قسم الهستولوجـــــى
كلية الطب ـ جامعة أسيـوط
رئيس القسم : أ٠د/أحمد نعمان نصر

دراسة هستولوجية وهستركيميائية على الحوصلة المنوية للفأر فى أعمار مختلفـــة

رقية شامـــخ ، سعـــاد شاكـــر ، محمـود صالـح

أظهرت هذه الدراسة التركيب الهستولوجى والمحتوي الهستوكيميائى للحوصلة المنوية للفأر الابيض فى أعمال مختلفة شاملة العمر المتقدم ٠ فعند الولادة تكون الحوصلة المنويـة مكونة من أنبوبة صغيرة مبطنة بنسيج طلائى عمادي كاذب ومحاطة بنسيج متوسط وعنـد عمـر ١٠ أيام يزداد حجم وتعرجات الحوصلة وتظهر ثنيات فى الطبقة المخاطية كما أن النسيـج المتوسط يتميز الى عضلات غير مخططة ملساء ونسيج ضام ويتحول النسيج الطلائى الكـاذب الـى خلايا عمادية مفرزة ٠ هذا ويبدأ ظهور الافرازات فى تجويف الغدة عند عمر شهـر ٠

أما غدة الفأر البالغ (عمر ٣ ـ ٥ شهور) فانها تتميز بوضوح الى جزئين : جزء مجـــاور للمثانة مستقيم وآخر طرفى مقوس ومتعرج ووجد اختلاف واضح بين الجزئين فى شكـل وسمـك الطبقات وكذلك فى المحتوي الكيميائى للانسجة ٠

وقد ظهرت علامات نقص النشاط والافراز فى التركيب الهستولوجى والمحتوى الكيميائـى لانسجة الحوصـلة المنويـة فـى العمـر المتقدم ٠ وقد نوقشت هـذه النتائج فـى ضـوء المراجع المتاحـة ٠

Dept. of Histoloty,
Faculty of Med., Assiut University,
Head of Dept. Prof. Dr. A.N. Nasr.

HISTOLOGICAL AND HISTOCHEMICAL STUDIES ON THE SEMINAL VESICLE OF ALBINO RAT AT DIFFERENT AGES

(With 21 Figs.)

By
ROKIA A. SHAMIKH; SOAD S. ALI; M.M. SALEH and MANAL M. SHEHATA

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SUMMARY

This study demonstrates the histological and histochemical structure of the albino rat seminal vesicles at different post-natal ages and in old age. The seminal vesicle of newly born albino rat was represented by a simple tube lined with pseudostratified columnar epithelium and surrounded with mesenchymal tissue. At 10 days, the seminal vesicle became sacculated with the appearance of simple folds in their mucosa and the mesenchymal tissue became differentiated into a muscle layer and a connective tisue layer. The epithelium changed gradually into simple columnar (secretory type). The onset of secretion began at one month of the post-natal life. The seminal vesicle of adults was differentiated into proximal and distal parts with distinct histological and histochemical differences. In old age, signs of decreased activity was observed both in the histological structure and histochemical characteristics of both parts of the gland. These points, were discussed in the light of the available literature.

INTRODUCTION

The seminal vesicles are significant in retaining fertility and reproduction in mammals because their secretion is important for the nutrition and motility of the sperms. Their involvement in pathologic processes such as tuberculosis and gonorrhoea also attracts the attention for thier study (JENSEN, 1980).

It was reported that castration, administration of androgens and aging influence both the structure and function of these glands (SALEH, 1976 and LIMANOWSKI & MISKOWIAK, 1979). This raised the question about the sequence of events that occur in the seminal vesicles during maturation and aging processes and the role of male sex hormones upon these processes. Moreover, the available literature on the structure of the seminal vesicle in post-natal life especially in old age are quite few.

Therefore, this work was done to study the histology and histochemical features of the seminal vesicle of albino rat at different postnatal ages. Starting from the newly-born until sexual maturity and also in old-aged rats in an attempt to provide a fundamental approach to a better understanding of these organs.

