

A STUDY  
OF THE  
NEOPLASTIC DISEASES  
OF THE  
LOWER ANIMALS  
VOL. 2

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WILLIAM H. FELDMAN

T H E S I S

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A STUDY OF THE  
N E O P L A S T I C D I S E A S E S  
O F T H E  
L O W E R A N I M A L S

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by  
W.H. Feldman

v.2.

STUDY NUMBER FIFTY-THREE

TUMOR NUMBER 45

Papilloma -- Lining of the Esophagus of a Bovine

This was material received from Dr. G. G. Feldman, Veterinary Inspector, B.A.I., Spokane, Washington.

Clinical Data: A seven year old cow was slaughtered for food and upon post-mortem examination a wrinkled warty formation was found on the lining of the esophagus. This was removed and placed in formalin solution for future study.

Gross Appearance: The material consisted of a portion of the wall of the esophagus on the mucous surface of which was a tumorous growth covering an area of 5 cm. x 12 cm. with rugae projecting inward in a very irregular fashion. Close examination of the individual ruga showed that many of them were covered with large numbers of spine-like projections. The surface felt somewhat hard or warty to the touch and the color of the mass was a very light tan (Fig. 1).

Microscopic Description: Sections from this tumor showed a fibrous connective tissue stroma thrown up in ridges with very definite projections and depressions. Over the surface of this stroma stratified squamous epithelium occurred. This layer of tissue varied considerably in thickness and the inner portion formed a very irregular line of contact with

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the underlying stroma, the epithelia jutting into the connective tissue in such a manner as to form a tooth or saw-like margin.

Under the high power the epithelial layer presented some interesting features. The cells in the deeper layers were oval to spindle shaped and among them an occasional mitotic figure could be seen. The outer third of the epithelial layer had undergone advanced cornification as indicated by the degree to which it took the acid stain together with the fact that the cells were hardly discernible and only a few nuclei were observed. These had a compressed pinched appearance with deeply staining nuclei (Fig. 3). The deeper connective tissue gave support to many large well formed blood vessels while that adjacent to the epithelia carried smaller vessels and capillaries.

Diagnosis: This is an epithelial type of new growth from a location that is fairly common in the bovine. We have in this instance an epithelial proliferation that grows away from the stroma instead of into the stroma such as we find in carcinomas. The type cell and its relative position in relation to the connective tissue would qualify this tumor as a papilloma.

The fact that some of the cells were undergoing mitosis might lead one to believe that the tumor was assuming

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a malignant behavior but close study of the various sections failed to reveal any infiltrative activity which one must observe before deciding as to the malicious tendencies of a growth of this kind. There must be some growth to a tumor, be it benign or malignant, and the new cells in a stratified squamous structure would quite likely come from those lying in the deeper portions where the mitotic figures were seen. This is a tumor that only would have been likely to become troublesome from the mechanical interference with the passage of food and water to the rumen.

Papilloma

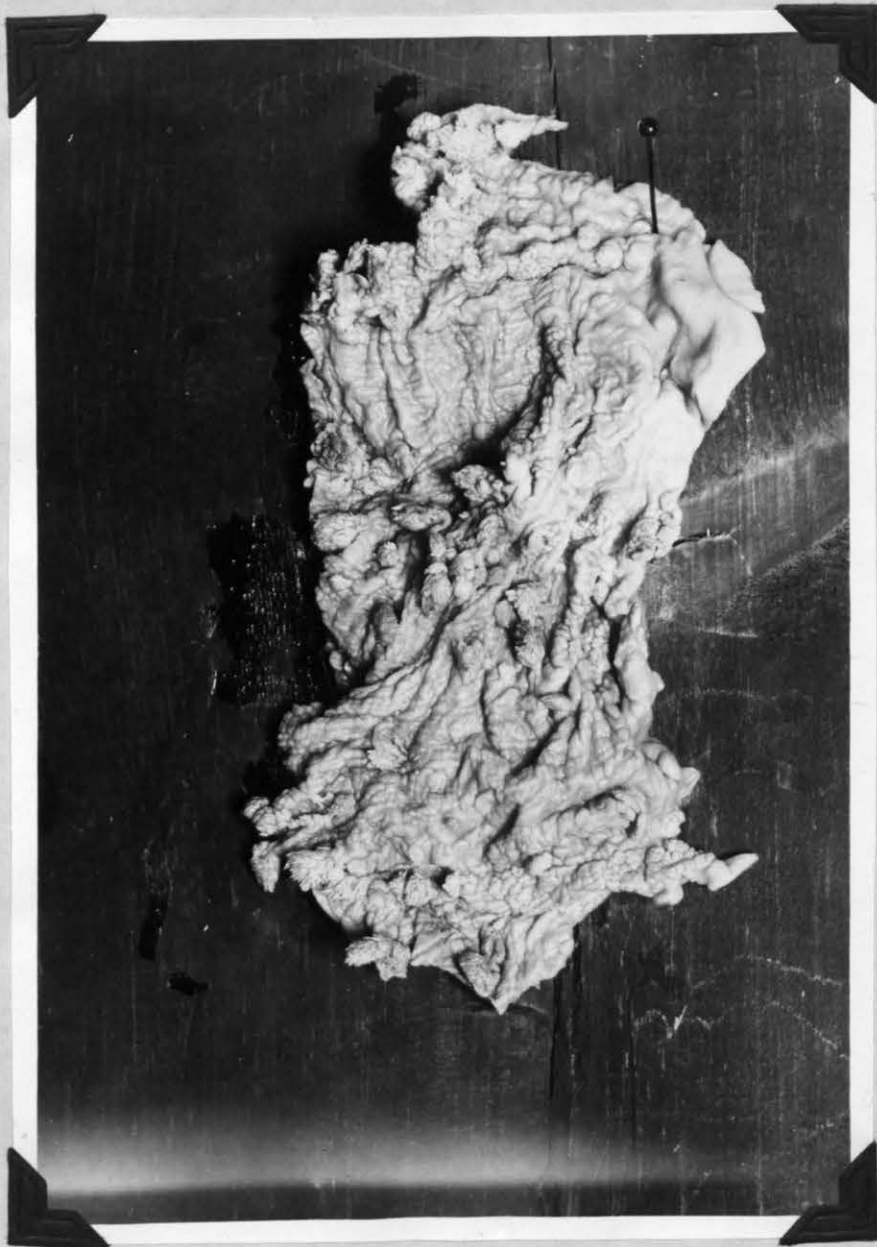


Fig. 1. (T.45) Papilloma of the esophagus of a Bovine.  
Photograph showing the wrinkled , warty appearance of the tumor.

Papilloma



Fig. 2 (T.45) Papilloma of the Esophagus of a Bovine.  
Low power photomicrograph showing the squamous epithelium dipping into a depression in the fibrous stroma.



Fig. 3 (T.45) Papilloma of the Esophagus of a Bovine.  
Low power photomicrograph showing the irregular papillae of the tumor.

STUDY NUMBER FIFTY-FOUR

TUMOR NUMBER 156

Papilloma -- Lower Lip -- Dog

This was a case from the Veterinary Hospital of the Colorado Agricultural College, presented through the courtesy of Dr. H. E. Kingman.

Clinical Data: The animal was a mature fox terrier bitch. At the posterior half of the right lower lip was a multiple tumorous formation (Fig. 1). There was no data dealing with the duration of the tumor. The growth was removed surgically by Dr. Kingman and the animal made a satisfactory recovery.

Gross Appearance: The various parts of the tumor were grouped in cluster formation. Three portions were about of equal size while the fourth was considerably smaller. They were somewhat spherical in shape and the average diameter of the larger ones was 1.8 cm. They were light pink in color and quite firm and horny to the touch. The growths were firmly adherent to the underlying tissue by a wide base but a capsule was absent. The surface of the tumors was cut by a large number of deep clefts which separated the multitude of papillary projections which constituted the bulk of the neoplasm. The mass was somewhat vascular but suppuration was not in evidence.

Microscopic Description: The tumor consisted of a large number of separate units each made up of a fibrous core



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covered to a variable depth with squamous epithelial cells (Fig. 2). The stroma was quite firm and carried the blood vessels of the structure. The epithelial cells were inclined to be small and very irregular in shape. The cells nearest the core or stroma were a good deal less mature than those towards the periphery and seemed to simulate the cells of stratum germinativum of the normal skin. At the edge of the various projections the epithelial cells were badly compressed and were almost spindle shape. The zone between the various papillae was occupied by a horny substance, the product of the epithelial cells.

Diagnosis: This is a simple benign epithelial tumor possessing the features common to papillomas and offers nothing unusual deserving of special comment.

Papilloma



Fig. 1 (T.156) Papilloma of the Lower Lip of a Dog. Photograph showing the multiple nodules at posterior half of the lower lip on the left side.



Fig. 2 (T.156) Papilloma of the Lower Lip of a Dog. Low power photomicrograph showing many fibrous cores covered to a variable depth by epithelial cells.

Papilloma



Fig. 3 (T.156) Papilloma of the Lower Lip of a Dog.  
Low power view of the epithelial processes cut longitudinally.

STUDY NUMBER FIFTY-FIVE

TUMOR NUMBER 112

Adenoma -- Membrana Nictitans -- Dog

This case was from the clinic of the Veterinary Hospital.

Clinical Data: The animal was a four months old male Boston Terrier pup. At about the second month of life the puppy developed a small red swelling at the inner canthus of the left eye (Fig. 1). This continued to develop until it was removed surgically by Dr. H. E. Kingman. The animal was making a satisfactory recovery when it was accidentally killed by an auto two weeks after the operation.

Gross Appearance: The tumor had been attached by a short pedicle and presented an oval contour. It was somewhat flattened and measured 1 cm. x .75 cm. It was grey in color and possessed a capsule and a smooth surface. Cysts or any evidence of ulcerations were not observed.

Microscopic Description: Cross sections made from this tumor revealed an atypical type of structure consisting of an elongated plate of cartilage surrounded by variable depths of fibrous connection tissue, which served as a stroma for the cuboidal epithelium of the tumor parenchyma. The epithelium was arranged in a manner suggestive of a gland and many alveolar spaces were present, practically all of which were lined by a single layer of cells. In many instances, however, the spaces were obliterated and the cells occurred in compact mass formation, (Fig. 1) although the epithelial

Study Number Fifty-five - 3

structures exhibited some tendency to infiltrate the adjacent tissue.

Mitotic figures were not observed. A few extremely large alveoli were present but they seemed to be devoid of contents as were the rest of the alveoli. Many of the glandular structures were distinctly separated from the others by narrow bands of fibrous tissue in an attempt to reproduce a lobular type of architecture. Most of the blood vessels ran in this interlobular stroma. The mass was covered over a greater part of its surface by an epithelial layer such as invests the membrana nictitans.

Diagnosis: Here we have an epithelial tumor, whose cells tend to assume a gland-like arrangement. Such a growth in the absence of proof of malignancy should be called an adenoma. While this tumor did reveal features indicating an infiltrative behavior, there was nothing additional to substantiate a diagnosis of malignancy.

This histogenesis of this tumor must be traced, I believe, to the superficial third palpebral gland of the membrana nictitans. This is the only structure in the vicinity that might have served as the parental forerunner for this growth. The early age at which this tumor appeared makes this an interesting case. The compact arrangement of many of the cells and the tendency of the tumorous

Study Number Fifty-five - 3

units to push into the surrounding stroma would suggest the possibility of the early development of an adenocarcinoma, if the growth had not been removed.

An adenoma of the membrana nictitans.

Adenoma



Fig. 1 (T.112) Adenoma of the Membrana Nictitans of a Dog.  
Photograph showing the tumor at the inner canthus of the right eye.

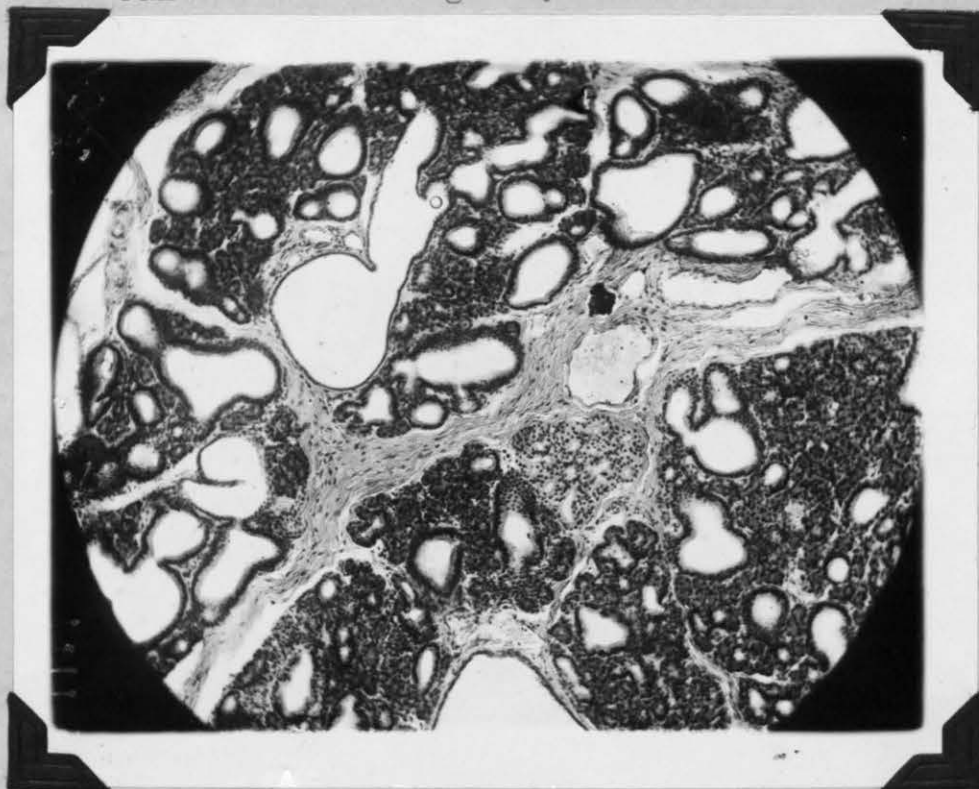


Fig. 2 (T.112). Adenoma of the Membrana Nictitans of a Dog.

Low power photomicrograph showing the gland like structure of the tumor. Many areas show compact type of growth while in others alveoli are common.

STUDY NUMBER FIFTY-SIX

TUMOR NUMBER 116

Bilateral Adenomas - Membrana Nictitans - Dog

Material for this study was received from Dr. Frank P. Mathews, Lafayette, Indiana.

Clinical Data: The subject was a two year old male Boston terrier. About one month previous to the removal of the tumors a firm nodule about the size of a pea was observed in the inner canthus of each eye. The membrane nictitans was apparently involved. No other structures were affected and the animal was apparently in the best of condition. The tumors were both removed surgically and the animal made an uneventful recovery.

Gross Appearances: The tumors were practically identical and both had a pedicle form of attachment. They were pink in color and had a slightly roughened surface. They were somewhat almond shaped, measuring about 16 mm. in length, 0.8 cm. in width, and 0.5 cm. in thickness, and tapering toward the proximal portion. The specimens exhibited but slight vascularity.

Microscopic Description: Slides from this tumor were practically identical with those of tumor #112. A longitudinal section revealed an elongated plate of cartilage occupying the middle portion of the structure. It was surrounded on three sides by epithelial tissue arranged in a



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rather definite glandlike fashion. The epithelial areas were quite variable as to size and shape and were definitely outlined by compact layers of fibrous tissue. (Fig. 1). This suggested a lobular type of structure. The blood vessels, many of which were large, ran in these fibrous septa.

The type cell was of the columnar variety and rested on a delicate basement membrane. Many of the glandlike alveoli contained serous fluid and in a few some fat globules were seen. No mitosis was observed. An epithelial membrane covered the free borders of the growth.

Diagnosis: This is a simple adenoma with no tendency to assume malignancy. It probably had its origin from the cells of the third palpebral gland of the membrana nictitans. This case was unusually interesting in having a bilateral manifestation. The reason or cause of the origin of such a growth is difficult to explain and any attempt can be little more than a guess.

An adenoma.

Adenoma

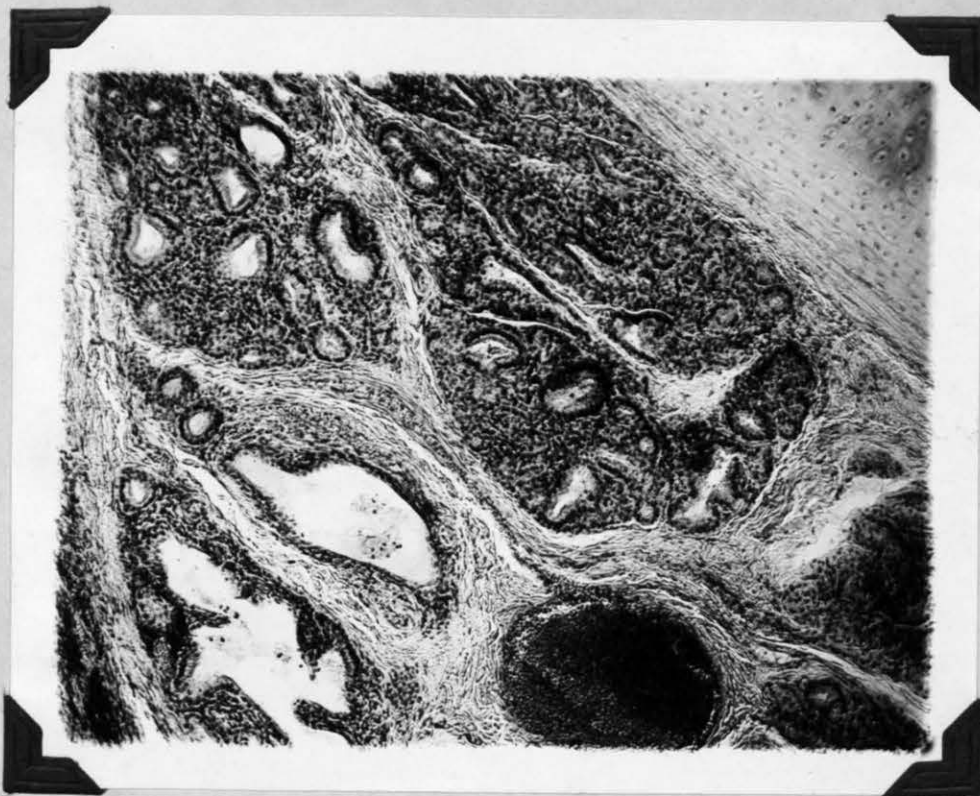


Fig. 1 (T.116) Adenoma of the membrana nictitans of a dog.  
Low power photomicrograph showing the adenomatous structure of the tissue with the epithelial areas outlined by heavy fibrous strands.

STUDY NUMBER FIFTY-SEVEN

TUMOR NUMBER 140

Multiple Adenoma Sebaceum -- Concha -- Dog

This tumor was received from Dr. H. G. Weigand, Denver, Colorado.

Clinical Data: The animal was a police dog. One ear contained a number of scattered nodules which were found to be very vascular when removed surgically. The tumors were located on the internal surface of the concha.

Gross Appearance: The tumors were wartlike structures somewhat oblong in shape and measuring on the average about 3 cm. in length by 1 cm. in width and from 0.5 cm. to 0.7 cm. in depth. They were attached firmly by a rather broad base. The surface presented a multitude of small projecting masses of tissue in close association. The tumors weighed between one and two grams each. They were a greyish pink in color and a few very delicate hairs were present over a portion of the surface.

Microscopic Description: This was an epithelial tumor possessing considerable connective tissue stroma. The epithelial cells occurred in irregular nests and processes but their arrangement entirely lacked order and system (Fig. 1). The type cell was that of the sebaceous gland, and the structure of this gland was further suggested by the cystic dilation of many of the ducts or tubules present (Fig. 2). The type cell was squamous in its arrange-

Study Number Fifty-seven - 3

ment and polyhedral in shape. The cells were packed with small fat globules and as a consequence the nuclei were compressed and often eccentrically located. The surface of the growths was invested with an epidermal covering which in some fields dipped into the substance of the tumor in a manner suggesting a carcinomatous overgrowth. (Fig. 3). The tumor was abundantly supplied with blood vessels of all sizes most of which were filled. Mitosis was not observed.

Diagnosis: This is clearly a new growth originating from the parenchyma of the sebaceous glands. The multiple manifestation of the tumor is somewhat difficult to explain since there was no evidence of any particular aggressiveness on the part of the individual tumors. Probably the different tumors had a common etiology and the same agent that causes one to develop also was the stimulating factor in the others. The tumor is peculiar in having the general appearance of malignancy and yet possessing no actual evidence of such behavior. The overgrowth of the cells and their relation to the stroma is typically carcinomatous but no mitosis or metastatic foci were observed.

I am somewhat at a loss to know what would be a proper designation for this tumor. It would be hardly correct to call it a papillary carcinoma due to the absence of mitotic figures yet it has such a structural design. Again,

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it might be permissible to group it with the adenomas for there is a marked tendency to reproduce the design characteristic of the sebaceous gland. Perhaps it would not be amiss to call the disease a multiple adenoma sebaceum.

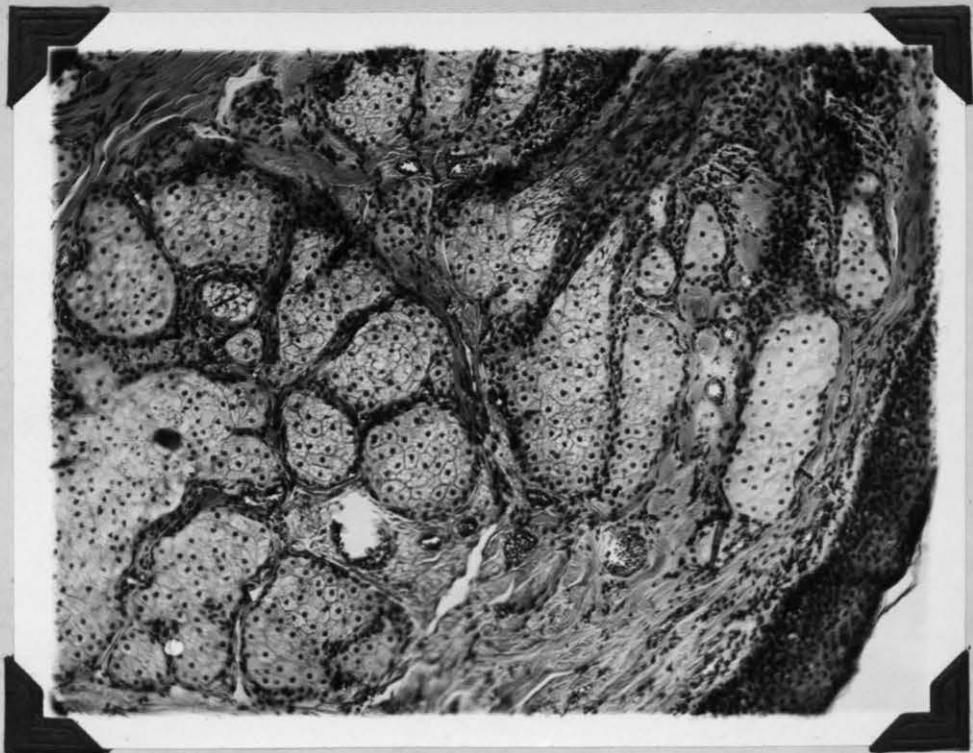


Fig. 1 (T.140) Adenoma Sebaceum Concha of A Dog. Low power photmicrograph showing the glandular arrangement of the cells most of which are over loaded with fat globules.

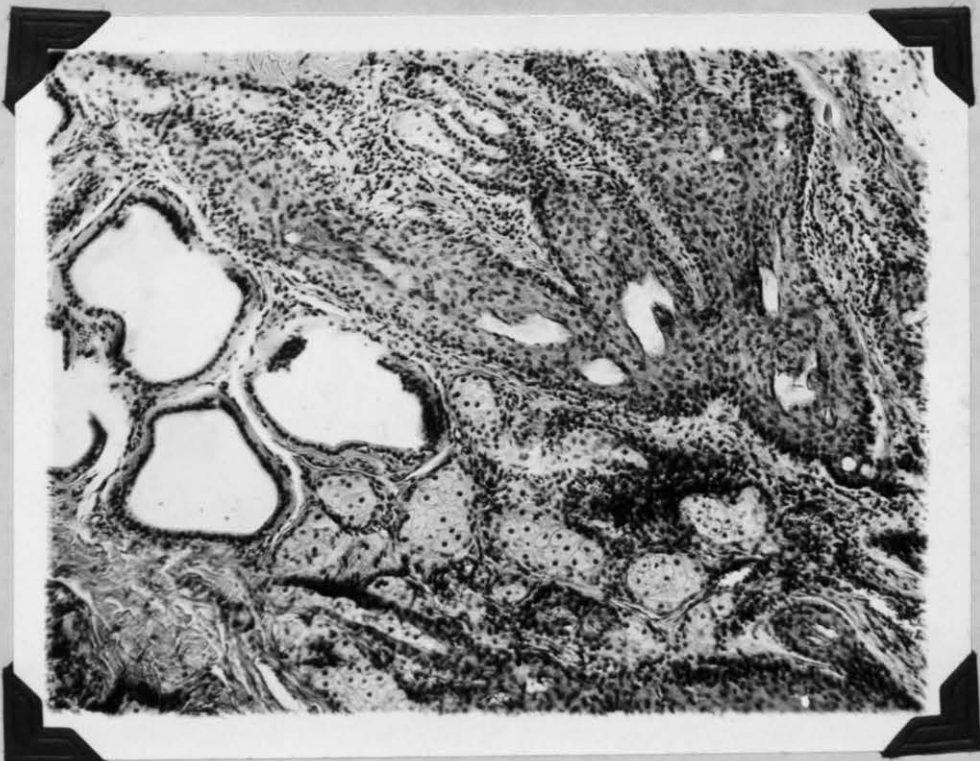


Fig. 2 (T.140) Adenoma Sebaceum Concha of a Dog. Low power view showing a dilation of some of the ducts. Also one of the solid strands of epithelium which is dipping into the depths of the tissue in a carcinomatous fashion.

STUDY NUMBER FIFTY-EIGHT

TUMOR NUMBER 150

Gelatinous Cystadenoma -- Abdominal Cavity -- Chicken

Material for this study was received from Dr. Geo. W. Stiles, Jr. of Denver, Colorado.

Clinical Data: Information on this case was rather scant. The animal, a bird, was posted by Dr. Stiles, who reported that he found a soft, somewhat gelatinous mass which "occupied the entire abdominal cavity." The exact attachment of the tumor was not recorded, nor was the condition of the abdominal viscera described.

Gross Appearance: The mass was somewhat oblong in shape and measured about 6 cm. in length with a diameter between 2.5 cm. and 3 cm. The surface was covered with a capsule over the outside of which was a serous layer. The tumor had a honey comb appearance due to a multitude of cystic cavities which varied in size from 0.1 cm. to 1 cm. in diameter (Fig. 1). Some of the cavities contained a clear watery fluid while others possessed a semisolid gelatinous substance which became quite firm after fixation in ten percent formalin solution.

Microscopic Description: The tumor possessed a fibrous stroma of variable thickness which carried large numbers of thin walled blood vessels all of which were much dilated. The stroma proper was somewhat loose in texture

Study Number Fifty-Eight - 2

with some fluid quite generally distributed throughout the structure. The cysts were very irregular in their shape and size. (Fig. 2). The majority of the larger ones were devoid of contents (Fig. 3) while the smaller ones contained a pinkish clear homogeneous material suggestive of colloid. By Van Gieson's stain this substance had a pinkish lavender color. A few of the filled cavities contained some with red blood cells. The cavities were lined with a single layer of cuboidal epithelial cells resting directly upon the connective tissue of the stroma. No mitotic figures were seen.

Diagnosis: We have here an interesting type of adenoma which could properly be called a gelatinous cystadenoma. It is unfortunate that the exact location of attachment of the tumor is not known for with this information one could perhaps speculate on the origin of the type cell. It must have originated from some portion of the abdominal mucosa.

Due to the cuboidal type of the epithelium and its tendency to produce a gelatinous or mucous like substance I am inclined to favor the ovary or some portion of the oviduct as the point of initial proliferation.

From the available data this type of tumor is of uncommon incidence in the lower animals. The tumor in this particular instance would menace the well being of the



Study Number Fifty-eight - 3

individual only by its mechanical influence upon the associated tissues since there were no indications of malignant proliferations of any kind. It was probably rather slow growing.

A gelatinous cystadenoma.

Cystadenoma



Fig. 1 (T.150) Gelatinous Cystadenoma of a Chicken. Sections of the gross specimen showing the cavitated structure.



Fig. 2 (T.150) Gelatinous Cystadenoma of a Chicken. Low power photomicrograph showing one large cyst filled with a gelatinous substance.

Cystadenoma



Fig. 3 (T.150) Gelatinous Cystadenoma of a Chicken.  
Portions of large cysts devoid of contents.

STUDY NUMBER FIFTY-NINE

TUMOR NUMBER 9

Squamous cell Carcinoma of the Penis of a Horse

This case is from the clinic of Dr. H. E. Kingman, Fort Collins, Colorado.

Clinical Data: An irregular multiple tumorous mass was removed from the glans penis of a sixteen year old bay grade horse. While most of the growth was situated on the lateral surface of the organ, yet the entire glans appeared to be affected.

Gross Appearance: The tumor was a foul smelling specimen about 5 cm. by 10 cm. in size. In shape it was irregularly elongated. The surface was much roughened and no capsule was present. The surface gave off a thin purulent discharge and the mass was rather vascular. The color was a light grey to a flesh pink, while the consistency of the growth was rather soft. It weighed 260 grams at the time of removal.

Microscopic Description: Generally speaking this structure presented three main features; the connective tissue stroma, the tumor cells proper and accumulations of leucocytes. The tumor was very cellular and the type cell was epithelial of the squamous variety. The arrangement of these cells in relation to the stroma indicated a lawless type of growth with but feeble resistance encountered in its progressiveness. The epithelial cells were arranged in fingerlike processes, each process being several cells in thickness. (Fig. 1).

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Various fields showed an early attempt at cornification although this feature was not prevalent. (Fig. 3).

The material offered a splendid opportunity for the study of indirect cell division and many excellent mitotic figures were present in nearly every field. (Fig. 3 and 4). The leucocytes were in great abundance and two main varieties, lymphocytes and polymorphs. The lymphocytes were found mainly in the connective tissue between the nests of tumor cells while the polymorphs could be seen in rather close association with the neoplastic cells. In certain areas where infection seemed to be particularly evident, as shown by the presence of polymorphs and edema, there were a good many tumor cells undergoing necrosis. Pyknotic nuclei together with coagulation necrosis could be plainly seen. Thin walled blood vessels provided an abundant blood supply.

Diagnosis: The type cell and its apparent lack of respect for the laws of normal growth would stamp this as a cancer. An infected squamous cell carcinoma with some retrogression.



Fig. 1 (T.9) Squamous Cell Carcinoma.--Penis of a Horse.  
Low power view showing closely packed nests of epithelial cells of a minimum of stroma.

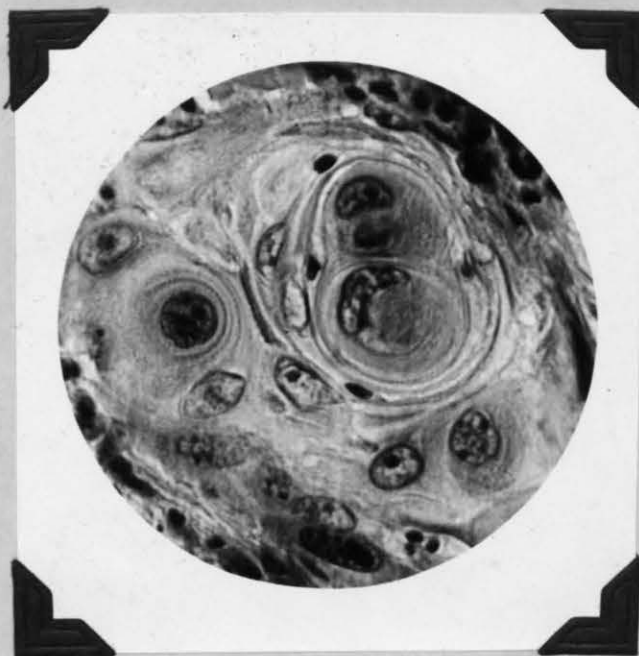


Fig. 2 (T.9) Squamous Cell Carcinoma.--Penis of a Horse.  
High power photomicrograph of cells undergoing very early cornification.

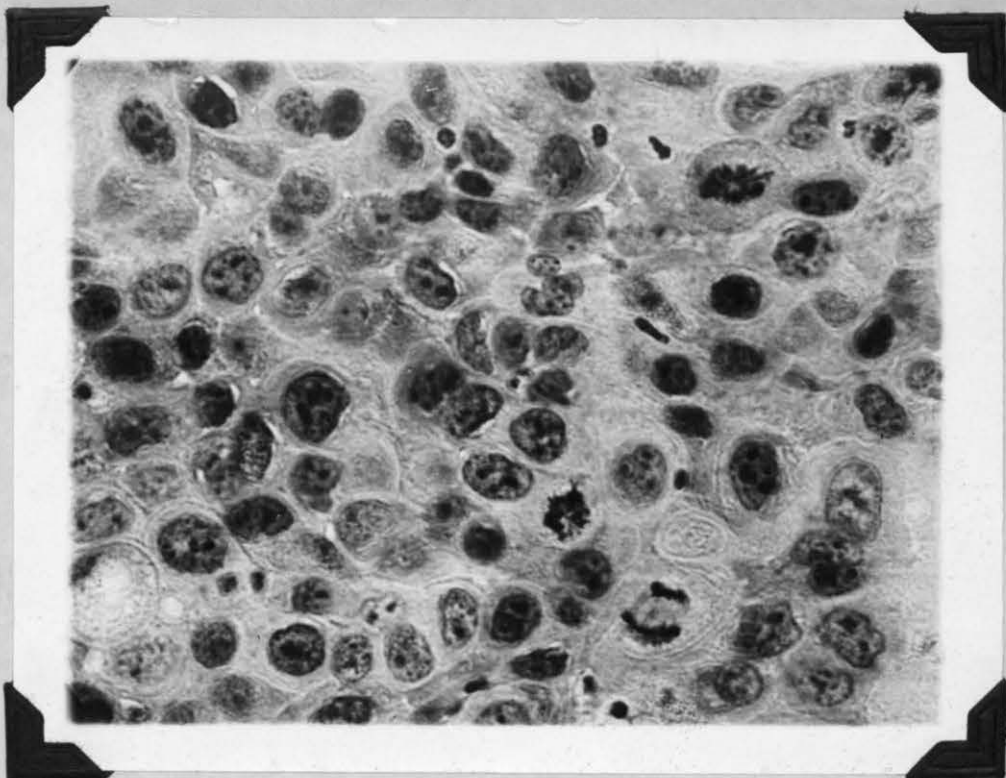


Fig. 3 (T.9) Squamous Cell Carcinoma.--Penis of a Horse.  
High power photomicrograph showing many mitotic figures.

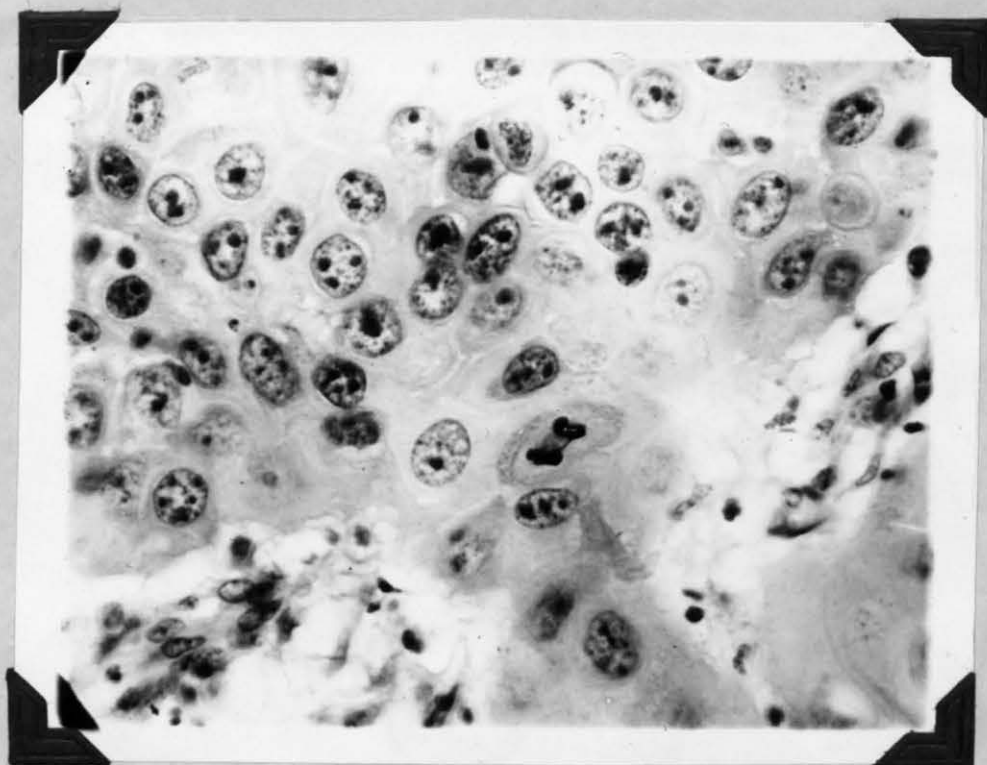


Fig. 4 (T.9) Squamous Cell Carcinoma.--Penis of a Horse.  
Oil immersion photomicrograph showing one cell in an  
interesting phase of mitotic division.

STUDY NUMBER SIXTY

TUMOR STUDY 16

Squamous Cell Carcinoma -- Toe and Foot Pad of a Dog

This material was supplied by Dr. H. E. Kingman, Veterinary Hospital, Colorado Agricultural College, Fort Collins, Colorado.

Clinical Data: The subject was a six year old, female Collie dog. Several months before the tumor was removed a small ulcer appeared on the foot pad of the right hind foot. A single diffusely attached growth developed in this area involving also the middle toe. The tumor was removed surgically. While the dog was slightly lame in the affected foot her general physical condition was good.

Gross Appearance: The tumor was a flat oval formation measuring 2 cm. x 3.5 cm. The surface was slightly roughened and some ulceration of the part was evident. The tissue was soft to the touch and gray in color.

Microscopic Description: Sections of this tumor showed an atypical structure consisting of epithelial tumor cells of the squamous variety resting on a connective tissue stroma which was everywhere heavily infiltrated with leucocytes. In some areas just beneath the surface there was considerable edema with large numbers of endothelials present. Some little hemorrhage was noticeable but blood channels were few. Extensive cornification was a striking feature of this material, this change being most pronounced in the deeper parts of the tissue. The cornified areas seemed to indicate a retrogression



Study Number Sixty - 2

of some standing and showed many small clear spaces, indicative of fluid (hydrops). (Fig. 1) Under the high power it was observed that the leucocytes were largely lymphocytes and endothelials and that certain parts of the stroma possessed eosinophiles in great quantities. Mitotic figures while present were not abundant.

Diagnosis: This is a slow growing retrogressive type of epithelial malignant tumor with the elements of chronic inflammation interfering with the cancer's attempts at growth.

A squamous cell carcinoma.

Carcinoma

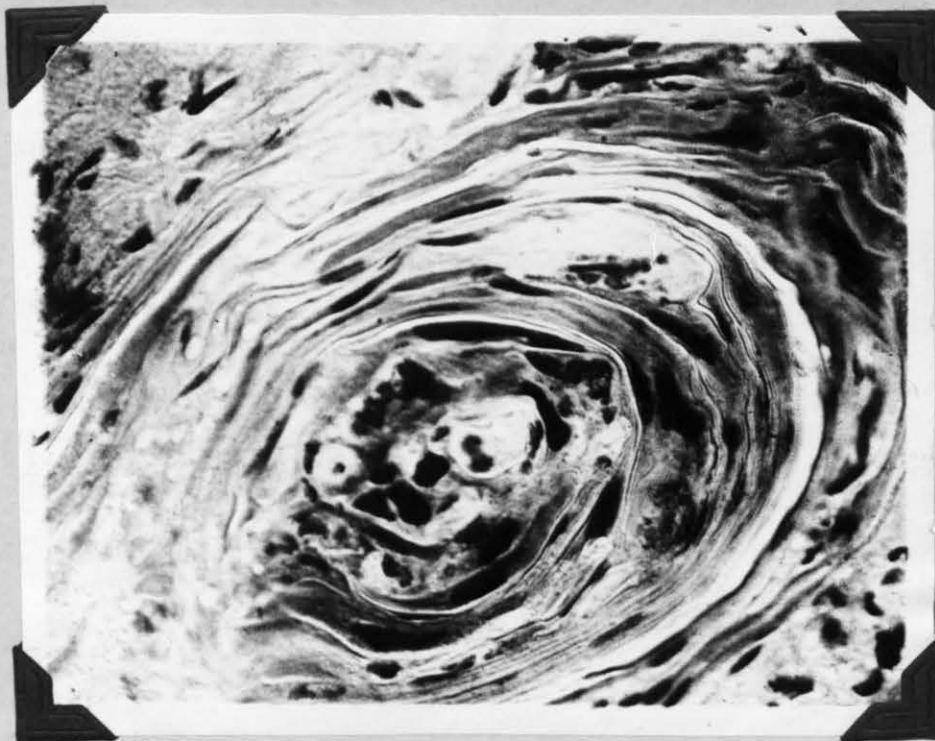


Fig. 1 (T.16) Squamous Cell Carcinoma Toe and Foot Pad of a Dog.

Low magnification showing cornified areas and hydrops.

STUDY NUMBER SIXTY-ONE

TUMOR NUMBER 21

Epidermoid Carcinoma -- Eye of a Cow

This material was from a case from the practice of Dr. H. E. Kingman, Fort Collins, Colorado.

Clinical Data: The animal was an old thin Hereford cow. Four days before the tumor's removal a growth was observed in the inner canthus of the right eye. It was a single diffusely attached growth that lent itself readily to surgical removal.

Gross Appearance: The mass was flat crescent shaped; gray in color and soft in consistency. The surface was roughened and no capsule was present. In size it was 2.5 cm. by 5 cm. by 0.7 cm. in thickness. The tumor was firmly attached to the cartilage of the membrana nictitans extending outward from this structure.

Microscopic Description: This material was extensively involved in a pronounced inflammatory process which was particularly noticeable at the external margin. There was a decided leucocytosis and a very heavy infiltration of eosinophiles following the connective tissue stroma into the depths of the growth. The type cell of the tumor was epithelial of the squamous variety and pronounced cornification was a striking feature (Fig. 1). The epithelial cells were arranged in strands very irregular in contour, each strand being several cells across. These epithelial processes were pushing into the adjacent tissue in a very destructive fashion,

Study Number Sixty-one - 2

there being no line of demarcation between the neoplastic activity and the normal tissue of the part. Some of the epithelial strands widened out into bulbous masses with indented margins that gave them a certain fantastic appearance. Mitotic figures were present but not abundant. When present, they were found in the cells constituting the outer layer of the epithelial strands. A few well defined blood vessels were seen in the connective tissue of the growth.

A study of the individual epithelial cells showed them to be rather large with the nuclei occupying rather more than half of the cell area. In shape they were irregularly polygonal with an asymmetrical relationship to each other. The nuclei were especially rich in chromatin which took a deep basic stain. Those cells in the central portions of the cell masses or strands stained less intense than those nearer the periphery, this probably being due to their position which was farther removed from the source of nutrition. The chromatin material was far more abundant in the nuclei of the cells in the outer zone than in those more centrally located.

Diagnosis: This was an epithelial new growth apparently of some standing and lacking in the vigorous aggressiveness so often found in tumors of this nature. The growth was evidently of some duration since no recent growth of this sort would be likely to undergo such an extensive keratiniza-

Study Number Sixty-one - 3

tion. The relatively few mitotic figures would indicate a rather slow growing malignant tumor.

An epidermoid carcinoma.

Carcinoma



Fig. 1 (T. 21) Epidermoid Carcinoma.--Eye of a Cow.  
Low power view showing pronounced cornification.

STUDY NUMBER SIXTY-TWO

TUMOR NUMBER 29

Epidermoid Carcinoma -- Glans penis -- Horse

This is a case from the clinic of Dr. H. E. Kingman, Fort Collins, Colorado.

Clinical Data: The animal was an eight year old black horse. Three months previous to removal a small growth was noticed attached diffusely on the glans penis. This was eventually removed by surgical methods.

Gross Appearance: This was an irregularly flattened tumor measuring about 0.5 cm. x 2 cm. It was gray in color and rather soft to the touch. The surface was quite roughened and there was evidence of some inflammation in this region.

