrument for obtaining aseptic bacteriologic and histologic samples from the bovine genital. *Vet. Res.*, **25** : 1051 - 1057.
- Rakha, A.M.** (1958) : Infertility among buffalo cows in Egypt. Ministry of Agriculture, Egypt, Vet. Service, Animal Health Centres, Publication, **13** : 1 - 14.
- Rawson, L.E.A., Lamming, G.E. and Fry, R.M.** (1953) : The relationship between ovarian hormones and the uterine infection. *Vet. Rec.*, **65** : 335.
- Roberts, S.J.** (1971) : Veterinary obstetrics and genital diseases. Second ed. Published by the author. Ithaca, N.Y.
- Skjerven, O.** (1956) : Endometrial biopsy in studies in reproductively normal cattle. Clinical, histochemical and histological observations during the oestrus cycle. *Acta Endocrinologica, suppl.*, **26** : 1 - 101.
- Stevenson, C.S.** (1965) : The endometrium in infertile women. Prognostic significance of the initial study Biopsy : Findings in a series of 97 selected couples. *Fert. and Steril.* **16** : 208 - 222.
- Tanabe, T.Y. and Casida, L.E.** (1949) : The nature of reproductive failures in cows of low fertility. *J. Dairy Sci.*, **32** : 3 - 237.
- Tanabe, T.Y. and Almquist, J.O.** (1953) : Some causes of infertility in dairy heifers., *J. Dairy Sci.*, **36** : 586.
- Weber, A.F., Morgan, B.B. and McNutt, S.H.** (1948a) : A histological study of metrorrhagia in the virgin heifer. *Amer. J. Anat.*, **83** : 309.
- Zurgilgen, H.** (1948) : Die brunstausloende Wirkung des Oestradioldipropionates (Ovi cyclin) und dessen Einfluss auf die Uterusschleimhaut beim Rinde. Diss. Zurich.

Author's address : M.A. El-Naggar. : Dept. of Obst and Gynaec. Fac. of Vet. Med. Assiut University.

... of the ...

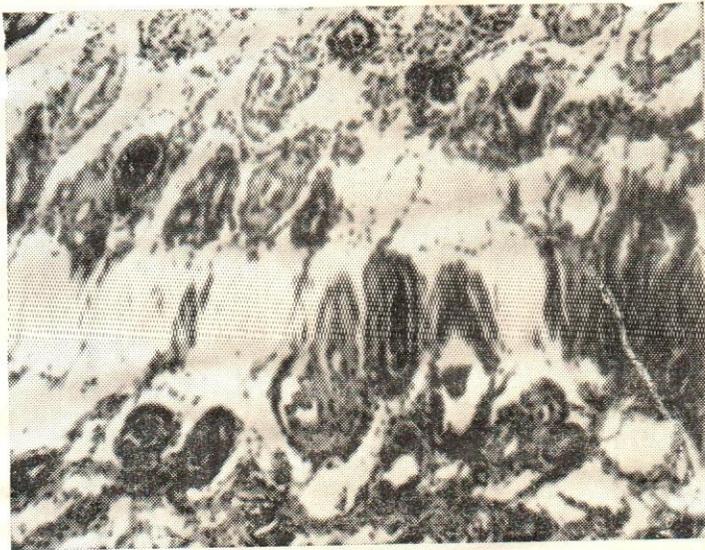


Fig. 1.—Endometrial atrophy. The uterine glands are small in size, lined by cuboidal cells, desquamated in some gland. H. and E. (12.5 × 25).