MATERIAL and METHODS

A total number of 50 male albino rats were used in this study. The ages used were newly-born, 5, 10, 15, 21, 30, 60 days adult (3-5 months) and old age (30 months). The animals were anaesthesized with ether and the seminal vesicles were removed and fixed in 10% neutral formalin and cold acetone. The specimens were prepared for paraffin embedding. Sections of 7-10u were obtained, and stained with haematoxylin and eosin, Van Gieson, orcein, Weigert elastic stain, PAS, mercury bromophenol blue and Gomori's method for alkaline phosphatase. Moreover, fresh cryostate sections were prepared and stained for succinic dehydrogenase. The techniques used for histological stains and histochemical methods were done according to PEARSE (1972) and DRURY & WALLINGTON (1980).

RESULTS

1. Histological structure of the seminal vesicle at different ages:

New born:

The seminal vesicle of newly born rats appeared as simple tube lined with pseudostratified columnar epithelium. The cytoplasm of the cells was non-granular and slightly acidophilic. The epithelium was surrounded by undifferentiated mesenchymal tissue (Fig. 1).

5-10 days:

The mucosa of the seminal vesicle started to show simple folds (Fig. 2) lined with pseudostratified columnar epithelium which had faint acidophilic cytoplasm and deeply-stained nuclei. Differentiation of mesenchymal tissue into muscle layer and serosa was evident at the age of 10 days. (Fig. 2).

15-21 days:

The seminal vesicle increased in size and length and the upper surface showed indentation or corrugation, it started to be differentiated into proximal and distal parts. The proximal part showed thick muscular wall and numerous mucosal folds while the distal part showed a slightly thinner wall, wider lumen and less folded mucosa. The wall however, was composed of three parts: mucosa, muscle layer and adventitia. (Fig. 3).

The mucosa consisted of an epithelium which was still of the pseudostratified columnar variety with patches of simple columnar epithelium. The epithelium had a basement membrane resting on a lamina propria of loose connective tissue. The muscle layer was more developed and consisted of smooth muscle fibers arranged in various directions and separated by collagenous fibers (Fig. 4). The adventitia is formed of loose connective tissue containing both collagenous and elastic fibers.

1-2 months:

The seminal vesicle at this age increased both in length and size. Its differentiation into a straight proximal part and a serrated curved distal end became more evident. The mucosal folds of the proximal part became more elongated that in the distal part. The lining epithelium changed to short simple columnar epithelium (Fig. 5) having basophilic cytoplasm and moderately stained oval or rounded relatively large nuclei. In addition, some clear basal cells were seen. Moreover, the lumen of the seminal vesicle at the age of 1-2 months contained highly acidophilic

secretion with few cell debris. The muscle layer was more well developed and appear thicker in the proximal part compared to the distal part of the vesicle. There was a slight increase in the amount of collagenous and elastic fibers in comparison with the previous ages.

Adult (3-6 months):

At this age the seminal vesicle became larger in size, distended with secretory material and well differentiated into a proximal straight part near the urinary bladder and a slightly curved tapering distal part.

In general, the wall of the seminal vesicle was composed of three layers, mucosa, muscle layer and adventitia.

The proximal part showed highly folded mucosa and a thick muscle layer (Fig. 6). The epithelial lining of this part was simple tall columnar showing most of the features of secretory cells such as basal basophilia, supranculear negative Golgi images and apical finely granular acidophilic secretory material. Some basal clear cells were observed in the epithelium (Fig. 7). Their nuclei were oval or rounded in shape and vesicular in appearance with one or two prominant nuclei (Fig. 7). Some cells showed mitotic figures (Fig. 7 at the arrow).