Microscopic Description: The structure of this neoplasm could be roughly divided into two kinds of tissue: epithelial and connective tissue, with the epithelial predominating. The connective tissue stroma was fairly vascular and decidedly cellular. It contained some leucocytes among which could be seen polymorphs, lymphocytes and a few eosinophiles. The connective tissue was being irregularly invaded by the epithelial elements in somewhat mass formation with no intervening tissue separating the tumor cells from the stroma.

The epithelial cells were squamous in character and were compactly arranged in cord or finger-like processes. In many instances there were only a few narrow strands of

Study Number Sixty-two - 2

connective tissue between neighboring columns (Fig. 1). The center of many of the epithelial accumulations was under going cornification. The greatest cellular activity was in the peripheral zone, for here, many mitotic figures could be demonstrated. (Fig. 3). In fact, mitosis was abundant throughout. The columns of tumor cells were sharply differentiated from the adjacent connective tissue and the nuclei especially were deeply stained and the granular chromatin was very apparent.

The epithelial cells had no special relationship to each other and their outlines were polyhedral except near the margins of the epithelial cords where many appeared almost columnar in type. The nuclei were large and occupied a considerable portion of the cells interior. At one edge of the tumor there was considerable necrosis involving not only the connective tissue but the tumor cells as well and some entire columns showed this retrograde change. (Fig. 3). The surrounding tissues showed some edema and a large amount of hemorrhage. Some polymorphs were also present in these areas together with a few lymphocytes.

Diagnosis: This is a malignant epithelial new growth apparently arising from the epithelium of the mucous membrane of the glans. Histologically, it appears decidedly aggressive, showing abundant mitosis and a malign proliferative type of growth that characterizes neoplasms of this class.

An epidermoid carcinoma.



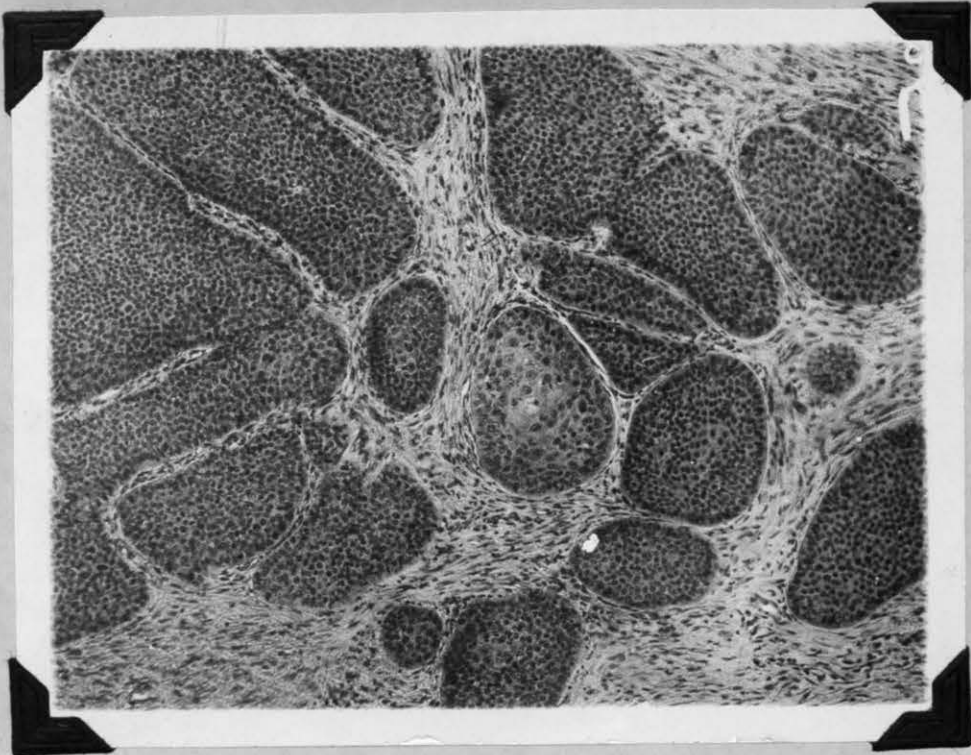


Fig. 1 (T.29) Epidermoid Carcinoma.--Glans Penis of a Horse.

Low power photomicrograph showing the cancerous cells arranged in cord or finger-like processes some of which are cut transversely.

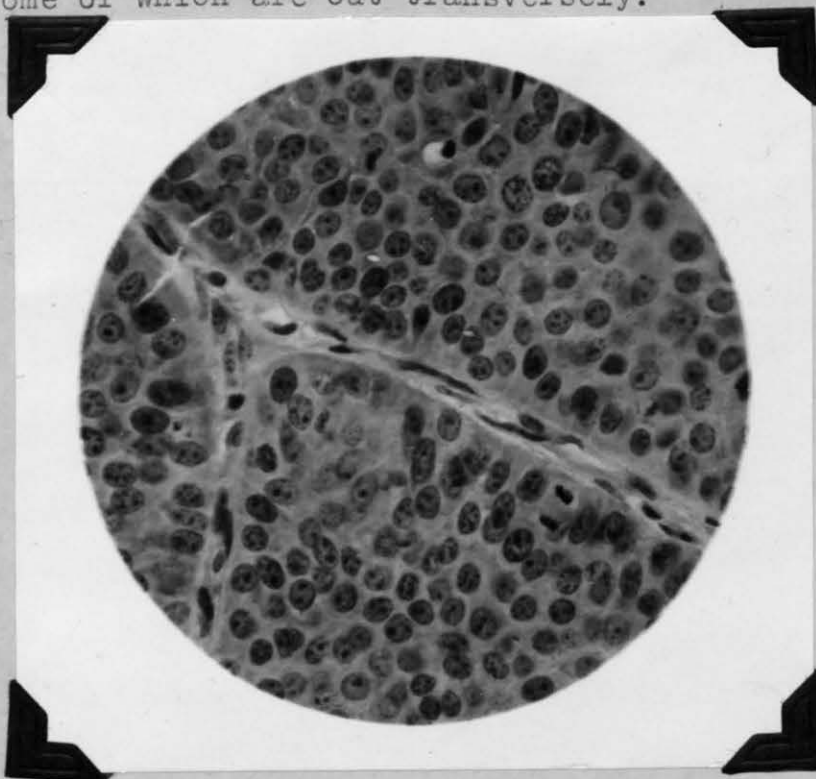


Fig. 2 (T.29) Epidermoid Carcinoma.--Glans Penis of a Horse.

High power view showing a mitotic figure in the peripheral zone of one of the cellular processes.

Carcinoma

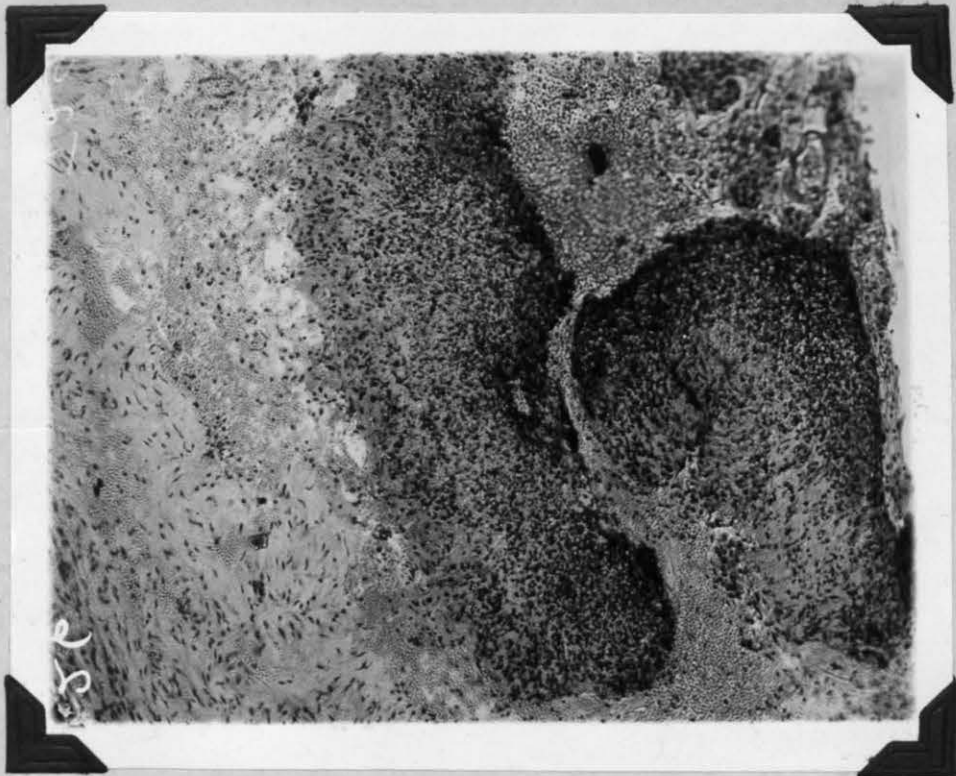


Fig. 3(T.29) Epidermoid Carcinoma.--Glans Penis  
of a Horse.  
Low power view near edge of tumor showing necrosis  
edema and hemorrhage.

STUDY NUMBER SIXTY-THREE

TUMOR NUMBER 38

Squamous Cell Carcinoma -- Eye of a Horse

This is a case from the practice of Dr. N. J. Miller, Eaton, Colorado.

Clinical Data: The animal in this case was a ten year old sorrel mare that had received an injury to the left eye. About one year following the injury a tumorous formation was noticed at the point of the old injury and the surgical removal of the entire organ was effected. One year later a tumorous mass filled the left orbital space made vacant by the removal of the eye. The tumor appeared to infiltrate the surrounding tissues and the bones of the zygomatic arch and the other bones of the skull in that region were "honey combed" as a result of the tumorous activity.

Gross Appearance: The tumor was a hard irregularly shaped mass weighing about four hundred grams. There was a bad odor associated with the growth due to an ulcerated surface and the presence of pus. The tumor was quite vascular and the surface was scantily covered with hair. A freshly cut surface showed a greyish material mixed with tissue of a white glistening appearance.

Microscopic Appearance: Material was selected from various areas and sections obtained which were stained with hemotoxylin and eosin and others with Van Gieson's stain.

The stroma of this tumor consisted of strands of connective tissue promiscuously interrupted by epithelial

Study Number Sixty-three - 2

outgrowths, irregularly circular in outline (Fig. 1). The epithelial type cell was of the squamous variety. A striking feature was the large amount of cornification present. Practically every epithelial process showed this change which, however, was not advanced. Narrow zones of connective tissue separated the adjacent epithelial units and interposed between the connective tissue and the tumor cells proper were many clear spaces or vacuoles. These extended in a peripheral manner around most of the epithelial structures. (Fig. 2). Mitotic figures were commonly observed in the outer layer of the epithelial cells and the material presented the typical picture of the vicious aggressiveness of malignant epithelial tumors.

Blood vessels were abundant in the strands of connective tissue and some areas showed an extensive infiltration of lymphocytes and endothelials with an occasional eosinophile. Some considerable areas of epithelial cells were undergoing a coagulation necrosis and a few calcium deposits were seen.

Diagnosis: This is a highly cellular epithelial new growth of considerable destructiveness as is indicated by the history and its pathological histology. The epithelial cell was apparently under very little restraint and was proliferating in a wild and lawless manner, becoming quiescent

Study Number Sixty-three - 3

only when subjected to the pernicious influence of necrosis. The calcium deposits probably indicate an end result following necrosis while the various leucocytes were attracted to the process as part of the inflammatory reaction. A squamous cell carcinoma which probably had its origin in the mucosa of the eye.

Carcinoma.



Fig. 1 (T.38) Epidermoid Carcinoma.--Eye of a Horse. Low power view showing irregular cellular outgrowths with considerable cornification and lymphocytic infiltration.



Fig. 1 (T.38) Epidermoid Carcinoma.--Eye of a Horse. Low power view showing extensive advanced cornification.

STUDY NUMBER SIXTY-FOUR

TUMOR NUMBER 50

Carcinoma -- Of the Right Eye and Orbital Region of the  
Masseter Muscle -- Cow

This case was furnished by Dr. James Farquharson from the Anatomical Laboratory of the Colorado Agricultural College.

Clinical Data: The animal was a five year old Hereford cow with a diffuse mass involving the right eye and extending to the orbital portion of the masseter muscle and the submaxillary region (Fig. 1). The submaxillary and parotid lymph glands were enlarged and the affected eye was apparently entirely destroyed. The animal was in a very poor and weakened condition.

Gross Appearance: The tumor was a roughened mass about 20 cm. across at its greatest dimension. It had a very irregular margin, was fairly firm and did not possess a capsule. The surface was bloody and the mass appeared quite vascular. There was considerable ulceration with some discharge of pus from the surface which emitted a most offensive odor. Smoothly cut surfaces of fixed material from this tumor had a striking lobulated appearance. The color of the fixed material was a dirty white.

Microscopic Description: This tumor was a highly cellular structure made up of epithelial cells supported by fibrous connective tissue stroma of variable thickness. The larger strands gave off smaller ones which surrounded

Study Number Sixty-four - 2

irregular masses of tumor cells giving the cell masses an alveolar arrangement. Many of these alveolar masses were presented in a transverse manner while others, cut longitudinally, appeared as cord like accumulations of cells (Fig. 2).

The epithelial cells were mostly polyhedral of large size. They were lying in apposition with no apparent intercellular material present. The most interesting feature of these cells was the large amount of chromatin material contained within the nuclei. It was very granular and fairly evenly scattered throughout the nuclear contents. Small dark bodies that resembled nucleoli were noticed within the many of the nuclei. Mitotic figures were strikingly abundant, many fields containing as many as six cells undergoing this change (Figs. 3 and 4). A close study of many slides showed that the majority of the mitotic figures were involving cells in the peripheral portion of the alveolar masses.

Some large blood vessels were present in the denser connective tissue and smaller vessels were frequently encountered in the finer strands of the interalveolar stroma. Large accumulations of eosinophiles were also noted in the connective tissue of the stroma as were many lymphocytes and polymorphs.

Cavities of different sizes and shapes were common.



Study Number Sixty-four - 3

They appeared to have had their origin in the connective tissue structure and all were practically empty. Areas of necrosis, which were often extensive, were an interesting feature of this tumor (Fig. 5). The change for the most part was a simple coagulation with the cellular outlines still perceptible but with many of the nuclei fading out and disappearing. Some necrotic portions showed the presence of a large number of eosinophiles, although as mentioned above, the majority of these leucocytes were found in the substance of the connective tissue.

Diagnosis: This is a malignant epithelial tumor consisting quite largely of cells of an immature type growing in a lawless, unrestrained manner. As to its structural classification, if one were to follow Ewing (1) this structure would probably be called a large alveolar carcinoma. This tumor had almost every malignant characteristics such as vascularity, infiltrative invasiveness, embryonic cells undergoing frequent mitosis and apparent metastasis to the regional lymph glands. A very vicious and destructive type of cancer. The necrosis present was probably the result of trauma and the resulting inflammatory reaction. These things are very apt to disarrange the blood supply of such a soft structure as a carcinoma of this type, and with an impaired blood supply death of the cells soon follows.

An alveolar carcinoma.



Fig. 1 (T.50) Carcinoma in a Cow. The mass involved the right eye and the orbital region of the masseter muscle.

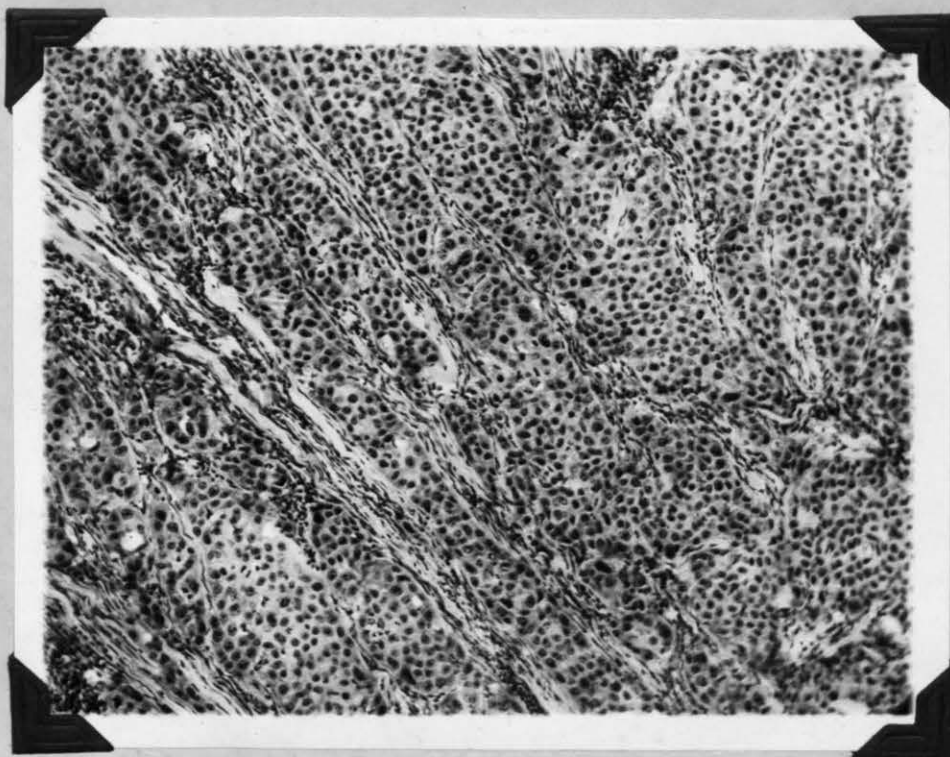


Fig. 2 (T.50) Carcinoma.--Eye of a Cow.  
Low power photomicrograph showing solid columns of epithelial cells and a minimum amount of stroma.

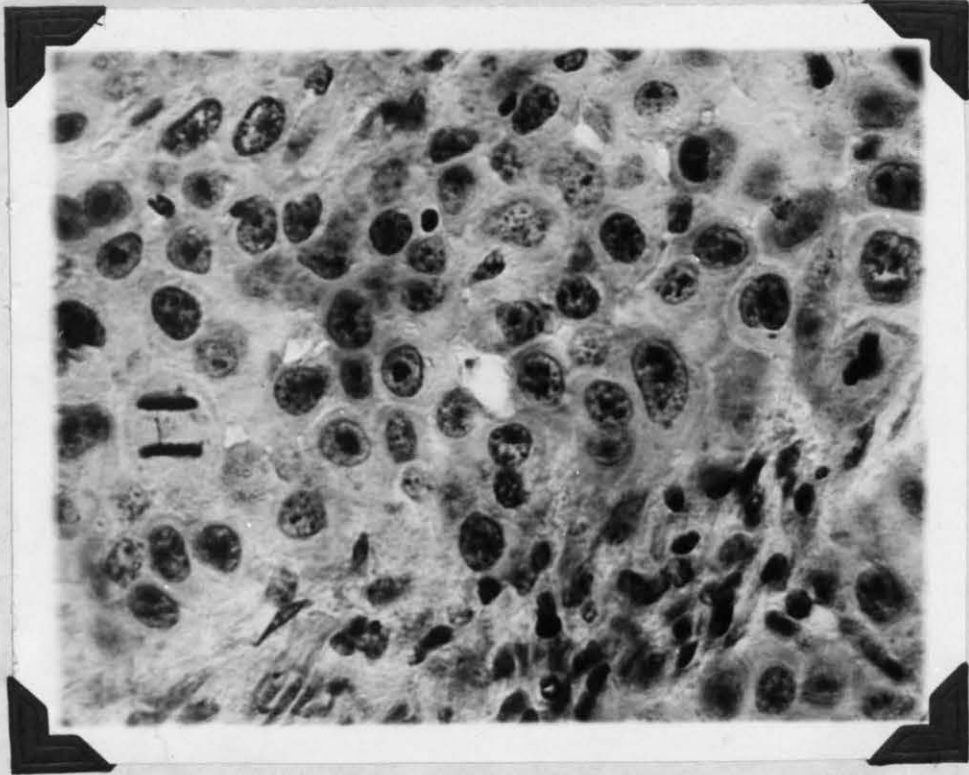


Fig. 3(T.50) Carcinoma.--Eye of a Cow.  
High power view showing the large polyhedral cells,  
one of which is in mitosis.

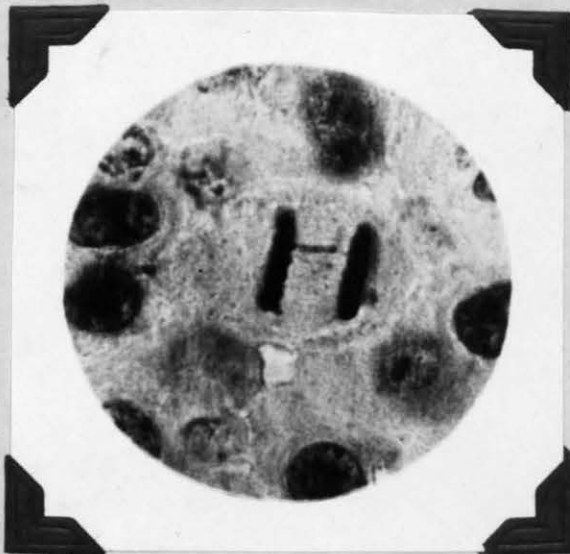


Fig. 4 (T.50). Carcinoma.--Eye  
of a Cow.  
Oil immersion photomicrograph of  
a mitotic figure.

Carcinoma



Fig. 5 (T.50) Carcinoma.--Eye of a Cow.  
Low power photomicrograph showing an irregular  
area of coagulation necrosis.

STUDY NUMBER SIXTY-FIVE

TUMOR NUMBER 55

Embryonal Carcinoma -- Testicle of a Dog

This tumor was received from Dr. G. H. Roberts, Lafayette, Indiana.

Clinical Data: The subject was a seven year old brown male dog. About four months previous to the animal's death one of the testes was observed to be nearly twice its normal size. The gland continued to enlarge and interfered with the animal's gait when he attempted to run. It was also observed that the subject was in poor physical condition at the time of death. No information as to the exact cause of death was received. Upon post mortem the testicle seemed to be involved in a tumorous process which extended upward into the abdominal cavity.

Gross Appearance: The tumor mass was about 15 cm. long and nearly 8 cm. in diameter. It was white in color and soft in consistency. No definite capsule was noticed. The neoplasm was somewhat club shaped with the swollen end distal to the body of the animal. No photograph showing the tumor in the gross was obtainable.

Microscopic Description: Sections studied from various portions of the tumor showed a richly cellular structure the continuity of which was interrupted by a few well defined strands of fibrous connective tissue arranged

Study Number Sixty-five - 2

in a manner suggestive of large indistinct alveoli. (Fig. 1). The type cell of this tumor was a fairly large structure irregularly round or polyhedral in shape with a pale staining cytoplasm. The majority of the cellular bulk was represented by the nucleus which was also polyhedral in contour. A large percentage of the nuclei possessed what appeared to be nucleoli (Fig. 3). Chromatin material was not abundant and when observed was in the form of fairly large granules. The nuclei also contained small vesicles in considerable numbers. Mitotic figures were numerous. (Fig. 4). The tumor cells were closely packed not permitting of any intercellular material. An abundance of blood was insured by ample vessels in the strands of connective tissue and in the tumor tissue proper. The blood vessels among the tumor cells were thin walled affairs consisting of a layer of endothelial cells and a thin stroma or supporting tissue. A few extravascular blood cells were seen among the tumor cells. Extensive areas of coagulation necrosis were seen in some of the sections. No evidence of testicular tissue was seen.

Diagnosis: We have here a very immature type of cell involved in a malignant proliferation as a consequence of which the entire parenchyma of the gland has been destroyed and replaced by the cells of the neoplasm. The large size of the cells and their undifferentiated appearance

Study Number Sixty-five - 3

together with the presence of nucleoli and mitotic figures would strongly indicate an embryonic type of cell. Possibly a careful postmortem examination of this dog would have disclosed tumor metastasis in the regional lymph glands and perhaps in the vital organs. Most of the growths of this nature described by the older writers were considered some form of round cell sarcoma. Ewing (1) thinks differently and considers them as cancers and calls them embryonal carcinomas, feeling that they arise as teratomas in which there is a suppression of the other elements. Ewing gives evidence to disprove the contention of some that these tumors may arise from the spermatoblasts.

In view of Ewing's remarks I would call this an embryonal carcinoma.

Ref. Ewing, James -- Neoplastic Diseases, 1st Edition, page 773.  
W. B. Saunders Company, Philadelphia, 1919.



Fig. 1 (T.55). Embryonal Carcinoma.--Testicle of a Dog.  
Low power view showing highly cellular structure and fibrous stroma.

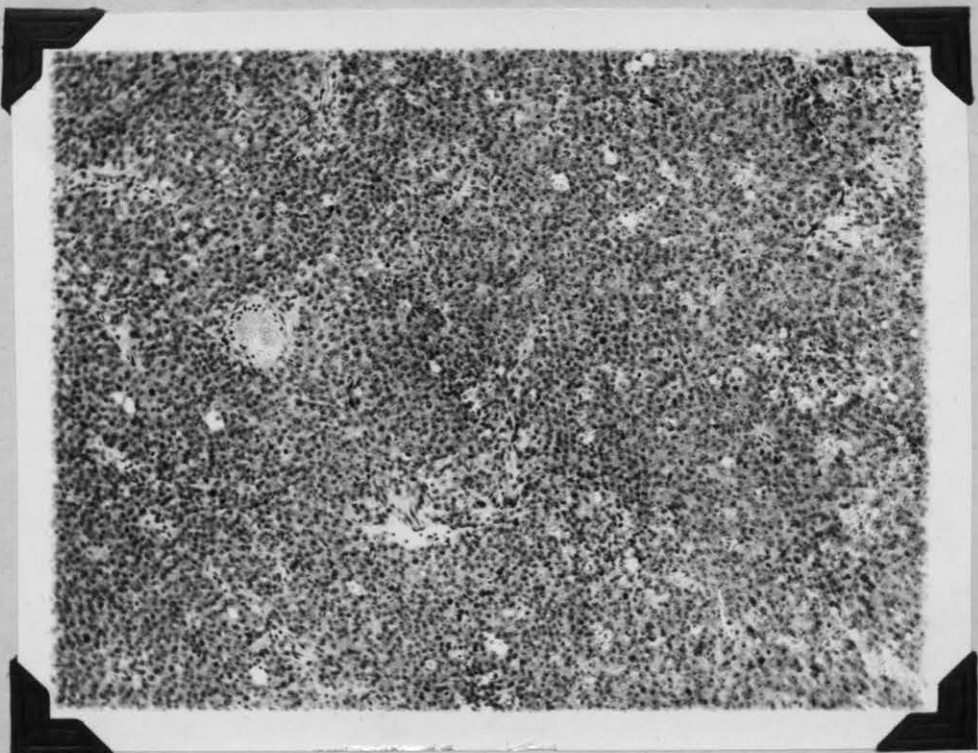


Fig. 2 (T.55) Embryonal Carcinoma.--Testicle of a Dog.  
Low power view showing an extreme cellular structure.



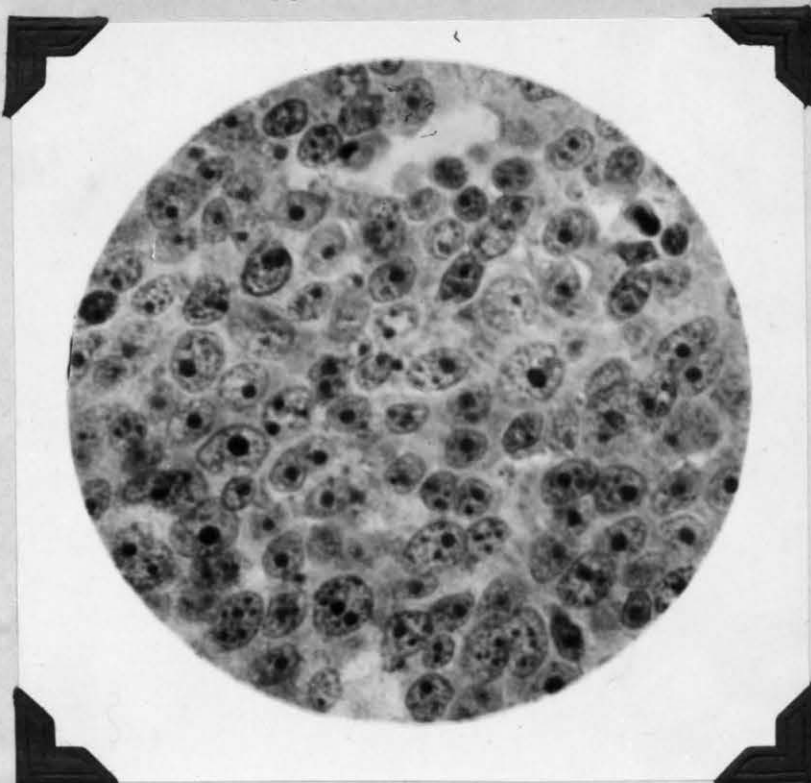


Fig. 3 (T.55) Embryonal Carcinoma.--Testicle of a Dog.  
High power photomicrograph showing large polyhedral cells and many nucleoli.

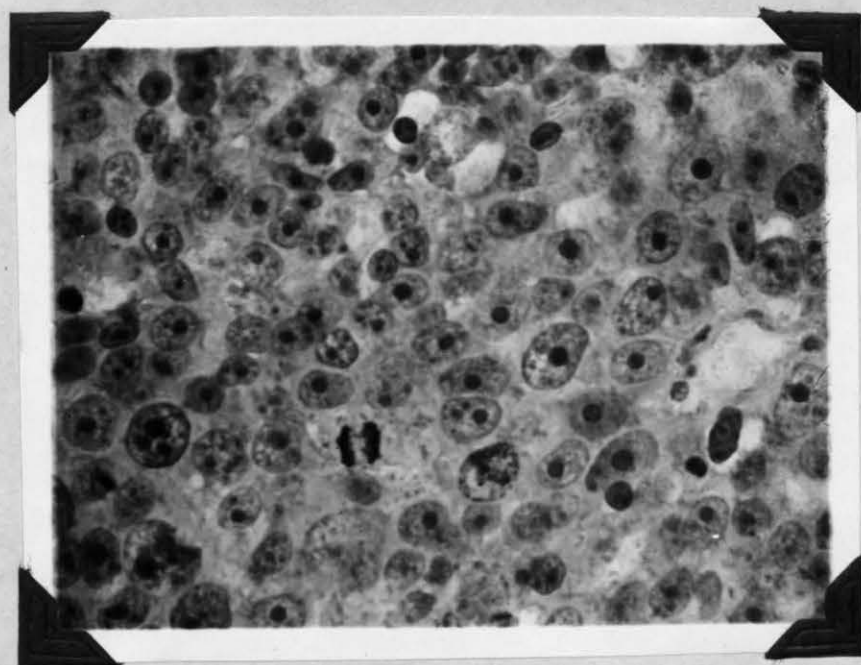


Fig. 4 (T.55) Embryonal Carcinoma.--Testicle of a Dog.  
High power view showing the large polyhedral cells one of which is undergoing mitosis.

STUDY NUMBER SIXTY-SIX

TUMOR NUMBER 64

Epidermoid Carcinoma of the Penis -- Horse

This material is from a case in the practice of Dr. H. E. Kingman.

Clinical Data: Information dealing with the clinical aspects of this case was scant. Nothing is known except that the tumor which was a large roughened mass was removed surgically from the distal end of the penis of a horse.

Gross Appearance: No measurements were made nor was the weight of the growth determined. The external surface was much eroded and quite granular. While the mass was closely knit yet it was rather friable and inclined to be crumbly especially at the surface. The surface was of a dirty yellow color and showed the presence of a purulent suppurative exudation. The interior of the mass was of a greyish white color and a cut surface presented a somewhat mottled appearance due to areas of tumorous tissue being separated by the remains of tissue normal for the part. It was evident that the neoplastic tissue was pushing into the surrounding substance as projecting masses of new tissue were seen at every point where the tumor came in contact with the tissue of the organ. No capsular covering was present.

Microscopic Description: Sections showed this tumor to consist mainly of two kinds of tissue, epithelial and fibrous connective tissue. The type cell was the squamous

Study Number Sixty-six - 3

epithelial. These were growing in solid strands or cordlike extensions with the outer most cells in immediate contact with the surrounding stroma (Fig. 1). The various cellular accumulations were quite irregular in contour and presented a jagged outline with the tissue of the stroma jutting into the depressions of the tumor (See Fig. 1). This gave many of the groups of tumor cells a papillary appearance.

Many of the isolated cellular masses showed extensive cornification. This change was most pronounced near the center where it was difficult to distinguish cell outlines and where many of the nuclei had disappeared (Fig. 2). The structure of the epithelial "pearls" was well revealed in many of these cornified areas. Definite layers of flattened atrophic epithelial cells with elongated nuclei were in the intermediate zone of these cellular accumulations while the few remaining normal tumor cells were confined to one or two layers at the periphery (Fig. 3). Clear spaces of varying sizes were common and most of the areas of cornification showed an infiltration of polynuclear leucocytes.

Mitosis was a common feature in the outer zone of the epithelial masses where the individual cells differed in appearance somewhat from those in the deeper portions of the tumor parenchyma (Fig. 4). The cells in this zone were smaller in size with a large nucleus that possessed an

Study Number Sixty-six - 3

abundance of basic staining chromatin material. Those cells in the body of the tumorous strands were quite large and somewhat flattened with rather indistinct outlines (Fig. 5 ). The nuclei of these cells stained rather faintly and mitosis was not observed in the depths of these areas.

Near the surface, the spaces between the neoplastic processes were occupied by granulation tissue. Vacuoles were many in this tissue as were wandering cells, lymphocytes, eosinophiles and polymorphonuclear leucocytes. Sections from the depths of the tumor showed the neoplastic cells pushing into the muscle fibres in many instances from several different directions. As a result of this pressure most of the muscle fibres were atrophic and some degree of hydropic degeneration was noticeable. Blood vessels were fairly numerous in the connective tissue substance although many were devoid of blood.

Diagnosis: This is a cancerous growth, the type cell of which had a squamous cell parentage. From the manner of its extension and the abundance of mitotic figures one would conclude that it possessed considerable tendency towards the destruction and invansion of the normal tissues. These features and the frequency of epithelial "pearls" would class this tumor with the epidermoid carcinomas.

Study Number Sixty-six - 4

These keratinized masses of cells offered a splendid opportunity for their detailed study. They revealed the capacity of the older cells, those nearest the center of the cellular columns and farthest from the cells representing the Malpighian layer, to undergo keratinization by maintaining features common to cells of the squamous epithelial variety in normal situations.

The inflammatory changes near the surface were probably the result of trauma, complicated by infection. These things are usually part of the picture of carcinoma of this region. The infection and the subsequent inflammatory reaction is apt to result in more or less necrosis of the superficial cells in tumors of this kind and some evidence of this is present here. This is a rather frequent malignant tumor of the horse.

An epidermoid carcinoma.

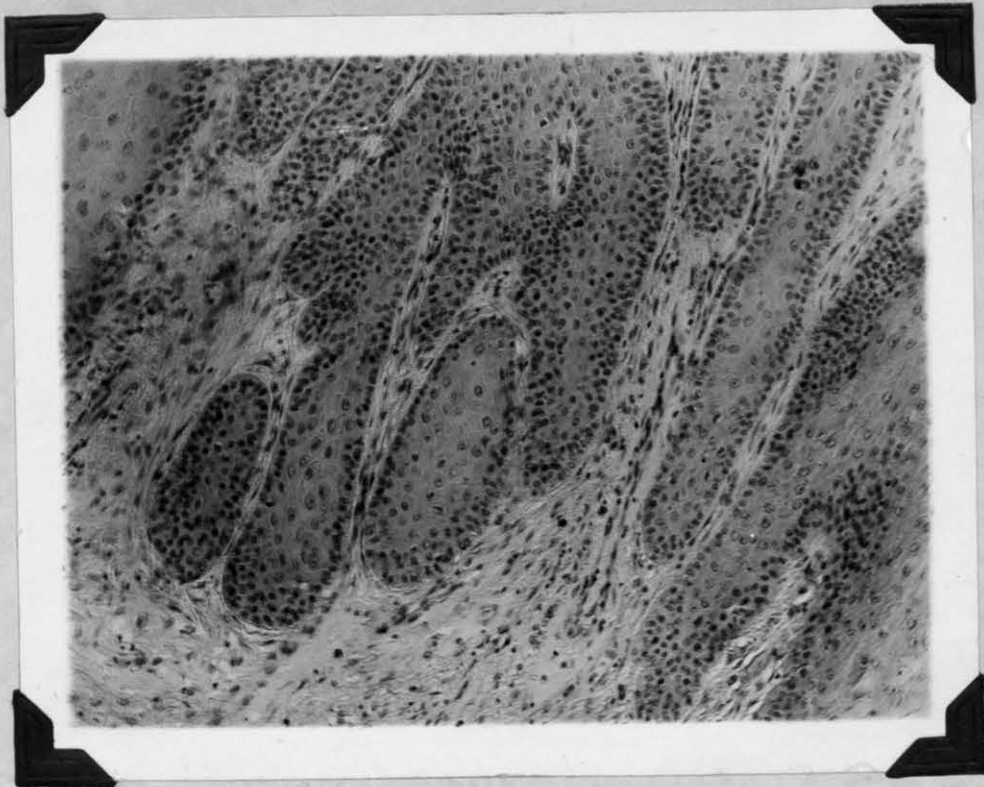


Fig. 1 (T.64) Epidermoid Carcinoma of the Penis of a Horse.  
Low power photomicrograph showing the finger-like projections of epithelial growing into the stroma.



Fig. 2 (T.64) Epidermoid carcinoma of the Penis of a Horse.  
Low power view showing extensive cornification.

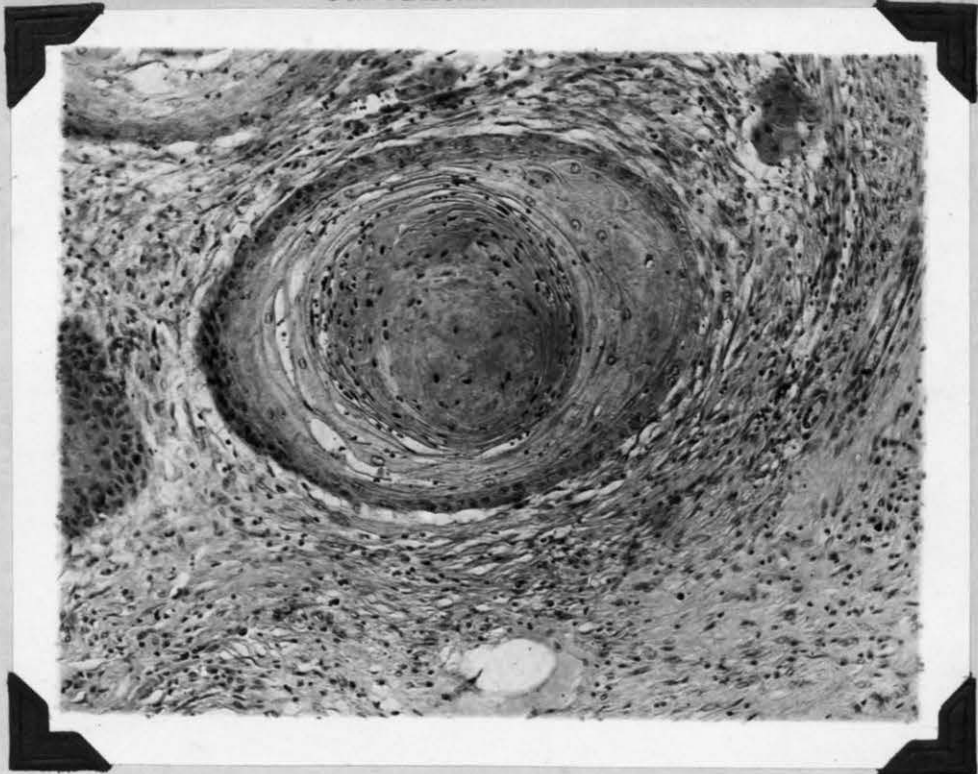


Fig. 3 (T.64) Epidermoid Carcinoma of the Penis of a Horse.

Low power view showing an epithelial "pearl" with many flattened atrophic epithelial cells.

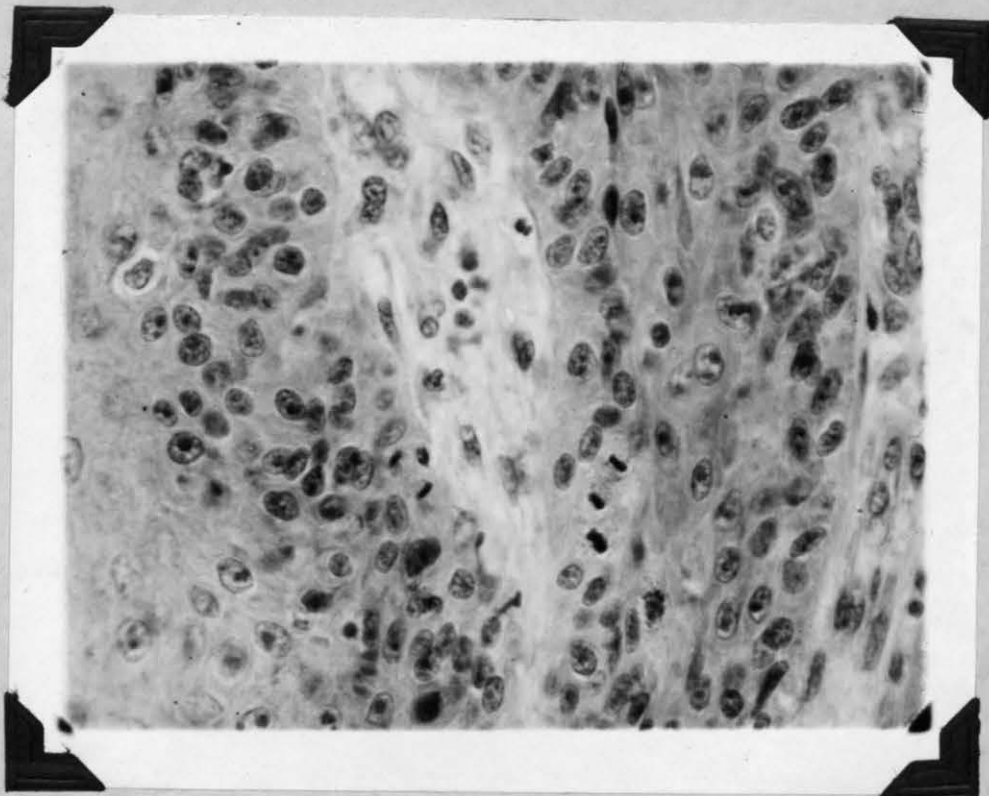


Fig. 4 (T.64) Epidermoid Carcinoma of the Penis of a Horse.

High power view showing two epithelial cells in mitosis.

Carcinoma



Fig. 5 (T.64) Epidermoid Carcinoma  
of the Penis of a Horse.  
Cornified areas with a few squamous  
epithelial cells with distinct cell  
outlines.



STUDY NUMBER SIXTY-SEVEN

TUMOR NUMBER 67

Papillary Carcinoma -- Prepuce of a Horse

This is a tumor from a case in the practice of Dr. G. H. Roberts, LaFayette, Indiana. The material was sent to our laboratory by Dr. Frank P. Mathews of Purdue University.

Clinical Data: The subject was an old bay horse. One year previous to the tumor's final removal a mass about the size of the end of the thumb was observed on the lower edge of the prepuce. Four months after the tumor was first seen it was removed by a ligature. This was followed by a recurrence and as the mass increased in size there was some interference of function upon retraction of the penis. The general physical condition of the patient was fair. The growth was removed surgically by the knife.

Gross Appearance: The mass presented a roughened surface and was cauliflower like in appearance (Fig. 1). It measured 12 cm. x 5 cm. x 2.5 cm. No record was made of its weight. The tumor consisted of a large number of rugae of folds of tissue with rather deep clefts between them. The mass presented a convoluted appearance, was rather firm in consistency and light red in color. It was attached to the prepuce by a pedicle and considerable hemorrhage followed the operation necessary for its removal. There was no capsule. Examined more minutely a cut section showed the larger folds to consist of smaller ones. Through the center of the large

Study Number Sixty-seven - 2

masses was a fibrous core and branches were given off from this structure to provide a stroma for the smaller rugae.

Microscopic Description: An examination of the microscopic anatomy of this tumor showed its various units or folds to consist of a conspicuous core of fibrous connective tissue from which were given off, in a very irregular manner, small papillae of a similar structure. (Fig. 2). Many of these papillae projected almost to the surface of the growth while others terminated at a short distance from the parent core. Epithelial cells of the squamous variety covered these skeletal structures to such a degree as to completely fill the areas between them. In sections obtained from a plane longitudinal to the long axis of the core, the epithelial elements and the connective tissue papillae seemed to "dove tail" with each other, the parenchyma of the tumor being arranged in fingerlike sheets which fit between the fibrous papillae from the central core.