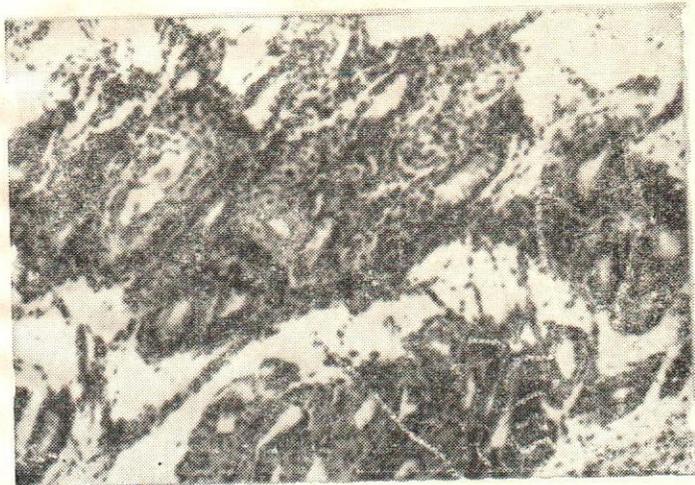


Fig. 2.—Atrophy of the uterine glands accompanied by periglandular fibrosis. H. and E. (12.5 × 25).

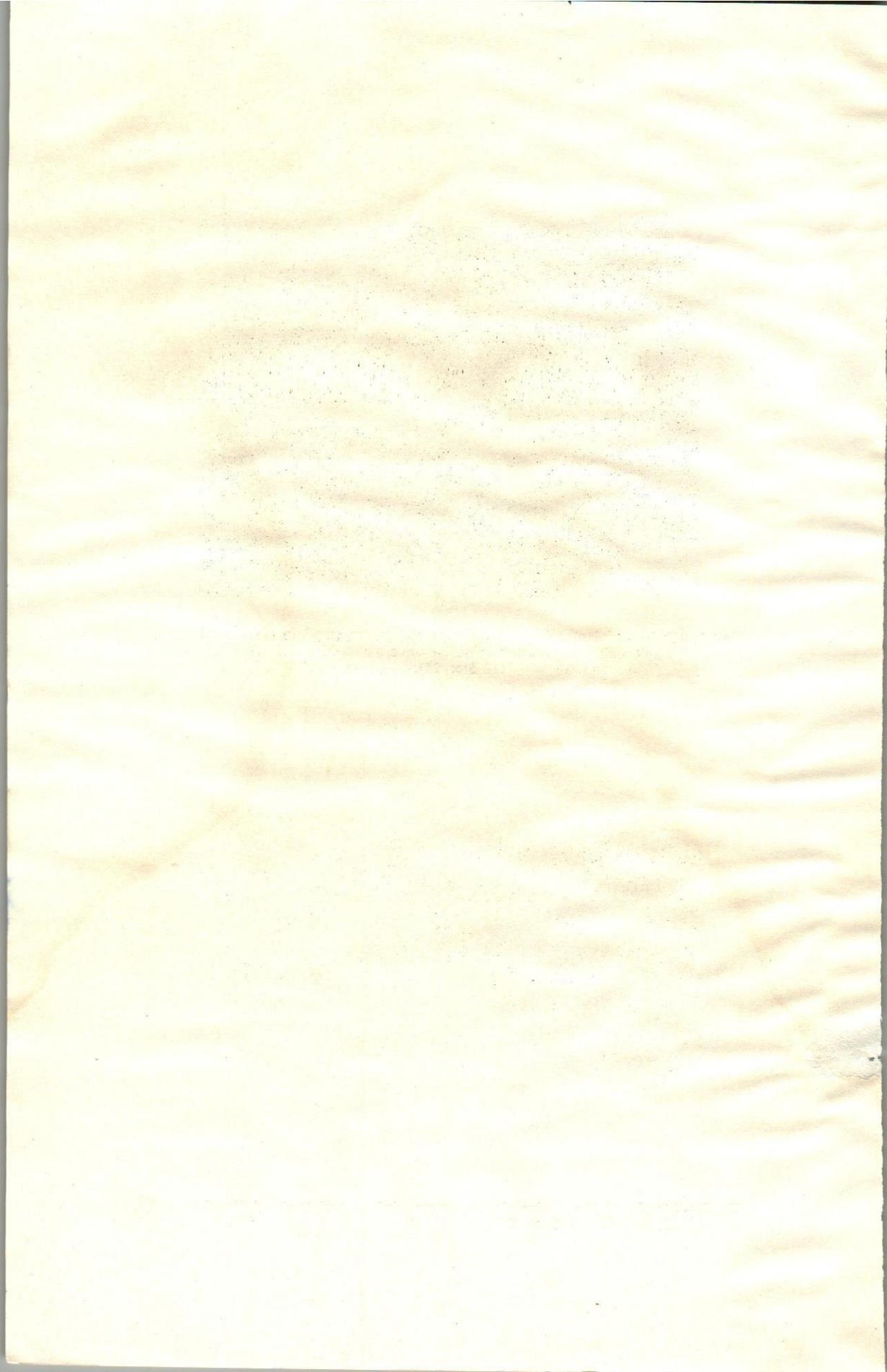




Fig. 3.—Desquamation of the uterine gland