The distal part of the seminal vesicle formed the main bulk of the gland and its wall was thinner and its lumen was wider than the proximal part (Fig. 8). The mucosa was thrown into numerous compound folds. The lining epithelium was low columnar or even cuboidal and the cytoplasm of the epithelial cells was less basophilic than that of the proximal part. The nuclei were oval or round and deeply stained (Fig. 9). The lumen of the adult seminal vesicle contained large amount of highly acidophilic homogenous secretion. The muscle layer is much thinner than the proximal part. In the lamina propria, musculosa and adventitia of the proximal part of the adult seminal vesicle, numerous connective tissue cells including mast cells and collagenous fibers of thin quality were observed (Fig. 10). Few and fine elastic fibers were observed within the adventitia.

Old age (30 months):

Well apparent changes were observed in the seminal vesicle of old age (Figs. 11, 12) involving thinning of the mucosal folds of both proximal and distal parts. So the lumen of both appear wider compared to that of a adult, in addition, there was a decrease in height of epithelium in many regions (Figs. 11 & 12), decrease in basophilia of the epithelial cells and the amount of secretion in the lumen of the gland. There was an increase in the amount and thickness of collagenous fibers (Fig. 13). The muscle layer especially in the distal part became thicker and underwent hyaline degeneration so it appears more acidophilic and vacuolated (Figs. 11 & 12). Moreover, dilated and engorged blood vessels, were observed (Fig. 12).

Histochemical features of the seminal vesicle at different ages:

A highly positive reaction for PAS was observed in the mesenchymal and connective tissue of the seminal vesicle of rats from newly born to 10 days of age. The lining epithelium started to show diffuse positive reaction only at the age of 10 days (Fig. 14). At 21 days age the apical parts of the lining epithelium showed moderately PAS-positive fine granules. Also, the basement membrane, the connective tissue fibers of lamina propria, muscle layer and adventitia showed high positive reaction for PAS at the age of 1-2 months. In adult, the same results were observed beside the high PAS-positive reaction of secretory material (Fig. 15). In the old-aged specimes a decrease in the amount and intensity of positive reaction for PAS was observed (Fig. 16).

General protein:

An intense staining with bromophenol blue was observed in the mesenchymal tissue of the seminal vesicle of the newly born rats, however negative staining was observed in the lining epithelium. At the age of 15-21 days, the epithelial lining and the muscle layer of the seminal vesicle stained with bromophenal blue (Fig. 17). The same results were observed in the seminal vesicle of rats aged one and two months. In the adult rats, positive reaction for bromophenol blue was observed in the secretion inside the lumen of the seminal vesicle (Fig. 18).

In the old-age rats, a decrease in the amount of material stained with bromophenol blue wa observed (Fig. 19).

Alkaline phosphatase:

In the newly born rats the seminal vesicle showed a highly positive reaction for alkaline phosphatase in the mesenchymal tissue, however a negative reaction was observed in the lining epithelium. At 5-10 days, a weak reaction for alkaline phosphatase was observed in the nuclei of the lining epithelium. At the age of 21 days a slight or weak reaction for alkaline phosphatase was observed in the apical parts of the lining epithelium however a highly positive reaction was observed in the surrounding structures (Fig. 20). In the seminal vesicle of adult rats a strong positive reaction for alkaline phosphatase was observed in the nuclei of the epithelial lining and in the connective tissue fibers of the mucosal folds (Fig. 21) and among the muscle fibers. However, the cytoplasm of the epithelial cells showed negative or weak positive reaction. In the seminal vesicle of old aged rats, a decrease in the intensity of alkaline phosphatase activity was observed.

Succinic dehydrogenase:

A positive reaction for succinic dehydrogenase was observed in the mesenchymal tissue of the seminal vesicle of newly-born rats and later in the muscle layers of successive ages. The lining epithelial cells started to show positive reaction in the form of blue formazan granules at the age of 21 days. These granules increased in number and staining intensity at the adult age. Insignificant changes in both number and intensity of staining regarding succinic dehydrogenase were observed at old age.