The epithelial cells were of medium size and for the most part oval in shape. They were in close association with each other, an intercellular substance not being observed. The nuclei were large and revealed a tendency to take the basic stain rather deeply. Most of the nuclei were hyperchromatic and mitosis was a common feature (Fig. 3). Taken in all, the epithelial cells of this tumor showed very little tendency to differentiate as similar cells in a normal process

Study Number Sixty-seven - 3

should.

There was no evidence of cornification and the mitotic figures were promiscuously scattered throughout the epithelial areas and were not confined to the cells of the Malpighian layer such as was true in Tumor Study No. 64. A rather extensive lymphocytic infiltration was apparent throughout the connective tissue stroma of this neoplasm, the small type of lymphocyte predominating (Fig. 4). A generous supply of blood was assured through the abundance of well formed vessels in the connective tissue areas. Most of the fibroblasts of the central core had a drawn atrophic appearance and the collagen fibrils were in rather thin compact strands.

Diagnosis: The architecture of this tumor; the type cell involved and its proliferative tendencies would classify this neoplasm as a papillary carcinoma. The tumor showed no retrogression and very little infection. It had every characteristic of a vigorous unrestrained growth with the epithelial cells proliferating with such rapidity as to make differentiation impossible, hence the abundance of mitosis throughout the cancerous areas and the absence of cornification. It is perhaps a little difficult to account for the extensive infiltration of lymphocytes which occurred in the

Study Number Sixty-seven - 4

substance of the connective tissue. Possibly they were engaged in neutralizing certain toxic products resulting from the excessive activity of the epithelial cells of the growth.

A papillary carcinoma.

Carcinoma

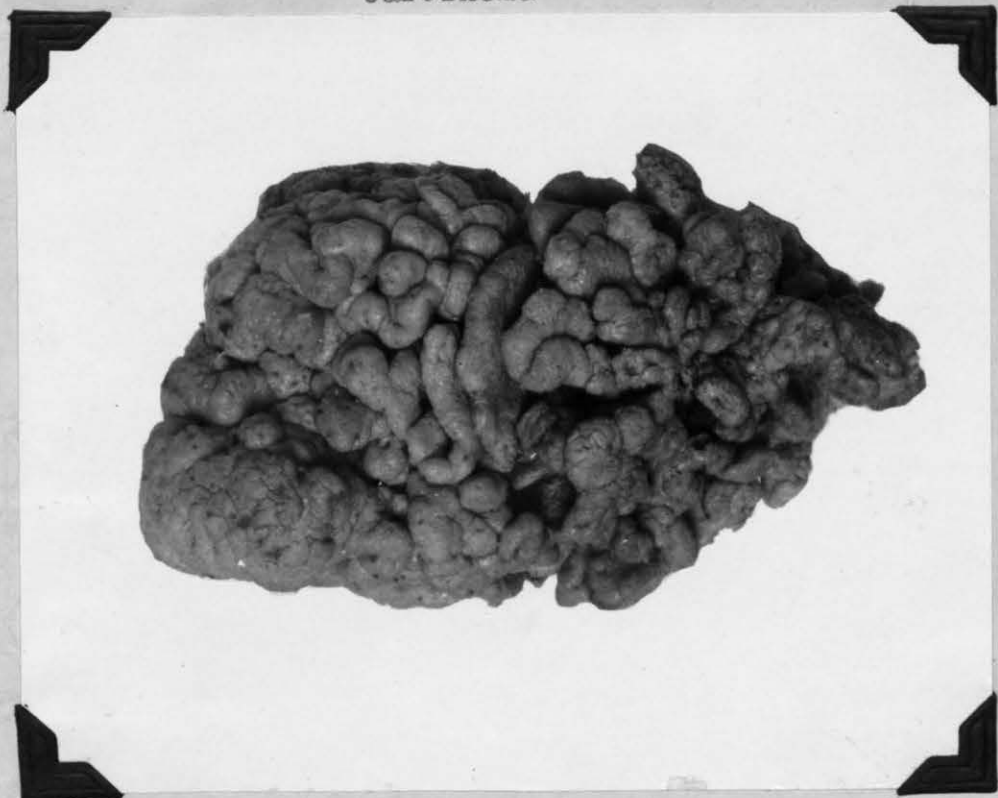


Fig. 1 (T.67) Papillary Carcinoma from the Prepuce of a Horse.

Carcinoma

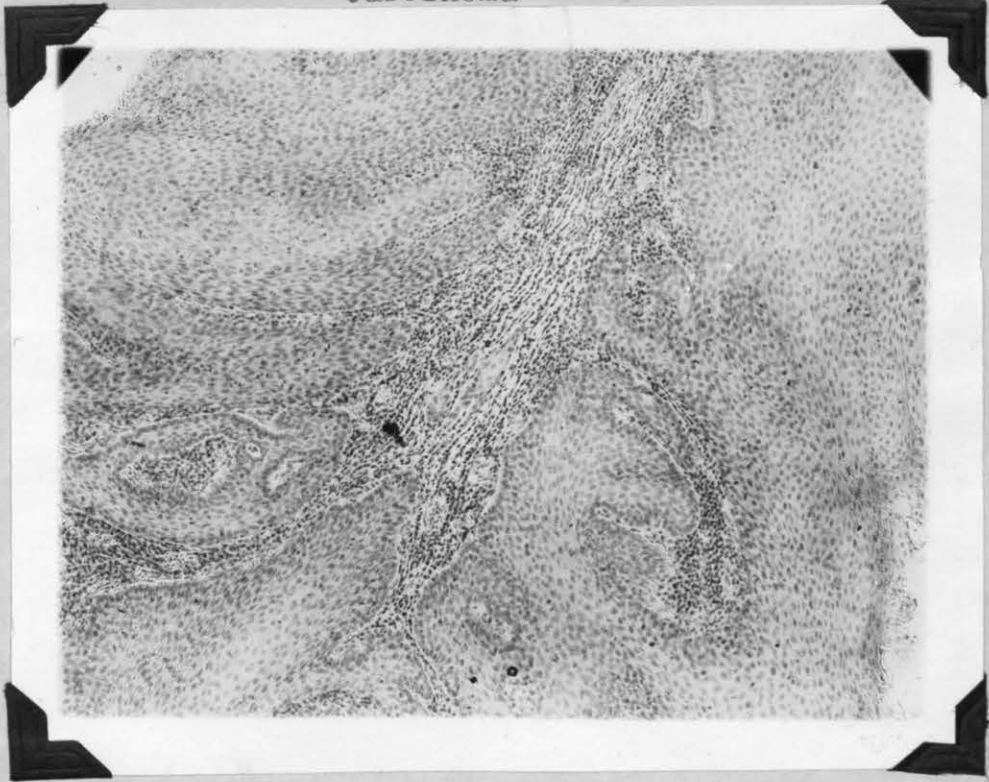


Fig. 2 (T.67) Papillary Carcinoma from the Prepuce of a Horse.  
Low power view showing fibrous papillae covered by squamous epithelial cells.

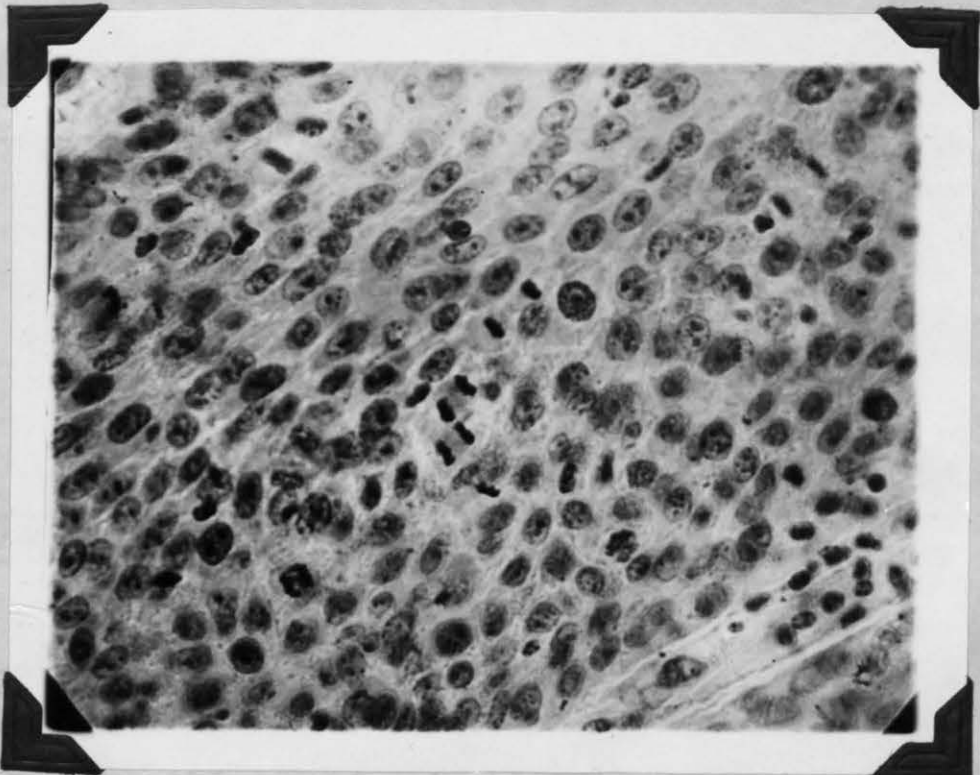


Fig. 3 (T.67) Papillary Carcinoma from the Prepuce of a Horse.  
High power photomicrograph showing cells undergoing mitotic division.

Carcinoma



Fig. 4 (T.67) Pappillary Carcinoma from the Prepuce of a Horse.  
Low power photomicrograph showing an intense lymphocytic infiltration.

STUDY NUMBER SIXTY-EIGHT

TUMOR NUMBER 73

Squamous Cell Carcinoma -- Orbit -- Eye of a Horse

This is a case from the clinic of the Veterinary Hospital of the Colorado Agricultural College.

Clinical Data: The animal was a grade horse with a small tumorous involvement of the inner lower portion of the left orbit. No information was obtainable as to the duration of the condition. The mass was large enough to interfere with vision for while there was no great external presentation of the tumor its presence caused the eye ball to be pushed backward and upward. There was a purulent discharge which gave the lesion a smeary repulsive appearance (Fig. 1).

Gross Appearance: The mass was non-encapsulated and possessed a very irregular ragged appearance being somewhat oblong and flattened. It measured about 4 cm. x 2.5 cm. x 1.5 cm. It was grey in color of a closely knit texture but rather soft in consistency. The mass was not particularly vascular.

Microscopic Description: This was clearly an epithelial growth consisting of a predominant arrangement of squamous epithelial cells in large groups or processes separated from each other by narrow strands of fibrous connective tissue (Fig. 2). There was no scheme nor order observed in the manner in which the epithelial processes



Study Number Sixty-eight - 2

were presented and a minimum amount of stroma was apparent throughout.

The type cell was of the typical large squamous variety. The nuclear contents were finely granular with the chromatin substance appearing as a single small mass of deeply basic material located slightly eccentrically. Mitosis was frequently observed but did not appear to be confined to any particular portion of the epithelial groups such as is often the case in tumors of this kind.

Wide spread retrogressive changes were strikingly in evidence in this tumor and large groups of cells showed a coagulative necrosis, (or perhaps a hyalin change) (Fig. 3). Areas of unquestionable caseous necrosis were frequent and a few instances were seen where red corpuscles had poured into these necrotic areas, due no doubt to the breaking down of the tissues adjacent to the capillaries in the connective tissue stroma.

A considerable number of the nuclei of the epithelial cells contained small acidophilic droplets suggestive of a hyalin degeneration. The outer portions of the tumor showed more or less fluid and many polymorphonuclear leucocytes and lymphocytes. A few eosinophiles were also seen. Blood vessels were limited to the connective tissue

Study Number Sixty-eight - 3

between the sheets of epithelial cells. Cornification was not observed.

Diagnosis: This is a squamous cell carcinoma that does not appear to have been especially aggressive. In fact there appears to be more of a regressive tendency than a progressive one. Nevertheless a growth of this kind must be considered dangerous with metastasis possible at any time.

Carcinoma



Fig. 1 Squamous Cell Carcinoma.--  
Orbit of the eye of a Horse, showing  
the smeary purulent discharge.

Carcinoma

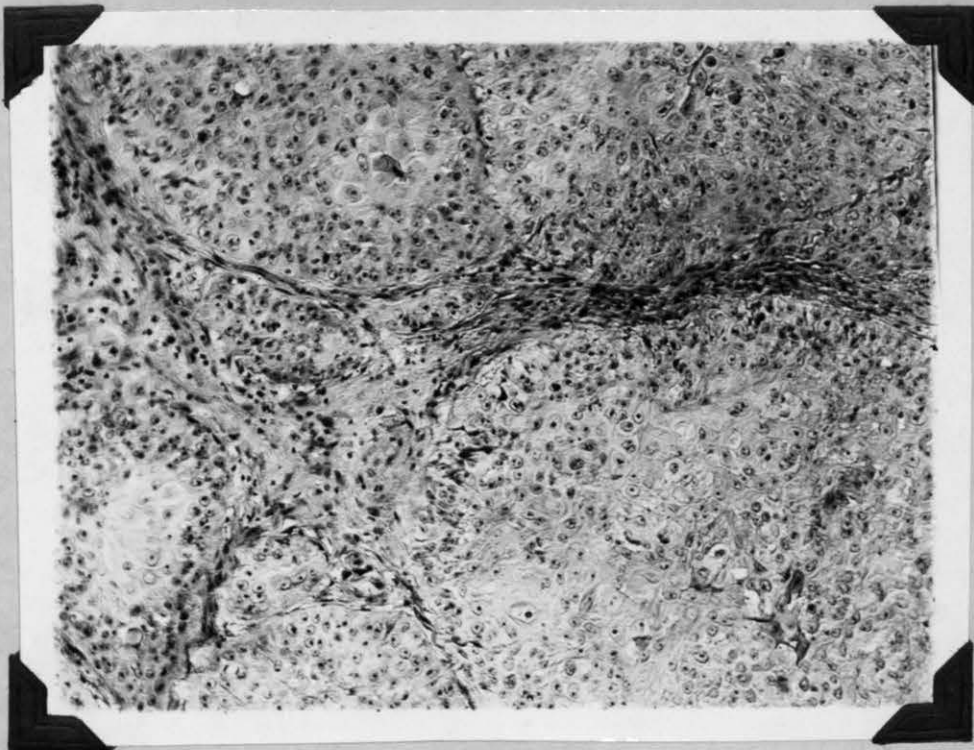


Fig. 2 (T.73) Squamous Cell Carcinoma.--Orbit of the eye of a Horse.  
Low power photomicrograph showing large groups or processes of cells separated by connective tissue.



Fig. 3 (T.73) Squamous Cell Carcinoma.--Orbit of the Eye of a Horse.  
Low power view showing extensive areas of coagulation necrosis.

STUDY NUMBER SIXTY-NINE

TUMOR NUMBER 74

Squamous Cell Carcinoma -- Eye -- Hereford Cow

This was a case of Dr. Kingman's, the animal belonging to the College herd.

Clinical Data: This was rather scant. The only information in the data sheet was that the animal was a Hereford cow and that she was affected with a small tumorous growth in one eye. The growth involved the membrana nictitans and was removed surgically by Dr. Kingman.

Gross Appearance: A liberal portion of the area was removed and the tumor appeared over the outer surface as a flattened irregularly shaped growth, a little larger than a split pea. It was greyish white in color and was firmly attached to the underlying tissue. It was soft to the touch and did not appear to be particularly vascular. The surface was noticeably roughened.

Microscopic Description: Sections cut at right angles to the mass revealed a new growth consisting of squamous epithelial cells disposed in a typical carcinomatous fashion. Connective tissue between the various epithelial processes was small in amount and many areas consisted only of wide sheets of epithelial cells. These sections were especially interesting because of the apparent transition of the well behaved, orderly epithelial cells of the normal

Study Number Sixty-nine - 2

mucosa of the part could be followed to a point where the epithelial cells of the normal mucosa of the part could be followed to a point where the epithelial zone suddenly widened and became the parenchyma of the tumor (Fig. 1). This showed conclusively the parentage of the type cell. Mitotic figures while abundant were confined largely to the outer zone of the various epithelial units. The majority of the epithelial cells were spindlelike in contour and many stained but lightly. An unusual feature was the epithelial giant cells that appeared in many of the processes (Fig. 2). These appeared to be due to a clumping of a considerable number of epithelial cells to form a coarsely granular body, quite irregular in outline. They did not occupy any particular position in the epithelial structure being rather promiscuously scattered in their distribution. Most of the cells making up such a group appeared to have lost their cytoplasmic elements and only the nuclei remained. Round cell infiltration was common in the stroma of certain areas and large blood vessels were frequent in the same tissue.

Diagnosis: By the older authors growths like the above were termed bleeding cancers, medulary sarcomas and fungus hematoides. In view of the type cell and its infiltrative behavior this growth is properly called a squamous cell carcinoma. Where this type of cell is present we often see cornification which, however, was absent in this material.

Study Number Sixty-nine - 3

No doubt this was a rapidly growing specimen. The abundant mitosis and scarcity of stroma would indicate such a feature. The giant cells were interesting although their exact origin and purpose must remain undetermined. Perhaps they were the result or an indication of a certain retrogression. Retrogression is common in many rapidly growing neoplasms.

A squamous cell carcinoma.

(Note: Nearly two years has elapsed since this growth was removed and as far as I can ascertain there has been no recurrence.)

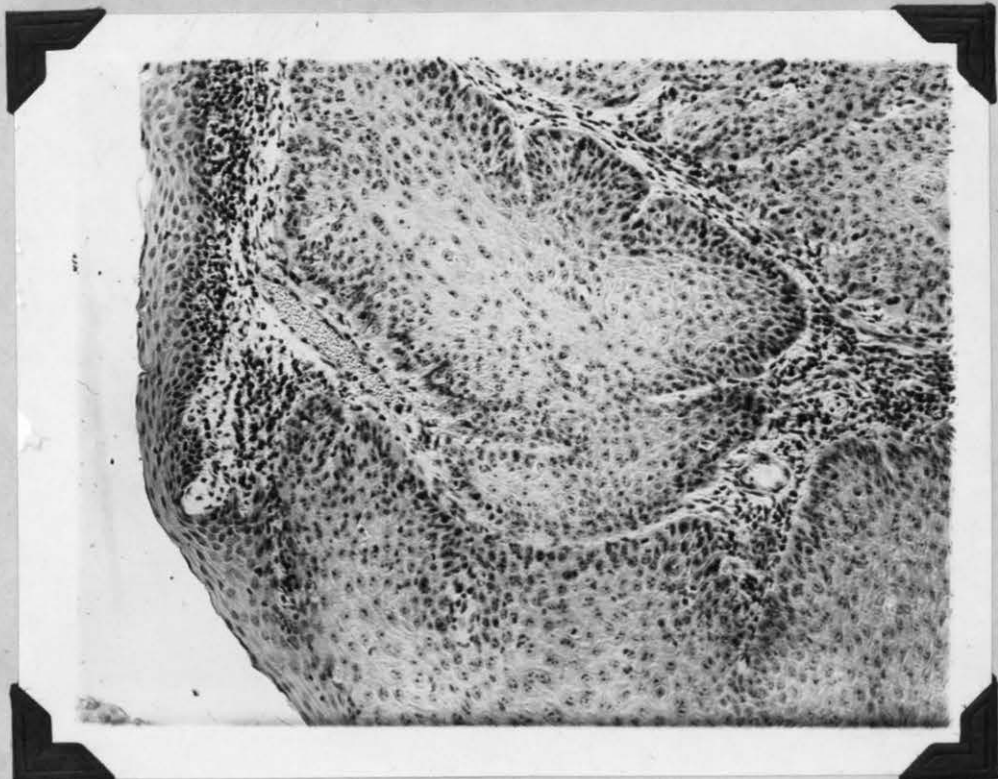


Fig. 1 (T.74) Squamous Cell Carcinoma.--Eye of a Cow.  
Low power photomicrograph showing the transition from  
the normal mucosa to the wide sheets of epithelial cells  
of the tumor.

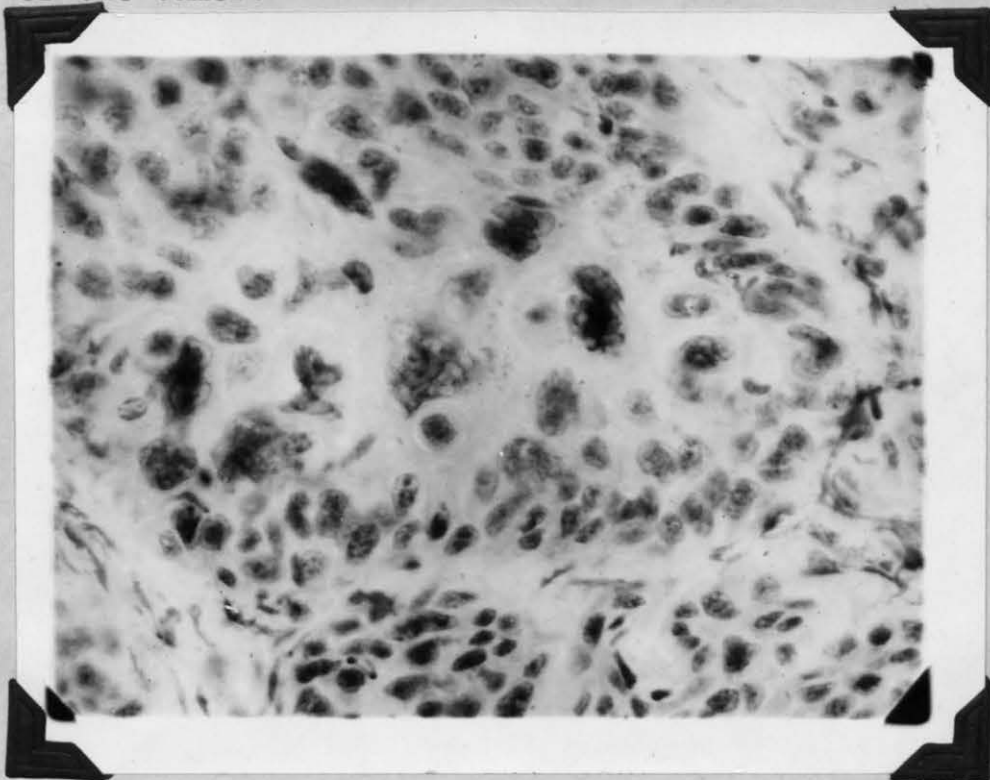


Fig. 2 (T.74) Squamous Cell Carcinoma.--Eye of a  
Cow.  
High power view of a giant cell formed by a fusion  
of epithelial cells.



STUDY NUMBER SEVENTY

TUMOR NUMBER 85

Carcinoma -- Eye of a Horse

This material was furnished from a case of Dr. N. J. Miller, Eaton, Colorado.

Clinical Data: The animal was a ten year old bay, grade mare. About one year previous to the tumor's removal it was first observed by the owner as a small growth or spot on the sclera of one eye. The growth continued until a large portion of the eye ball became involved (Fig. 1). The entire eye was removed surgically.

Gross Appearance: About one half of the circumference of the sclera was destroyed by a rather diffuse roughened mass which projected irregularly above the surface of the organ. The growth was deep seated and must have reached almost to the depths of the orbital cavity. The tissue was flesh pink to red in color and while it was quite compact in texture and not easily torn it was rather soft to the touch. A capsular covering was present over a part of the mass but the upper surface, which was exposed, possessed no such structure. The capsule apparently had its origin from the connective tissue of the sclera and its presence showed that the tumor was growing within the organ proper and not destroying it by encroachment from without. A black pigment was present over a portion of the surface of the tumor but was confined to the fibrous material that constituted the coarser stroma.

Study Number Seventy - 2

Microscopic Description; Sections were stained with hemotoxylin and eosin and by Van Gieson's method. This material consisted of rows or masses of epithelial cells separated from each other by a compact stroma of fibrous tissue of variable thickness. A great many of the epithelial processes were undergoing extensive retrogressive changes as a result of which little of the parenchyma remained (Fig. 2). The type cell was of the squamous type with a polyhedral contour. The nuclei were quite large and hyperchromatic (Fig. 3). Many of the nuclei were oval in shape and conformed to the general outline of the cell proper.

The retrogression was mostly a necrosis. It was largely of a coagulative variety but a few areas showed softening suggestive of caseation. Some of the degenerated portions contained many red corpuscles. These areas resembled infarctions of the hemorrhagic variety since the blood was not contained within vessels of any kind. Mitotic division was commonly seen and some very interesting phases were noted. (Fig. 4). The fibrous stroma was involved in an extensive round cell infiltration and an occasional eosinophile was encountered.

Diagnosis: This is one of a group of carcinomas so commonly seen in the eye of horses and cattle. From the position of the growth and the type of the cells constituting the parenchyma I am of the opinion that it had its origin

Study Number Seventy - 3

from the epithelia overlying the cornea. The necrosis probably resulted from the rapidity of growth; the neoplastic elements outstripping their blood supply. Changes of this kind are frequently seen in rapidly growing tumors although they appeared more extensive in this instance than is usually the case. However, regardless of the retrogression in parts of this tumor the viable tumor cells were aggressive enough in their behavior to indicate the ultimate destruction of the entire organ, if surgery had not intervened.

A squamous cell Carcinoma.

(Note: Eighteen months after the removal of this cancer, Dr. Miller informs me that the animal has made what appears to be a complete recovery.)

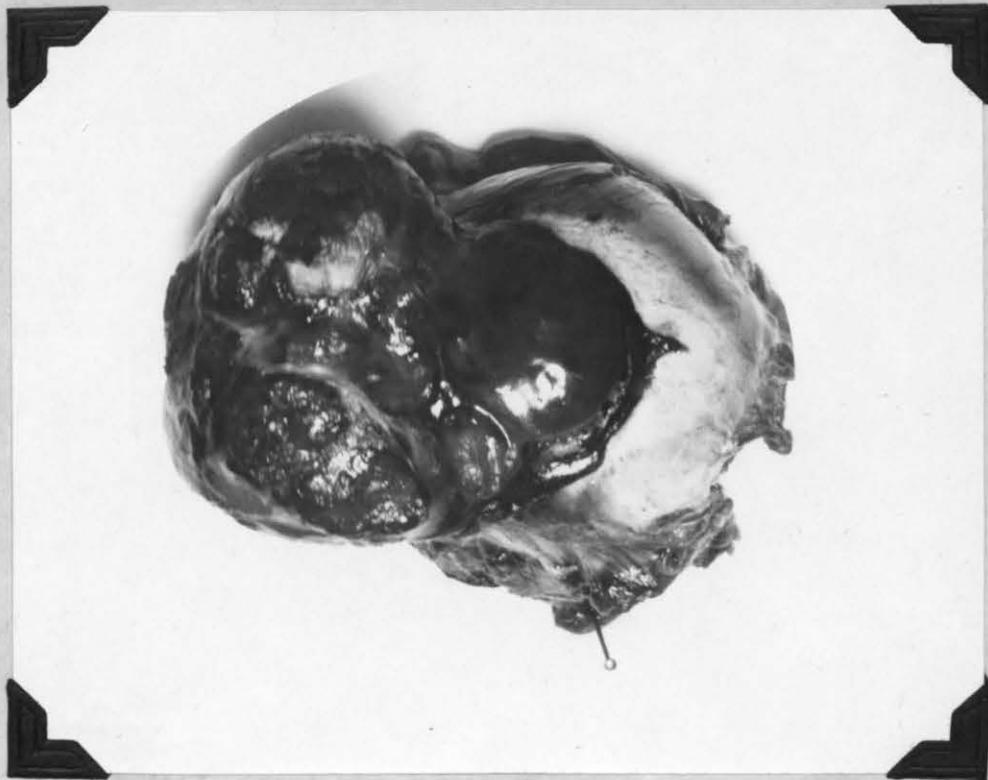


Fig. 1 (T.85) Squamous Cell Carcinoma of the eye of a horse.  
Gross specimen showing the bulging irregular character of the growth and its position in the eye ball.



Fig. 2 (T.85) Squamous cell Carcinoma of the Eye of a Horse.  
Low power view showing the extensive necrosis and the few remaining rows of epithelial cells.

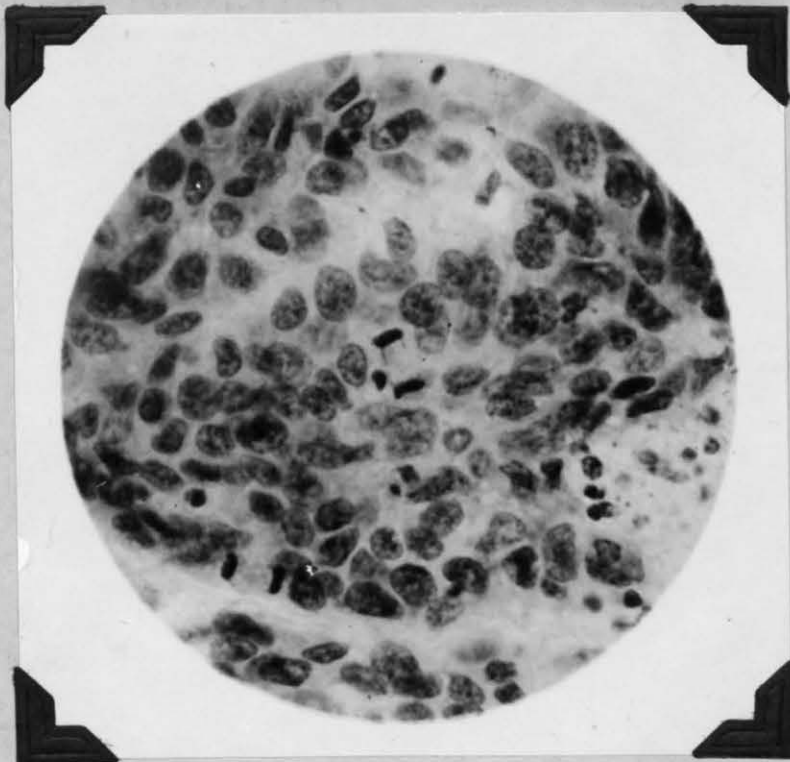


Fig. 3 (T.85) Squamous Cell Carcinoma.--  
Eye of a Horse.  
High power view showing two mitotic figures.

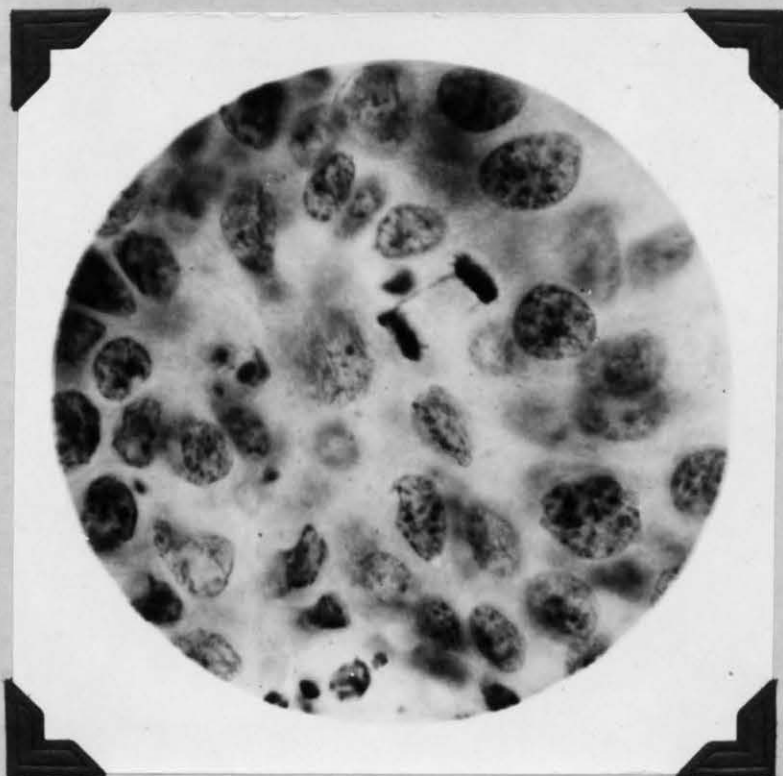


Fig. 4 (T.85) Squamous Cell Carcinoma.--  
Eye of a Horse.  
Photomicrograph under oil immersion show-  
ing mitosis of one tumor cell.

STUDY NUMBER SEVENTY-ONE

TUMOR NUMBER 89

Epidermoid Carcinoma -- Eye -- Cow

This material was from the practice of Dr. Charles R. Strange, Johnstown, Colorado, and was sent to our laboratory for diagnosis.

Clinical Data: A tumorous growth was removed surgically from one eye of a Holstein cow. After the growth's removal there was a recurrence and grew with such rapidity that within three months the vision in the affected eye was entirely gone. The tumor grew so vigorously and gave off such an offensive odor that the animal was destroyed about four months after the operation for the growth's removal.

Gross Appearance: The growth was oval or nodular in form and measured about 3.5 cm. by 2 cm. There was a grey, or greyish green outer zone over a good share of the periphery. This zone was soft and edematous and appeared to be very near the suppuration stage. When the tissue was cut across the interior was found to be dirty white color and rather compactly knit.

Microscopic Description: This material was largely epithelial in nature. It was highly cellular with squamous epithelium cells forming nests or processes depending upon the angle at which the structures were viewed (Fig. 1). Very thin strands of fibrous connective tissue were laid down between the various epithelial accumulations and constituted the stroma of the part.

Study Number Seventy-one - 2

The type cell was large and quite embryonic in appearance. The nuclei were likewise large and possessed considerable granular chromatin substance which showed a tendency to collect in small clumps. Mitotic figures were everywhere and almost every phase of indirect cell division was exhibited (Fig. 2). The centers of a great many of the epithelial accumulations showed well marked cornification. Mitosis in these instances was limited largely to the cells of the outer zone. The blood supply seemed to be limited to small capillary channels in the connective tissue stroma between the epithelial nests.

A wide zone near the surface showed extensive necrosis with considerable edema and some hydrops of individual tumor cells (Fig. 3). Polymorphs were common and some fibrin was seen.

Diagnosis: This is clearly a malignant epithelial tumor with considerable evidence of vigorous proliferation. The numerous mitotic figures and the scant amount of stroma would indicate a growth of dangerous possibilities. The superficial necrosis was probably the result of the constant trauma to which most external growth of this kind are subject.

A typical example of a rapidly growing epidermoid carcinoma.

Carcinoma

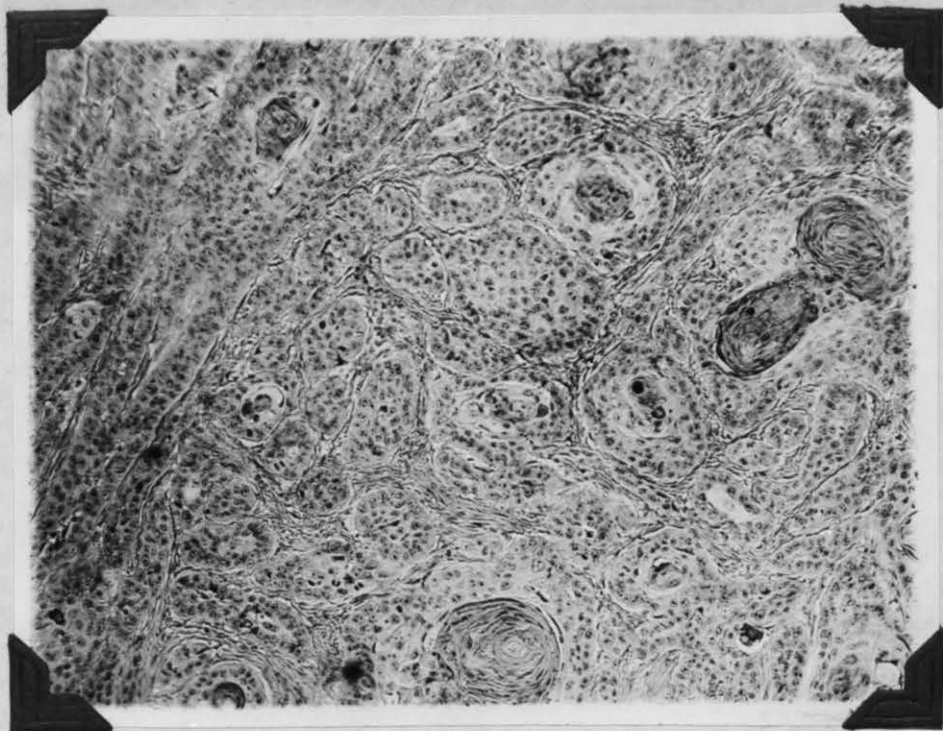


Fig. 1 (T.89) Epidermoid Carcinoma.--Eye of a Cow. Low power view showing nests and columns of cancerous cells and a minimum amount of stroma.

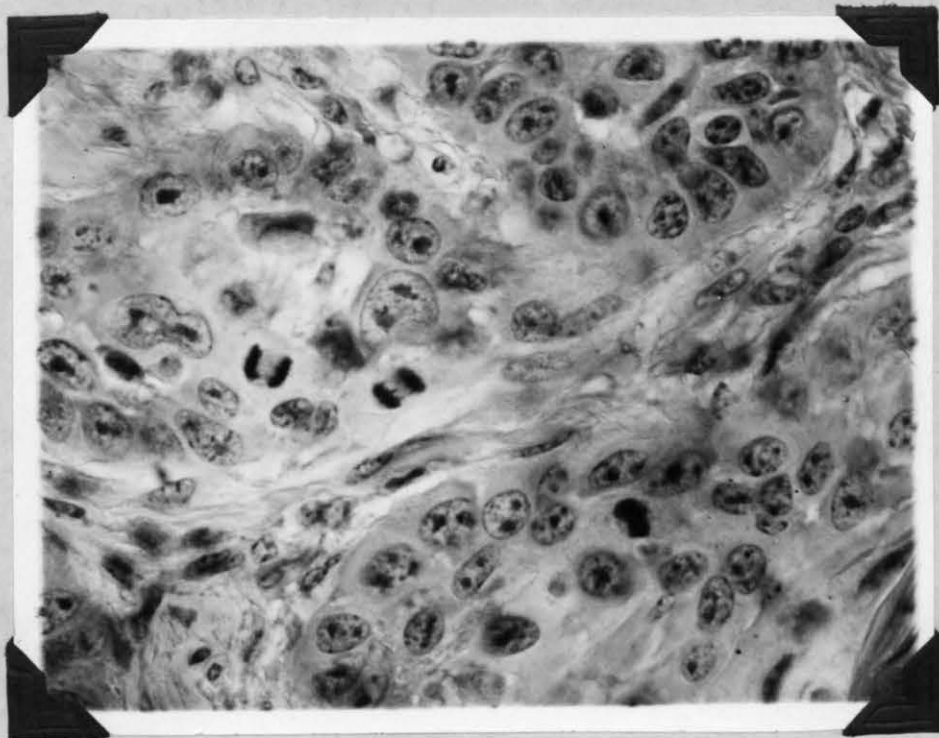


Fig. 2 (T.89) Epidermoid Carcinoma.--Eye of a Cow. High power photomicrograph showing two cells undergoing mitotic division.



Carcinoma

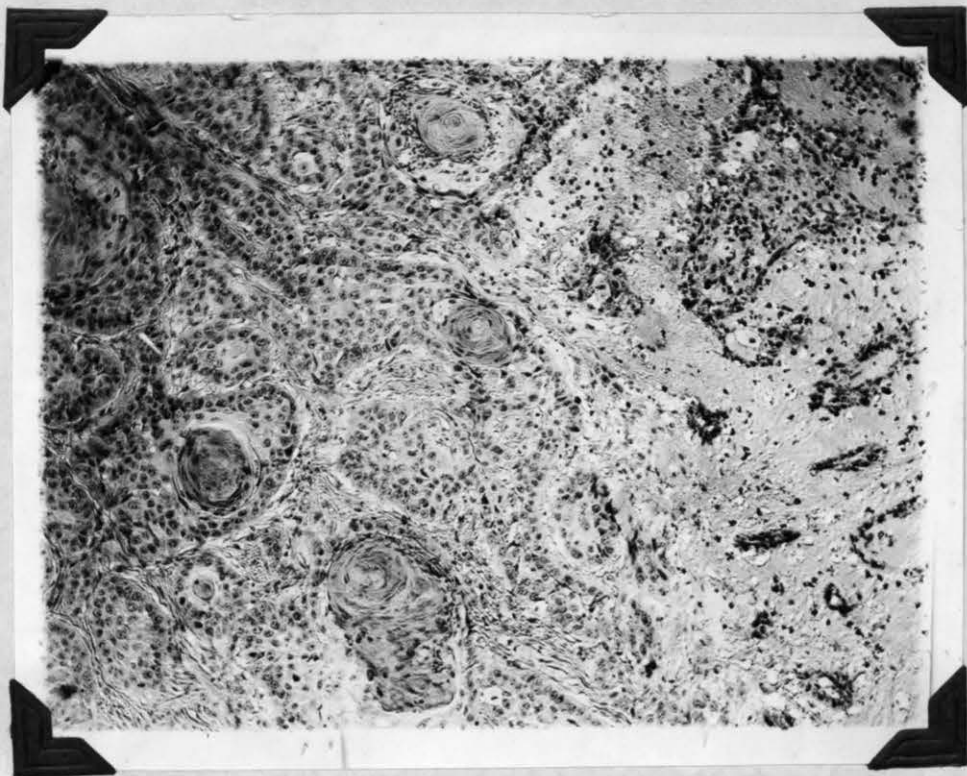


Fig. 3 (T.89) Epidermoid Carcinoma.--Eye of a Cow.  
Low power view showing considerable necrosis,  
edema, and some cornification.

STUDY NUMBER SEVENTY-TWO

TUMOR NUMBER 108

Carcinoma -- Membrana Nictitans -- Cow

This is one of a series of tumors received from Dr. Hugh Hurst, State College, New Mexico.

Clinical Data: The tumor was removed surgically from a Holstein cow (age not given). It involved the membrana nictitans at the inner canthus of the eye. There was no information received as to the duration of the condition.

Gross Appearance: The tumor had a flattened triangular shape and had been rather firmly attached by an extensive base. It was flesh pink in color and soft to the touch. It was very little larger than an almond and weighed but a few grams.

Microscopic Description: There was nothing microscopic by which one could identify the anatomical position from which this growth was derived. The tissue consisted of irregular groups or nests of epithelial cells. Some appeared in elongated processes while others were in clumps depending upon the angle at which they had been cut. A fibrous stroma occupied the interstitial areas and it was likewise irregularly disposed and of a variable width. The blood vessels ran in the substance of the stroma. The parenchyma of the tumor did not appear to recognize any particular restraint but was pushing its tentacle like columns of cells into the adjacent tissue in every direction.

The type cell was of the large squamous variety.

Study Number Seventy-two - 2

They were quite embryonic in appearance and a few showed prominent nucleoli. Most of the nuclei contained an excess of chromatin and mitotic figures were commonly observed. Cornification was not evident but many of the cells showed clear spaces peripheral to the nuclei which were suggestive of a degeneration possibly mucoid in nature. The outer portions of the tumor showed a loose fibrosis with an intensive lymphocytic infiltration. A few small areas of early necrosis were also present in outer parts of the tumor but the parenchyma of the growth seemed to have escaped this change.

Diagnosis: This tumor presented a typical carcinomatous structure with every feature of a malignant neoplasm. The immature appearance of the cells and the abundant mitosis together with the infiltrative manner of growth all support this view.

A squamous cell carcinoma.