Epith. Disorganization and disintegration of C.T. fibers with basophilic amorphous substance in between. Erythrocytic extravasation. H. and E. (12.5 × 40).

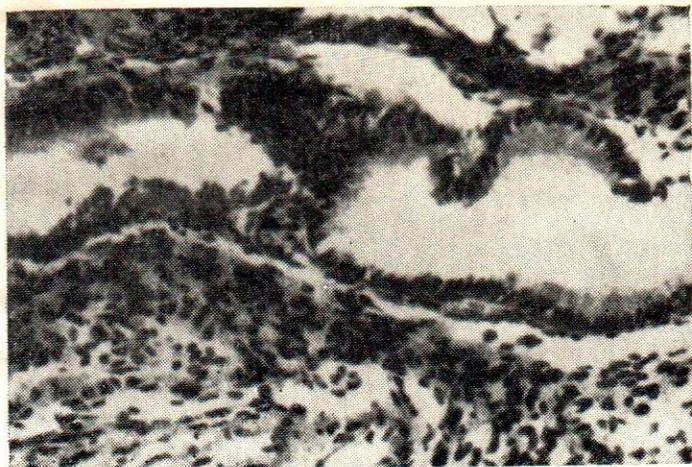
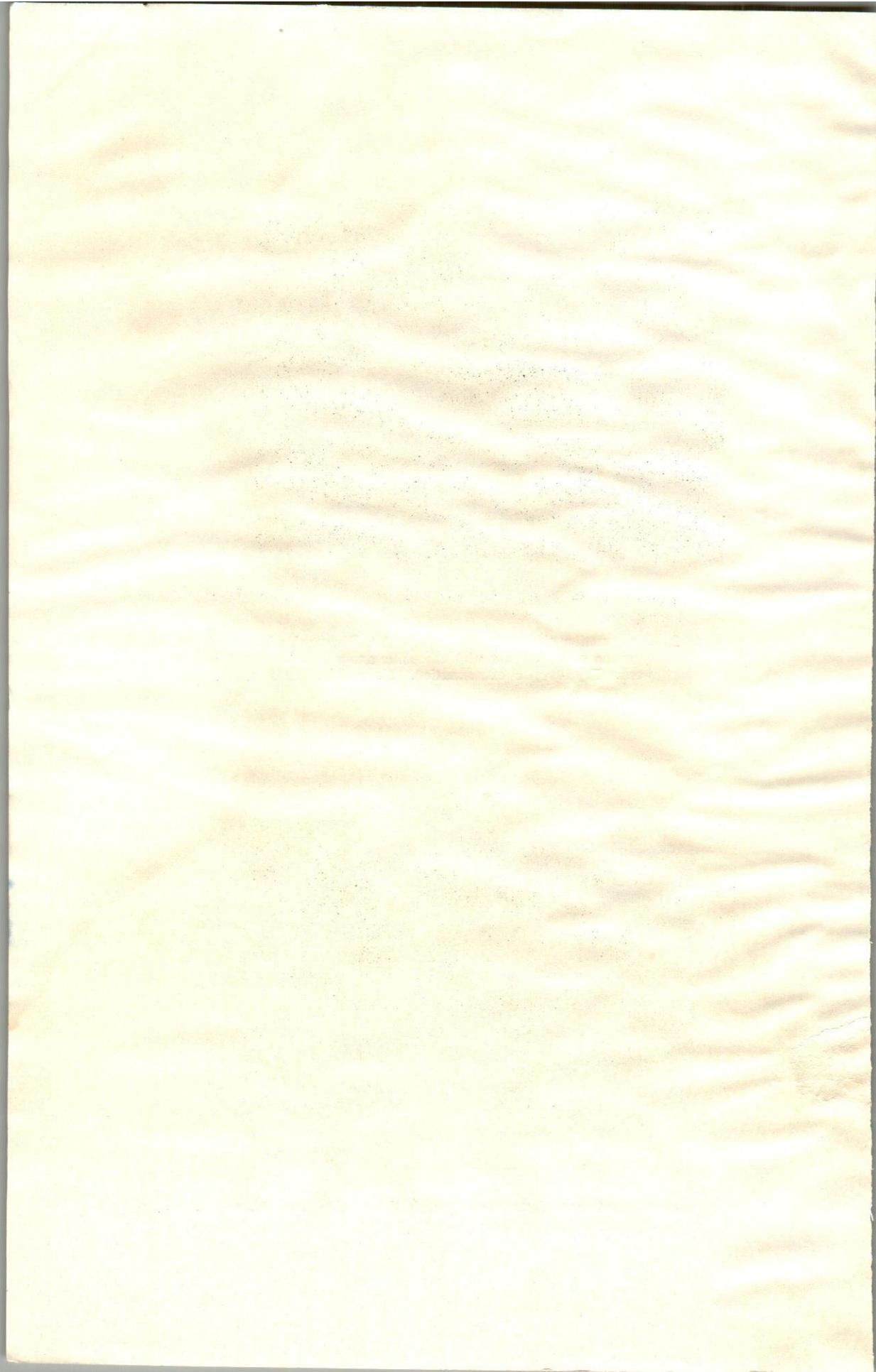