DISCUSSION

The significance of studying the development of seminal vesicle during different stages of life is obvious. It is well established that it has an important role in retaining fertility in male (DAVID, 1980) because their secretion is important for nutrition and motility of sperms.

It is apparent from the present study that the onset of development of rat seminal vesicles and their differentiation occur at later stages of life than do most of other organs. The seminal vesicle of newly-born rats was represented by simple short straight tube lined by pseudostratified columnar epithelium which was surrounded by a layer of mesenchymal tissue. The latter contained abundant amount of polysaccharides and protein and exhibited a high activity of both alkaline phosphatase and succinic dehydrogenase. The presence of abundant amount of polysaccharides and protein is logic in immature developing tissue.

The stromal alkaline phosphatase may play a role in the transport of sugar and related substances into the lining epithelial (BRANDES, 1966 and PEARS, 1972). This study revealed

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that development of the seminal vesicle occured by its transformation from merely a simple tube into a more convoluted one. The mesenchymal tissue changed into smooth muscle fibers and connective tissue. The lining epithelium changed from pseudostratified columnar into a simple columnar secretory variety. It was observed that the differentiation of the muscle layer occurs (at the age of 10 days) prior to histo-differentiation of the lining epithelium which occurs at 21 days of age. BREWSTER (1965) reported that the early differentiation of the muscle layer is needed to help in shaping the developing vesicle into the adult form.

At the 21 days, the rat seminal vesicle became curved with a serrated upper border. It became differentiated into proximal and distal parts. The proximal part had a thick muscle layer and a more folded mucosa. The lining epithelium is still of pseudostratified columnar type with patches of columnar or cuboidal epithelium. These results are in accordance with those obtained by DEAN and WURZELMANN (1965) in mice and SALEH (1976) in rats. However, those authors did not mention the separation of the vesicle into two distinct parts. It was also observed that the secretory activity started at the age of one month and this activity was more evident in the seminal vesicle of rats at the age of one and two months, where the lining epithelium became columnar with well defined negative Golgi immages, and apical secretory granules showing positive reaction for PAS and bromophenol blue. The secretory material was also positive for these reactions. This confirms the results of PRICE (1936); HENNIGSEN (1963) and SALEH (1976). However, WIESNER (1934) was unable to find evidence of secretory activity before 35 days of age. This variation in the onset of secretion may probably be due to differences in the breeding conditions in various laboratories.

LIST OF FIGURES

Plate I:

Fig. (1): Section in the seminal vesicle of a newly-born albino rat stained with H & E, showing simple tube lined with pseudostratified columnar epithelium and surround mesenchymal tissue (X 125).

Fig. (2): Section in the seminal vesicle of 5 days-age rat stained with H & E. Notice: The simple folds of the mucosa. (X 125).

Fig. (3): Section in the seminal vesicel of 21 days age stained with H & E, showing the well differentiated muscle layer. (X 125).

Fig. (4): The seminal vesicle of 21 day-age rat stained with Van Gieson, showing collagenous fibers in the lamina propria, muscle layer and adventitia. (X 125).

Fig. (5): Part of section in the seminal vesicle of one month-age rat stained with H & E, showing that the lining epithelium is differentiated into simple low columnar variety. (X 500).

Plate II:

Fig. (6): Section in a seminal vesicle of adult rat stained with H & E, showing the highly folded mucosa, very thin lamina propria and relatively thick muscle layer (X 125).

Fig. (7): Part of the previous section magnified, showing the simple tall columnar epithelium of the mucosa with some basal clear cells at the (arows). (X 500).

Fig. (8): Section in the distal part of a seminal vesicle of adult rat stained with H & E, showing the wide lumina, less folded mucosa and the muscle layer. (X 32.5).

Fig. (9): Part of the same previous section magnified, showing wide lumina, less folded mucosa and thin muscle layer. (X 125).

Fig. (10): Part of section inthe proximal part of a seminal vesicle of adult rat stained with Van Gieson showing collagenous fibers in the lamina propria, and connective tissue between the muscle fibers. (X 125).