Carcinoma

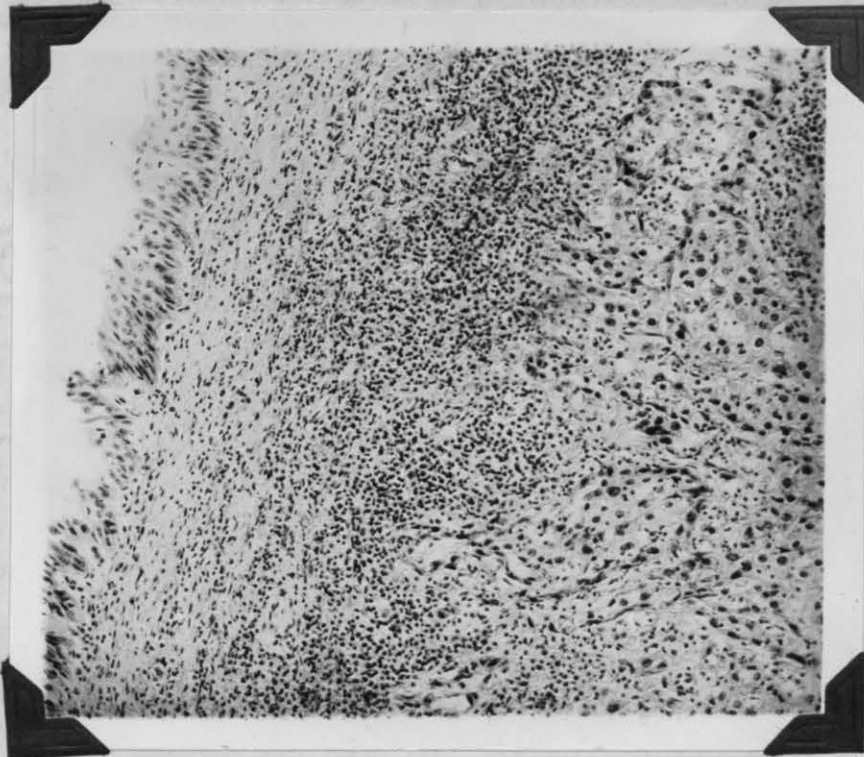


Fig. 1 (T.108) Carcinoma of the Membrana Nictitans of a cow.  
Low power view of irregular columns of tumor cells pushing into the adjacent substance.

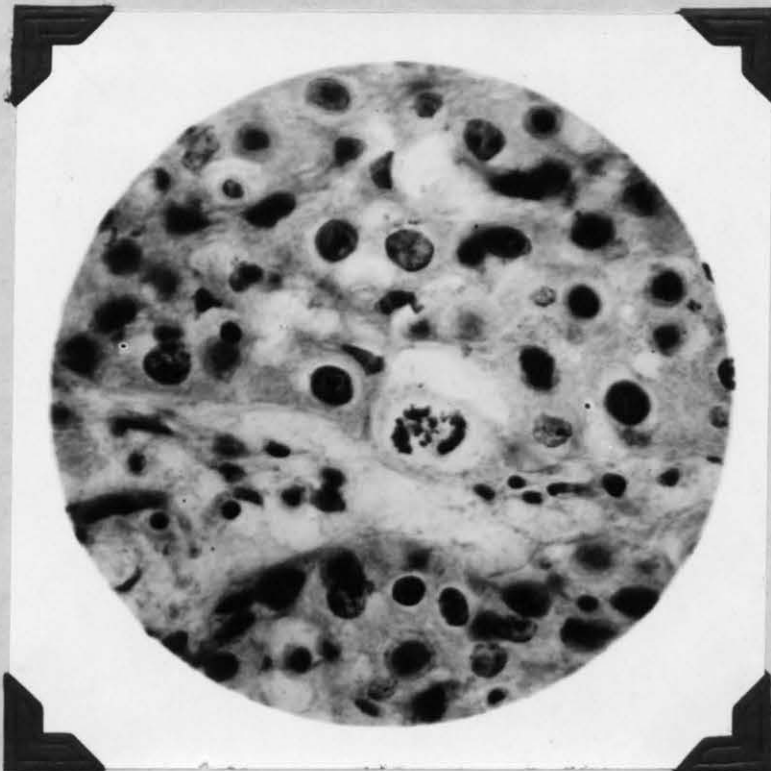


Fig. 2 (T.108) Carcinoma of the Membrana Nictitans of a Cow.  
High power photomicrograph showing the large embryonic squamous cells, one of which is undergoing mitosis.

STUDY NUMBER SEVENTY-THREE

TUMOR NUMBER 111

Metastatic Epidermoid Carcinoma -- Lung -- Bovine

The specimen was received from Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: The animal was a mature grade cow that had been slaughtered for food. At the ante-mortem inspection a tumorous growth, involving one eye was observed. The surface of this tumor was ulcerated and gave off a foul smelling discharge. Post-mortemly a tumorous area 5 in. x 5 in. was discovered in one of the lungs and a similar growth was found in the heart muscle. A diagnosis of generalized malignant disease was made and the carcass was condemned. Only a portion of the lung tumor was received at our laboratory for study.

Gross Appearance: The mass was diffusely anchored in the substance of the lung. It presented an irregular contour measuring about 13 cm. at its greatest width. It was covered externally by the pleura. It had a very light cream color and a somewhat mottled appearance due to the presence of small areas of lung tissue scattered promiscuously throughout the neoplastic portion. Certain of the tumorous areas had a gritty consistency when cut with a scalpel.

Microscopic Description: This material presented very little if any normal lung tissue. The alveoli that remained were sandwiched in between irregular areas of squamous

Study Number Seventy-three - 2

epithelial cells and were either filled with a serous fluid or were practically obliterated due to their collapse from the effect of pressure.

There was quite a difference in the picture presented by the various tumorous areas. Some showed the epithelial cells growing in wild profusion without any attempt to restrain its infiltration by the tissues of the organ or by fibroblastic proliferation. Others showed extreme retrogression by complete cornification and considerable calification (Fig. 1). These portions were also enveloped at least partially by heavy strands of fibrous tissue. Other phases of the process occupied an intermediate position with the cells appearing in large well defined groups or nests. (Fig. 2). These usually showed an attempt at encapsulation and a lymphocytic accumulation of variable degree. The epithelial nests were in the first stage of cornification and many young "pearls" were present.

Mitosis was common in the cells of the peripheral zone of these nests and was also abundant in other progressive portions of the cancer. Practically all the blood vessels of the part were congested. Newly formed vessels serving the tumor tissue exclusively were not seen. The type cell was of the typical squamous variety although many were somewhat smaller than the usual cell of this kind due to their compact arrangement. In the tumorous areas all traces of

Study Number Seventy-three - 3

bronchioles had been obliterated.

Diagnosis: This is an epidermoid carcinoma of the lung, probably metastatic in origin. In discussing carcinomas of the lung Ewing (1) mentions that the primary growths may arise from (a) the bronchial epithelium with a squamous cell or cylindrical cell, aveolar type of structure; (b) the bronchial mucous glands with an adenocarcinoma or alveolar form of structure; (c) the epithelium of the pulmonary alveoli which fills the air spaces, solid or partially, with cuboidal, cylindrical or flat cells. From this, one could account for this tumor resulting primarily from the bronchial epithelium which may produce according to Ewing a squamous cell type carcinoma.

Whether or not these tumors undergo cornification is a matter of conjecture since I have been unable to find any reference to this phase of the process. I am of the opinion that this particular lung tumor is purely metastatic from the initial tumor which occurred in the eye. I cannot offer any absolute proof in support of this contention since I did not have the opportunity to section and study the eye tumor.

It is to be regretted also that a portion of the growth from the heart was not sent for sectioning. Sections from the eye, heart and lungs, if all were available would

Study Number Seventy-three - 4

simplify the task of determining the histogenesis of the tumor. The heart lesions could have started from cells from the lung foci by way of the blood stream. Ewing's remarks on this point are interesting. He states that pulmonary carcinoma may metastasize through the blood stream as well as by the lymphatics and that in man the heart is often the seat of secondary carcinomas from the lungs (thirty times out of 374 cases). In this case it seems probable that the lung tumor resulted from the involved eye and that the lung in turn provided the material for metastasis to the heart.

Ref. Ewing, James. Neoplastic Diseases. 1919. P. 787-791.  
W. B. Saunders Company, Philadelphia.



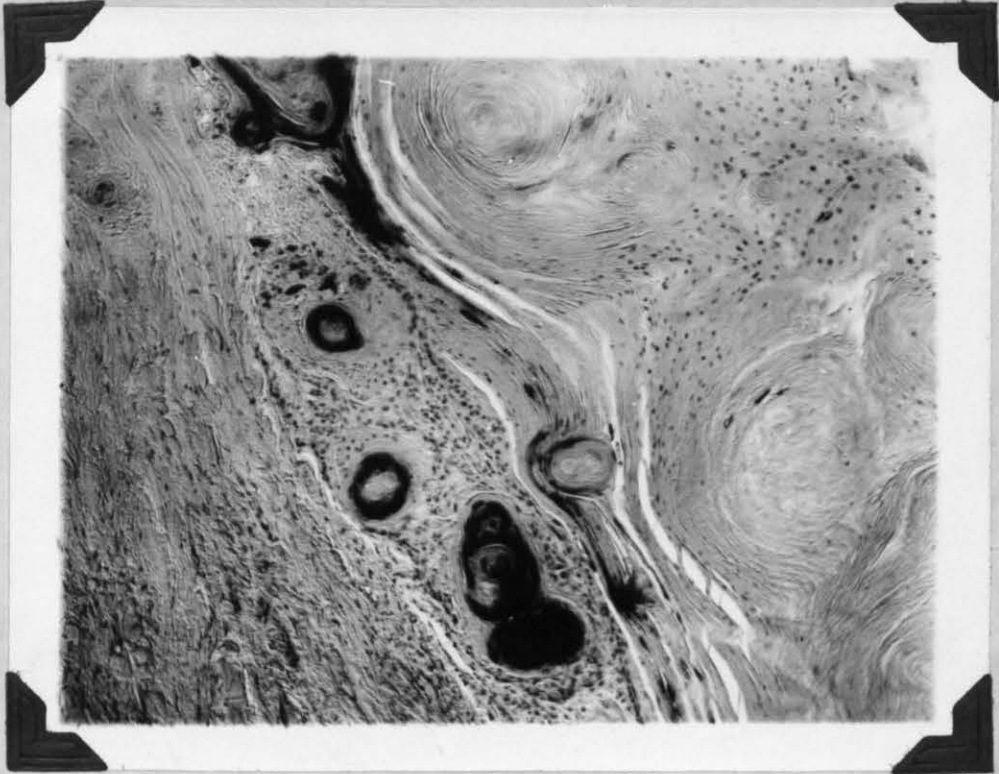


Fig. 1 (T.111) Metastatic Epidermoid Carcinoma.--  
Lung of a Bovine.  
Low power view showing extreme retrogression by complete cornification and considerable calcification.

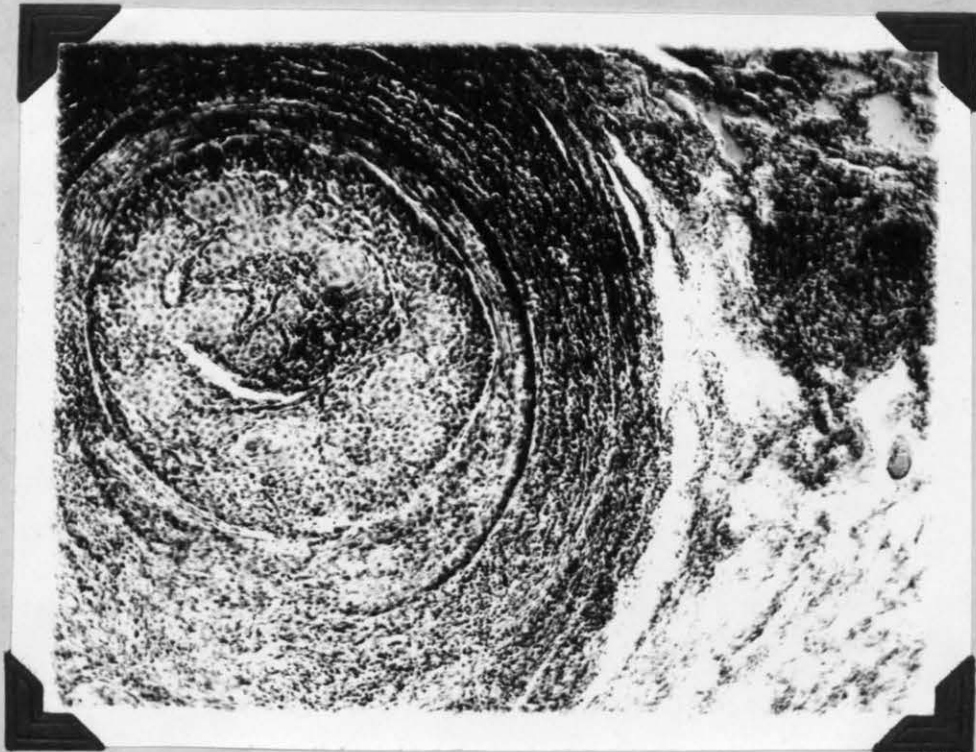


Fig. 2 (T.111) Metastatic Epidermoid Carcinoma.--  
Lung of a Bovine.  
Low power view showing the cells arranged in a well define group with some attempt at encapsulation.

STUDY NUMBER SEVENTY-FOUR

TUMOR NUMBER 123

A Squamous Cell Carcinoma -- Membrana Nictitans -- Horse

This is a case from the practice of Dr. N. J. Miller, Eaton, Colorado.

Clinical Data: Information on this phase of the study was rather scant. The subject was an eleven year old male horse. His color was reddish or bay. Six months before the growth was removed a small nodule was observed in the left membrana nictitans. This gradually increased in size and was finally removed surgically by Dr. Miller.

Gross Appearance: The growth involved the third eyelid superficially in the region of the caruncula lacrimalis. Only atrophic remnants of the third eye lid remained. The growth was the size of a hazel nut, measuring about 2.5 cm. by 1.5 cm. While soft to the touch, yet the growth was fairly compact. Its color was greyish white, contrasting sharply with the reddish pink of the surrounding tissues. The surface was slightly roughened and possessed a membranous covering. The mass was not weighed.

Microscopic Appearance: This tumor presented the typical structure of a malignant epithelial new growth. Large irregular columns of epithelial cells were separated from each other by a dense fibrous stroma in which appeared the many blood vessels of the part. (Fig. 1). In areas where the stroma was particularly abundant marked infiltration of lymphocytes were evident. This was especially true in the

Study Number Seventy-four - 2

zone immediately adjacent to the columns or nests of epithelial cells. Mitotic figures were present but not a permanent feature. In fact they were rather infrequent. Cornification was not observed.

The type cell was of the squamous variety and presented some unusual features of a retrogressive character. A few of the smaller and apparently younger epithelial processes were less affected by these retrogressive changes but none were entirely free of them. The cells were swollen and their outlines very distinct. The cytoplasm of most of the cells was clear and failed to stain (Fig. 2). It contained many small globules that somewhat resembled fat but as the material had been preserved in alcohol for many months, it was not possible to stain for fat and so positive proof of its presence is lacking. The nucleoli were rather prominent in a majority of the cells and most of the nuclei had lost the greater portion of their chromatin material. A number of cells in every field showed the presence of a clear homogeneous substance that took the acid stain (Fig. 3). This was undoubtedly a hyalin change. The retrogression had its beginning in the central zone of the epithelial cores and expanded peripherally.

Diagnosis: This is a rather slow growing squamous cell carcinoma that is being overtaken by the products of

Study Number Seventy-four - 3

retrogression. The majority of the cells were not of an aggressive character and were probably of limited vitality and consequently highly susceptible to retrogressive influences. While there is a good deal of change of a hyalin nature present in the parenchyma of this cancer, I am unable to give a satisfactory explanation of the swollen globular appearance of the cells, which is such a striking feature. It is possible that they have been subjected to a fatty infiltration but this cannot be proven.

A squamous cell carcinoma.

Carcinoma



Fig. 1 (T.123) Squamous Cell Carcinoma.--Membrana Nictitans of a Horse.  
Low power view showing dense fibrous stroma with irregular nests of epithelial cells, many of which are undergoing degeneration.



Fig. 2 (T.123) Squamous Cell Carcinoma.--Membrana Nictitans of a Horse.  
Low power view showing extensive degeneration.

Carcinoma

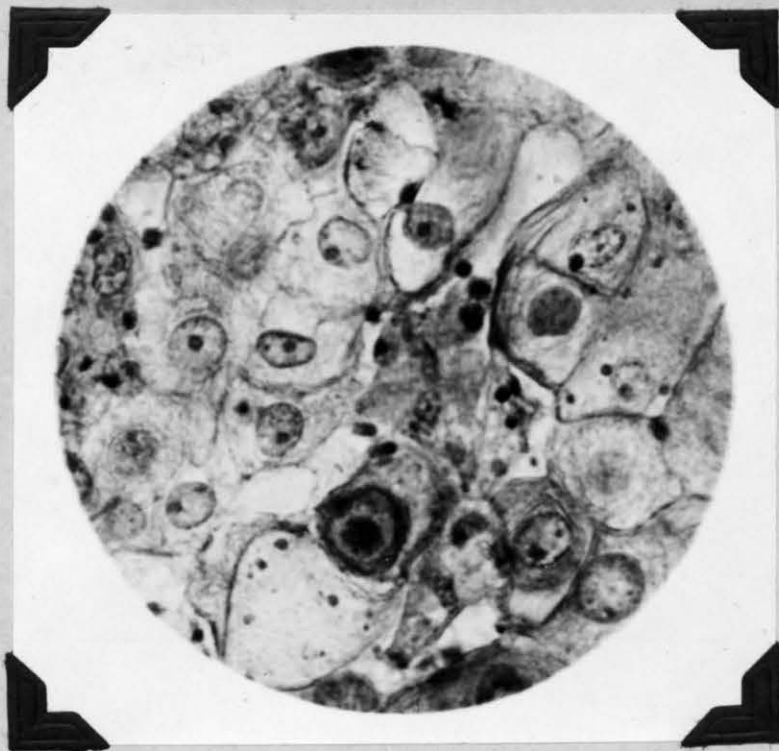


Fig. 3 (T.123) Squamous Cell Carcinoma.--  
Membrana Nictitans of a Horse.  
High power photomicrograph showing hyalin  
degeneration in the cancerous cells.

STUDY NUMBER SEVENTY-FIVE

TUMOR NUMBER 130

Squamous Cell Carcinoma -- Eye -- Horse

This specimen was received from Dr. Frank P. Mathews, La Fayette, Indiana.

Clinical Data: The subject was a 14 year old male horse. Several years previous to the appearance of the tumor one eye had been accidentally destroyed. About nine months before the tumor was removed a mass the size of a pigeon egg was noticed to be developing in the orbital space from which the eye had been lost. This gradually increased in size and finally filled the entire orbit. When the mass was removed surgically the atrophic remains of the eyeball were found posterior to the tumor which appeared to involve the conjunctiva.

Gross Appearance: The mass was somewhat oval in shape and conformed more or less to the shape of the orbital cavity. The tumor had a greyish pink color and while soft to the touch it was rather compactly knit. It appeared to have been attached over practically all the surface, except the exposed portion, by the connective tissue of the part. No capsule was present. The exposed surface was roughened, and gave forth a foul smelling purulent discharge. The tumor was rather vascular.

Microscopic Description: Sections were obtained showing both the tumorous process and the surrounding connective tissue into which it was growing. The tumor elements were

Study Number Seventy-five - 2

epithelial of the squamous type, with the cells arranged in columns or finger like processes with a minimum amount of fibrous stroma between the various units (Fig. 1). The cells possessed a large oval hyperchromatic nucleus. Mitotic figures were abundant (Fig. 2). The mitotic figures were not confined to the cells of the periphery of the process as is true with many squamous cell tumors but were promiscuously distributed throughout.

Necrosis was wide spread, especially near the exposed surface and purulent tracts were commonly encountered. In these suppurative areas the polymorph seemed to predominate with only an occasional lymphocyte and endothelial. A few foreign body giant cells were present in the vicinity of the suppurative foci. The new tissue was well supplied with blood from small vessels and capillaries which ran in the connective tissue strands between the epithelial columns. Keratinization was not observed.

Diagnosis: This is clearly a malignant epithelial tumor exhibiting considerable aggressiveness. The wild manner of growth can be readily accounted for by the large numbers of mitotic figures which were abundant in every field. Considering the duration of the disease and the size of the tumor it is difficult to imagine that metastasis had not already taken place before the growth was removed. Undoubtedly



Study Number Seventy-five - 3

the tumor had its origin from some epithelial portion of the eye lids.

A squamous cell carcinoma.

Carcinoma

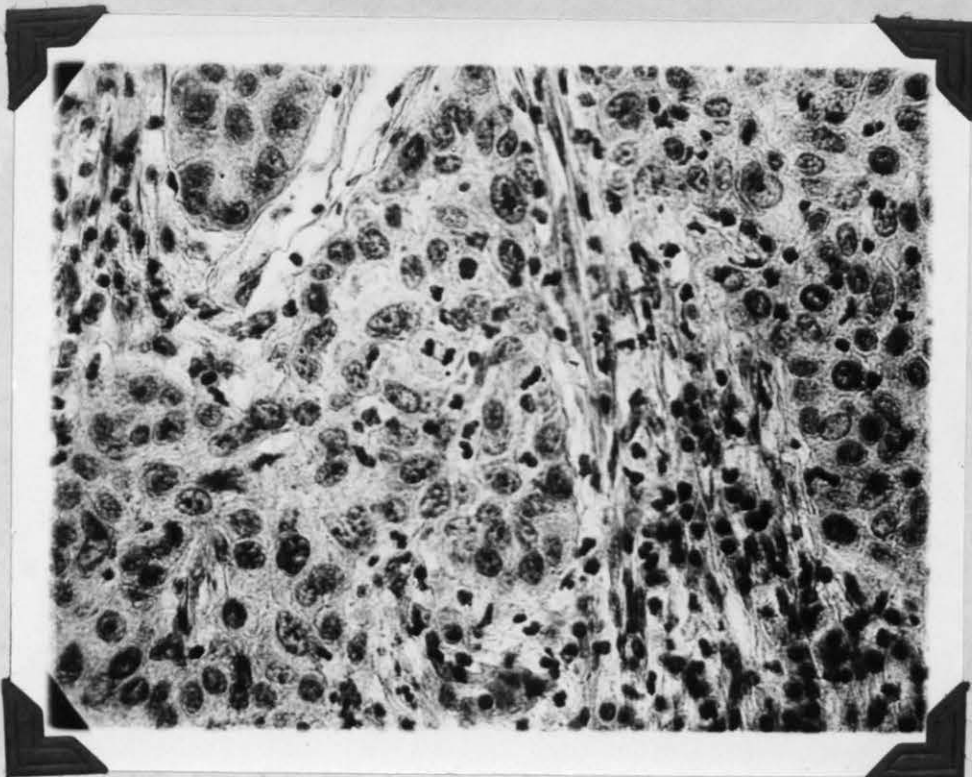


Fig. 1 (T.130) Squamous Cell Carcinoma.--Eye of a Horse.  
Low power magnification showing minimum amount of fibrous stroma between tumor cells. One cell in Mitosis.

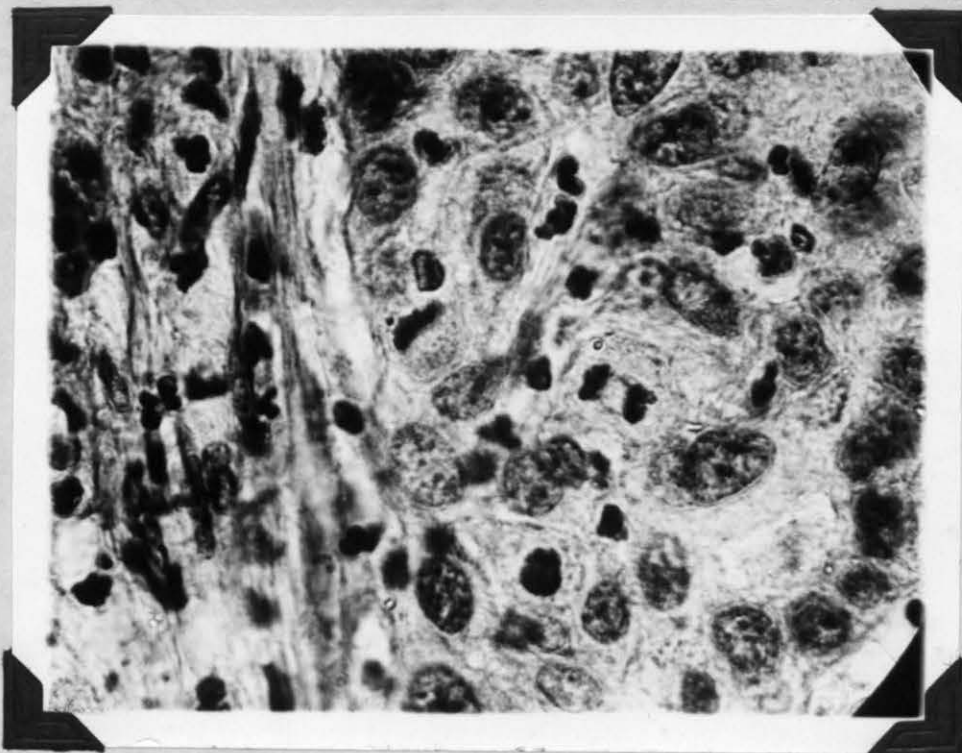


Fig. 2 (T.130) Squamous Cell Carcinoma.--Eye of a Horse.  
High magnification of same material as Fig. 1, showing squamous cells, one of which is undergoing mitotic division.

STUDY NUMBER SEVENTY-SIX

TUMOR NUMBER 147

Epidermoid Carcinoma -- Membrana Nictitans -- Hereford Cow

This is a case from the practice of Dr. H. E. Kingman.

Clinical Data: The subject was a two year old Hereford cow belonging to the Ken Karyl Ranch near Littleton, Colorado. Due to a tumorous development on the left membrana nictitans the animal was shipped to Dr. Kingman for treatment (Fig. 1). The mass was removed surgically and the wound healed without complications. A few months later, however, Dr. Kingman was advised that the growth showed evidence of recurring and that the animal was sent to slaughter.

Gross Appearance: The growth was a very irregularly shaped nodular formation that seemed to involve the bulk of the membrana nictitans. It measured about 2.5 cm. in length by 1.7 cm. in width and was 1.5 cm. thick with rounded edges. The growth had a pink color and was quite firm to the touch. The surface was roughened but there was no ulceration. The mass weighed twenty grams.

Microscopic Description: This was a very atypical structure with processes of epithelial cells running in every direction (Fig. 2). Any attempt to describe the form which the epithelial columns assumed would be futile. They were very irregular as to shape. Size, system and order were entirely lacking in their disposition. The cells were squamous in type and a cross section of a cellular column showed all gradations between the larger adult cells toward the central zone, and

Study Number Seventy-six - 2

the smaller more embryonic forms nearer the periphery. The central portions of many of the processes showed all degrees of cornification. The cells had a granular cytoplasm and a rather hyperchromatic nucleus with an occasional nucleolus showing. Mitosis was commonly observed. Near the surface of the growth a large number of the cells had a clear cytoplasm and a pinched, deeply staining nucleus indicating perhaps a hydropic degeneration approaching necrosis. The epithelial processes were separated from each other by compact strands of fibrous tissue which were for the most part rather narrow and almost atrophic due to the pressure from the adjacent cellular increase. The blood vessels were found here and most of them were filled.

Diagnosis: This is a good example of a particularly aggressive type of carcinoma of the epidermoid variety. This fact is further borne out by the clinical evidence of the tumor's recurring after what was considered a careful and thorough dissection of the original mass. It is common neoplasm of this location in the Hereford.

An epidermoid carcinoma.

Carcinoma



Fig. 1 (T.147) Epidermoid Carcinoma.--Membrana Nictitans of a Cow.  
Tumor is located at the innercanthus of the right eye.

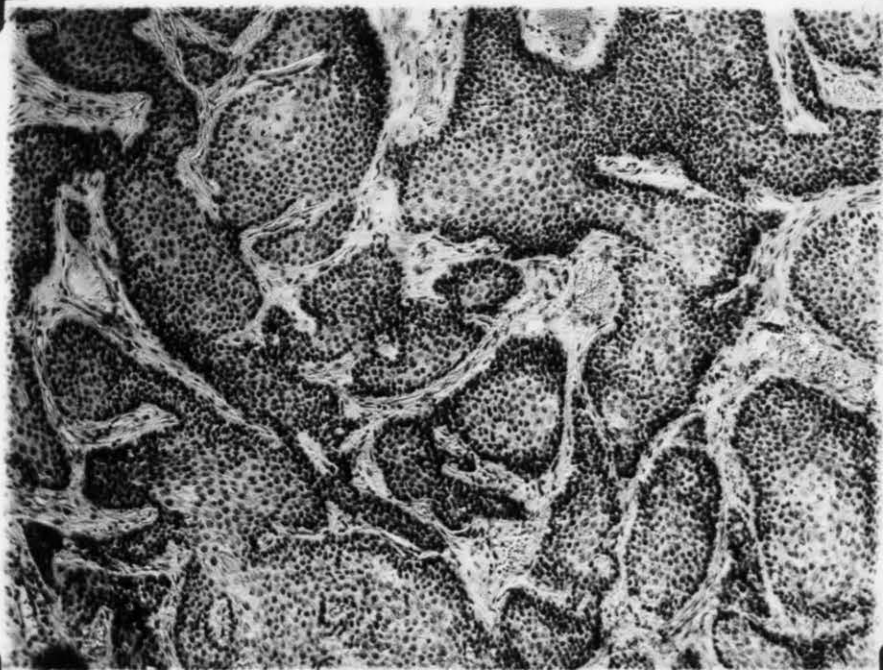


Fig. 2 (T.148) Epidermoid Carcinoma.--Membrana Nictitans of a Cow.  
Low power view showing the very irregular manner in which the epithelial processes were disposed.

Carcinoma

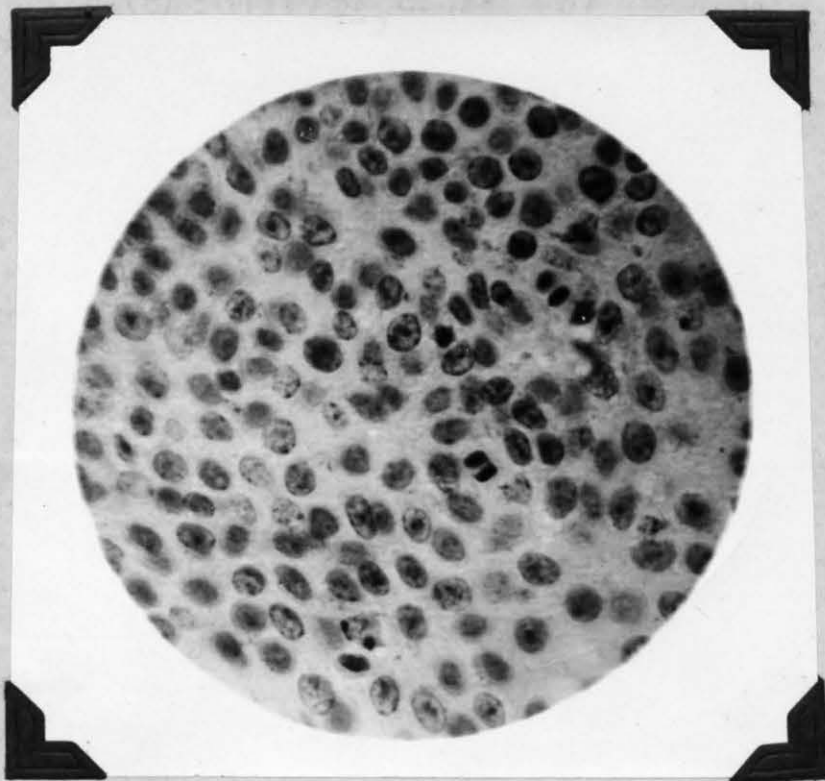


Fig. 3 (T.147) Epidermoid Carcinoma.--  
Membrana Nictitans of a Cow.  
High power view of the squamous tumor cells,  
one of which is undergoing mitotic division.

STUDY NUMBER SEVENTY-SEVEN

TUMOR NUMBER 148

Epidermoid Carcinoma -- Eye -- Hereford Cow

This was a packing house case received from Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: A seven year old Hereford cow was presented for slaughter. At the antemortem examination a large tumor was found involving the left eye. The exact position of the tumor was not given. The animal was otherwise in fair condition. After slaughter, a portion of the mass was removed and preserved for future study.

Gross Appearance: The growth was somewhat spherical in contour and had a diameter of 15 cm. (6 inches). It was diffusely imbedded in the connective tissue of the orbit. The surface was rough and gave forth a bloody discharge. The mass was fairly firm in consistency and a light pink in color. No capsule was present. Considerable vascularity was observed.

Microscopic Description: This tumor had the typical appearance of a malignant epithelial new growth. The irregular cords or columns of cells were in great abundance and exhibited every evidence of infiltration (Fig. 1). The cellular processes ran at every conceivable angle and were separated from each other by fibrous stroma of variable thickness. The individual cells were of the polyhedral squamous variety with a marked tendency to undergo cornification (Fig. 2). The peripheral layer of cells in the various processes were the ones responsible for practically all of the multiplication

Study Number Seventy-seven - 2

which the cells were undergoing and here mitosis was frequent. Most of the nuclei in the peripheral zone were hyperchromatic and a few nucleoli were present. In portions of the fibrous stroma a heavy lymphocytic infiltration was observed. Vasculature was not marked.

Diagnosis: This is a rather common neoplasm of interest because of its large size. Tumors of this kind are seldom permitted to attain the size reported here unless the animal be under range conditions.

An epidermoid carcinoma.



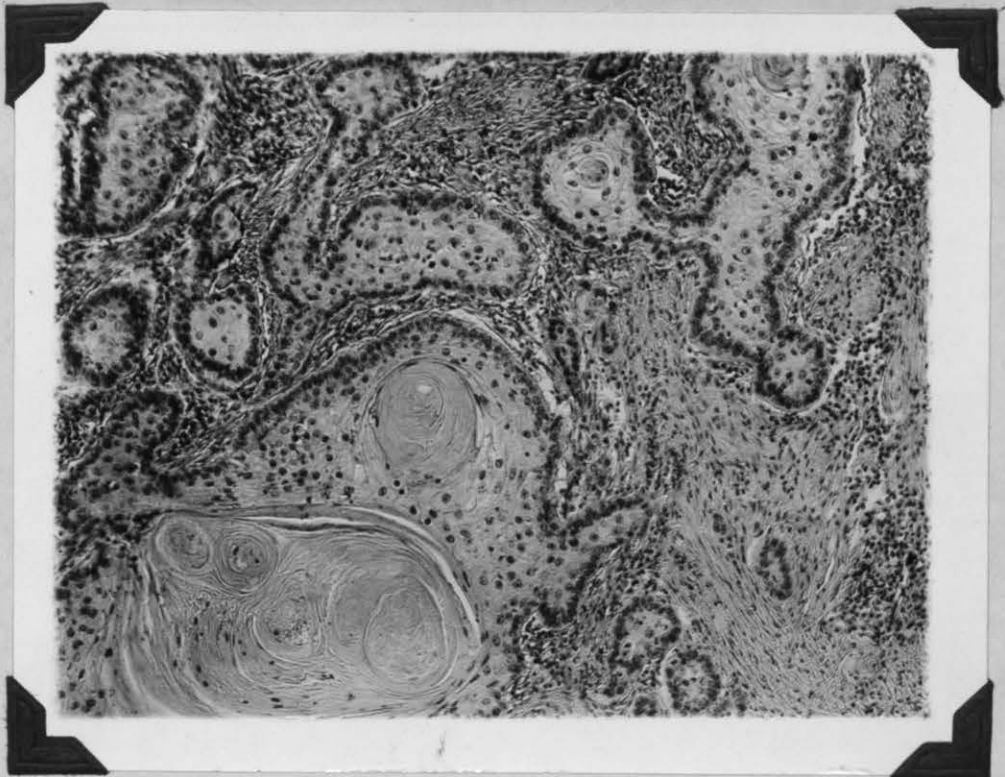


Fig. 1 (T.148) Epidermoid Carcinoma.--Eye of an Ox.  
Low power view showing the invasive character of the  
epithelial cells and considerable cornification.

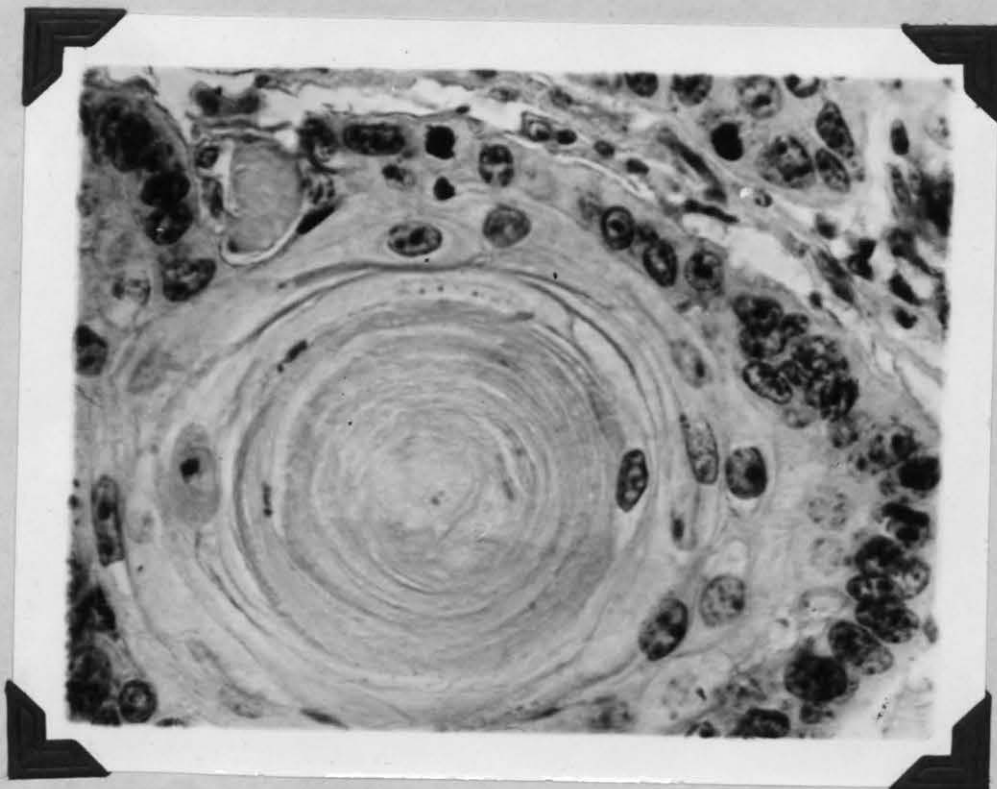


Fig. 2 (T.148) Epidermoid Carcinoma.--Eye of an Ox.  
High power view of an epithelial pearl.

STUDY NUMBER SEVENTY-EIGHT

TUMOR NUMBER 154

Epidermoid Carcinoma -- Eye -- Ox

This material was received from Dr. Hugh Hurst, Mosequero, New Mexico.

Clinical Data: The animal was a mature Hereford bull. Three months previous to the tumor's removal a growth was observed under one of the upper eye lids. This continued to enlarge and as a consequence the eye ball was considerably compressed.

Gross Appearance: (Note--The material was poorly preserved for shipping and arrived in rather unsatisfactory condition for descriptive purposes.) The mass was so irregular in shape as to make accurate measurements difficult, if not impossible. The tumorous tissue was rather soft to the touch, grey in color and seemed to be diffusely scattered through considerable of the connective tissue present. A capsule was missing.

Microscopic Description: This tumor consisted of irregular columns of epithelial cells pressing into the stroma in all directions (Fig. 1). The type cell was of the squamous variety with the younger cells near the periphery and the older ones towards the center of the processes. Mitosis, which was common, was also most frequent near the outer layer of cells.

In many of the larger epithelial groups the central cells had lost their cell outlines and the nuclei had

Study Number Seventy-eight - 2

disappeared in many instances. The fusion of the central cells of many of the groups indicated that cornification was under way. Other phases of degeneration of the epithelia were the atrophic nuclei in certain fields and the hydropic condition of a few of the cells.

The fibrous stroma showed considerable hydrops and a pronounced lymphocytic infiltration that was almost universal. A few eosinophiles were also present among the connective tissue strands.

Diagnosis: This is an example of a typical aggressive carcinoma. The abundant mitosis and the invasive character of the growth marks this a neoplasm of pronounced malignant possibilities with metastasis to the regional lymph glands a certainty, if not at the time of the tumor's removal, then very shortly if the growth had been permitted to remain.

An epidermoid carcinoma.

Carcinoma

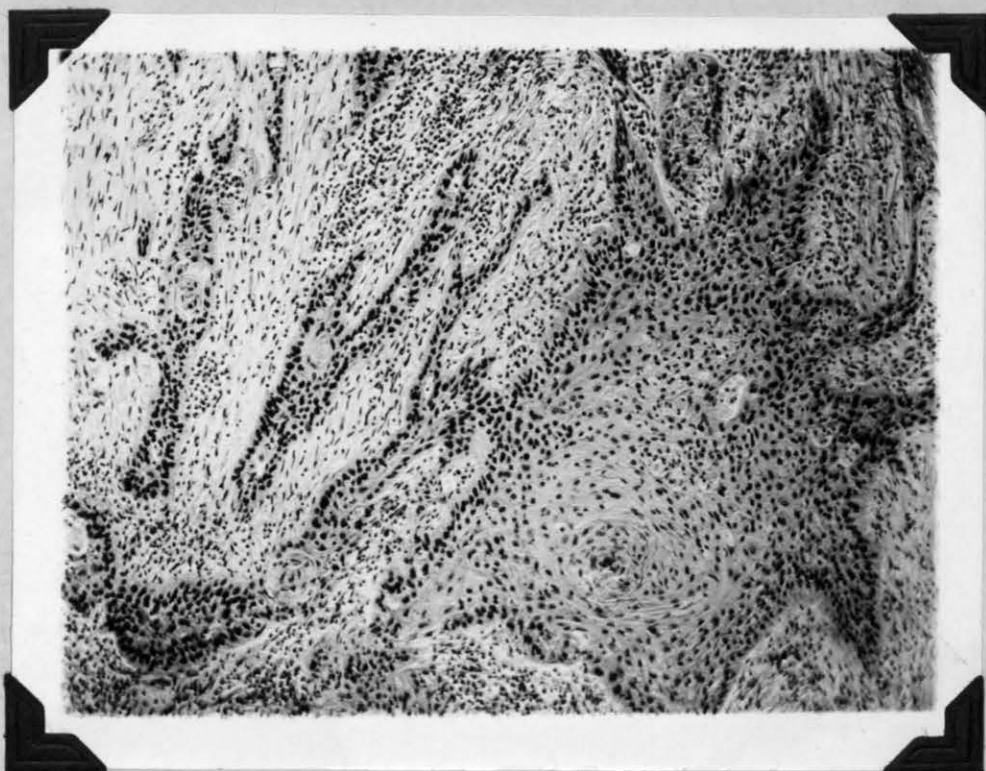


Fig. 1 (T.154) Epidermoid Carcinoma.--Eye of a Bull. Low power view showing a large amount of fibrous stroma with atrophic strands of epithelial cells in its midst.

STUDY NUMBER SEVENTY-NINE

TUMOR NUMBER 155

An Epidermoid Carcinoma -- Eye -- Ox

This material was received from Dr. Hugh Hurst, Mosquero, New Mexico.

Clinical Data: This animal was a mature Hereford bull from the same ranch as the bull in Study No. 154. Dr. Hugh Hurst, who sent in the specimens, wrote, "There has been considerable trouble on this particular ranch, the disease occurring in either males or females from four years up." Dr. Hurst also stated that he had never observed the condition in animals under four years. The tumor occupied the orbital space, the eye ball having been entirely destroyed.

Gross Appearance: The growth was attached over all except the exposed surface by loose connective tissue. The exposed surface was roughened as though ulcerated. A capsule was not observed. A freshly cut cross section of the mass showed the greyish white tumorous tissue in irregular processes or streaks with connective tissue between. The deeper portions of the tumor showed considerable black pigment rather diffusely distributed. While the tissue was rather soft in consistency, it was compactly knit.

Microscopic Description: This was an epithelial new growth consisting of nests of squamous epithelial cells supported by an abundance of connective tissue stroma. Very little aggressiveness on the part of the tumor cells was evident due to the widespread nature of retrogressive changes

Study Number Seventy-nine - 2

in which the parenchyma was involved. The connective tissue had increased out of all proportion for a tumor of this kind and as a result most of the tumor cells were atrophic or undergoing actual necrosis. Many of the columns showed this atrophic shrinkage to a marked degree (Fig.1 ). A great many of the remaining epithelial clumps or nests were cornified. Lymphocytes were common in the connective tissue around many of the epithelial groups and in some portions they were present in such enormous numbers as to appear like lymphoid tissue. The part was highly congested and some little hemorrhage was seen. The black pigment observed in the gross specimen was melanin and due to its abundance in the individual clumps it was impossible to determine if it was present within leucocytes or not. (Fig. 1). It was scattered among the strands of the stroma, the epithelia not being involved. Mitosis was observed occasionally among the smaller and younger nests of epithelial cells. Even here, however, the effects of pressure from the surrounding stroma was apparent, the cells being elongated and having a pinched appearance.