Fig. 4.—Proteinous dystrophy of the glandular epithelium. H. and E. (12.5 × 40).



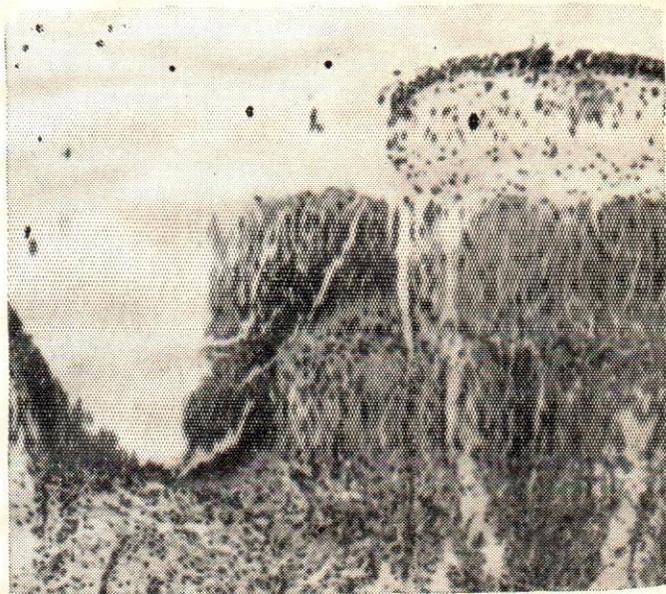


Fig. 5.—Metaplasia of the lining epithelium with lymphocytic infiltration superimposed on the surface. H. and E. (10×12.5).