Fig. (11): Section in the proximal part of seminal vesicle of old-aged rat stained with H & E, showing the decrease in thicknes ofthe epithelium, the decrease in the intensity and amount of secretion and the decrease in thickness and changes in the muscle layer. (X 125).

Fig. (12): Section in the distal part of the seminal vesicle of old age. Notice : The decrease in thickness of the lining epithelium.(X 125).

Fig. (13): Section in the proximal part of the seminal vesicle of old aged rat stained with

Fig. (15): Section in the proximal part the seminal vesicel adult rat, showing high positive-PAS reaction in the secretion inside the lumen, basement membrane, and connective tissue of the lamina propria and muscle layer. However, the cytoplasm of epithelial cells shows moderate reaction. (X 160).

Fig. (16): Section inthe seminal vesicle of old aged rats, showing a decrease in the amount and intensity of PAS reaction. (X 160).

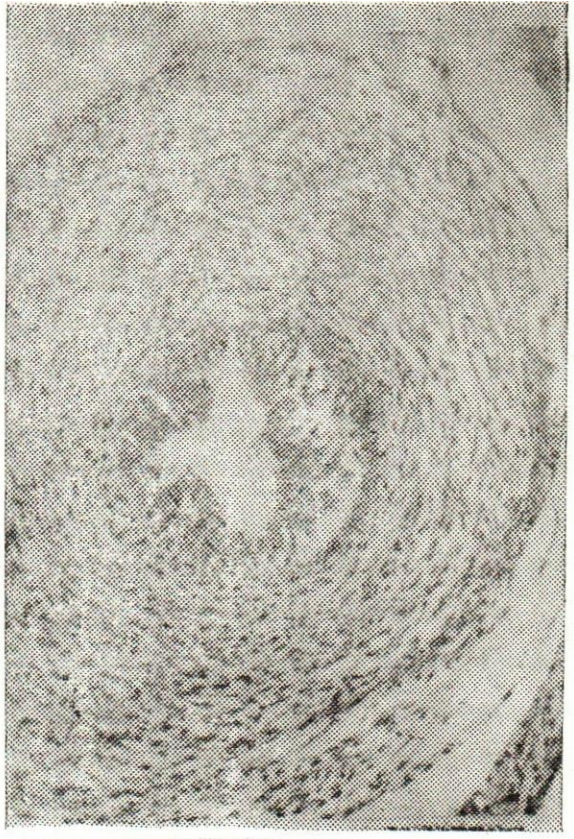
Fig. (17): Section in the seminal vesicle of 21 days aged rat stained with mercury bromophenol blue. (X 125).

Fig. (18): Section in the proximal part of seminal vesicle of adult rat stained with mercury bromophenol blue, showing high positive reaction in the secretion and connective tissue and faint positive reaction in the epithelium. (X 125).

Fig. (19): Section in the seminal vesicle of old aged rat stained with mercury bromophenol blue, showing decrease inthe amount and intensity of positive reaction. (X 125).

Fig. (20): Section in the seminal vesicel of 21 days aged rat stained for alkaline phosphatase. (X 160).

Fig. (21): Section in seminal vesicle of adult rat. Notice: The high positive alkaline phosphatase reaction in the connective tissue core of the mucosal folds. (X 256).