Diagnosis: This is an epidermoid carcinoma, which has about spent itself in so far as the limitations of the orbit are concerned. The retrogression described is probably the natural result of pressure due to the increased bulk which filled the available space of the orbit. The melanin present

Study Number Seventy-nine - 3

was perhaps derived from the choroid of the eye which was destroyed by the tumor.

An epidermoid carcinoma.

Carcinoma

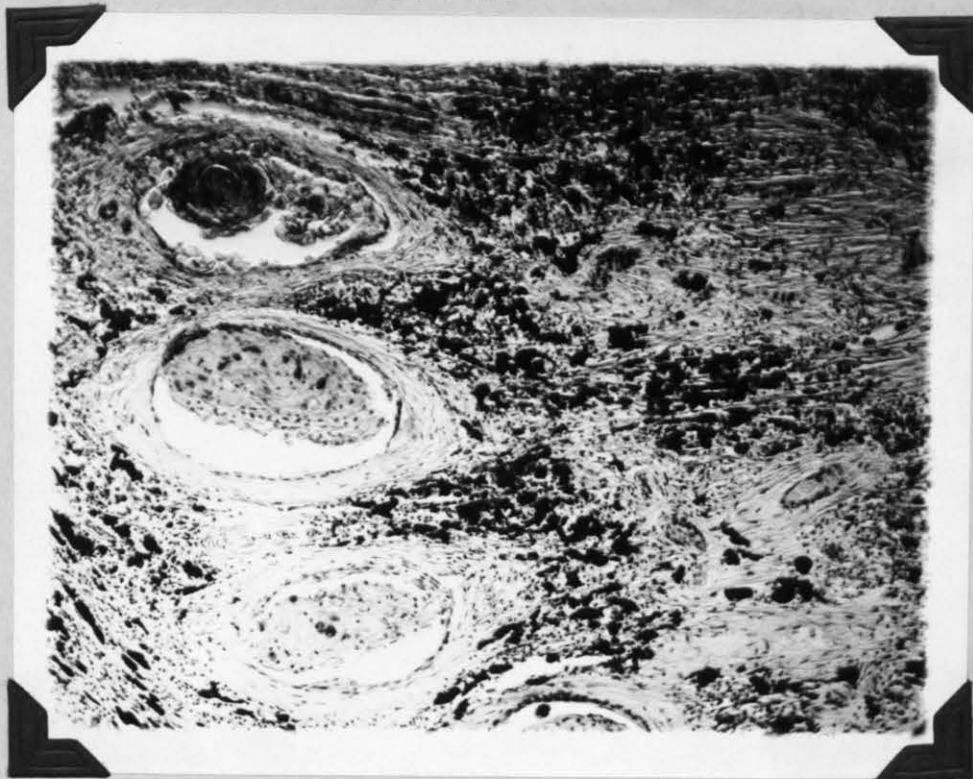


Fig. 1 (T.155) Epidermoid Carcinoma.--Eye of a Bull.  
Low power view showing the shrunken atrophic nests  
of epithelial cells and the dense fibrous stroma.  
Melanin is also senn in considerable amount.



STUDY NUMBER EIGHTY

TUMOR NUMBER 158

Epidermoid Carcinoma -- Lower Eye Lid -- Cow

This specimen was from Dr. George W. Reuter, Berthoud, Colorado.

Clinical Data: The subject was an eight year old Holstein cow. About six months previous to its removal a pea sized tumor was observed at the edge of the left lower eye lid. This continued to increase in size until it involved most of the lid. It also extended into the skin. There was no apparent impairment of function and the general physical condition of the animal was good. The tumor was removed surgically and the wound healed satisfactorily.

Gross Appearance: The growth was an oval flattened mass, measuring about 3 cm. by 2 cm. by 1.3 cm. The tumor was very firm, and was deeply imbedded in the surrounding tissue. The exposed surface was quite rough and ulcerated and gave off a thin, foul smelling, purulent discharge. At the time of its removal the tumor was considered to be quite vascular.

Microscopic Description: This tissue consisted of whorls of epithelial cells between which were slender strands of fibrous connective tissue. Most of the epithelia had undergone cornification and epithelial "pearls" were abundant. (Fig. 1). Many of the cornified areas contained deposits of calcium. The epithelium was squamous in type and practically all of the cells were compressed and atrophic. Mitosis,

Study Number Eighty - 2

while present, was infrequently seen. Blood vessels were not a prominent feature.

Diagnosis: This is an epidermoid carcinoma undergoing some retrogression. It would not be considered a particularly aggressive tumor at its present stage but rather a slow growing proposition. This growth is of interest because of its location. While tumors of the eye are very common and especially so in cattle, they are not often reported from the lower lid.

An epidermoid carcinoma.

Carcinoma

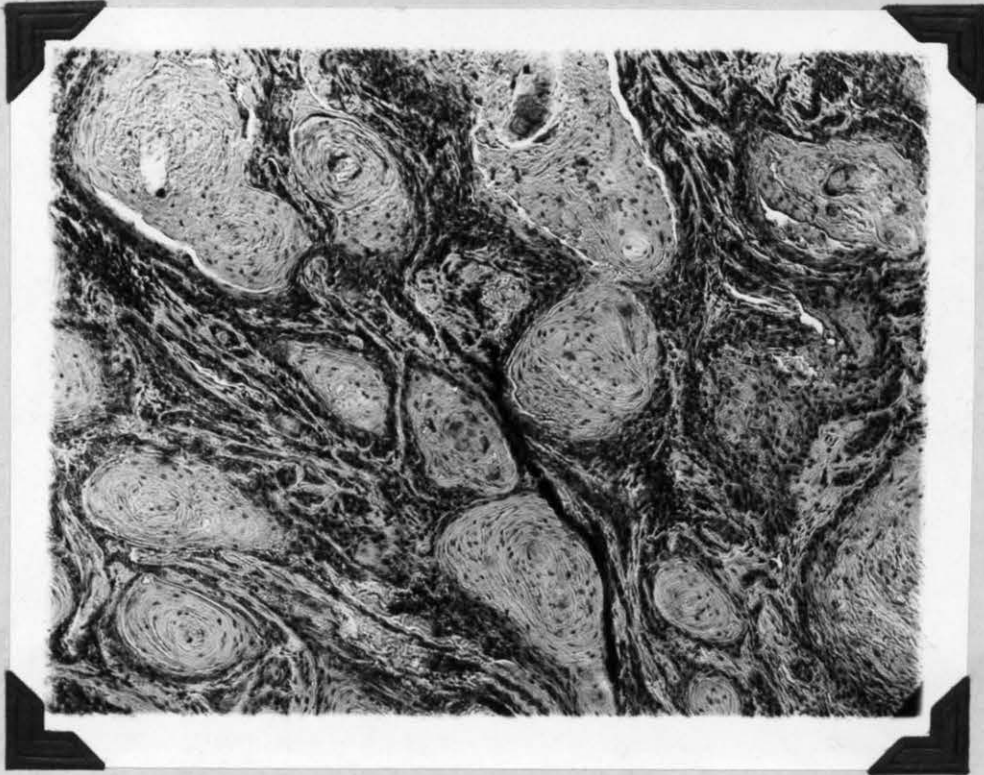


Fig. 1 (T.158) Epidermoid Carcinoma.--Lower Eye Lid of a Cow.  
Low power view showing extensive cornification and many epithelial "pearls."

STUDY NUMBER EIGHTY-ONE

TUMOR NUMBER 169

Epidermoid Carcinoma -- Pharynx -- Chicken

This material was presented for diagnosis at the laboratory by Professor O. C. Ufford of the Animal Husbandry Department.

Clinical Data: The subject was a two year old single comb white leghorn hen. During an examination of the flock this bird was noticed to be in considerable distress when attempting to breathe. The attempts to breathe were described as "gasping for breath." The bird was in good condition physically and after an examination of the mouth and throat a tumorous swelling to the right of the pharynx was found and being considered inoperable the bird was destroyed and the tongue and throat tissues with the attached tumor were removed entire. At post-mortem, lesions of white diarrhea were found in the ovaries.

Gross Appearance: The growth was attached diffusely to the right side of the pharynx and its presence had caused the larynx to be pushed over to the left. The mass had a flattened oval shape and measured 2.5 cm. in length by 1.2 cm. in width by 7 cm. in depth. The tumor projected slightly forward and presented a roughened surface but no capsule was present. It was greyish white in color and while soft to the touch it was closely knit.

Microscopic Description: The more superficial portion of the growth was covered by the mucous epithelial

Study Number Eighty-one - 2

layer under which were a few mucous glands and voluntary striated muscle. Beneath this were small islands or nests of squamous epithelial cells extending in an infiltrative manner in all directions. In some portions a large amount of fibrous stroma was present while in the more cellular areas the stroma was of minimum amount. The tissue was fairly vascular and mitotic figures were frequent (Fig. 1). The squamous epithelial cells were rather large in size and many of the nests or whorls of cells showed the effects of cornification.

An interesting feature of the material was the manner in which the tumorous cells were pushing into the adjacent musculature. As a consequence of this aggressiveness many of the muscles were entirely surrounded by the neoplastic elements and the muscle bundles were showing signs of atrophy.

Diagnosis: This is an epidermoid carcinoma of considerable viciousness. It not only endangered the life of the animal by respiratory interference but it was invasive enough in character to eventually menace life by metastasis to organs of vital importance. This has a rather infrequent location for malignant neoplasms.

An epidermoid carcinoma.

Carcinoma

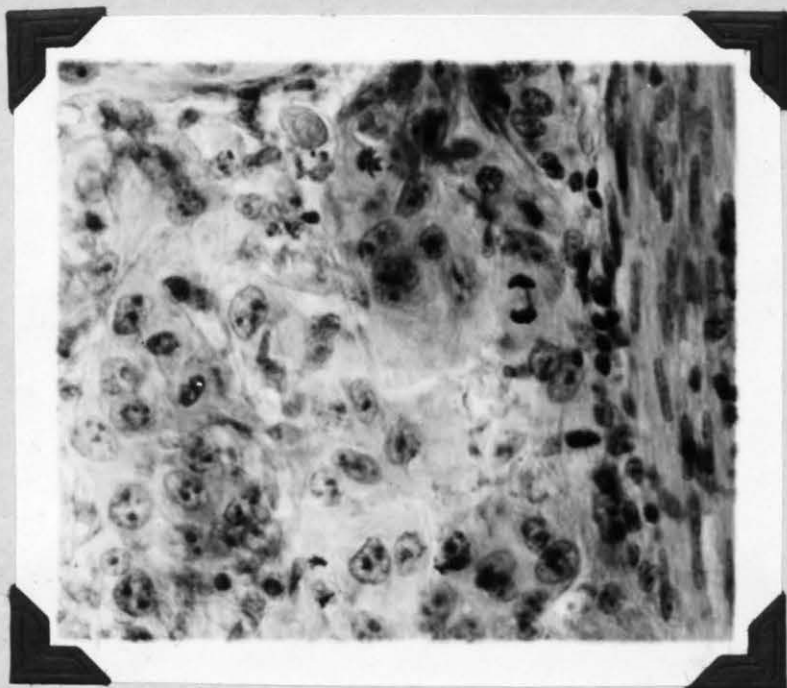


Fig. 1 (T.169) Epidermoid Carcinoma  
from the pharynx of a Chicken.  
High power photomicrograph with one cell  
undergoing mitosis.

STUDY NUMBER EIGHTY-TWO

TUMOR NUMBER 1

Adenocarcinoma -- Oviduct -- Chicken

This specimen was received from Dr. H. P. Scott, Fort Morgan, Colorado.

Clinical Data: The subject was a two year old Plymouth Rock hen. The cause of death was not given. A tumorous mass was observed to be attached to the oviduct.

Gross Description: The mass had a grape like structure being very irregularly lobulated; the larger dimensions consisting of multiple nodules. The indentations separating the various "clusters" differed in their depth. The tumor presented a gray, glistening, irregularly roughened surface, rather firm in consistency with a rather substantial attachment at one side of the tissue from which it sprang. The tumor measured 6 cm. x 4 cm. and weighed 20 grams.

Microscopic Appearance: Under the low power the tumor had a very cellular appearance with bands of connective tissue stroma spreading somewhat fanlike throughout many of the fields. The type cell of the neoplasm was epithelial in character, of a simple columnar type, disposed in such a manner as to form ducts with intercommunicating lumina (Fig. 1). In some areas the epithelial cells were closely packed together with thin strands of connective tissue separating the various communities of cells, the whole having an alveolar appearance. Many of the epithelial cells of the duct-like

Study Number Eighty-two - 2

structures were undergoing mitotic division. Blood channels were few. In certain areas where the stroma tended to form broad septa and was consequently abundant there were great accumulations of eosinophiles.

Diagnosis: Since this is an epithelial new growth in which the cells have a duct or gland-like arrangement and show evidence of certain progressiveness, a diagnosis of adenocarcinoma would be proper.



Adenocarcinoma



Fig. 1 (T.1) Adenocarcinoma.--  
Oviduct of a Hen.  
Gross specimen showing the  
grape-like lobulations.

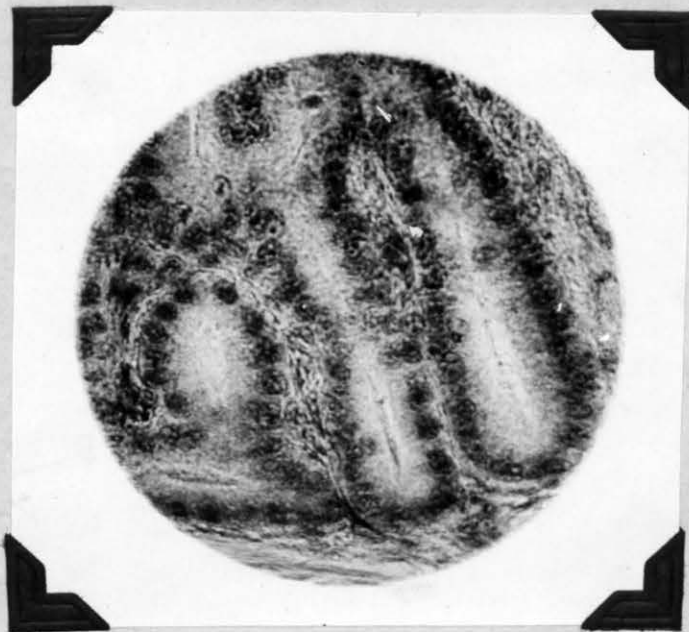


Fig. 2 (Adenocarcinoma.--Oviduct of  
a Hen.  
Photomicrograph showing duct-like ar-  
rangement of epithelial cells.

STUDY NUMBER EIGHTY-THREE

TUMOR NUMBER 14

Adenocarcinoma in the Lung of a Dog.

This material was received from Dr. D. C. Patterson, Sterling, Colorado.

Clinical Data: The subject was a five year old male Collie dog. Three months previous to the animal's death a tumor was observed very close to the trachea on the left side at about the middle portion of the cervical region. At the same time he started to cough and lose appetite. He found it impossible to lie down on either side and would stand until exhausted and then lie on the sternum. The animal also suffered from tympanitis and became very emaciated. In order to relieve the distressing dyspnoea due to the pressure of the tumor it was decided to remove same by surgical operation, but the animal died under the anesthesia. A post mortem examination was conducted and the lungs were found to be extensively involved in a neoplastic process.

Gross Appearance: For some reason the tumor from the cervical region was not sent to the laboratory. It was described as being an oblong growth 3 cm. x 7.5 cm. of a reddish color and of a firm consistency. It was located beneath the skin. One of the lungs was received for examination and it presented a most interesting condition. (Fig. 1).

The organ was slightly enlarged and the surface was generously studded with nodular formations measuring 0.5 cm.

Study Number Eighty-three - 2

to 2. cm. in diameter. There was scarcely any of the lung's surface that was not involved by these nodular growths. The interior of the lung tissue contained nodules of a similar nature. Upon incision the nodules appeared to be of a different color than the lung tissue, being of a slightly grayish yellow tint. The growths were rather soft and velvety to the touch. Those on the surface of the lung were covered with pleura.

Microscopic Description: Sections were obtained showing both lung and tumorous tissue. The lung tissue was feebly separated from the tumorous cells by a connective tissue barrier. Some areas of the lung showed the presence of fibrinous exudation and there were a great many endothelial cells in most of the alveoli which were in a collapsed state.

Some considerable area of the neoplastic tissue was undergoing a caseous necrosis with but a scattering of live cells remaining. The type of tumor cell was epithelial of the small cuboidal variety and it was attempting to follow an alveolar form of architecture.

The tumor alveoli were quite irregular and the majority were closely packed with tumor cells. (Fig. 2). It was in these areas where the cells were most abundant that the necrobiotic changes were in evidence. Blood supply to the new growth was largely in the form of capillaries running

Study Number Eighty-three - 3

in the stroma of the alveolar walls. This stroma which consisted of strands of connective tissue was for the most part very delicate. Where the alveoli were not filled they were lined with the tumor cells in a single layer (Fig. 3 and 4), and here the thinness of the stroma was most evident.

Studied under the oil immersion lens the individual tumor cells were found to be small spherical or oval structures with but scant cytoplasm, the nucleus occupying two-thirds of the cell bulk. The nuclei, some of which appeared to be located eccentrically, were of the same general shape as the cells proper. They took a very intense basic stain and possessed very fine chromatic granules which in many were undiscernible due to the intenseness of the stain. No nucleoli could be seen. A few mitotic figures were present but they were by no means abundant.

Diagnosis: We have here a history of two tumors in the same animal with only one available for microscopic study. This is unfortunate for with an opportunity to section the tumor from the cervical region an explanation of the origin of the lung tumor would be possible. There is a probability that these two tumors had a close relationship; the lung tumor being a possible metastatic result of the other tumor which may have been primary. However, I must base my conclusions upon the data before me and not upon a hypothesis based in

Study Number Eighty-three - 4

part upon absent evidence.

The type cell here one must admit is unusual. The structure of the mass in places resembled an endothelioma, yet when the type cell is examined minutely this similarity fades. The general aspect is that of an epithelial structure, the type cell of which could have been derived from the epithelium somewhere along the bronchial mucosa. It could have developed from the cells lining the smaller bronchi, especially those in the terminal branches which are simple cuboidal and non-ciliated.

My diagnosis is adenocarcinoma.

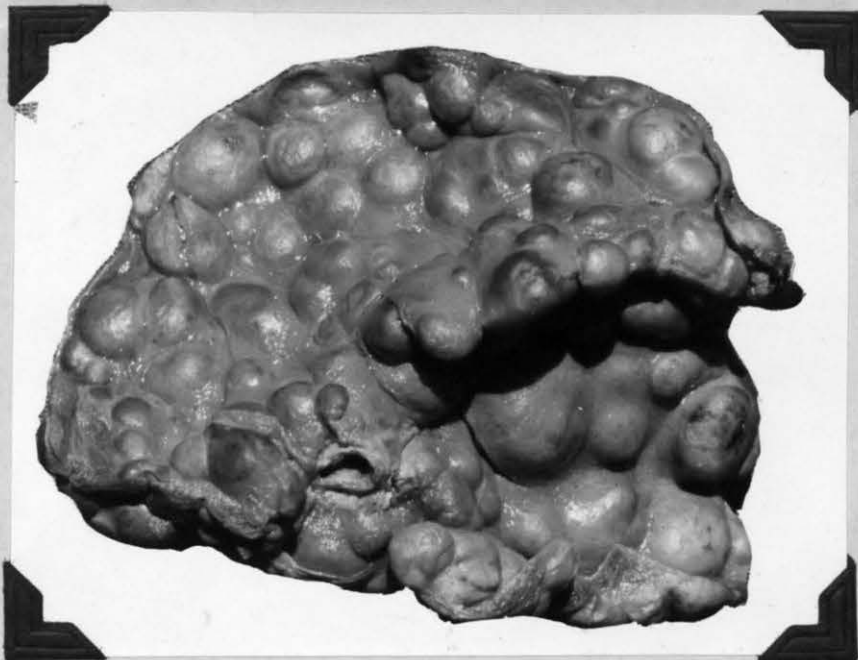


Fig. 1 (T.14) Adenocarcinoma.--Lung of a Dog.  
Photograph showing the distribution of the  
tumorous nodules throughout the lung.

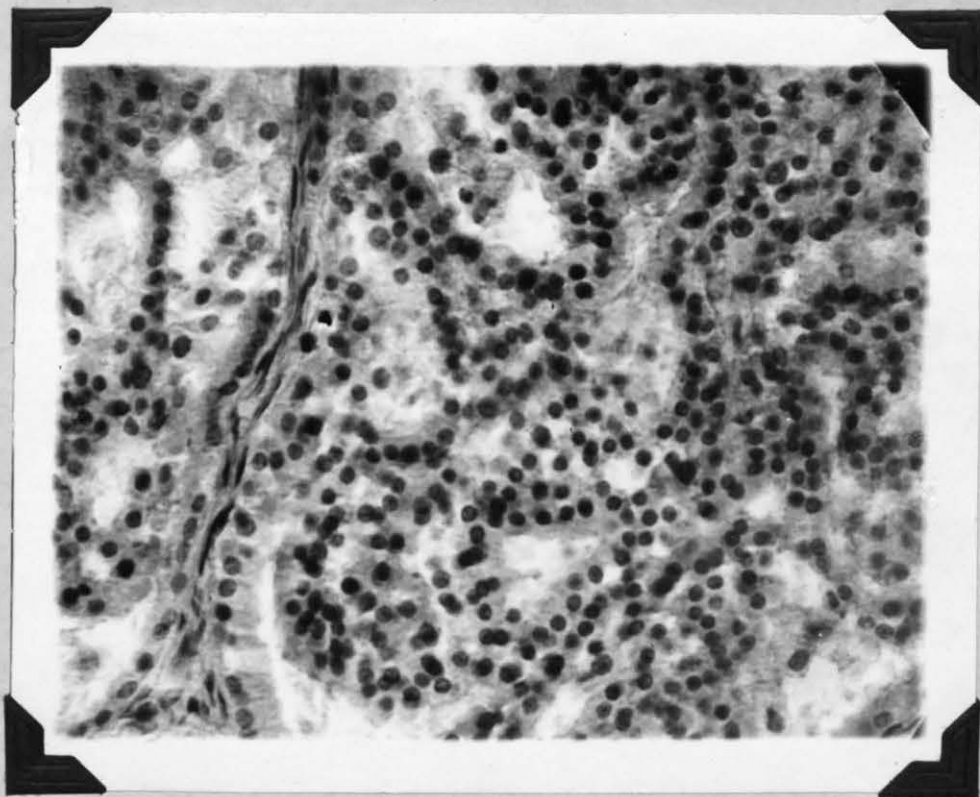


Fig. 2 (T14) Adenocarcinoma.--Lung of a Dog.  
High power photomicrograph showing the alveoli  
packed with cuboidal cells.

Adenocarcinoma



Fig. 3 (T.14) Adenocarcinoma.--Lung of a Dog.  
High power view showing unfilled tumorous alveoli  
lined by a single layer of cuboidal epithelial cells.

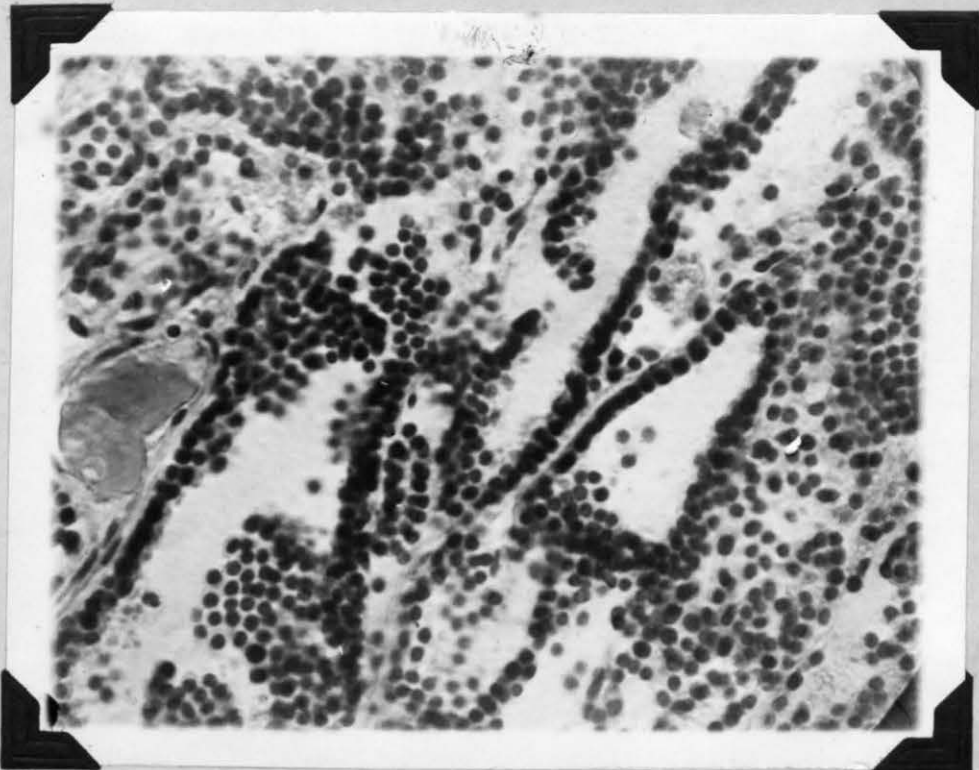


Fig. 4 (T.14) Adenocarcinoma.--Lung of a Dog.  
High power view showing both a diffuse and alveolar  
arrangement of the cells.

STUDY NUMBER EIGHTY-FOUR

TUMOR NUMBER 18

Adenocarcinoma -- Kidney -- Hog

This tumor was part of a pathologic exhibit sent to the Department of Pathology thru the courtesy of and by the Meat Inspection Division of the Bureau of Animal Industry, Denver, Colorado.

Clinical Data: The animal, which was a hog, was slaughtered and subjected to the usual post mortem examination. One of the kidneys was involved in a large tumorous process. The entire mass was received at the laboratory.

Gross Appearance: The entire tumor measured 15 cm. x 25 cm. It had an irregularly oval shape; was gray in color and firm in texture. The surface was smooth and covered by a white tough capsule. Fragments of what appeared to be kidney tissue were scattered throughout part of the tumor near its attachment.. The formation weighed 2200 grams. (Fig. 1).

Microscopic Description: Under the low power the tissue appeared rather irregularly cut by broad connective tissue septa, and no remains of kidney tissue were present. (Fig. 2). Finer strands of these structures ran throughout the space between the septa and gave support for the type cell of the tumor which was disposed in an alveolar or tubular fashion. (Fig. 3).

Under the high power the type cell was epithelium of the low columnar variety with a nucleus that stained very



Study Number Eighty-four - 2

intense and which was difficult to study for the same reason. In shape the nuclei were somewhat peculiar in that most of them were elongated and some were almost spindle-like. The epithelial cells were laid down in a single layer. Blood channels did not appear to be abundant. Mitosis was frequently observed.

Sections obtained from those areas that in the gross specimen appeared to consist of kidney tissue showed the same to consist of a hydropic degeneration associated with necrosis of the tumor cells. A brownish yellow, finely granular pigment was present in these locations which resembled melanin. These portions of the tumor revealed a simple adenomatous type of structure with the gland like alveoli of a greater magnitude than was shown by the rest of the neoplasm.

Diagnosis: After some study of the elements involved in this tumor and their mode of arrangement I am of the opinion that this type of tumor is an epithelial growth of low, flattened columnar cells arranged in a tubular or alveolar manner. When one considers the great variations exhibited by the epithelium of the kidney, it is not difficult to assume that the parent cells of this tumor possibly sprang from the epithelium of the glomerulus or Bowman's capsule. It is of a somewhat different character than the epithelial cells lining the kidney tubules but in an outlawish proliferation of this sort considerable deviation from the normal is commonly

Study Number Eighty-four - 3

observed. While some of the cells in the stroma between the tubules show some undifferentiated features yet the absence of mitotic figures would indicate a variety of fibroblastic cell without malignant tendencies per se.

It is my opinion that this is an epithelial new growth, malign in character and should be classed as an adenocarcinoma.

Adenocarcinoma



Fig. 1 (T.18) Adenocarcinoma.--Kidney of a Hog.  
Photograph of section thru the tumor showing the  
small amount of kidney tissue yet remaining.

Adenocarcinoma

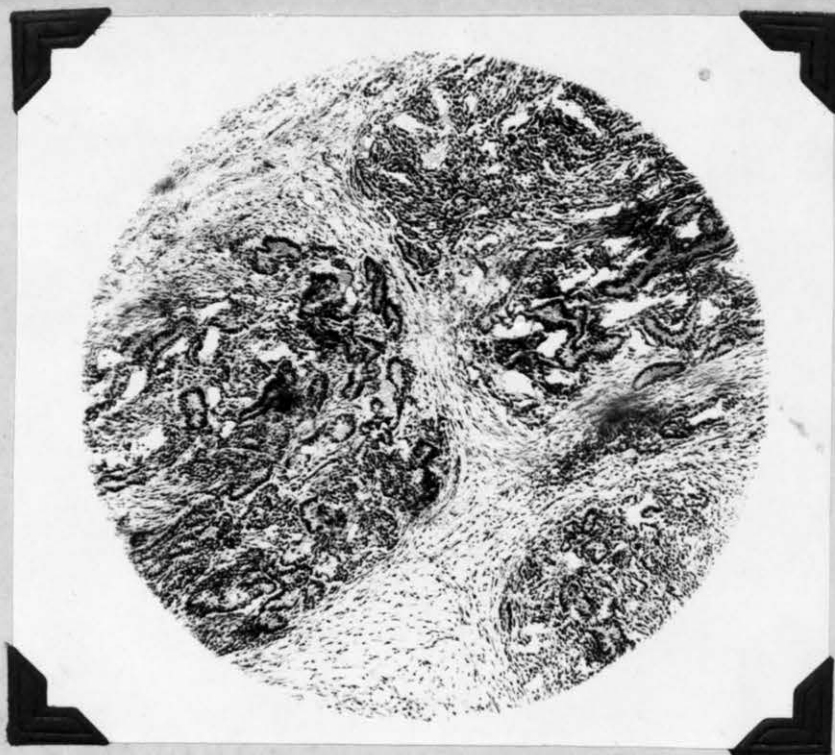


Fig. 2 (T.18) Adenocarcinoma.--Kidney of a Hog.  
Low power view showing the heavy fibrous septa  
forming compartments containing the parenchyma  
of the tumor.



Fig. 3 (T.18) Adenocarcinoma.--Kidney  
of a Hog.  
Low power view showing the tubular  
structure of the tumor.

Adenocarcinoma

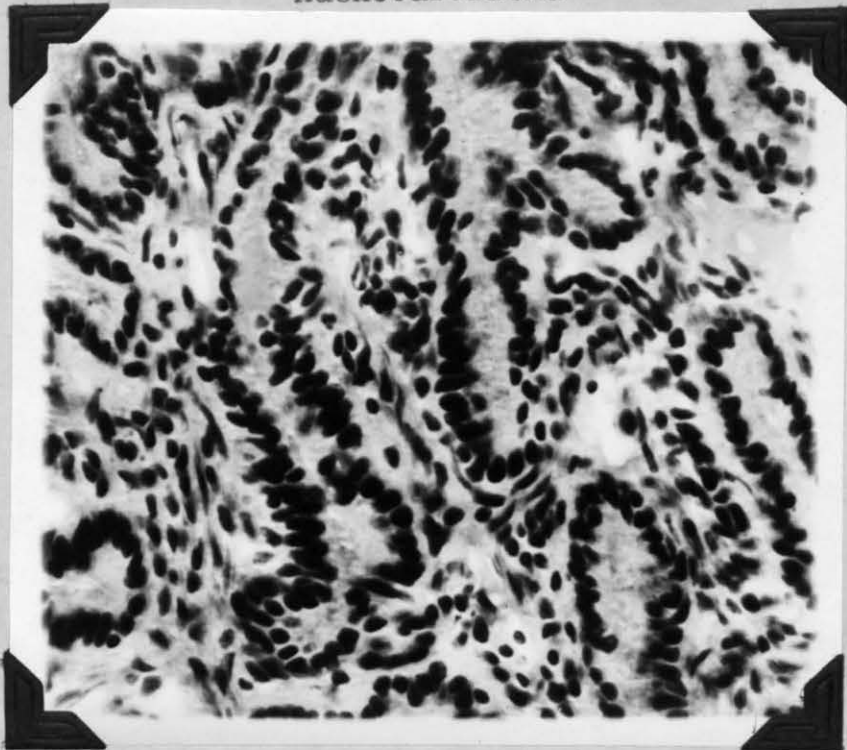


Fig. 4 (T.18) Adenocarcinoma.--Kidney of a Hog.  
High power view showing the intensely staining  
spindle shaped nuclei.

STUDY NUMBER EIGHTY-FIVE

TUMOR NUMBER 24

Adenocarcinoma of the Kidney -- Hog

This specimen was sent to our laboratory by Dr. G. G. Feldman, Veterinary Inspector, Armour and Company, Spokane, Washington.

Clinical Data: A two year old Duroc sow was slaughtered for food and a tumorous mass was observed in the body of the right kidney. The carcass was in good condition otherwise.

Gross Appearance: The tumor was a firm sharply circumscribed mass imbedded in the body of the kidney particularly the medullary portion but approaching the capsule at the hilum. (Fig. 1). In size it measured 4 cm. x 7 cm. It was grey in color and somewhat irregular in shape. The surface was roughened and invested with a capsule. A freshly cut surface showed the tissue to be distinctly mottled.

Microscopic Description: A search of the neoplastic tissue failed to show anything suggestive of kidney structure. The make up of the tumor was quite cellular, the parenchyma being irregularly interrupted by broad connective tissue septa which carried a few blood vessels. From these larger septa smaller strands were given off which passed into the cellular areas and which seemed to provide support for same. Where these supporting strands left the parent septa their structure was easily followed but due to many ramifications

Study Number Eighty-five - 2

it was impossible to trace them to their ultimate deposition.

Under low power the tumor cells appeared to form tubular or alveolar spaces with a lining of a single layer of cells. (Fig. 2). The interalveolar or intertubular spaces were highly cellular and possessed a few small blood channels in the connective tissue stroma.

A very interesting type of structure was revealed under the higher magnification. Most of the gland-like or tubular structures consisted of a single layer of low columnar epithelium resting on a delicate connective tissue stroma. A few, however, were lined with what appeared to be a low cuboidal epithelium. The nuclei were hyperchromatic and oval in shape. Mitosis was abundantly in evidence but more especially in those tubules showing the columnar type of cells. (Fig. 3). The highly cellular spaces between the tubules consisted of large cuboidal or oval epithelial cells with a minimum of cytoplasm. (Fig. 4). The nuclei, like those of the cells of the tubules, were hyperchromatic and mitotic figures were numerous. The cells in these areas were closely packed together and no intercellular material was discernible. Well defined nests of lymphoid cells were seen in certain parts of the sections and an occasional eosinophile was present.

Study Number Eighty-five - 3

While this growth possessed the most striking of malignant features, namely abundant mitosis, yet the growth was sharply limited in the gross by a well formed capsule and appeared to be growing by expansion rather than by infiltration which is the usual manner of most malignant proliferations. A suitable name for this tumor is difficult to determine. The older writers used the terms adenosarcoma, sarcoadenoma, etc., yet none of these seem to be exactly descriptive of the histological elements involved.

I feel that this is nothing more than a slightly atypical adenocarcinoma. With the close resemblance of the duct-like structures in this tumor to the tubules of the kidney we can not help being impressed with the likelihood of the two having a common origin. While the type of epithelium differs in the tubular structures and in the intertubular spaces this could be accounted for by transitional changes. The epithelial cell is not a cell of constant form but may vary in the same structure from cuboidal to high columnar. If this happens in locations where the restraining influence of normal cell physiology is in force it could certainly be true in neoplastic formations where the cells are apparently not subject to the same restraint.

**An adenocarcinoma.**



Adenocarcinoma



Fig. 1 (T.24) Adenocarcinoma.--Kidney of a Hog.  
Gross specimen showing the extent of the involve-  
ment.

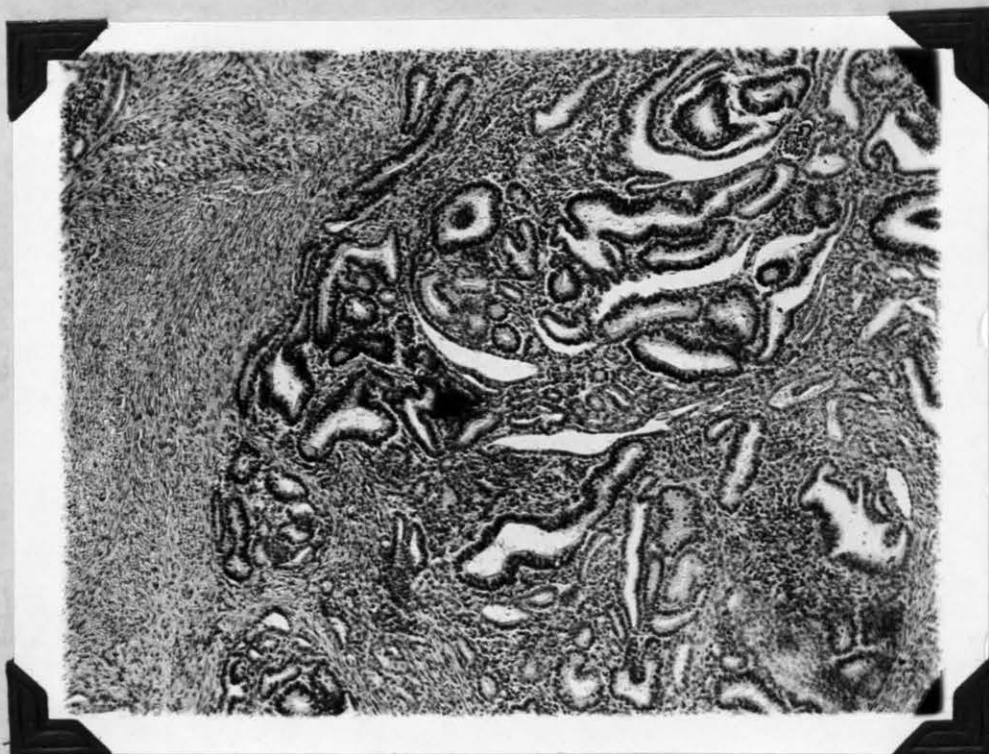


Fig. 2 (T.24) Adenocarcinoma.--Kidney of a Hog.  
Low power view showing the tubular arrangement of  
the epithelial cells.

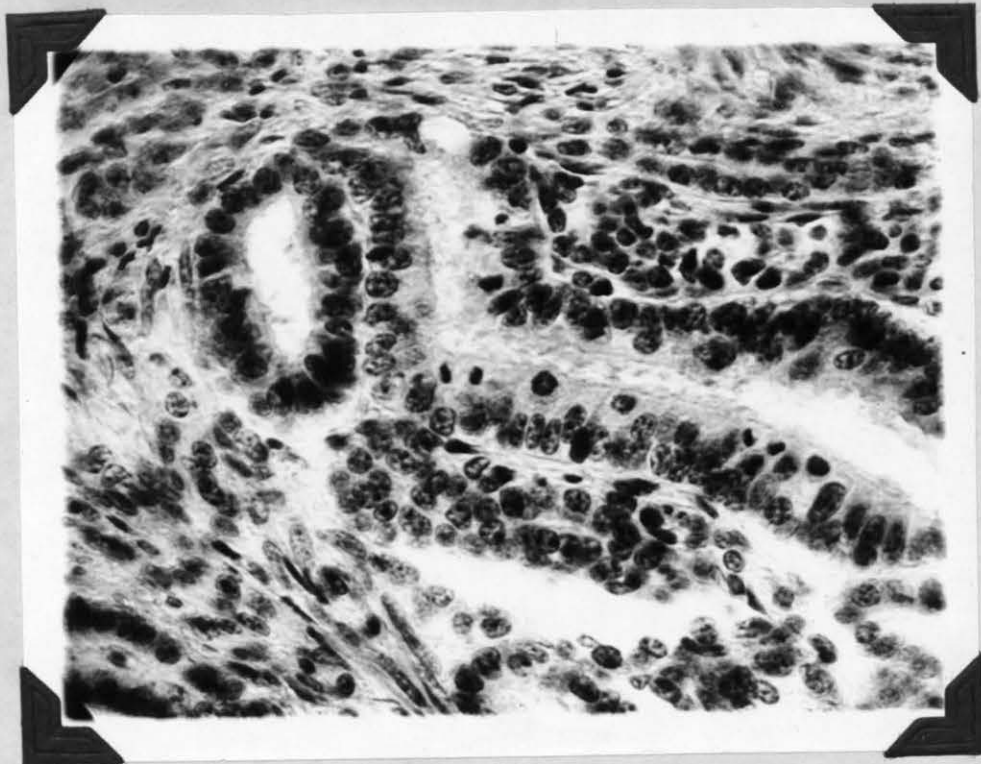


Fig. 3 (T.24) Adenocarcinoma.--Kidney of a Hog.  
High power view showing columnar type of epithelial  
cell which lined many of the tubules. Mitosis present.

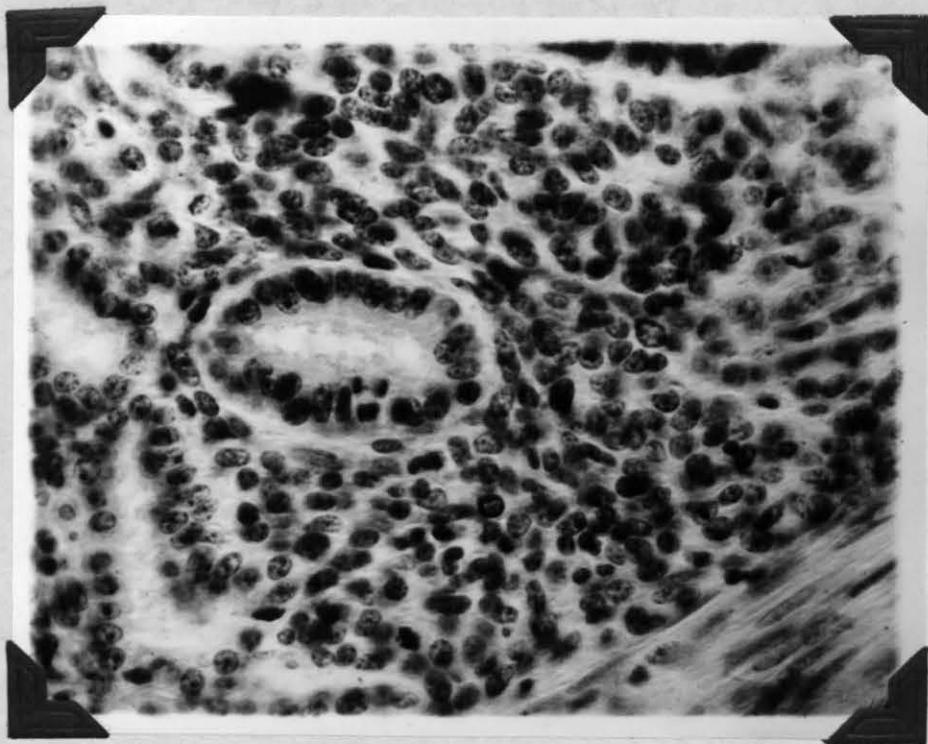


Fig. 4 (T.24) Adenocarcinoma.--Kidney of a Hog.  
High power view showing the highly cellular nature  
of the intertubular areas. One mitotic figure  
present.

STUDY NUMBER EIGHTY-SIX

TUMOR NUMBER 26

Adenocarcinoma -- Sublumbar region -- Hog

This tumor was received from Dr. G. G. Feldman, Veterinary Inspector, Armour & Company, Spokane, Washington.

Clinical Data: A two year old Poland China hog was slaughtered for food and upon post-mortem examination a tumor was discovered in the sublumbar region adjoining and posterior to the kidneys. The general physical condition of the carcass was good and no other structures were involved.

Gross Appearance: The mass was spherical in shape and measured about 25 cm. in diameter. It was of a flesh color and soft to the touch. The surface was smooth and covered by a capsule. A cross section of the material revealed some irregular spongy areas measuring up to 1 cm. across. These contained papillary projections and appeared to be of a light brown color. The tumor seemed quite vascular at the time of its removal from the carcass.