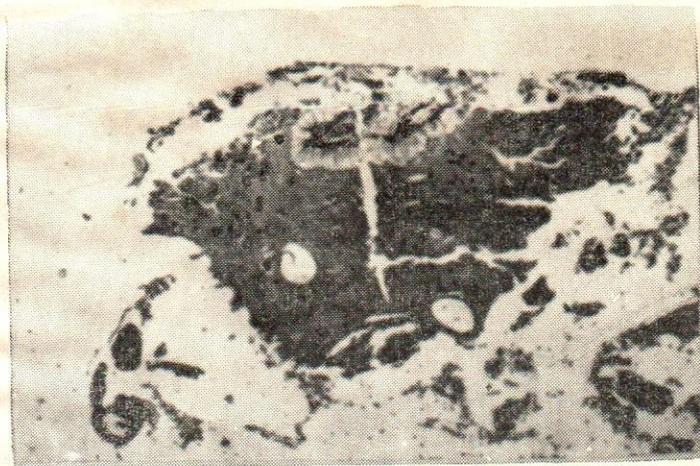
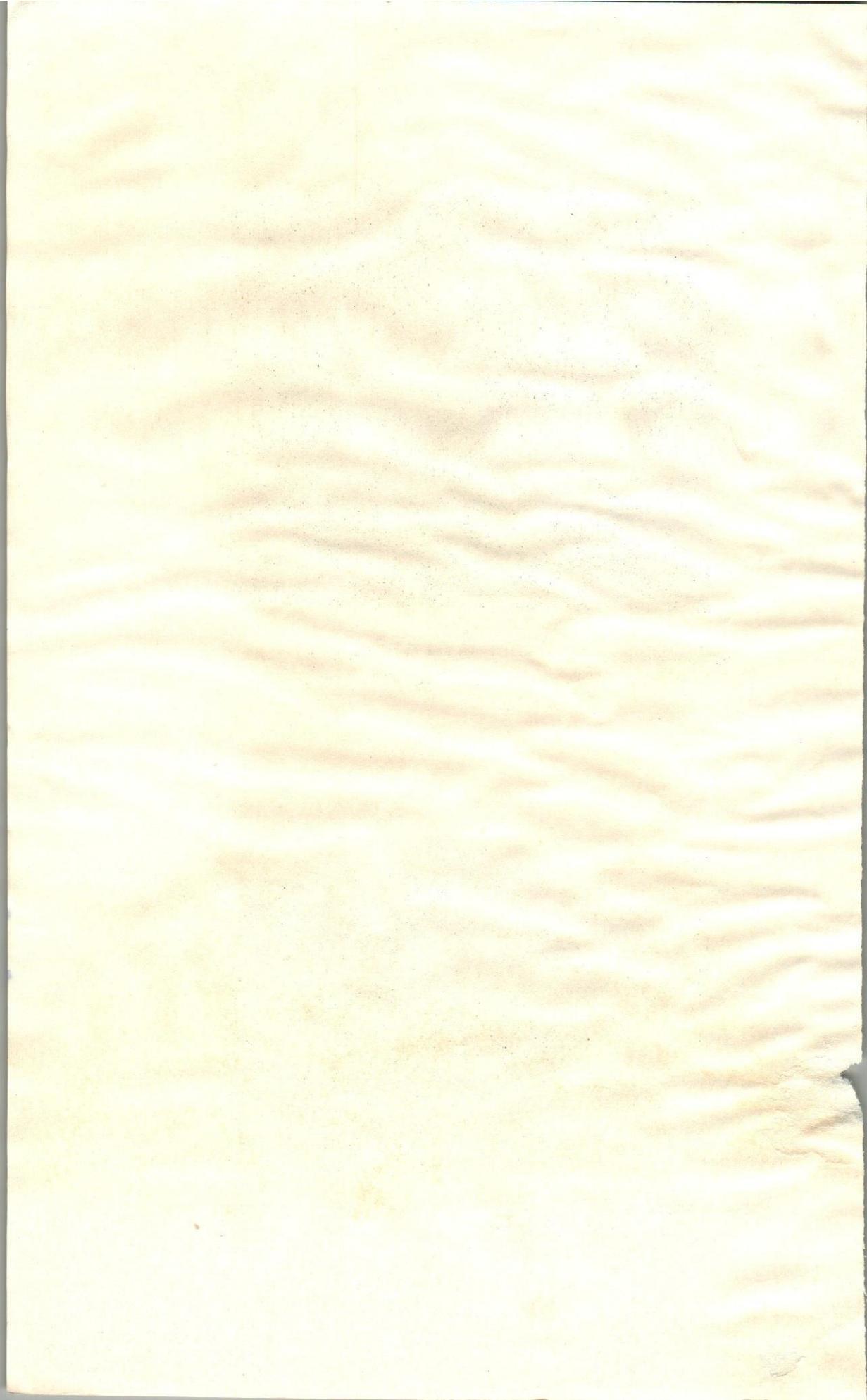