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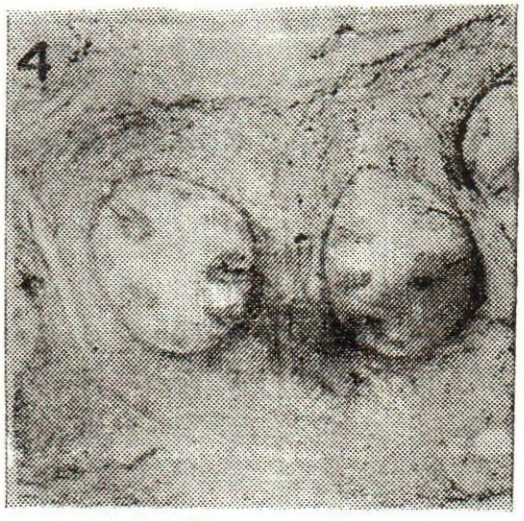
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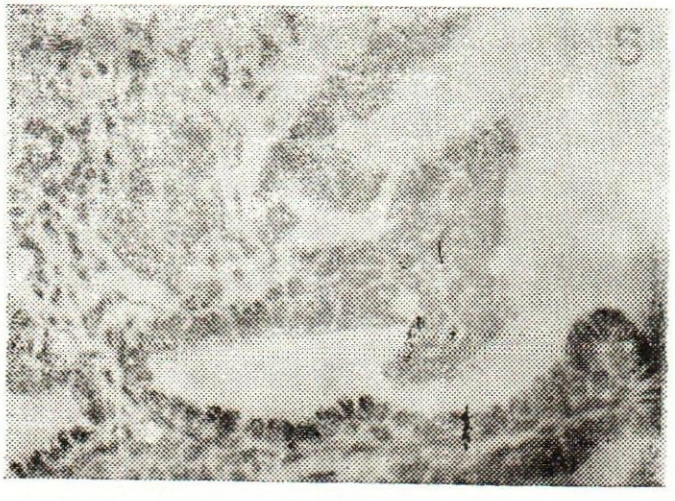
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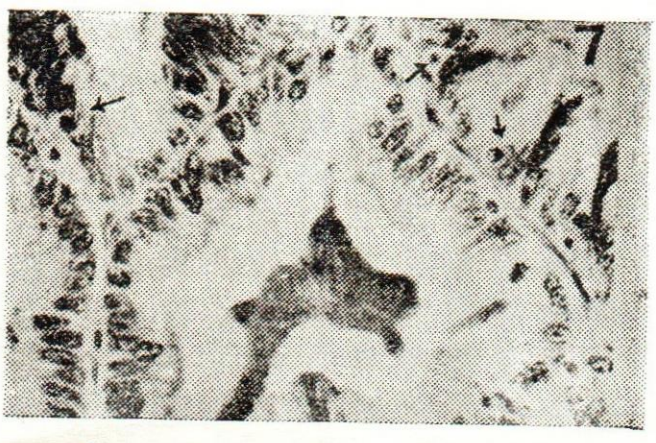
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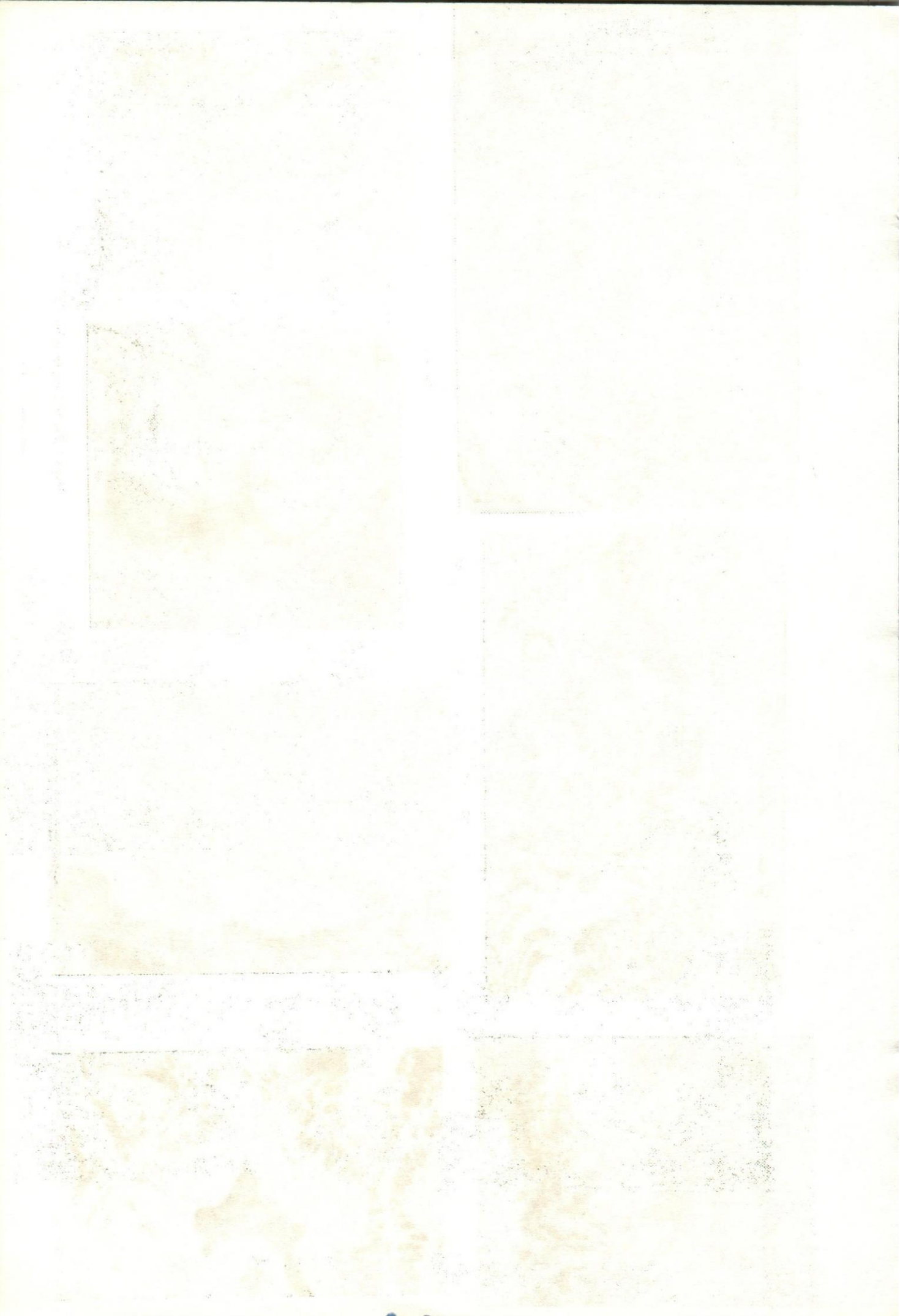