Microscopic Description: Sections from this material showed areas of fibrous tissue interspersed with dense accumulations of fibroblastic cells and lymphocytes with a minimum of collagen fibrils. Projecting into this in a very uneven manner were great areas of epithelial cells in duct like formation. (Fig. 1). The lumina of many of the ducts or tubules were greatly enlarged with the epithelial cells jutting into the cavities in a papillary fashion. (Fig. 2). Many of the cavities were quite large and formed definite cysts, some

Study Number Eighty-six - 2

containing a clear pink staining material while a few contained some red blood corpuscles and leucocytes. Under the high power the lining epithelium of the acini was of a large cuboidal type for the most part in a single layer, this changing to a columnar type over the surface of the papillae that projected into the cyst-like cavities. In most locations a single layer obtained which rested upon a firm connective tissue stroma. In this were also found minute blood channels. Many of the epithelial cells were undergoing mitotic division. (Fig. 3). A critical study of the connective tissue elements of this section brought out some interesting features as to the exact character of the fibroblastic cell and its behavior. In certain fields these cells had a distinctly embryonic appearance with decided malignant tendencies and mitosis could be frequently demonstrated. In the midst of some such fields could be seen epithelial duct-like structures such as were described above.

Diagnosis: In a tumor of this sort one is confronted by features of such a nature as to make a clean cut diagnosis difficult, if not impossible. The arrangement and behavior of the epithelial elements here would call for a diagnosis of papilliferous adenocarcinoma which form it clearly assumes. However, when we take into consideration the other elements of this neoplasm, we find that we are also dealing with embryonic

Study Number Eighty-six - 3

fibroblastic cells that look suspiciously like sarcoma. However, we can not be sure if this be an indication of true sarcoma or if it is simply an overactivity of the fibroblasts due to an irritative impulse from the proliferating epithelial structures. With the great excess of epithelial cells over the fibroblasts I am inclined to the later belief.

The tumor as a whole resembles the mixed type of growth we often encounter in the kidney of swine. (See Tumor Study No. 24). Here, of course, the kidneys were apparently not involved and the tumor instead of being part of a definite organ was found alone as an encapsulated mass. Coming from the pelvic region of a hog suggests the possibility of it having had a common origin with the kidney tumors above mentioned which Ewing (1st Edition P. 939) claims in the human are mesodermal in nature and derived from the primitive kidney and adjacent tissues. This was no doubt a tumor resulting from some embryonal disturbance.

An adenocarcinoma.

Adenocarcinoma



Fig. 1 (T.26) Adenocarcinoma. Sublumbar Region of a Hog.  
Low power view showing the epithelial duct-like formations.

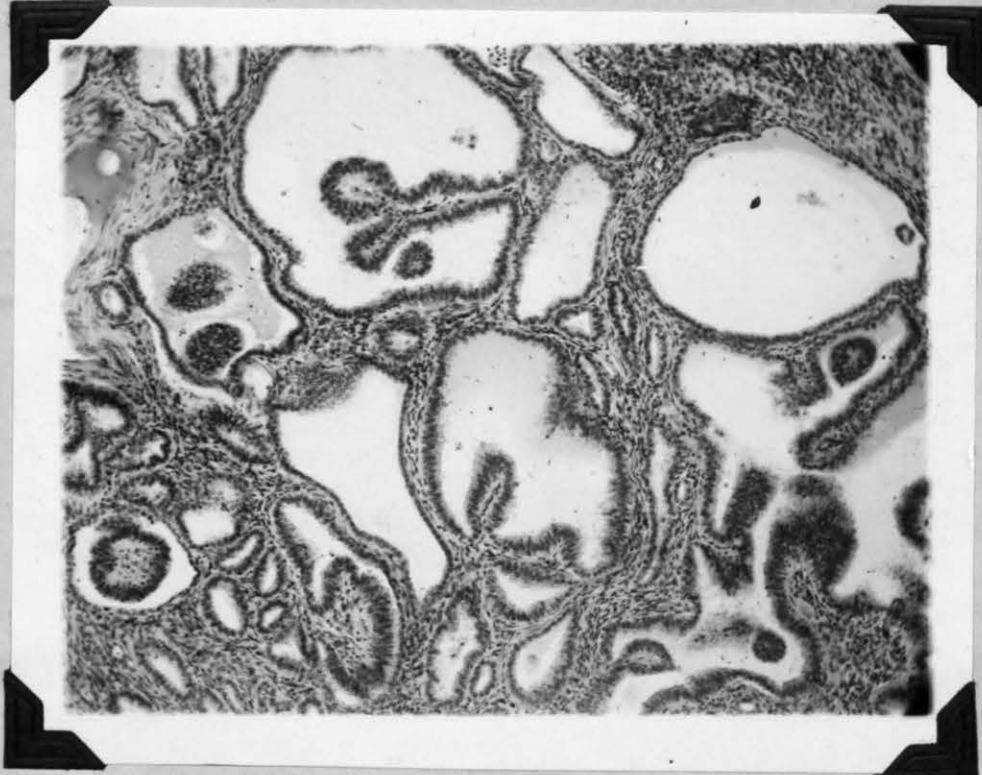


Fig. 2 (T.26) Adenocarcinoma. Sublumbar Region of a Hog.  
High power photomicrograph showing the papillary projections into the dilated cavities.

Adenocarcinoma

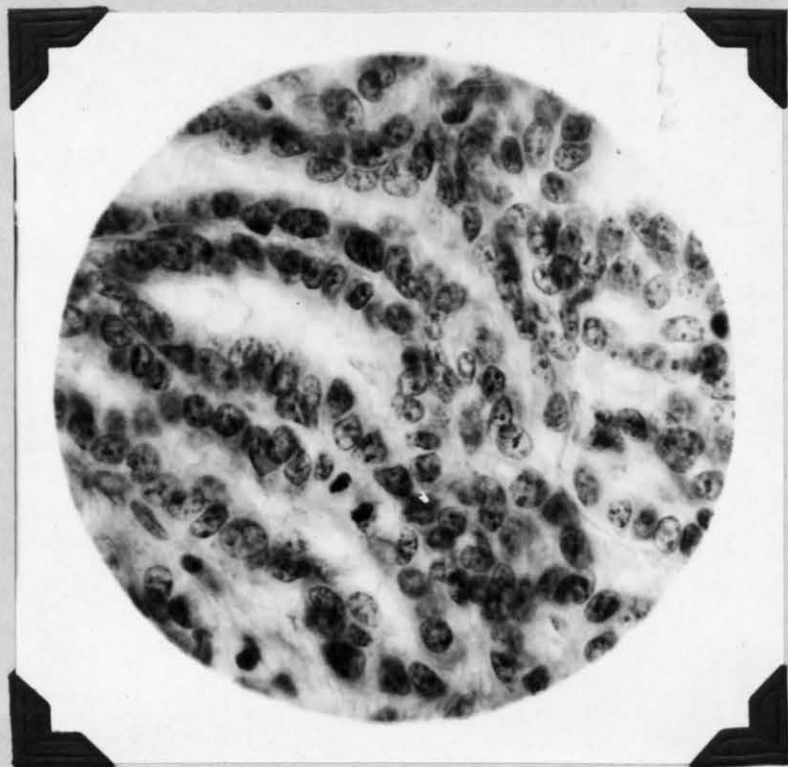


Fig. 3 (T.26) Adenocarcinoma. Sublumbar  
Region of a Hog.  
High power photomicrograph showing one  
epithelial cell undergoing mitosis.

STUDY NUMBER EIGHTY-SEVEN

TUMOR NUMBER 39

Adenocarcinoma in the Sublumbar Region of a Hog

This tumor was forwarded to our laboratory by Dr. G. G. Feldman, Veterinary Inspector, Armour and Company, Spokane, Washington.

Clinical Data: The animal was an eight months old Duroc male hog. The animal was slaughtered for food and the usual post-mortem examination made to determine the wholesomeness of the carcass. The carcass was found to be in good condition with the exception of a tumorous mass lateral and distal to the left kidney. This was removed.

Gross Appearance: The tumor proved to be a bean shaped, firm mass, measuring 38 cm. by 30 cm. and weighing nearly 8 kilos (16½ pounds). It had a gray color, was rather vascular, and the surface was covered with a capsule which could be removed without difficulty. It was also noticed that the tumor was covered with serous membrane.

Microscopic Description: This tumor possessed a considerable amount of connective tissue of a fibrous nature, laid down so as to provide an abundance of stroma to support the cellular elements of the parenchyma. Strands of connective tissue of various widths were given off from the larger septa or trabeculae. These served as partitions separating or dividing the more cellular portions of the tumor into rather indistinct lobular areas. Finer strands finally ramified with each other to become lost in the complex



Study Number Eighty-seven - 2

constituency of the parenchyma.

The cells constituting the cellular lobular areas or parenchyma of the tumor were of two varieties, epithelial and connective tissue. The epithelial cells which were in predominance were of two types, columnar and cuboidal. The columnar cells were arranged to line definite tubules resembling very much the tubules of the kidney (Figs. 1 and 2). The cuboidal cells were closely packed into the intertubular spaces, giving the whole an appearance resembling in many details an adenocarcinoma (Fig. 3). Mixed with the cuboidal cells in many of the intertubular areas were embryonic fibroblasts.

Examined under the high magnification the cells lining the tubular structures were found to be of low columnar variety laid down in a single layer with very little, if any, stroma separating them from the intertubular cells. Mitotic division of these cells was common (Fig. 4). The cuboidal epithelial cells also showed an occasional mitotic figure and were possessed of a large amount of finely granular chromatin material.

An interesting feature was the manner in which the cells in the intertubular spaces merged with the dense bands of connective tissue. One seemed to pass into the other without any distinct line of demarcation. Of some interest also were the irregular spaces filled with a homogeneous substance

Study Number Eighty-seven - 3

that stained the orange color of epithelial hyalin with Van Gieson's method. These spaces were located in the substance of the denser stroma and were lined with a single layer of cells that resembled those cuboidal epithelium found lining the cavities of the thyroid gland. (Fig. 5). It was also observed that certain portions of the stroma gave the characteristic light yellow color of muscle in those sections stained with Van Gieson's stain. The muscle accumulations were rather distinct from the connective tissue and were not extensive. An ample blood supply was insured by the many vessels running in the connective tissue stroma and by the capillary structures seen in the midst of the cellular parenchyma.

Diagnosis: This is another of those complex tumors that are so frequently observed in the region of the kidney of hogs. The more I study material of this kind the more I become of the opinion that the essential cellular elements are largely epithelial in nature. The fibroblastic cells often seen in intimate association with the epithelial cells undoubtedly have their origin in the dense connective tissue structure of the growth. The manner in which the fibroblasts of the intertubular areas seem to pass without definite change into the fibrous frame work would indicate this. Whether the activity of these fibroblasts as evidenced by

Study Number Eighty-seven - 4

mitosis is a neoplastic proliferation or simply an overgrowth due to inflammatory stimulation from the effects of the epithelial cells upon the stroma is not clear. From the available data, however, I am inclined to lean toward the inflammatory explanation and to consider this tumor as being essentially epithelial. The "lakes" of epithelial hyalin lined with cuboidal epithelium also strengthens the importance of the epithelial cells in this regard. It is quite possible that the two types of epithelium, cuboidal and columnar, had a common origin and thru transitional changes two types are presented.

The epithelial structures involved are arranged so suspiciously like the tubules of the kidney that one must consider some embryonic mishap as the possible etiology of this tumor. In further substantiation of this contention is the huge size of this tumor even in the very young. Even in this study (No. 39) the animal was only eight months old, yet the mass weighed  $16\frac{1}{2}$  pounds. This would indicate that the tumor must have had an early beginning, for while there was considerable proliferative capacity on the part of the tumor cells, it seems unlikely that the mass could have reached such a size, if it had an extra-uterine inception.

Compared to other tumors of this kind, this case emphasizes quite forceably the role of the epithelial cell in the make-up of these tumors. Here the epithelial over-

Study Number Eighty-seven - 5

growth was so apparent and the epithelial cell was in such predominance as to identify this with the epithelial tumors.

Contrary to what others have called tumors of this kind I believe the term adenocarcinoma is to be preferred.

Adenocarcinoma



Fig. 1 (T.39) Adenocarcinoma in the Sublumbar Region of a Hog.  
Low power photomicrograph showing the tubular arrangement of the tumor cells and the broad fibrous septa.



Fig. 2 (T. 39) Adenocarcinoma in the Sublumbar Region of a Hog.  
Low power view showing the kidney like tubules of the tumor.

Adenocarcinoma

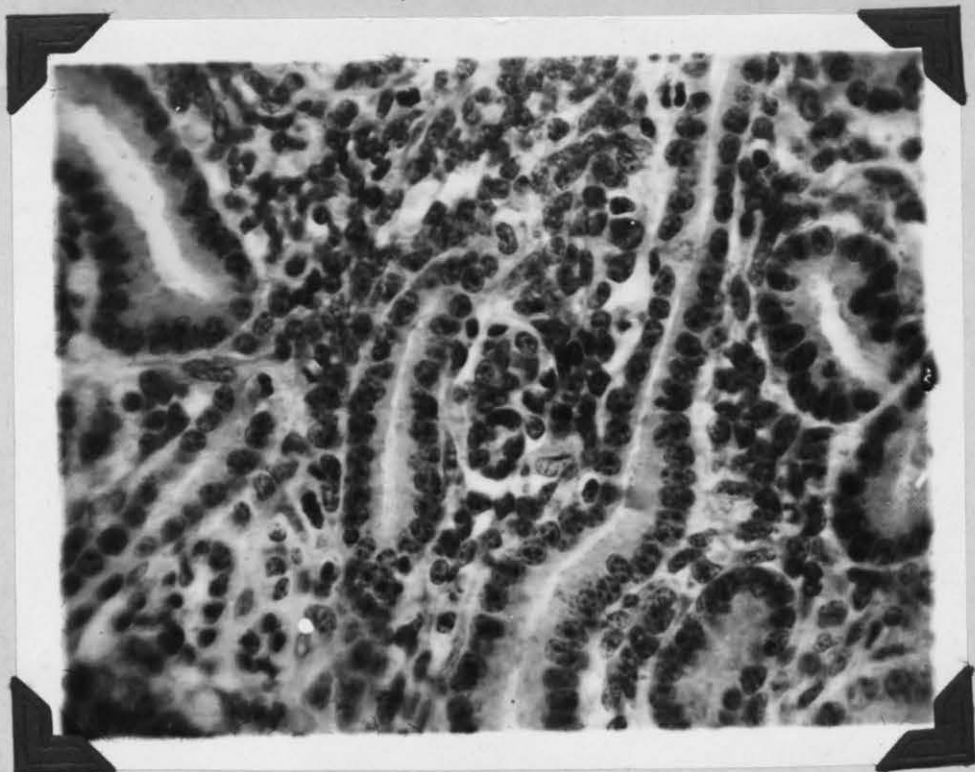


Fig. 3 (T. 39) Adenocarcinoma in the Sublumbar Region of a Hog.  
High power photomicrograph showing the highly cellular makeup of the tumor. The detailed structure of the tubules is clearly evident.

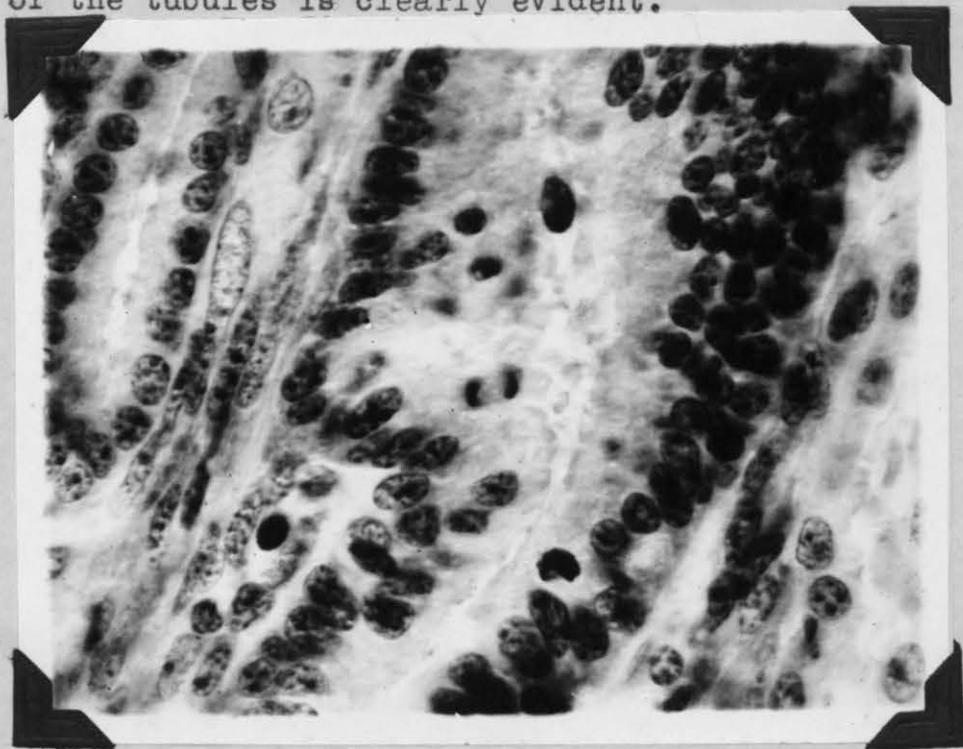


Fig. 4 (T.39) Adenocarcinoma in the Sublumbar Region of a Hog.  
High power photomicrograph showing one cell in mitosis.

Adenocarcinoma

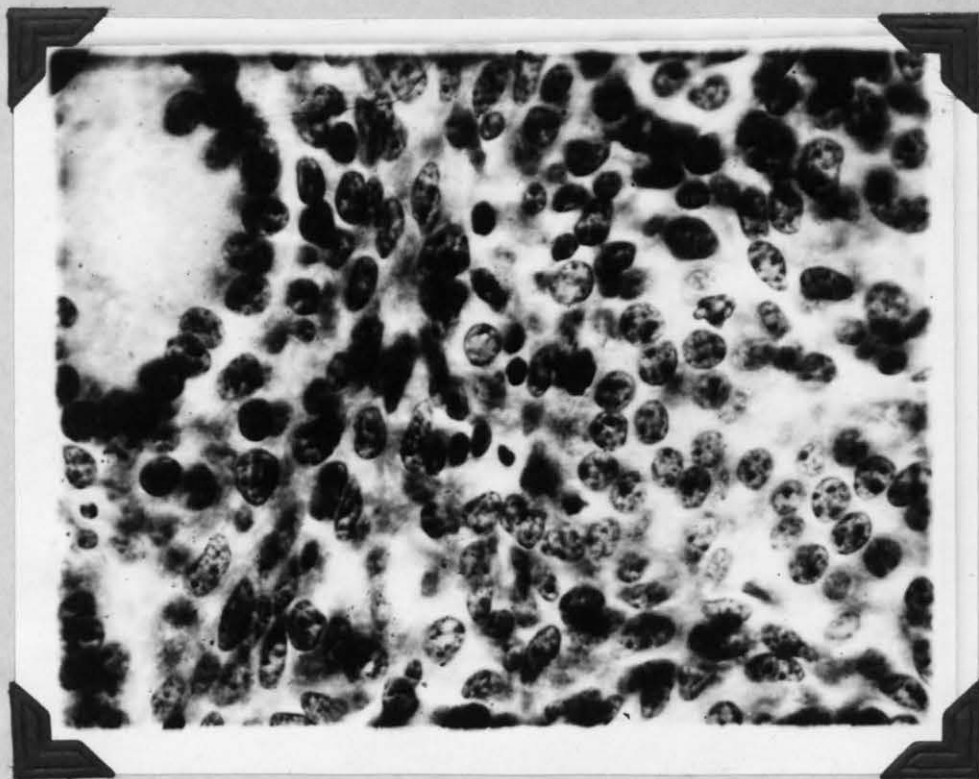


Fig. 5 (T.39) Adenocarcinoma in the Sublumbar Region of a Hog.  
High power photomicrograph showing a cystic cavity filled with a homogeneous substance.

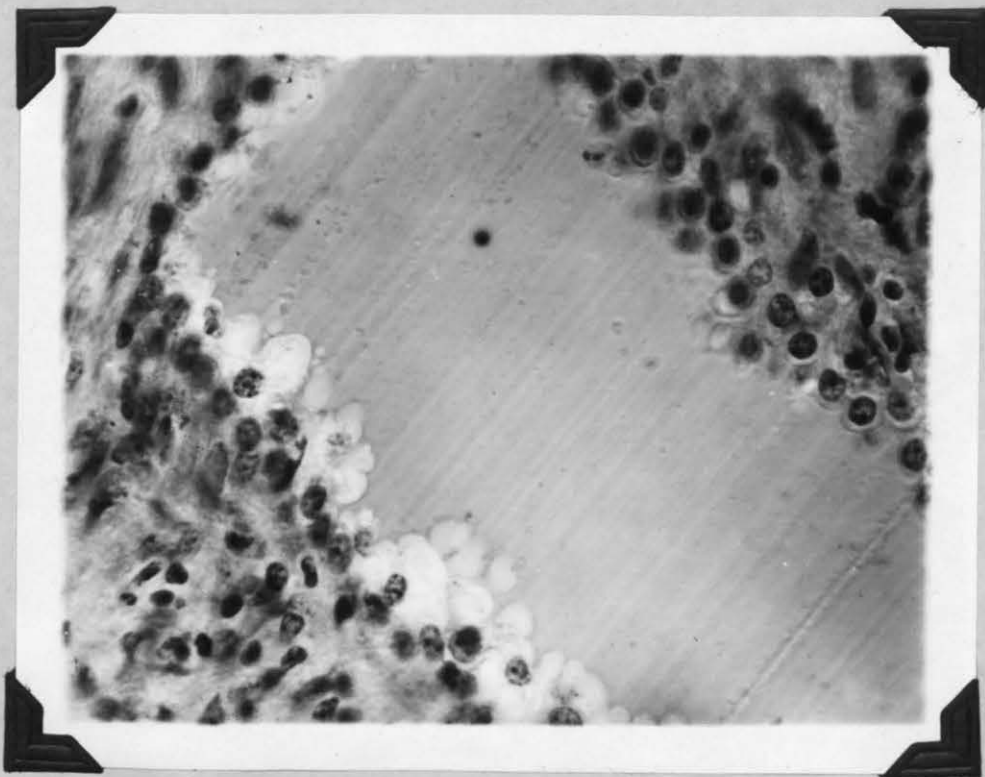


Fig. 6 (T.39) Adenocarcinoma in the Sublumbar Region of a Hog. High power view showing the highly cellular character of the intertubular spaces.

STUDY NUMBER EIGHTY-EIGHT

TUMOR NUMBER 43

Adenocarcinoma -- Kidney of a Hog

This specimen was received from Dr. G. G. Feldman, Veterinary Inspector, B. A. I., Spokane, Washington.

Clinical Data: A one year old male Duroc hog was slaughtered for food and the carcass subjected to the usual post-mortem examination. A diffusely attached tumor was observed attached to the hilus of the left kidney. This was removed for microscopic study and diagnosis.

Gross Appearance: The tumor had an irregular roughened surface and measured about 5 cm. x 5 cm. It was firm in consistency and of a greyish-white color with a few dirty-yellow areas scattered throughout the substance of the mass.

Microscopic Description: Sections of this tumor were stained by both hemotoxylin and eosin and Van Gieson's method. An abundant close knit connective tissue stroma was irregularly interrupted by areas of epithelial cells arranged in the form of tubules (Fig. 1). In the epithelial areas the connective tissue of the stroma was in the form of delicate strands which ramified with each other and became lost in the complexity of the maze of cells.

By far the most interesting features of this tumor were the areas resulting from the activities of the epithelial cells. These areas occurred without apparent plan or system



Study Number Eighty-eight - 3

and due to the various planes at which they were cut, they differed considerably in size. Under high magnification the epithelial cells lining the tubule-like structures were cuboidal to low columnar in type and were disposed in most instances in a single layer. In some of the tubules which were cut in a longitudinal manner a very low flattened epithelial cell could be made out (Fig. 3). This gradually became larger and more oval and eventually assumed the appearance of fairly large cuboidal cells. (Fig. 4). These cells appeared to rest upon a very scant basement membrane. No mitotic division was observed in any of these flattened cells, although many excellent examples of mitosis were noticed in the cells of a columnar type. The intertubular areas were filled with cuboidal epithelial cells, in many instances so closely packed as to appear "stacked" on each other. Mixed with these cells were some immature fibroblasts. Mitotic figures were also in evidence among the epithelial cells of the intertubular areas but this type of cell division was not seen as occurring in the fibroblastic cells.

A rich blood supply was insured to the tumorous tissue thru large numbers of small vessels more or less rudimentary in their structure. No large well formed blood channels were seen even in the dense connective tissue of the specimen and the bulk of the blood supply appeared to

Study Number Eighty-eight - 3

be derived thru the vessels in the epithelia of the parenchyma.

Some large irregular shaped spaces surrounded by connective tissue and lined by a single layer of cuboidal epithelium were noticed in most of the sections. The cavities were filled with a clear homogeneous substance mixed with a few red blood cells. By Van Gieson's method the material of these spaces gave a reaction resembling somewhat epithelial hyaline. However, the reaction was not entirely typical of this material.

At one edge of the section a small portion of kidney tissue was attached. It was separated from the tumor by a fairly broad zone of connective tissue which eventually became lost among the tubules of the kidney. It was noted that a few epithelial tubules, of the same character as found in the tumor proper, were present in this intermediate zone. Other than the capillaries of the kidney tubules being hyperemic nothing of pathological significance was observed in this part of the section.

Diagnosis: This is another of those peculiar tumors of the kidney and sublumbar region of the hog which are so commonly observed in the packing house. Being essentially epithelial in nature, I can see no reason for calling them other than malignant adenomas or preferably adenocarcinomas. Here again, we have the malignant neoplasm of a vital organ

Study Number Eighty-eight - 4

at a very early age (one year). While metastatic evidence is lacking, who can say that this would be found if the animal had been permitted to live a number of years, giving the tumor an opportunity to proliferate to a degree where metastasis would be possible.

An adenocarcinoma.

Adenocarcinoma



Fig. 1 (T.43) Adenocarcinoma.--Kidney of a Hog.  
Low power view showing the tubular space and the  
cellular intertubular areas.

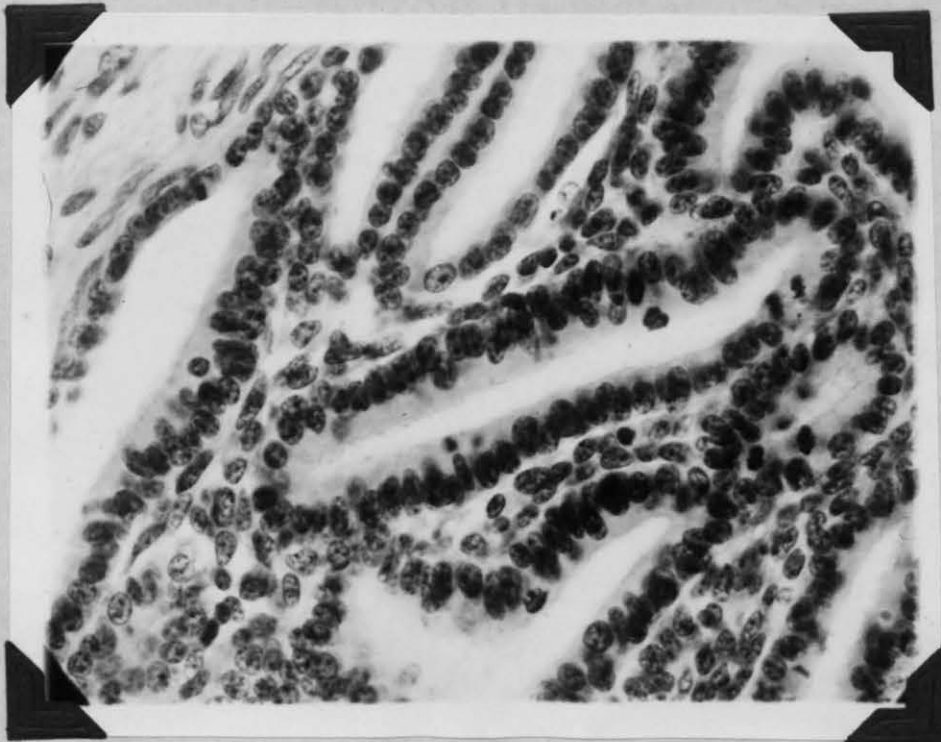


Fig. 2 (T.43) Adenocarcinoma.--Kidney of a Hog.  
High power view showing the tubules lined by a  
single layer of cells.

Adenocarcinoma

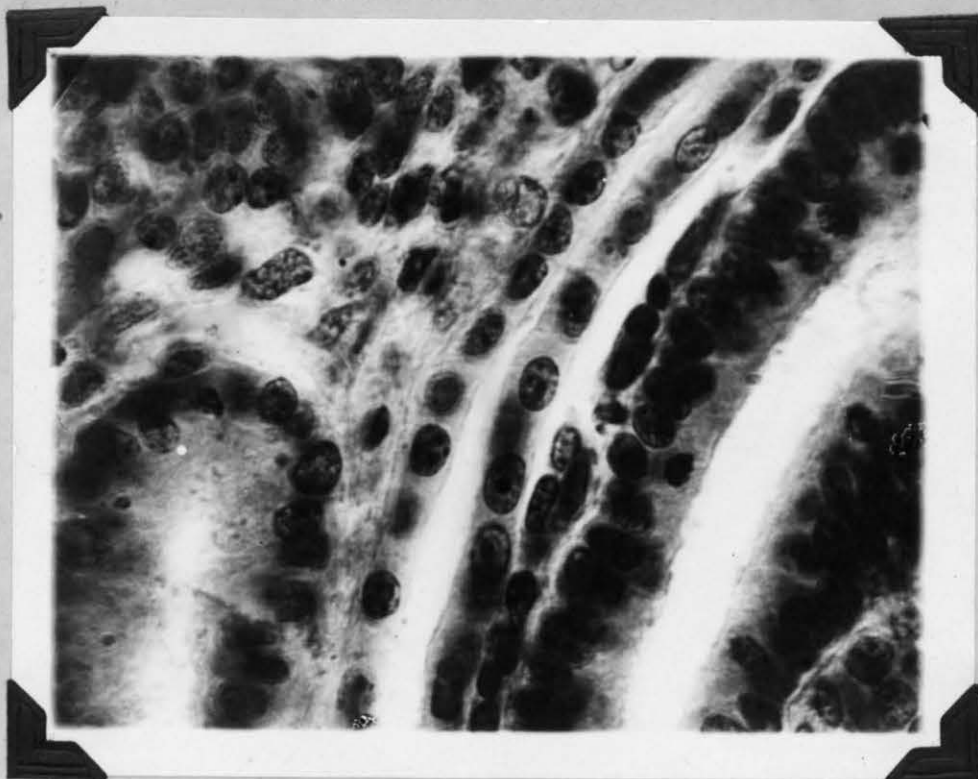


Fig. 3 (T.43) Adenocarcinoma.--Kidney of a Hog.  
High power view showing the flat type of cell  
which lined many of the tubules.



Fig. 4 (T.43) Adenocarcinoma.--Kidney of a Hog.  
High power view showing the gradual transition  
from the flattened epithelium cells to those of  
the large cuboidal type in a single tubule.

STUDY NUMBER EIGHTY-NINE

TUMOR NUMBER 44

An Adenocarcinoma Resembling the Thyroid Gland From Neck  
of a Cow

This tumor was received from Dr. G. G. Feldman, veterinary inspector in the United States Department of Agriculture, Bureau of Animal Industry, stationed at Spokane, Washington.

Clinical Data: A five-year-old grade cow was presented for slaughter. A spherical formation about six inches in diameter was observed attached under the skin over the muscles of the neck lateral and just posterior to the first cervical vertebra. After slaughter the mass was removed and placed in formalin fixative for future microscopic diagnosis and study.

Gross Appearance: The tumor was spherical in shape, about six inches in diameter, fairly firm in consistency and of a flesh color which gradually faded to a whitish gray. Over the unattached surface under the skin a capsule was present. The surface was smooth without ulceration and covered with hair. It was attached rather broadly to the underlying structures by the connective tissue and skin. The mass contained a considerable amount of blood but no pigments or cysts were observed.

Microscopic Description: Sections were prepared from various portions of the submitted material and stained with hemotoxylin and eosin.

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The low-power view presented an atypical structure containing a number of irregularly shaped alveoli lined with cuboidal epithelium. For the most part, the cells lining the alveoli were in a single layer, although many alveoli showed an excess of these cells usually at one side, as though infiltrating into the adjacent stroma (Fig. 1). Most of these alveoli were filled with a clear homogeneous substance that stained a bright pink with eosin, and which gave the characteristic orange-yellow reaction of epithelial hyalin, with Van Gieson's stain, although some of the material within the alveoli gave a light rose red reaction by the same method. In the areas between the alveoli the connective tissue was scant. Most of the space was occupied by what appeared to be epithelial cells morphologically similar to the cells lining the alveolar spaces. These cells were closely packed in small nest-like compartments, which arrangement was very apparent under the high power (see Fig. 2). Some fields contained large irregularly shaped areas, consisting of a hyaline-like substance which appeared vacuolated, and which stained a lavender color by Van Gieson's method. The nest-like groups of epithelial cells were few in these areas, and the number of cells making up the individual groups was a great deal less than in the other parts of the field and many showed changes suggestive of atrophy. Around many of the epithelial nests,

Study Number Eighty-nine - 3

and in the lumina of most of the alveoli were many vacuoles of variable size and shape (see Fig. 1). Red blood corpuscles were abundantly distributed in capillaries throughout the scant connective tissue of the stroma, and large blood vessels with well-defined walls were numerous. A few of the larger vessels showed thrombi formation apparently of some standing.

Viewed under high power the individual epithelial cells were spherical and oval in shape, with considerable variation as to size and staining capacity of the nuclei. Some, mostly of the small variety, stained with deep intensity so that chromatin granules were not discernible while others stained lightly except for the chromatin material which appeared as minute granules. The nucleus occupied most of the cell, the cytoplasm being so small in amount as to escape detection in most instances. Actual mitosis was not prevalent, although there was enough evidence of this to indicate some aggressiveness on the part of the tumor cells (see Fig. 3).

Diagnosis: The epithelial character of the cells, arranged in alveolar and nest-like formations, together with evidence of mitosis and infiltration would stamp this as an adenocarcinoma.

There is sufficient evidence, I think, to feel reasonably sure that the type cell in this formation had a common origin with the epithelial cells making up the



Study Number Eighty-nine - 4

parenchyma of the normal thyroid gland. The tendency toward alveolar arrangement and the presence of colloid material makes this obvious, even though the attempt at alveolar formation was not successful throughout. However, when one considers the location of the tumor it is somewhat difficult to give an acceptable explanation of its position that is in keeping with current embryological teaching although its heterotopic origin is possible from some prenatal mishap, involving one of the lateral thyroids. From the standpoint of a metastatic tumor from the thyroid gland the task of explaining its presence would not be so difficult, if it were possible to examine the gland, as it might present some interesting features bearing upon the possible origin of this tumor. Any change in the thyroid in this animal apparently was not obvious, otherwise the gland would have been removed at the time of slaughter.

While the bulk of the structure was decidedly infiltrative in character, yet the scarcity of mitotic figures together with the age of the animal and the apparent lack of metastatic foci would indicate a tumor of slight progressiveness.

Some of the microscopic features are difficult of interpretation, especially the hyaline-like areas which gave the atypical reactions to Van Gieson's stain. It is my

Study Number Eighty-nine - 5

opinion that the substance making up these areas and the hyaline contents of the alveoli had a common origin, and simply present different stages of the same material. Here we are confronted with the usual obstacles one encounters when attempting adequately to describe and interpret a hyaline change.

The vacuoles are possibly the spaces vacated by the removal of fat droplets since the tissue had been preserved in alcohol for some time. For this reason there was no opportunity of preparing sections for a specific fat stain.

**An adenocarcinoma.**

A description of this tumor appeared in the American Journal of Pathology, Vol. 1, No. 3, May 1925.

Adenocarcinoma

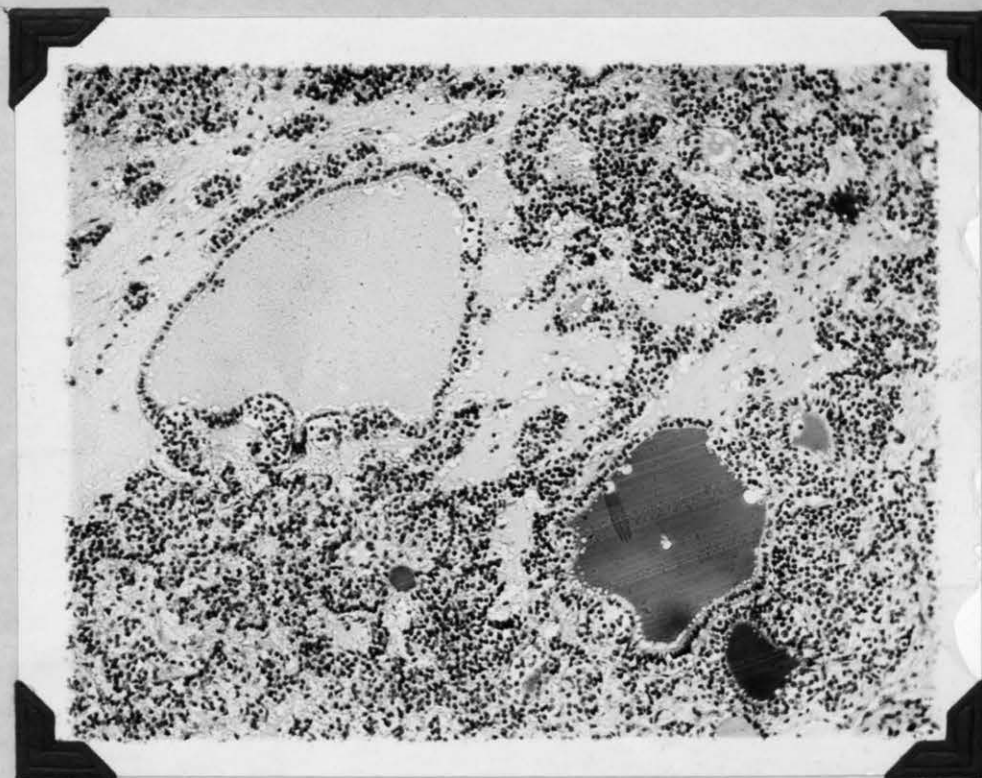


Fig. 1 (T.44) Adenocarcinoma Resembling the Thyroid Gland.

Low power photomicrograph showing irregular hyaline-like areas, alveoli, vacuoles, etc.

Adenocarcinoma

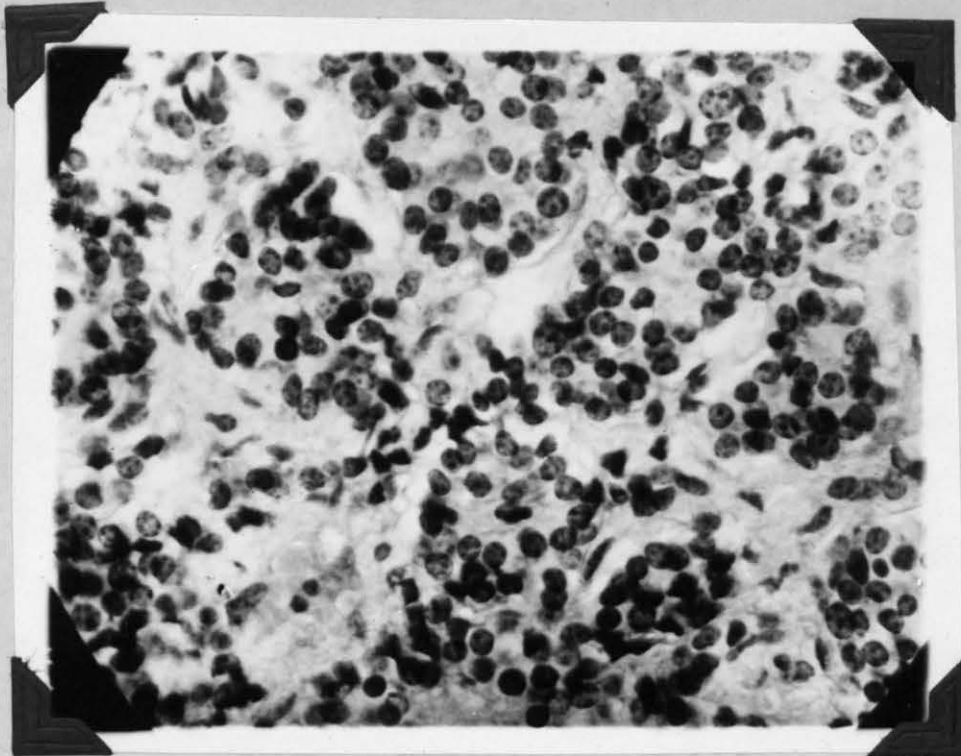


Fig. 2 (T.44) Adenocarcinoma resembling the Thyroid Gland.  
High power photomicrograph showing nest-like formations of tumor cells.

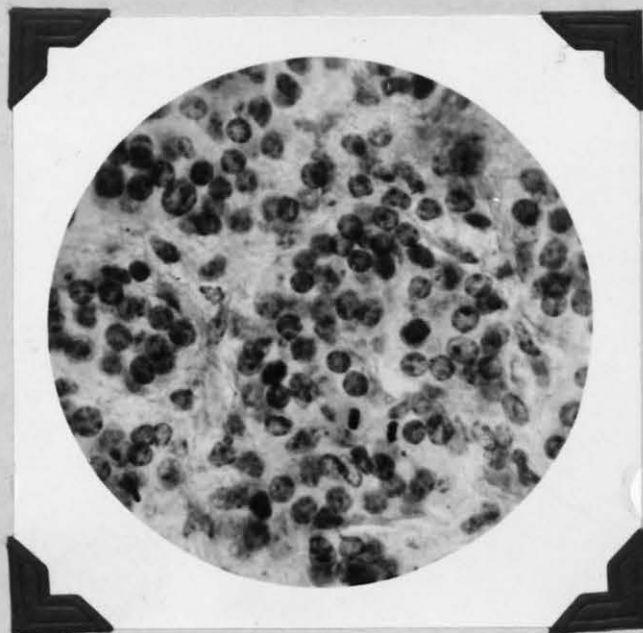


Fig. 3 (T.44) Adenocarcinoma resembling the Thyroid Gland.  
High power photomicrograph showing one cell undergoing mitotic division.

STUDY NUMBER NINETY

TUMOR NUMBER 52

Adenocarcinoma - Kidney of a Hog

This material was received from Dr. Payne, Inspector in charge of the Government Meat Inspection Service at Denver, Colorado.

Clinical Data: This was a packing house case. A hog in apparent health was slaughtered for food. During the usual post mortem inspection of the carcass a tumorous mass was observed in one kidney. The growth was located in the upper surface near one end of the organ.

Gross Appearance: The tumor was a greyish oblong structure surrounded by a very thin capsule. The surface was slightly roughened. The consistency of the mass was firm in some areas and spongy in others. The growth measured 12.5 cm. x 6 cm. x 4.5 cm.

Microscopic Description: This tumor consisted of broad bands of connective tissue forming large alveoli that were filled with epithelial cells arranged in an irregular tubular fashion (Fig. 1). It was observed, however, that a few solid cords of epithelial cells were present although the tubular type of arrangement predominated. The type of epithelial cell was interesting and somewhat unusual. It was columnar in contour and possessed a spindle shaped nucleus that took a deeply basic stain (Fig. 2). The cell was smaller and more elongated than the columnar cell usually encountered in kidney tumors of this variety. Those cells

Study Number Ninety - 2

that were arranged in tubular formation were disposed in a single layer. In some areas the intertubular spaces were packed with the tumor cells in a more or less disorderly fashion. Many cells were suggestive of mitosis but cells actually showing this change were not observed.

A few areas were present that consisted of cuboidal epithelial cells in closely packed formation and indistinct nests or cords of cells could be made out in certain of these fields. Some retrogression was in evidence here and areas of necrosis were common. The connective tissue strands or septa were more or less edematous and a few cystic cavities were seen in the midst of some of the epithelial tubules. Blood channels were few and occurred mostly in the connective tissue substance. Sections stained by Van Gieson's method failed to show any muscle elements.

Diagnosis: This is another of those frequent tumors of the kidney of swine that I prefer to call an adenocarcinoma. While the epithelial cell of this particular tumor differs in some respects from the type cell of most kidney tumors of this kind yet its arrangement and its behavior in general are very similar, if not identical, with the other tumors of this location which I have classed as adenocarcinoma.

The deeply basic quality of the nuclei of the epithelial cells made it impossible to demonstrate mitotic division yet the tumor had many features indicating its

Study Number Ninety - 3

malignant tendencies. There appears to be considerably more retrogression present in this material than in most of the others of this type examined.

An adenocarcinoma.