Fig. 6.—Severe mucous dystrophy of the uterine gland with periglandular fibrosis. H. and E. (2.5×25).



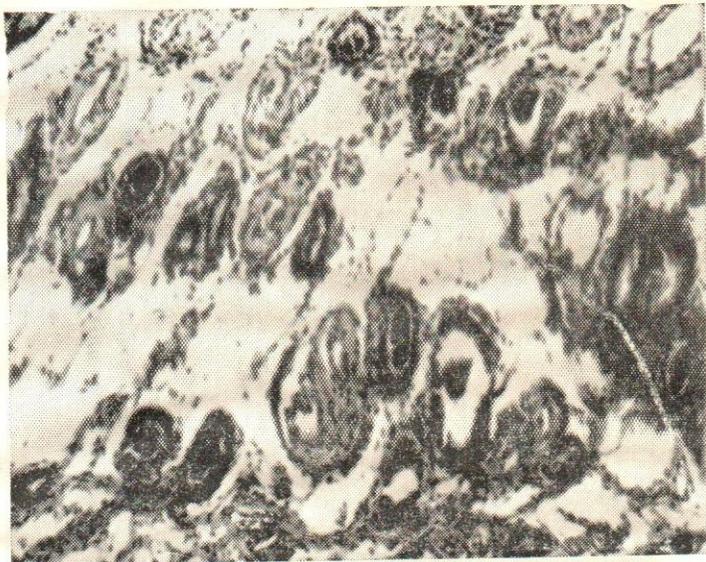


Fig. 1.—Endometrial atrophy. The uterine glands are small in size, lined by cuboidal cells, desquamated in some gland. H. and E. (12.5 × 25).

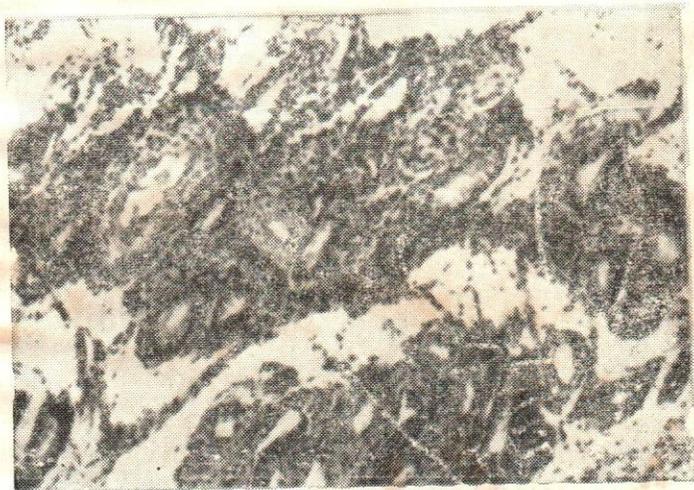


Fig. 2.—Atrophy of the uterine glands accompanied by periglandular fibrosis. H. and E. (12.5 × 25).