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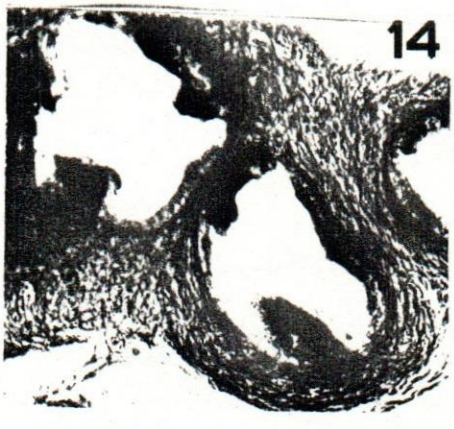
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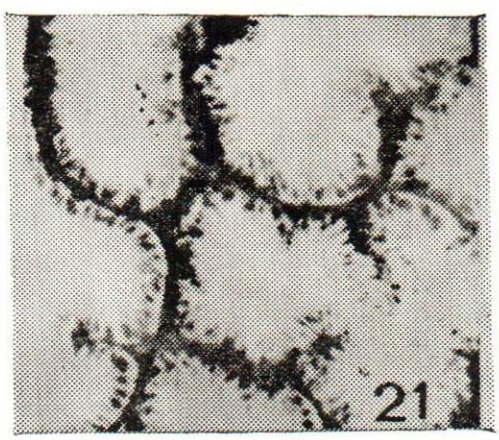
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