Adenocarcinoma

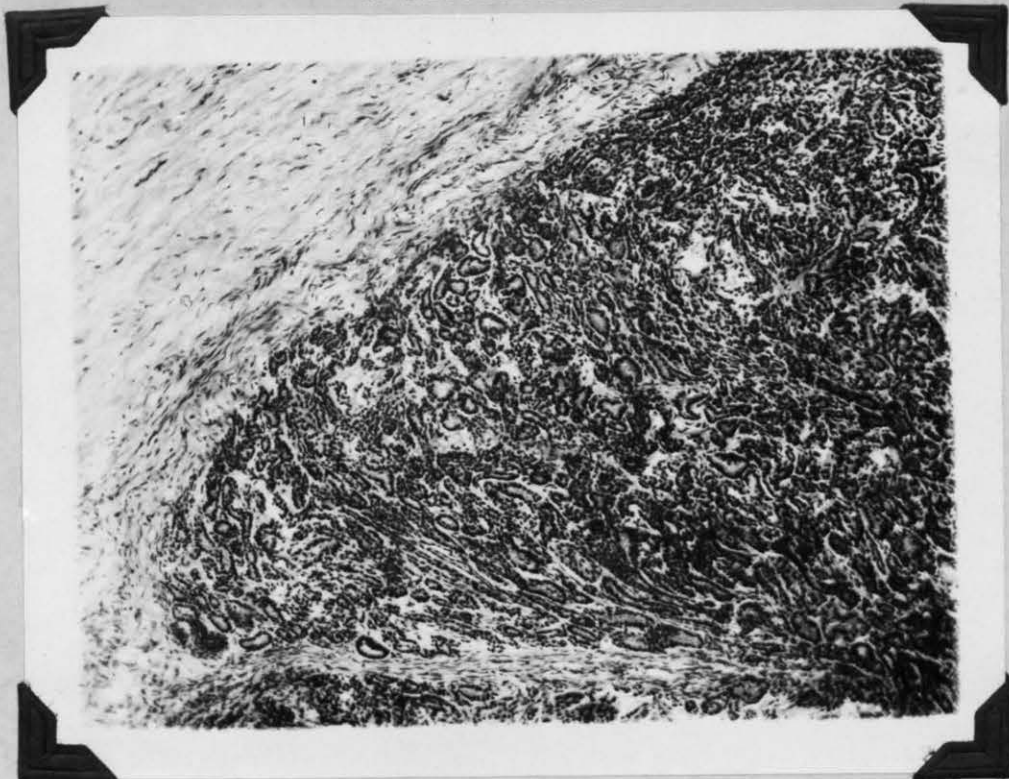


Fig. 1 (T.52) Adenocarcinoma of the Kidney of a Hog. Low power photomicrograph showing the highly cellular nature of the parenchyma of the tumor and the broad fibrous septa.



Fig. 2 (T.52) Adenocarcinoma of the Kidney of a Hog. High power photomicrograph showing the deeply staining spindle shaped nuclei.



STUDY NUMBER NINETY-ONE

TUMOR NUMBER 53

Adenocarcinoma of the Kidney of a Hog

A tumor presented thru the courtesy of Dr. Payne, Inspector in Charge of the Government Meat Inspection Service at Denver, Colorado.

Clinical Data: A tumor from the carcass of a hog that had been slaughtered for food. The neoplasm was located in the position ordinarily occupied by one of the kidneys although but very little kidney tissue was present.

Gross Appearance: The mass measured 20 cm. x 10.5 cm. x 20 cm. and was of a grey color, quite firm in consistency and surrounded by a capsule. In shape it was oval and flattened. A freshly cut surface showed strands of greyish white tissue cutting the tumor substance into small irregular lobular areas.

Microscopic Description: This proved to be a fairly cellular structure cut at irregular intervals by strands of fibrous connective tissue of variable thickness. Smaller septa or trabeculae were given off from the larger strands and in the alveolar-like spaces so formed were epithelial cells arranged for the most part as tubules. Between many of the tubular-like structures the epithelial cells were in close association. Many were grouped in cluster or nest-like fashion while others were disposed in a diffuse manner without scheme or system.

The epithelial cell, which lined the duct or tubular

Study Number Ninety-one - 2

structures by a single layer, was peculiar in some respects and differed from the usual columnar type of cell found in many kidney tumors of the hog. It was a rather small cell, oval to elongated in shape with a slightly granular cytoplasm. In some instances the cells were stretched or elongated so as to become almost spindle shaped. They possessed a rather large nucleus that occupied a considerable portion of the cellular bulk. The nucleus had a decided oat grain appearance and took an intensely basic stain which fact made it impossible to study anything more than its contour and size. A few nuclei were observed that appeared to be undergoing mitotic division but no clean cut examples of this phenomenon were seen.

The blood supply was limited to vessels in the connective tissue strands. These were rather large and occurred frequently. Considerable evidence of edema or hydrops was present in a portion of the connective tissue elements. Sections of this material were also stained by Van Gieson's staining method to determine the possible presence of muscle fibres with negative results.

Diagnosis: This tumor falls into that group of kidney tumors that I consider as adenocarcinoma. It is true that the type of architecture is a bit peculiar, yet the tubular or gland-like arrangement of the epithelial type cell,

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which appears to be growing without restraint, would place this tumor in the group above mentioned. There is nothing about the connective tissue of the stroma or septa that should influence one in classifying this neoplasm. It appears to serve as a framework for the more proliferic epithelial cells and does not of itself possess any malignant or aggressive tendencies.

In my experience adenocarcinomas of the kidneys of swine are of two general types of epithelial cells and a mixture of the two I have not observed. In one we find a definite cuboidal or columnar type of cell that is typical for this type of epithelium while in the other, of which this study (No. 53) is an example, we observe an elongated or spindle cell with a deeply staining oat grain shaped nucleus. The reason for this difference as well as the true explanation of the histogenesis of these tumors is as yet a matter of conjecture.

STUDY NUMBER NINETY-TWO

TUMOR NUMBER 62

Multiple Adenocarcinoma -- Abdominal Cavity -- Chicken

This material was presented through the courtesy of Maurice Shahan, a student in the Veterinary Department.

Clinical Data: The subject was a three year old Rhode Island Red hen. The bird had not been laying for some little time so she was killed and dressed preparatory to cooking. After the feathers had been removed a marked distention of the abdomen was noticeable. The abdomen was opened and a large amount of clear serous fluid escaped. The entire intestinal tract, including the omentum and mesentery, was covered with irregularly flattened tumorous masses. The liver and spleen showed well defined nodular formations firmly embedded in the substance of each organ and projecting outward from the surface.

Gross Appearance: Upon opening the abdominal cavity most of the intestines were observed to be studded with small nodules or granulations varying in size up to 0.5 cm. in diameter. The mesentery was much thickened and also possessed similar nodular elevations to a marked degree (Fig. 1). The liver appeared practically normal except for a few greyish white elevations in one or two areas. The spleen contained two large nodules each measuring about 0.7 of a cm. in diameter with a sharp line of separation showing where the tumorous tissue joined the splenic substance. A few nodules were scattered over portions of the peritoneum. The kidneys were

Study Number Ninety-two - 2

normal. The tumorous tissue was greyish-white in color and fairly firm to the touch. The surface of the nodules was smooth and enveloped in a serous capsule. There were no indications of any degenerative changes.

Microscopic Description: Liver--Sections were obtained from areas showing the external nodules, these apparently being the only portions of the organ involved. These areas were separated from the liver substance by a narrow band of connective tissue which joined the capsule of the organ at the periphery. The tumor proper consisted of duct or gland-like structures arranged in a very atypical fashion with a considerable number showing ramification. (Fig. 2). Connective tissue stroma was abundant in parts of the field and scant in others but constantly present to some degree between the various duct-like structures.

The type cell was epithelial of the cuboidal or low columnar variety. The nucleus was fairly large with a great number of fine chromatin granules present. Mitotic figures were frequently seen (Fig. 3). In the deeper portions of the neoplastic material a number of large clear spaces were seen. Blood vessels in the tumorous areas were few and limited to the denser connective tissue portions. The larger vessels of the organ were in a state of congestion although most of the parenchyma appeared normal. Just beneath the connective

Study Number Ninety-two - 3

tissue which separated the tumor from the liver tissue were accumulations of lymphocytes. This same type of infiltration was also evident around many of the larger blood vessels of the organ. Large numbers of eosinophiles were found in one portion of the tumorous tissue. These were intertubular and closely associated with the fibroblasts of the stroma. The serosa in the region of the tumor was greatly thickened and presented the appearance of a recently organized fibrinous peritonitis.

Spleen--Here, as in the liver, the tumorous nodules were sharply divided from the splenic pulp by a definite band of dense fibrous connective tissue. This ramified with the substance of the splenic capsule at the point where the tumor projected above the body of the spleen. From this connective tissue structure smaller strands were given off which passed to the interior of the nodule providing a stroma for the epithelial cells of the *parenchyma* of the tumor. In some areas the connective tissue occurred in rather broad sheets with an occasional group of tumor cells breaking their continuity.

The tumor cells, which were epithelial in type, were arranged in a tubular manner so as to form narrow channels. (Fig. 4). While most of these structures presented an orderly type of construction, yet, many showed the effects of an incomplete attempt at lumen formation and a few showed the cellular growths to be compact nests of cells. The epithelial cells were of the same type as those constituting the liver

Study Number Ninety-two - 4

tumor. Delicate strands of connective tissue divided the various epithelial units or tubules. Mitotic figures in nearly every stage were frequent. Some little necrosis was observed and pyknotic nuclei and tissue solution was an interesting feature of certain fields (Fig. 5). The blood supply was scant and confined to the connective tissue of the supporting structure.

Peritoneal Nodules: These consisted of tubular structures imbedded in a connective tissue stroma of much the same character as the neoplastic areas in the liver and spleen. The tubules were lined with a single layer of cuboidal or low columnar epithelial cells with the formation of a lumen which was incomplete in many instances. Many of the epithelial cells were undergoing a retrogression and examples of pyknosis, karyorrhexis and karyolysis were plentiful. (Fig. 6) Mitotic division of many of the cells was in progress but this feature was not so frequent as in sections from the liver and spleen. Very few blood vessels were present. The nodules were covered by the serosa.

Intestinal Nodules: The same type of architecture was present in these structures as obtained in the other tumorous formations above described. The muscular walls of the intestine were not involved, the growth arising seemingly from the serous layer and spreading via the tissue of the

Study Number Ninety-two - 5

mesentery, which was considerably thickened as a result of the tumorous proliferations. The serosa was considerably thickened apparently as the result of a chronic inflammatory reaction since the tissue excess consisted of vascularized fibrous connective tissue infiltrated with lymphocytes and wandering cells with an occasional eosinophile.

The new growth was spreading in both directions from the mesenteric attachment so as to extend nearly one-half the distance around the intestinal wall. However, it was limited to the zone between the outer muscular layer and the periphery of the serosa, the musculature at no point being invaded.

Evidence of early necrotic changes was abundant, the pyknotic nuclei were everywhere and in a few instances nearly all the epithelial cells lining the tubules or ducts had undergone solution (Fig. 7). The blood supply was not great and was conveyed to the tissue by way of vessels in the connective stroma. Mitotic figures, while present, were rather infrequently seen.

Kidney: No tumorous involvement of the kidney tissue was observed.

Diagnosis: This tumor would clearly fall under the heading of adenocarcinoma. The epithelial cells arranged in gland or duct fashion, many of which were undergoing mitosis



Study Number Ninety-two - 6

makes this designation proper.

Any attempt to locate the original or primary growth must necessarily be based on opinion and not fact. The relation of the liver and splenic nodules to the capsular structures in each instance and the freedom of the depths of the organs from the tumorous tissue would point perhaps to a metastasis by continuity via the serosa. This is perhaps further substantiated by the extensive involvement of the mesenteric structure and to a lesser degree of the parietal peritoneum.

The histogenesis of the growth must likewise be purely speculative. In view of the type cell, but two possibilities are probable. One is that the tumor arose from the bile duct epithelium of the liver with an infiltration of Glisson's capsule which Adami (1) mentions as a rare form of primary cancer of the liver. If this were true it would be difficult, however, to account for the tumor tissue in the other locations in which it was found. The other possibility and the one which I am inclined to accept as the most likely, is that the primary lesion occurred somewhere along the intestinal tract from an intestinal polyp or as the result of a proliferative activity on the part of the epithelia of the mucosa. Ewing (2) points out that in the human carcinoma of the small and large intestine with the secondary involvement of the peritoneum has such a histogenic explanation.

Study Number Ninety-two - 7

He also draws attention to the fact that the lymphatics of the colon follow the blood vessels in the mesenteric structure which fact would account for the profuse manner in which this structure was involved.

From the microscopic study it was apparent that the tumor cells were extending themselves in the sub-serous zone. As mentioned above, this manner of spreading, would explain the presence of the tumor nodules under the splenic and hepatic capsule and the absence of the usual features of a diffuse growth in these organs such as one would expect in case of metastasis by way of the blood. The presence of the dense fibrous partitions between the parenchyma of these organs and the tumorous tissue would add further weight to this contention. The growths gave the impression of having arisen from without instead of from within.

The non-existence of metastatic foci in the lungs and kidneys and especially their absence in the depths of the liver, would discount the theory that the tumor had been disseminated by way of the blood stream. The invasion of the blood vessels by an intestinal tumor would endanger the liver particularly due to its double afferent flow, yet in this instance there were no signs of neoplastic occupancy of this organ except in the sharply circumscribed nodule near the periphery.

Study Number Ninety-two - 8

The signs of beginning necrosis, which were many, constituted an interesting feature of this study. While pyknosis and karyorrhexis were frequently encountered and autolysis occasionally seen yet extensive alterations as a result of these changes were not apparent. No doubt the retrogression present was recent and the result of an inadequate blood supply as comparatively few vessels were seen throughout.

The evidence would point to a moderately aggressive tumor of some little standing and regardless of its wide distribution in the abdominal cavity I do not feel that the fowl's life was in immediate danger as a result of its presence. Undoubtedly this type of carcinoma when distributed as in this case demands considerable time to effect the death of the host. The eventual loss of flesh and the consequent emaciation and cachexia would perhaps pave the way for some lethal factor of a secondary nature.

A multiple adenocarcinoma.

Ref.

(1) Adami, J. Geo. and Nicholls, A. G. "Principles of Pathology." Vol. II P. 491. Lea and Febiger, Philadelphia, 1911.

Ewing, James -- Neoplastic Diseases. P. 643-647-648. W. B. Saunders & Company, Philadelphia, 1919.

Adenocarcinoma

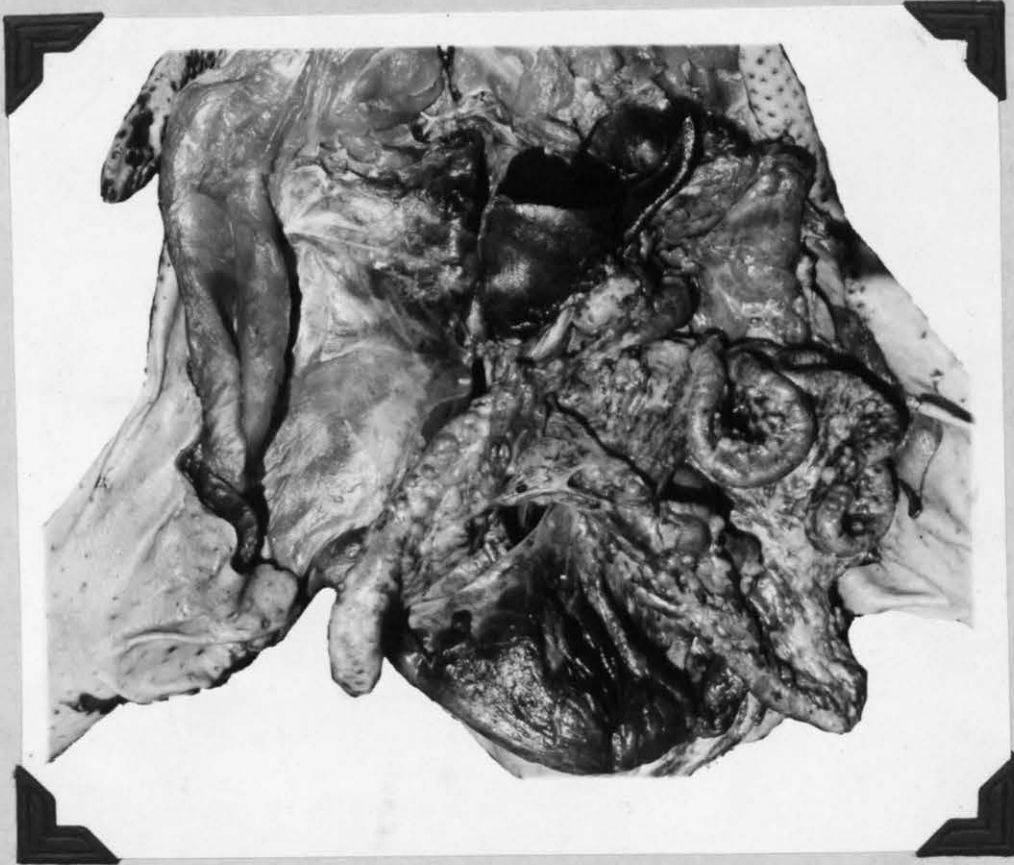


Fig. 1 (T.62) Multiple adenocarcinoma of the Abdominal Viscera of a Chicken. Photograph of the gross material showing the distribution of the numerous tumorous nodules under the intestinal serosa.

Adenocarcinoma

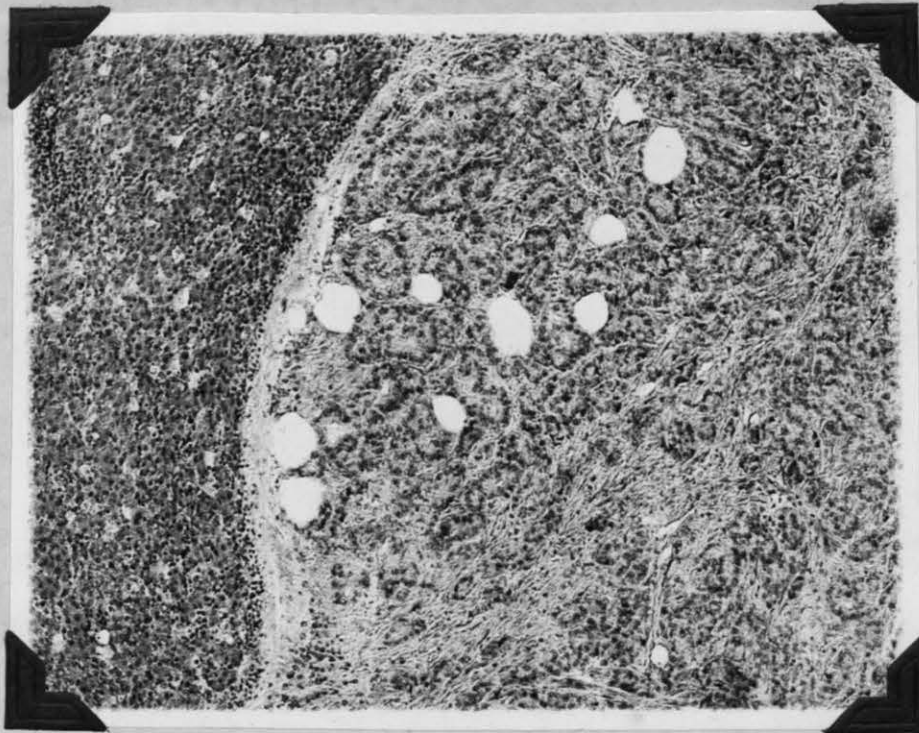


Fig. 2 (T.62) Multiple Adenocarcinoma of the Abdominal Viscera of a Chicken. Low power photomicrograph of material from a liver nodule showing the duct-like cavities with tumorous tissue separated from the liver cells by a band of fibrous tissue.

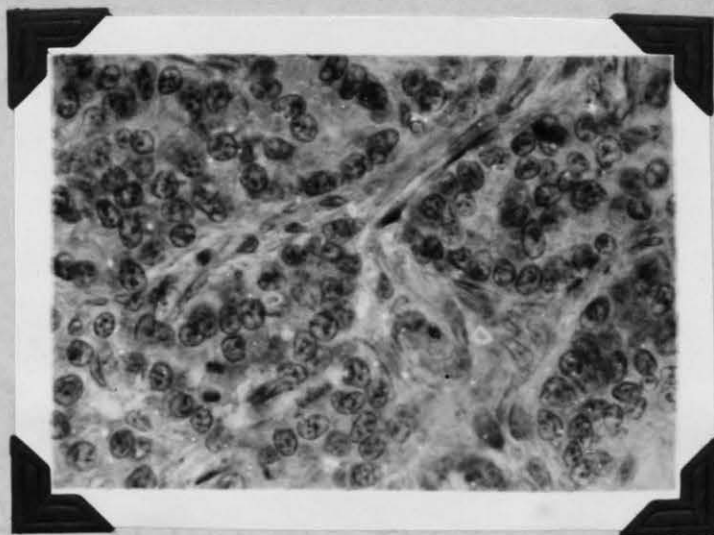


Fig.3 (T.62) Multiple Adenocarcinoma of the Abdominal Viscera of a Chicken. High power photomicrograph of liver nodule with one cell undergoing mitotic division.

Adenocarcinoma

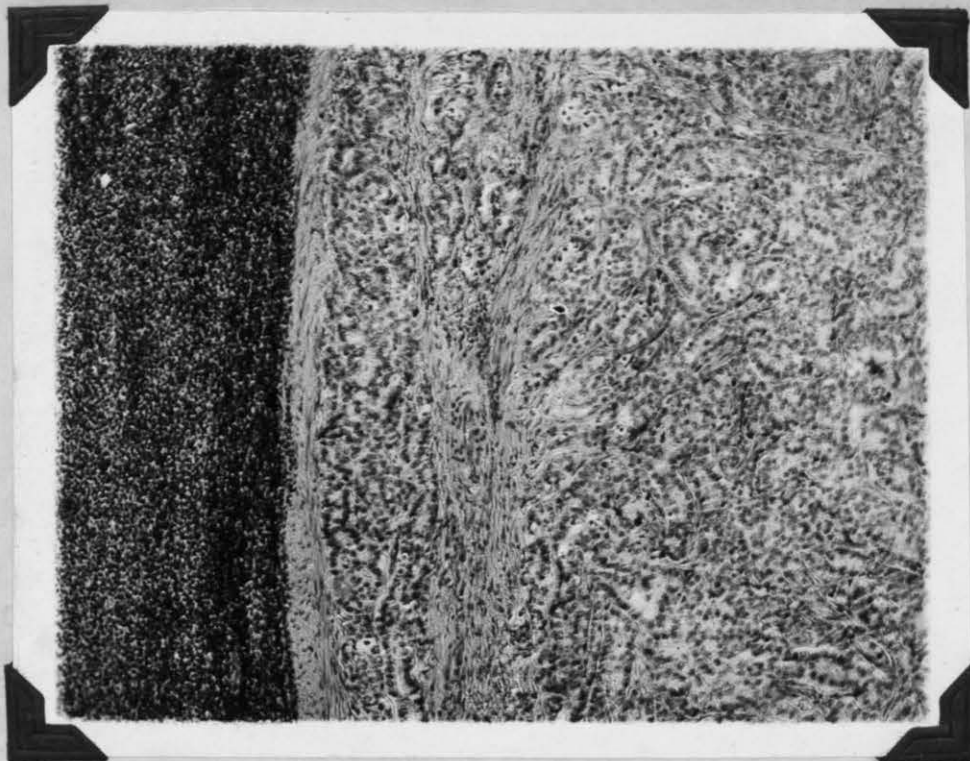


Fig. 4 (T.62) Multiple adenocarcinoma of the Abdominal Viscera of a Chicken.

Low power photomicrograph of material from the spleen showing the gland or ductlike structures formed by the cells of the tumor.

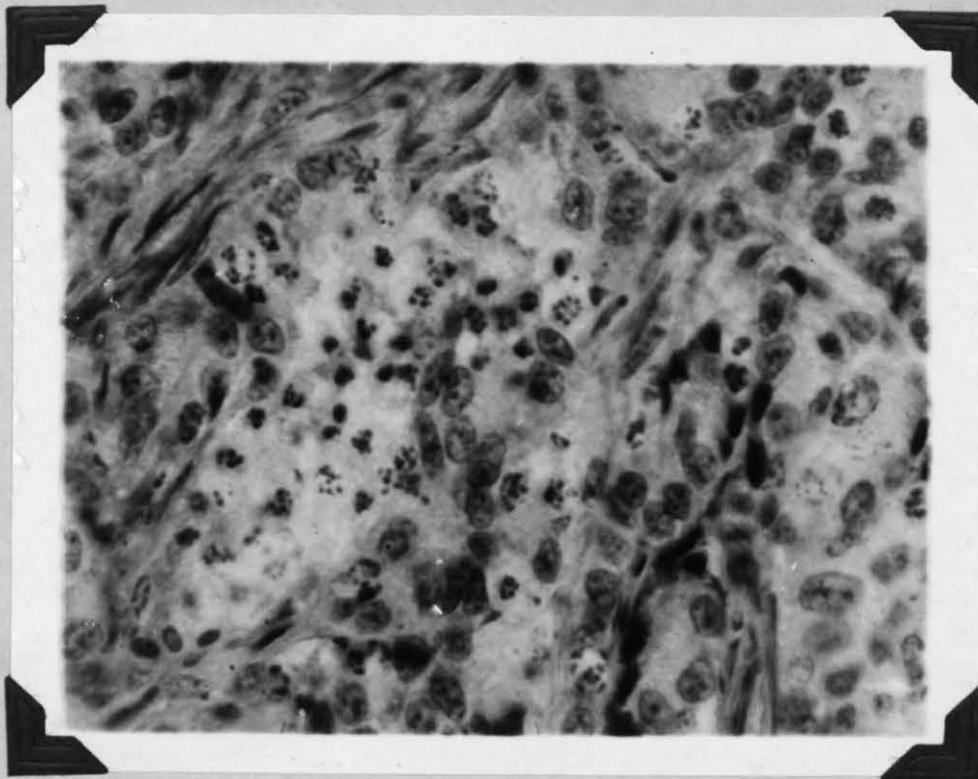


Fig. 5 (T.62) Multiple adenocarcinoma of the Abdominal Viscera of a Chicken.

High power photomicrograph from splenic nodule showing many cells undergoing necrosis ( pyknosis, karyorrhexis and karyolysis).

Adenocarcinoma



Fig. 6 (T.62) Multiple Adenocarcinoma of the Abdominal Viscera of a Chicken. Low power photomicrograph from a peritoneal nodule. Extensive evidence of necrosis present.

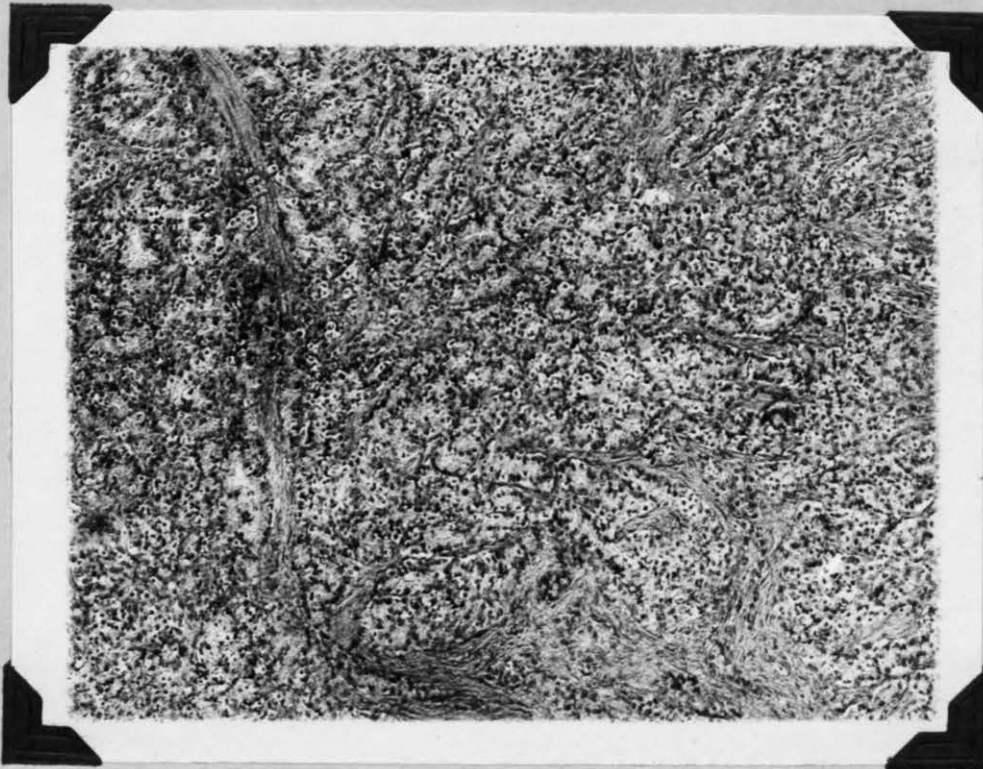


Fig. 7 (T.62) Multiple Adenocarcinoma of the Abdominal Viscera of a Chicken. Low power photomicrograph from intestinal nodule showing the many pyknotic nuclei.

STUDY NUMBER NINETY-THREE

TUMOR NUMBER 71

Adenocarcinoma -- Oviduct of a Hen

This case was presented by Dr. Maurice Shahan.

Clinical Data: A Rhode Island hen was killed for food and upon removing the abdominal viscera a nodular formation was observed in the substance of the oviduct. No other abnormalities were observed.

Gross Appearance: The tumor was somewhat oval in shape with a slightly irregular surface. The mass measured 1 cm. in diameter and was rather firm in consistency with the exception of a slight sponginess noted near one edge. It was firmly imbedded in the tissue of the part and was invested with a serous covering that appeared to be a deflection of the peritoneum of the organ. No evidence of vascularity was observed.

Microscopic Description: Sections were stained with hemotoxylin and eosin and others by Van Gieson's method. The wall of the oviduct was considerably thickened and the continuity of the structure was irregularly broken by large fields of epithelial alveoli (Fig. 1). These alveoli were separated from each other by strands of connective tissue which joined the denser connective tissue which surrounded the alveolar areas. In some fields there was evidence of considerable hydropic degeneration of the connective tissue stroma. This extended even to the duct wall in a few instances.



Study Number Ninety-three - 2

The alveoli were lined with a single layer of cuboidal or simple columnar epithelium and while a lumen was present in most of these structures yet in a considerable number the lumen was obliterated due to an overproduction of the epithelial cells. Many of the nuclei of the epithelial cells showed a hyperchromatism. Many stained deeply basic and mitotic figures were frequent (Fig. 2). While most of the lumens were free of contents some contained a pink staining homogeneous substance the exact nature of which was difficult to determine. More or less irregularity was observed in the contour of a few epithelial duct-like structures that had been cut longitudinally (Fig. 3) and in a few fields the epithelial cells were in mass formation. A few alveoli showed a slight desquamation of the lining cells. Retrogression was strikingly evident in one portion of the material and a large area was apparently undergoing atrophic changes with a consequent obliteration of the lumens (Fig. 4). The blood supply to the neoplastic areas was rather scant.

Diagnosis: This is an alveolar type of epithelial tumor which exhibits an unmistakable tendency towards malignancy. The atrophic changes and the hydropic condition of certain parts of the stroma on the other hand point to a retrograde movement of certain portions of the tumor. This neoplasm undoubtedly had its origin from the cells that normally line the oviduct. They were morphologically similar

Study Number Ninety-three - 3

except, of course, that cilia were apparently absent. Possibly the original impulse to proliferate in a lawless manner came as the result of some irritation or injury to the epithelia of the mucosa. The same explanation that accounts for carcinoma of the intestines when the tumorous process extends under the serosa and, as a consequence, perhaps invading the substance of the liver and spleen would probably hold here.

While this tumor possessed the most convincing feature of malignancy in the presence of numerous mitotic figures yet clinically it presented a more favorable picture. The growth was not multiple and its tendency to recede by regressive changes would argue against its being especially aggressive.

An adenocarcinoma.

Adenocarcinoma

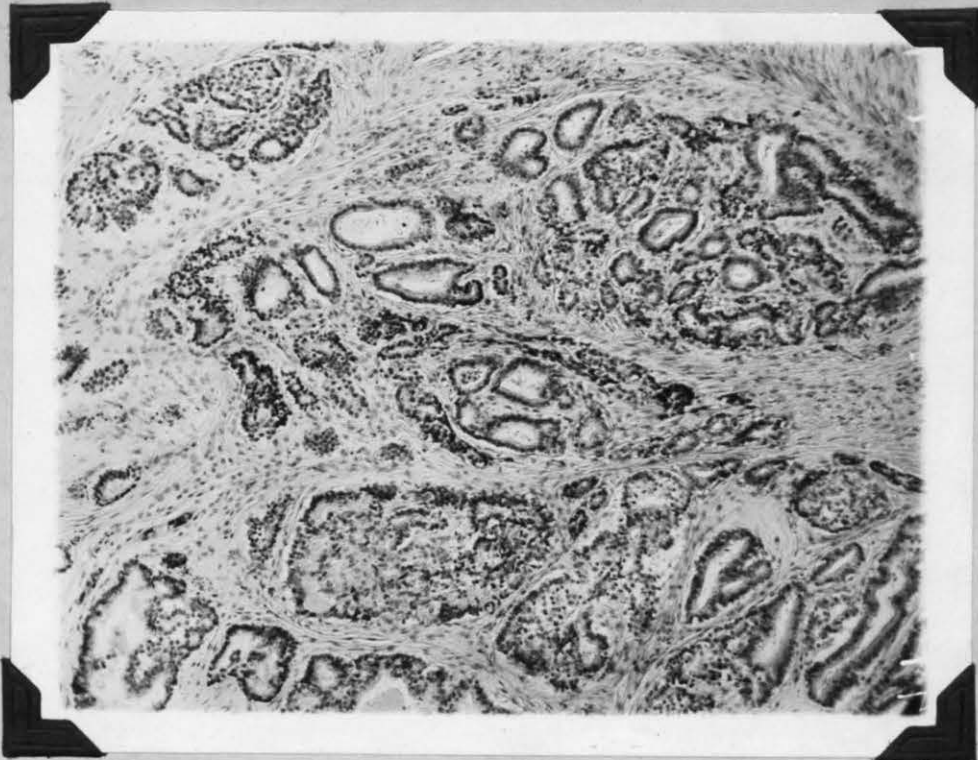


Fig. 1 (T.71) Adenocarcinoma of the Oviduct of a Hen.  
Low power photomicrograph showing many epithelial alveoli.

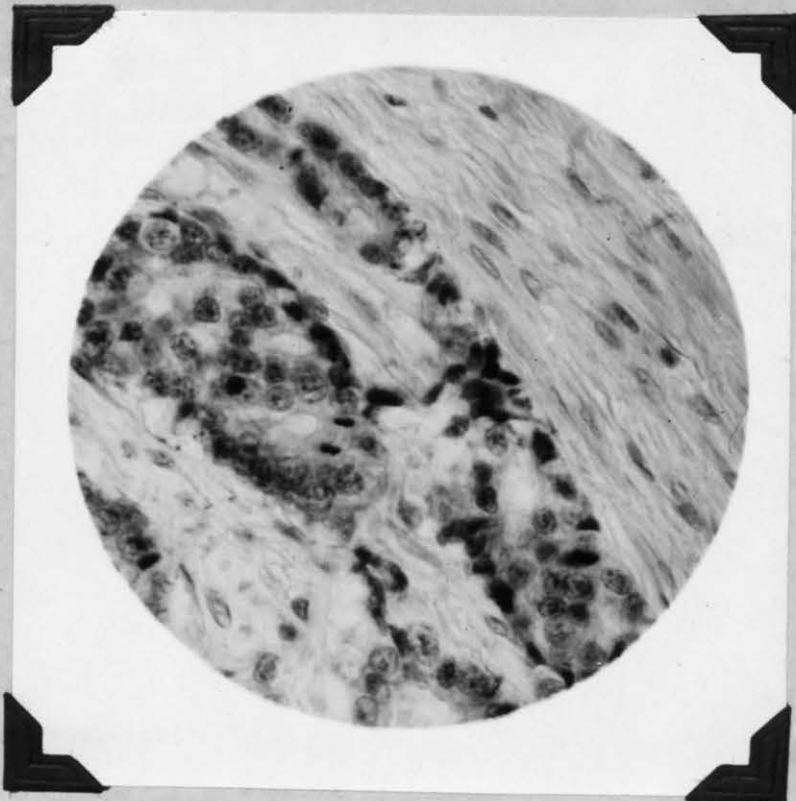


Fig. 2 (T.71) Adeno carcinoma of the Oviduct of a Hen.  
High magnification showing one cell in mitosis.

Adenocarcinoma

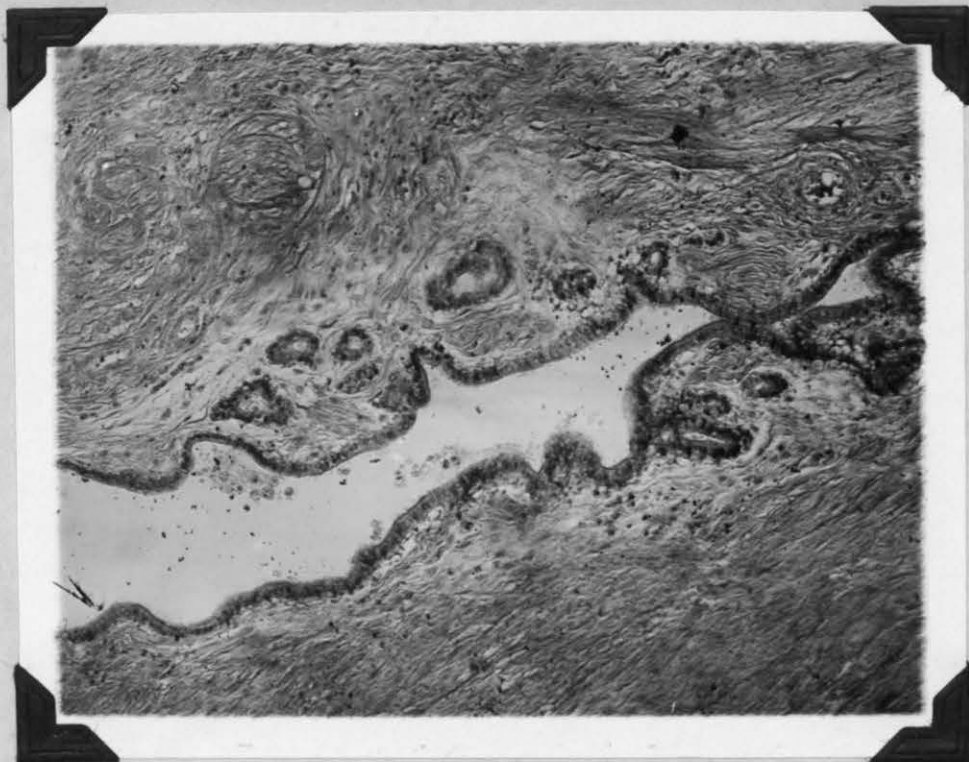


Fig. 3 (T.71) Adenocarcinoma of the Oviduct of a Hen.  
Low power photomicrograph showing the irregularity of a duct cut longitudinally. The single layer of epithelial cells is evident.

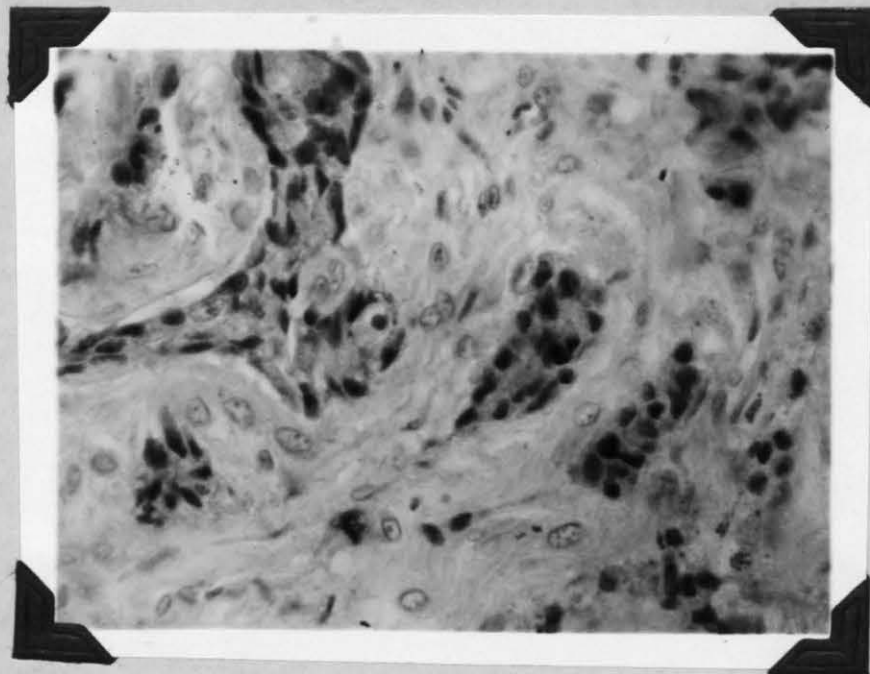


Fig. 4 (T.71) Adenocarcinoma of the Oviduct of a Hen.  
Photomicrograph showing obliteration of lumina due to atrophic changes of epithelial cells.

STUDY NUMBER NINETY-FOUR

TUMOR NUMBER 91

Adenocarcinoma -- Concha -- Horse

This tumor was secured through the courtesy of Dr. H. E. Kingman.

Clinical Data: The animal was a fifteen year old Percheron horse. Two years before the tumor was removed the owner had first noticed the gradual development of an elevated growth on the internal surface of the concha (the data sheet does not contain information as to which ear was involved). It was finally removed by surgical means.

Gross Appearance: The mass had a flattened oval shape and measured 3.5 cm. at its greatest diameter. It had been attached to the concha by a rather broad base and had a smooth though irregular surface. It was firm of texture and a cross section presented a surface that was divided by apparent septa into unequal units. A delicate fibrous capsule enshrouded the mass in a very tenacious fashion. The growth was not noticeably vascular and was free from ulceration.

Microscopic Description: This material was cut by broad connective tissue septa into compartments of varying sizes and shapes. These larger units were in turn farther parceled off by narrow strands of fibrous tissue which served as a stroma or basement substance for the cells of the parenchyma. These were of a low columnar or cuboidal type and epithelial in nature. Many were so disposed as to form tubular channels while others were in such profusion as to

Study Number Ninty-four - 3

constitute dense nests. While many of these ducts or tubules were lined by a single layer of cells there were many that showed two distinct layers; one being superimposed directly upon the other without any apparent stroma between. (Fig. 1). Those tubules still possessing a lumen contained a clear homogeneous material that took the acid stain. In addition to this substance many of the ducts possessed small clear spaces suggestive of fat droplets. While many large tubules were present no cysts were encountered.

While an incomplete lobular system was attempted, in a general sense there was no plan or system of an excretory nature to manage the products of the cells lining the tubules. While there was more or less communication between the various tubules yet this feature was very imperfect in its design. The tubular or definite nest-like arrangement of the cells was the general rule yet a few fields showed the epithelial cells growing in wild abandon. Mitotic figures were easily demonstrated and were not peculiar to any one part of the material. The immediate blood supply to the cells of the parenchyma was small in amount although some fairly large vessels were seen in the heavier septa.

Diagnosis: This was clearly an epithelial tumor whose cells attempted to form a glandlike structure. They probably had their origin from some portion of a sweat gland

Study Number Ninety-four - 3

although the rod shaped fibrillated cells which Mallory (1) describes as occurring outside of the cuboidal or columnar cells which line the coil portion were not observed. However, the double layer of cells lining many of the ducts and the general gland-like arrangement of the cell would support the sweat gland origin of this tumor.

No doubt it had a very modest beginning and grew but slowly although the numerous mitotic figures and the careless profusion in which many of the cells were growing would indicate a vigorousness characteristic of rapid growth.

An adenocarcinoma from a sweat gland.

Note: Due to imperfect fixation it was impossible to secure a properly differentiated stain of this material and as a consequence the sections were not satisfactory for making photomicrographs. The print (Fig. 1) was the only picture that could be used and it is not good.

Ref. Mallory, F. B. Principles of Pathologic Histology 1914  
p. 374. W. B. Saunders.

Adenocarcinoma

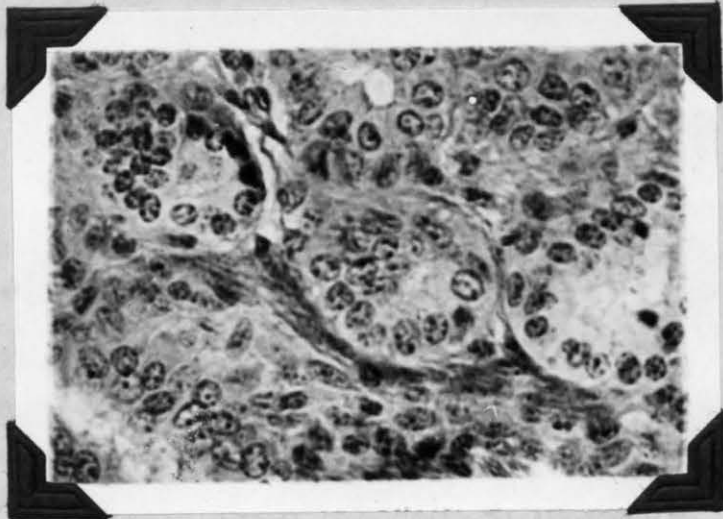


Fig. 1 (T. 91) Adenocarcinoma from the Concha of a Horse.  
High power photomicrograph showing tubular like arrangement of the epithelial cells.



STUDY NUMBER NINETY-FIVE

TUMOR NUMBER 118

Primary Adenocarcinoma of the Lung -- Bovine -- (With  
lymph node metastasis)

This material was from Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: The animal was a three year old Short-horn steer that had been slaughtered for food. The usual ante-mortem examination had failed to detect any abnormality. Postmortemly the following lesions were noted. Both lungs were extensively involved by numerous shot or pea like nodules, about 50 to 60 in all, and one lung contained a large mass measuring 2 inches by 3 inches and about three inches in depth. While both lungs showed the nodular condition it was most pronounced in the left. A careful examination was made of the entire carcass including the hide, eyes, head, tongue, spleen, heart, and abdominal viscera. The only other abnormality discovered was an enlargement of the left bronchial gland and a telangiectasis of the liver.

Gross Appearance: The large nodule in the lung was quite irregular in shape, greyish yellow in color and rather firm in consistence. It was not confined by a capsule although it was covered on the external surface by the pleura. It was about 5 cm. wide by 8 cm. long and had a depth of about 6 cm. There were no cysts or fluids of any kind but the mass did contain a yellowish pigment. The smaller nodules had about the same general feature as the larger one excepting that they were inclined to be spherical. Each was entirely distinct

Study Number Ninety-five - 2

from the others. The data sheet did not contain any information as to the distribution of the nodules in the substance of the lungs interior, the fifty or sixty nodules mentioned were in or near the surface.

Microscopic Description: Sections were obtained thru the tumorous material in such a manner as to show the adjacent lung tissue. Practically all of the alveoli were filled with a serous exudate but the capillaries were not dilated. The interlobular septa were much thickened by an enormous infiltration of lymphocytic cells into what appeared to be new fibrous tissue. Most of the alveoli adjacent to the neoplastic elements were in a state of collapse and many were entirely obliterated. There was nothing that could be construed as a capsule between the tumor and the lung tissue; where one left off, the other began. A lymphocytic infiltration was a constant feature in the zone of contact between the tumor and the alveoli.

The tumor proper consisted of a dense fibrous stroma supporting glandular or duct like structures. (Fig. 1). These structures were lined by cuboidal or low cylindrical epithelium, for the most part in a single layer. It was only occasionally that the cells showed a tendency to pile up, in which case, it was difficult to distinguish separate layers. A definite basement membrane was not discernible, the parenchyma

Study Number Ninety-five - 3

appearing to rest directly upon the fibrous stroma.

The tubules were quite variable as to size and shape. There was no evidence of order or system in their arrangement. The nuclei of the epithelial cells were rather large and contained an excessive amount of chromatin in the form of large, coarse granules. Mitosis was a common feature. (Fig. 2). Blood vessels were infrequent and the few seen were rather large. Practically all the tubules were empty.

Lymph Gland: Only portions of the gland had been replaced by the tumorous tissue. The remaining areas were apparently normal except for a small amount of melanin. As in the case of the lung there was no capsular substance between the lymphoid tissue and the new growth (Fig. 3) and the neoplastic elements appeared to be pushing into the gland in a more or less uneven fashion. The tumorous area was identical with that described as occurring in the lung. (Compare Figs. 2 and 5). Mitosis was a frequent feature. (Fig. 5). But scant remnants of lymphoid tissue were in evidence and these only in a few areas, mostly in the vicinity of the capsule of the gland which apparently was not invaded by the tumor. The blood supply was limited to a few vessels of medium capacity. The lumina of most of the newly formed epithelial tubules or ducts were empty.

Diagnosis: This is an adenocarcinoma probably primary in the lung with metastasis to the bronchial lymph

Study Number Ninety-five - 4

node by the lymphatics which drain the deep and most of the superficial portions of the lungs. The extension of the disease throughout the lungs indicates further metastasis undoubtedly from the larger pulmonary tumor. From the absence of any tumor elsewhere as determined by a careful examination at the time of the postmortem one must look to the lung as the source of primary origin. Since the tumor is adenomatous in type I am inclined to believe that it originated from the mucous glands of the bronchi or trachea. No other portion of the lungs has a histology of such a character as to account for the glandular type of reproduction noted in this tumor. The lack of secretion within the tubules is unusual for a tumor with such a histogenesis and I cannot offer a satisfactory explanation to account for its absence.

This seems to be an unusual location for a primary adenocarcinoma. This is the only instance in which I have observed a tumor of this kind involving the lungs and I have failed to encounter any similar cases in the literature at my disposal.

An adenocarcinoma of the lungs.

Adenocarcinoma

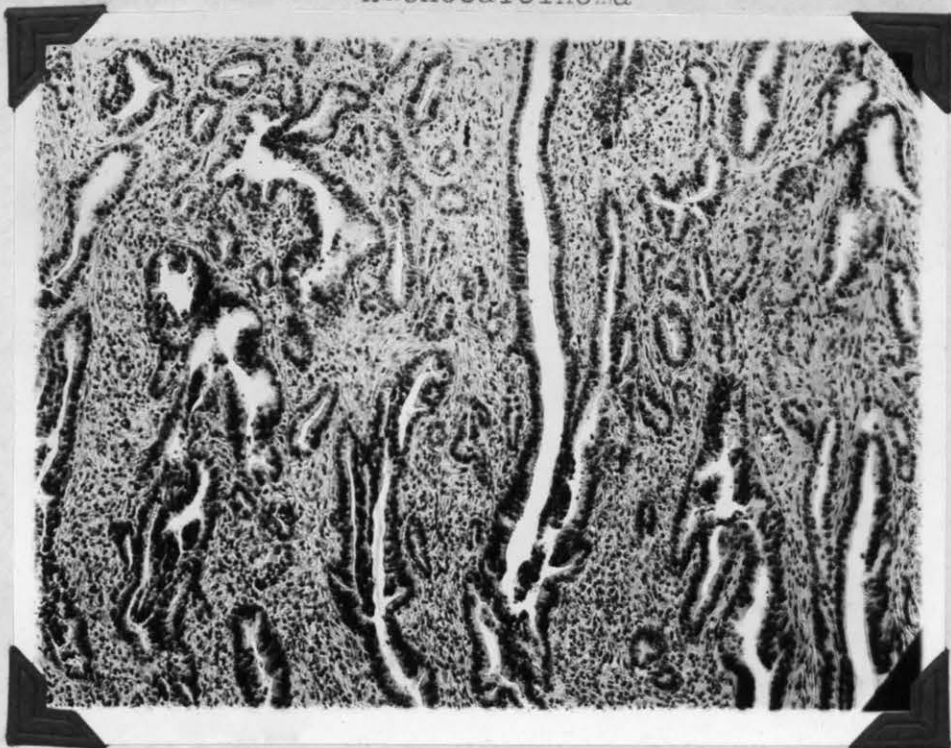


Fig. 1 (T.118) Primary Adenocarcinoma of the lung in a bovine.  
Low power photomicrograph of lung lesion showing the duct-like arrangement of the cells of the parenchyma of the tumor.

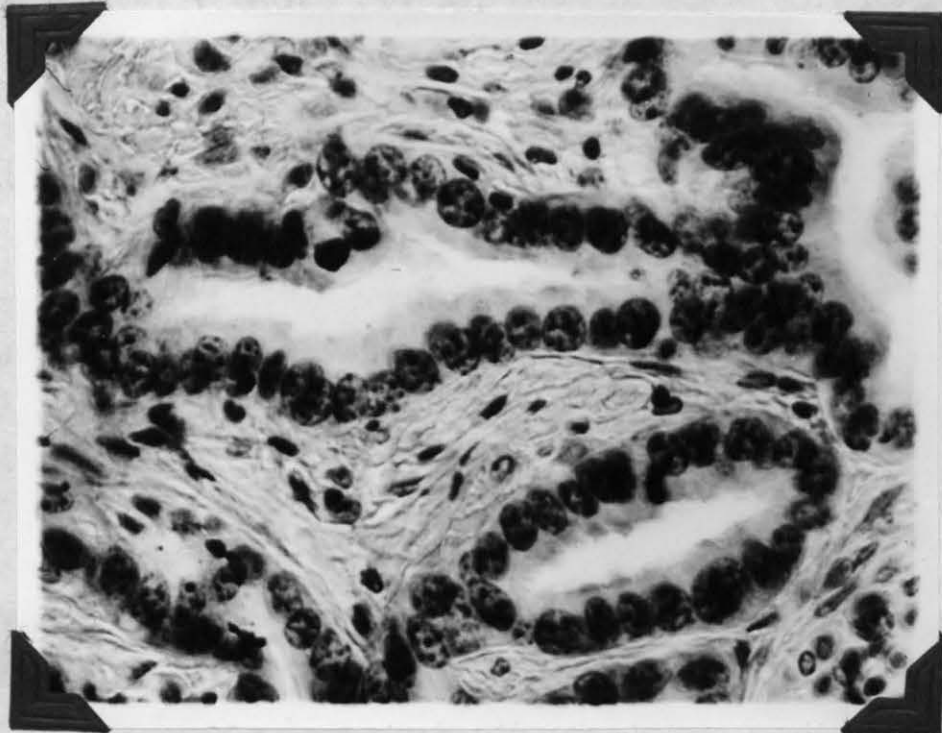


Fig. 2 (T.118) Primary Adenocarcinoma of the lung in a bovine.  
High power photomicrograph of lung lesion showing the single layer of epithelium lining the duct-like structure. One mitotic figure present.

Adenocarcinoma



Fig. 3 (T.118) Metastatic Adenocarcinoma of the Bronchial Lymph Nodes in a Bovine. Low power view showing the cancer invading the lymph tissue.



Fig. 4 (T. 118) Metastatic Adenocarcinoma of the Bronchial Lymph Nodes in a Bovine. Low power photomicrograph showing the tubular structure of the tumor.

Adenocarcinoma

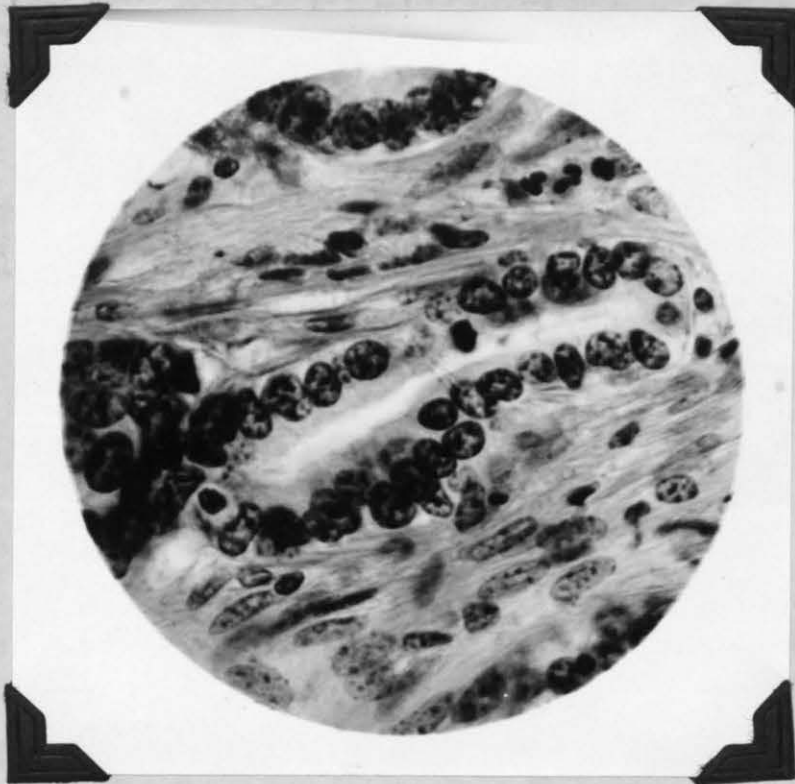


Fig. 5 (T.118) Metastatic Adenocarcinoma of the Bronchial Lymph Node in a Bovine. High power photomicrograph showing the gland like disposal of the epithelial cells one of which is in mitosis.

STUDY NUMBER NINETY-SIX

TUMOR NUMBER 137

Adenocarcinoma -- Kidney -- Hog

This was a packing house case received from Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: There was very little available information dealing with this phase of the study. The subject was a hog which had been slaughtered for food after having passed a satisfactory ante-mortem inspection. When the carcass was eviscerated one kidney was found to possess a number of greyish white areas of varying sizes, most of which were slightly raised above the surface. The kidney was cut through longitudinally and the greyish tissue, in some instances, was seen to extend almost through the cortical portion of the organ. (Fig. 1).

Gross Appearance: Freshly cut sections of the kidney through the greyish white areas showed them to be diffusely in contact with the substance of the organ with no attempt at encapsulation. The line of contact of the tumorous tissue with that of the kidney was quite uneven. The tumorous material had about the same consistency as the kidney proper.

Microscopic Description: The parenchyma of the kidney was invaded in a promiscuous manner by tumor cells which were diffusely scattered between many of the remaining tubules, many of the tubules having disappeared by being replaced by the tumorous process. The parenchyma of the tumor consisted of cuboidal epithelial cells which showed a marked tendency



Study Number Ninety-six - 3

to produce irregular tubular structures of variable sizes. (Fig. 2). Between most of the tubular structures a diffuse overgrowth of epithelial cells was present. They were arranged compactly and no intercellular fibrils were seen. Mitotic figures were frequent in the cells lining the tubules as well as in the diffuse intertubular areas. There was no attempt at encapsulation; the tumorous tissue pushing into the kidney substance unhampered. A few of the newly formed tubules contained a plasma-like material while others contained degenerating leucocytes and cellular debris. Sections were stained by Van Gieson's method but no connective tissue element were found.

Diagnosis: This is an early adenocarcinoma. Most of the kidney tumors of this type that I have studied were considerably larger in size than this one. In the more adult tumors heavy, dense, strands of fibrous stroma are often abundant. Day (1) holds that these connective tissue elements are of sufficient importance to qualify as a sarcomatous proliferation and their influence is further emphasized in the title he gives tumors of this type; calling them adenosarcomas. If these were truly mixed tumors one would expect to find sarcomatous elements in the early stages of the disease as well as later, yet in this study there is nothing to suggest that there is connective tissue aggressiveness. In fact, connective tissue in the tumorous areas of this study was not

Study Number Ninety-six - 3

found except as possible remains of the interstitial substance of the original kidney tissue. As far as my material is concerned I have never found any evidence that would justify the common usage of the term adenocarcinoma, when referring to tumors of this type. The neoplastic activity depends upon the cuboidal epithelial cell and no other and when connective tissue is present, as is often the case in bulky tumors of this type, it acts in the capacity of a framework for the more delicate parenchyma.

An adenocarcinoma of the kidney.

Ref. Day, L. Enos. Embryonal Adenosarcoma of the Kidney in Swine. Reprint from the Twenty-Fourth Annual Report of the Bureau of Animal Industry (1907).

Adenocarcinoma

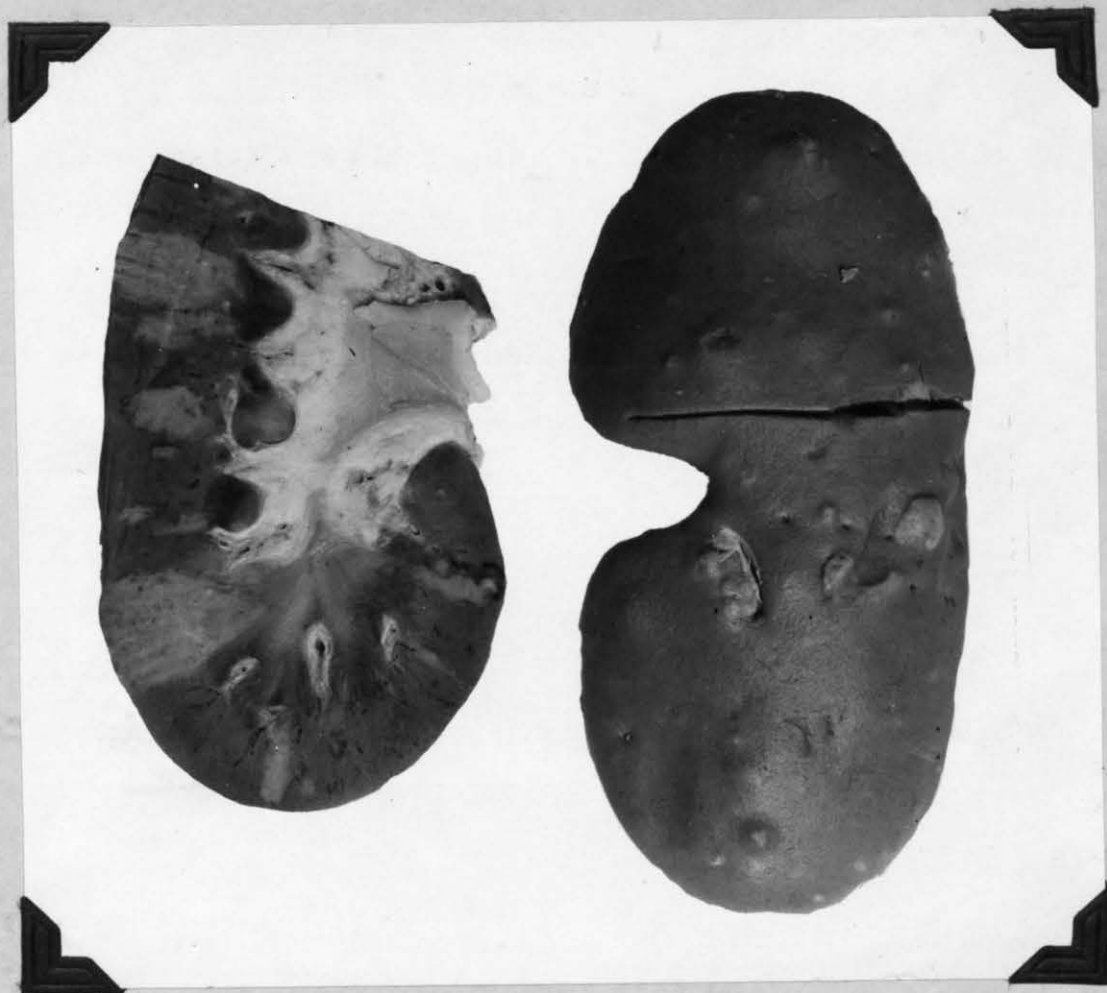


Fig. 1 (T.137) Adenocarcinoma of the Kidney of a Hog. Photograph of gross specimen showing the extent of the kidney involvement of the tumor. The distribution of the foci is clearly shown in the cortical zone and over the surface of the organ.

Adenocarcinoma



Fig. 2 (T.137) Adenocarcinoma of the Kidney of a Hog.  
Low power photomicrograph . The tubular structures and the diffuse deposition of the intertubular cells are clearly shown.

STUDY NUMBER NINETY-SEVEN

TUMOR NUMBER 134

A Squamous Adamantinoma -- Horse

This case is from the practice of Dr. James Farquharson.

Clinical Data: The animal was a six year old male horse. Four months previous to the operation for its removal a swelling was noticed over the right premolar teeth (Fig. 1). At this time the growth was about the size of a cocconut. The growth was single but quite diffuse in its attachment. The tumor attained such a size as to block the right nasal cavity. The surgical removal of the mass was attempted by Dr. Farquharson but he felt that the position of the growth and its size made its complete removal impossible.

Gross Appearance: The incased material was somewhat spherical in shape and measured nearly 13 cm. in diameter. It was greyish white in color and quite firm to the touch with boney spicules present. The surface was roughened and a capsule was absent. The mass was very vascular.

Microscopic Description: This proved to be an epithelial structure with the cells arranged in small spherical nestlike compartments (Fig. 2). A rather heavy fibrous stroma separated the various epithelial units and carried a considerable number of large blood vessels all of which were filled. No evidence of bone was seen in the section examined. The epithelial cells were of the squamous type. They were polyhedral in shape and possessed an acidophilic granular cytoplasm and a nucleus that filled considerably more than

Study Number Ninety-seven - 2

half of the cell's interior. The nuclei were irregularly spherical to oval in contour and a great many showed multiple nucleoli. Mitosis was a common feature. Certain of the cellular nests were undergoing a hydropic degeneration accompanied by atrophy of many of the cells (Fig. 3 and 4).

Diagnosis: This tumor presents some interesting features that separate it from the usual type of epithelial neoplasms. At first glance one is reminded of an epulis in the grouping of the cells of the parenchyma. However, giant cells were not a part of the picture. The cells being of the squamous epithelial type suggests at once the relationship of the tumor to the carcinomas. However, it is not typical of the ordinary type of these tumors in that the cells occur in irregular spherical clumps or nests and not in elongated processes or columns. In view of the above feature and considering the location of the tumor's origin (above the premolar teeth) I feel justified in saying that the growth was formed from the remains of the enamel organ, probably from the paradental epithelial debris and as such should receive the name of adamantinoma. (1).

A squamous adamantinoma of doubtful prognosis.

Ref. Ewing, James. Neoplastic Diseases (1919) p. 688.

W. B. Saunders Company, Philadelphia, Pennsylvania.

Adamantinoma



Fig.1 (T.134) Adamantinoma of a Horse.  
Picture taken after operation shows location of  
the major portion of the tumor over the right  
premolar teeth.

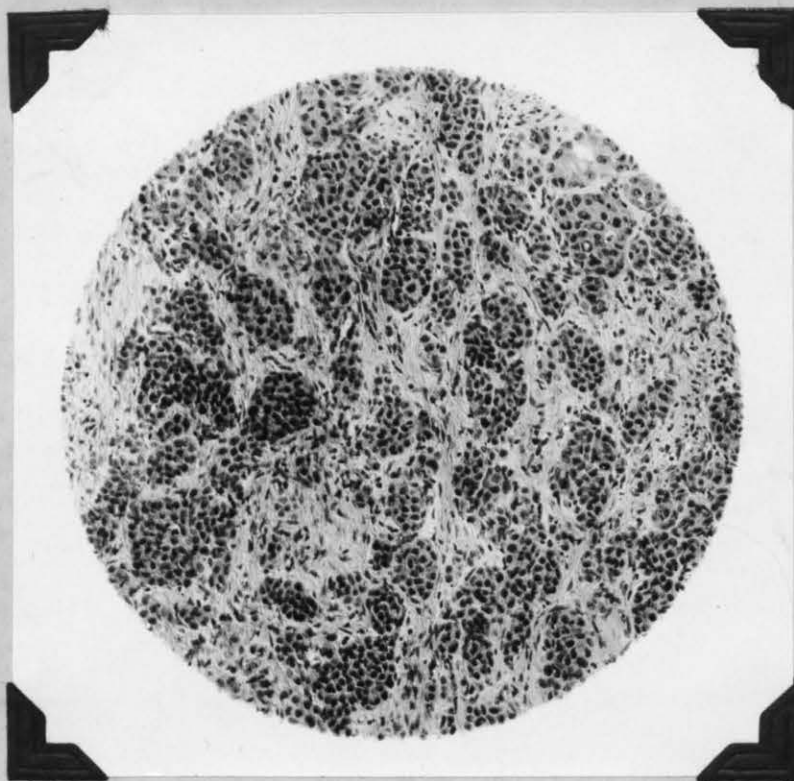


Fig.2 (T.134) Adamantinoma of a Horse.  
Low power photomicrograph showing the  
epithelial cells in nest like clusters.

Adamantinoma

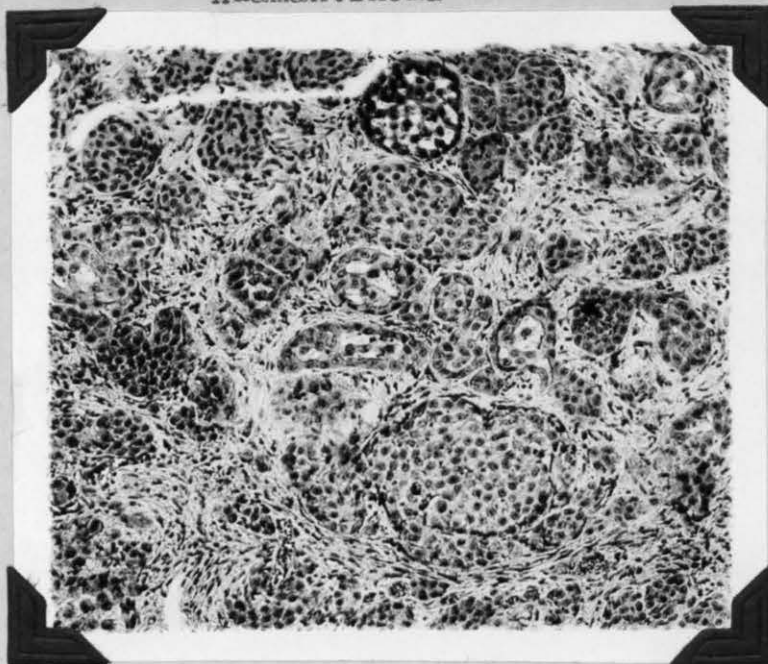


Fig. 3 (T.134) Adamantinoma of a Horse  
Low power view showing hydropic degeneration  
of many of the cells.

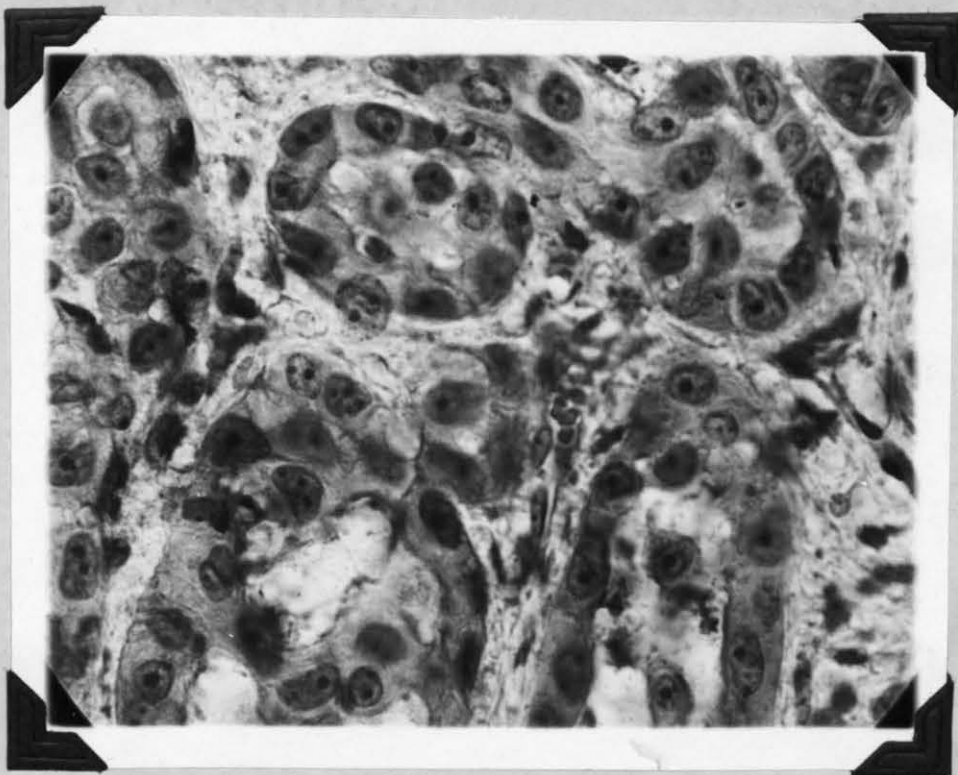


Fig. 4 (T.134) Adamantinoma of a Horse.  
High power photomicrograph showing hydropic degeneration  
of some of the cells.



STUDY NUMBER NINETY-EIGHT

TUMOR NUMBER 23

Hypernephroma (Grawitz' Tumor) -- Region of renal  
gland -- Bovine

This tumor was received from Dr. G. G. Feldman, Veterinary Inspector, Armour and Company, Spokane, Washington.

Clinical Data: The material was from a twelve year old red grade cow that had been slaughtered for food. During the post mortem examination a firm circumscribed formation was observed posterior to and adjoining the renal gland.

Gross Appearance: The tumor was an oval structure about 7.5 cm. in diameter at its greatest dimension. It was encapsulated and of a flesh color with some yellowish areas unevenly distributed throughout the mass. A considerable amount of mineral material was noticed when the tumor was cut, indicating some degree of calcification. The tumor was attached by being imbedded in the connective tissue of the region.

Microscopic Description: The structure possessed a definite capsule of dense fibrous tissue, which was quite thick in places. Running into the tumor substance from this capsule were fine connective tissue septa, the branches of which joined to form irregular compartments quite variable in size depending upon the plane at which they were cut. (Fig. 1) These compartments extended throughout the tissue and were filled with rather large oval cells possessing a definite

Study Number Ninety-eight - 2

cytoplasmic outline and with nuclei filling half of the cellular bulk. The cells appeared in apposition with no regularity in their relationships. A great many of the cells showed an almost clear cytoplasm. Others, that appeared almost clear, showed the cytoplasm to be finely granular. Some cells showed large clear lipoid-like droplets of varying size, the exact nature of which was undetermined. The nuclei were oval, pale staining bodies with very fine chromatin granules. Small blood channels were present between the fibres constituting the fibrous septa. Calcification had resulted to a considerable degree, the deposits of mineral material being well distributed thru the various sections. There were a number of large cavernous areas that were free of contents showing only the outlines of cells, the nuclei of which had disappeared. Some of the large cavernous areas were filled with a pink hyalin like substance which under high power seemed to be lined off in a sort of pavement design. No mitotic figures were encountered in any of the fields.

Diagnosis: This tumor resembles very closely that type described by the human pathologists as hypernephroma. In this class occurs those tumors thought to originate from misplaced adrenal tissue. While these are most often seen in the kidney they may occur in the adrenal body, the liver or in any of the tissues adjacent to the kidney and adrenal gland. The large type cell and its arrangement in mass

Study Number Ninety-eight - 3

formation within the compartments formed by the delicate connective tissue septa is diagnostic of these tumors known as hypernephromas. While many of them are malignant and produce a fatal metastases by way of the blood and lymph stream, this tumor showed none of the viciousness associated with malignancy in the usual sense.

A tumor due to an adrenal rest. A hypernephroma.

Hypernephroma



Fig. 1 (T.23) Hypernephroma in a Bovine.  
Low power photomicrograph showing the irregular compartments filled with large oval cells many with an almost clear cytoplasm.

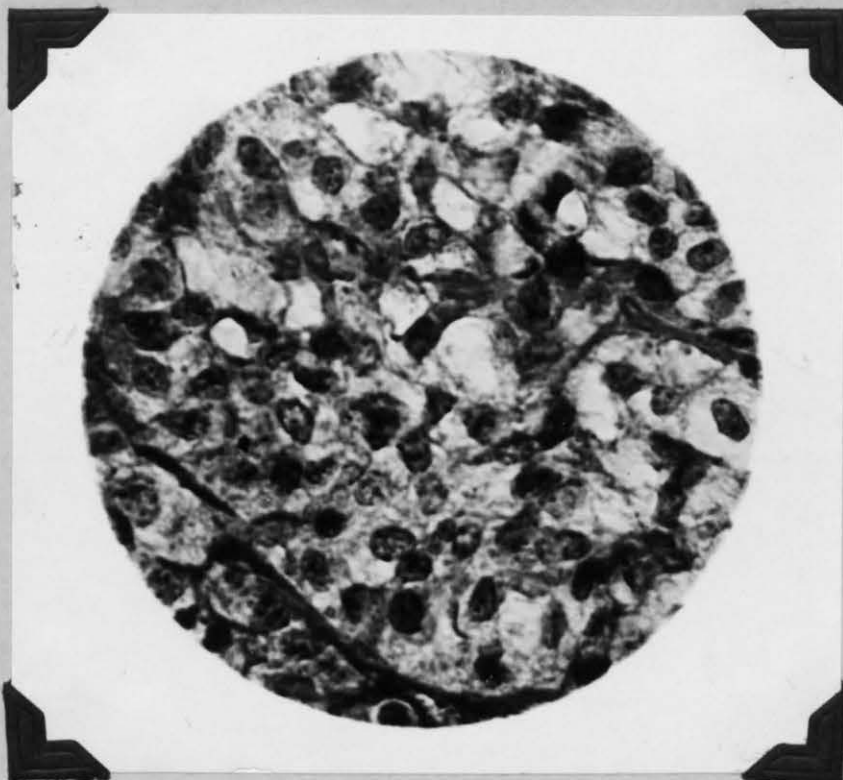


Fig. 2 (T.23) Hypernephroma in a Bovine.  
High power photomicrograph showing the large clear cells.

STUDY NUMBER NINETY-NINE

TUMOR NUMBER 99

Hypernephroma -- Adrenal Region -- Cow

This material was received from Dr. Chas. L. Davis, Veterinary Inspector, U. S. Bureau of Animal Industry, stationed at Denver, Colorado.

Clinical Data: This was rather brief since the animal was slaughtered for food and the tumor was found during the usual routine inspection of the carcass. The animal was a four year old cow of mixed breed. Her color was brown and her physical condition good. A single circumscribed growth was found a little ventral to the left adrenal body. This was removed for diagnosis.

Gross Appearance: The exact size of the tumor did not appear on the data sheet but from the size and general appearance of the portion received for sectioning, I would guess it to have been probably half the size of a man's fist. The mass possessed a rather thick, tough capsule and a fairly smooth contour. Fibrous septa were given off at irregular intervals and passed to the interior of the growth where they ramified with others or became lost in the substance of the parenchyma. The tissue was soft to the touch but was rather closely woven. The capsular covering was dark brown or red in color, while a freshly cut surface showed the interior to be of a dirty yellow color.

Study Number Ninety-nine - 2

Microscopic Description: This was an extremely cellular type of growth with a minimum amount of connective tissue septa disposed in a very irregular manner. From these larger septa, some fields showed a delicate reticulum forming lace like meshes filled with the cells of the parenchyma. Many of the cells were grouped in rows while others appeared in irregular clusters. Large fields showed the cells of the parenchyma grouped in solid compact sheets without the reticular support mentioned above. The type cell was fairly large and polyhedral in shape. The nucleus was also large and filled better than half of the cellular space. Many of the cells showed a finely granular cytoplasm and in many the same condition obtained in the interior of the nucleus. The majority of the cells, however, were peculiar in possessing clear cytoplasm and vesiculated nuclei (Fig. 1). While this feature was more pronounced in some fields than in others, it seemed constant enough to characterize the tumor. Many fields showed a marked hydropic condition. Mitosis was not observed. The blood supply was abundant. Large vessels were seen in the broad connective tissue septa and smaller ones were encountered in the delicate stroma that appeared to separate two or more of the rows or groups of cells.

Calcification was a striking part of the picture in all the slides examined. It was interesting to observe that

Study Number Ninety-nine - 3

most of the mineral material was located in the connective tissue elements and only occasionally occurred in the parenchyma. A good share of the fibroblasts of the connective tissue showed the effects of pressure and were decidedly atrophic.

Diagnosis: This is unquestionably a tumor made up of cells resembling those of the adrenal cortex. It has most of the features common to hypernephroma except that it did not occur in the renal tissue. It is difficult to advance a satisfactory explanation as to the original source of the first cells in this instance. Perhaps they were misplaced during embryonic development of the fetus. The calcification and the absence of mitotic figures would hardly indicate a rapidly growth tumor but rather one undergoing retrogression. Again the apparent absence of secondary growths would tend to support the view that this was a tumor of slight malignancy. The abundant blood supply would have provided ample opportunity for metastasis had the cells of the parenchyma possessed the necessary aggressiveness.

I am somewhat at a loss to know what to name this growth. It hardly appears to be a true carcinoma although the cells are undoubtedly epithelial. The term hypernephroma seems to fit better than any other although this term usually designates a certain well defined group of renal tumors arising from adrenal tissue. We have here a similar neoplasm

Study Number Ninety-nine - 4

without kidney involvement. Ewing (1) points out the numerous locations where aberrant adrenal tissue may occur and remarks that in man the occurrence of tumors arising from this tissue outside of the kidney is extremely rare. I feel, however, that it is proper to designate this growth as a hypernephroma.

Ref. (1) Ewing, James. Neoplastic Diseases (1919) p. 740-741.  
W. B. Saunders Company, Philadelphia.



Hypernephroma

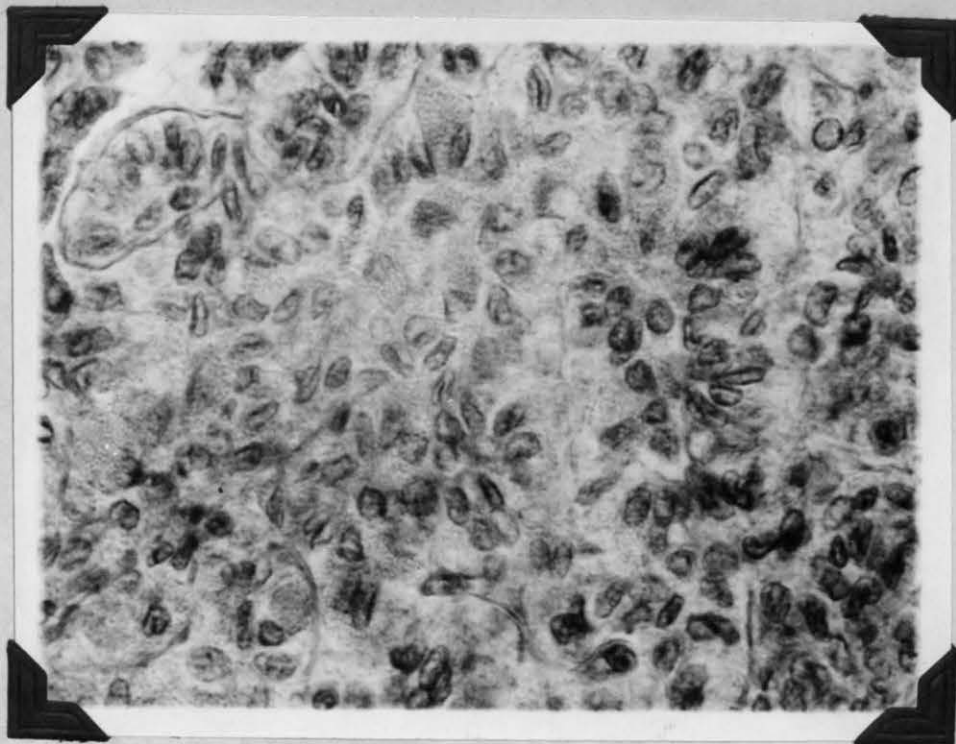


Fig.1 (T.99) Hypernephroma in a Bovine  
Photomicrograph showing irregular clusters of  
cells and many clear nuclei.

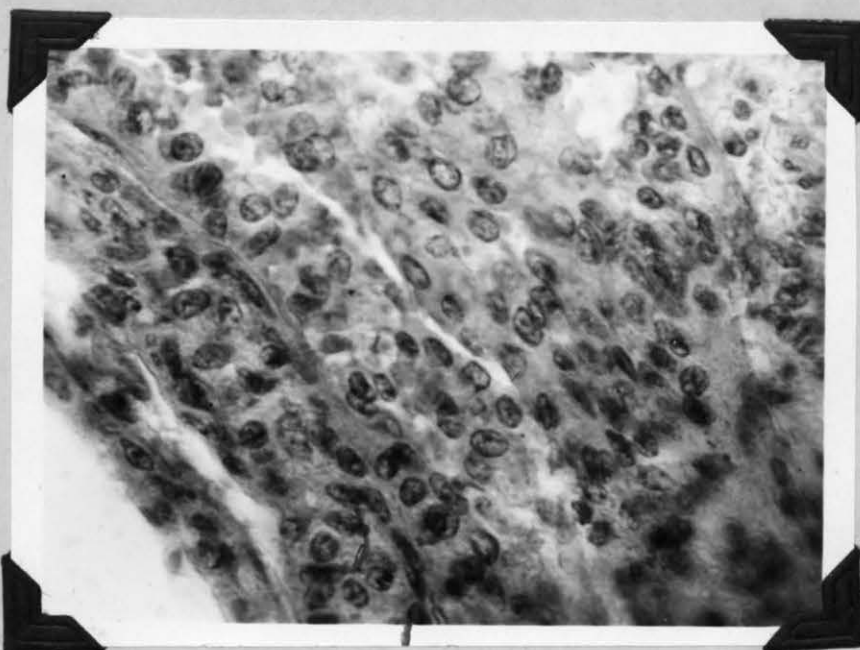


Fig. 2 (T.99) Hypernephroma in a Bovine.  
Tumor cells in row. Clear nuclei are apparent.

STUDY NUMBER ONE HUNDRED

TUMOR NUMBER 166

Cholesteatoma -- Left lateral ventricle -- Brain -- Horse

This material was received from the Department of Veterinary Pathology, Cornell University.

Clinical Data: This was an intracranial tumor from a horse. No other information was available.

Gross Appearance: The tumor occupied the left lateral ventricle of the brain and measured 7 cm. in length by 3.3 cm. at its greatest diameter. (Fig. 1). It was tuber like in shape and in fact resembled the general contour of a small sweet potato. The growth was attached to the choroid plexus by a slender pedicle while on the opposite side it was attached by a thin sheet of tissue to the septum pellicudum. The tumor was covered by a tough capsule and had a peculiar satin-like or pearly appearance which was evident on out surfaces even in the depths of the mass. The interior of the growth contained a number of small yellowish granular particles and such a well developed vascular system as to make its indentification easy when the tissue was teased apart.

Microscopic Description: Sections were prepared and some stained with hemotoxylin and eosin and others by Van Geison's method. This tumor presented some features which were entirely new to me. It consisted of a stroma made up of fibrous stands which supported rows of squamous cells of variable sizes (Fig. 2). These presented a laminated appearance and the clefs between were occupied by the remains of

Study Number One Hundred - 2

some rather clear substance that stained a very light purple by Van Geison's and a light pink with eosin. The cells were small and were arranged in compact rows and each contained a deep staining nucleus that was very irregular in shape (Fig. 3). In the non-laminated portions the cells were larger and more polyhedral in shape than those of the laminated areas. A few non-nucleated cells were present in some of the laminae and an occasional foreign body giant cell was encountered. A considerable number of polymorphs and eosinophiles were promiscuously distributed throughout the tumorous tissue but no suppurative areas were seen. Blood vessels were well developed, large and numerous and practically all were filled. No evidence of mitosis was seen.

Diagnosis: This tumor represents a class of neoplasms that while epithelial in nature are usually grouped with the tetratomas. These are considered to be practically always benign and are known as cholesteatomas due to the spaces between the laminae being filled with cholesterol crystals which are dissolved by the usual histological methods of tissue preparation (Wells) (1).

Regarding the origin of such tumors Ewing (2) after reviewing the opinions of many others concludes with the majority that there is "no evidence of any other than an epithelial origin." This supports the contention especially of Bostroem (quoted by Ewing) that all cholesteatomas arise

Study Number One Hundred - 3

from embryonal epidermal inclusions.

The presence of such a large cholesterol content in these tumors is probably due to a slow degeneration extending over considerable time. It does not seem possible that the degeneration in this case could have resulted from a deficient blood supply for the vessels were numerous and well formed. However, the pressure upon the tumor must have been great since it was a good deal larger than the ventricle under normal conditions. The brain is one organ that is capable of very little expansion and a growing tumor must enlarge at the expense of all the adjacent cells and undoubtedly the neoplastic elements are involved likewise. In such a case atrophy would be inevitable.

I feel fortunate in being able to include this tumor in my studies. Being quite rare in the lower animals the veterinary pathologist seldom has the opportunity for a study of this kind.

A cholesteatoma.

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Cholesteatoma



Fig. 1 (T.166) Cholesteatoma of a Horse.  
Tumor occupies the left lateral ventricle  
of the brain.

Cholesteatoma



Fig. 2 (T.166) Cholesteatoma of the Brain of a Horse.  
Low power view showing the fibrous stroma and the cholesteral content.

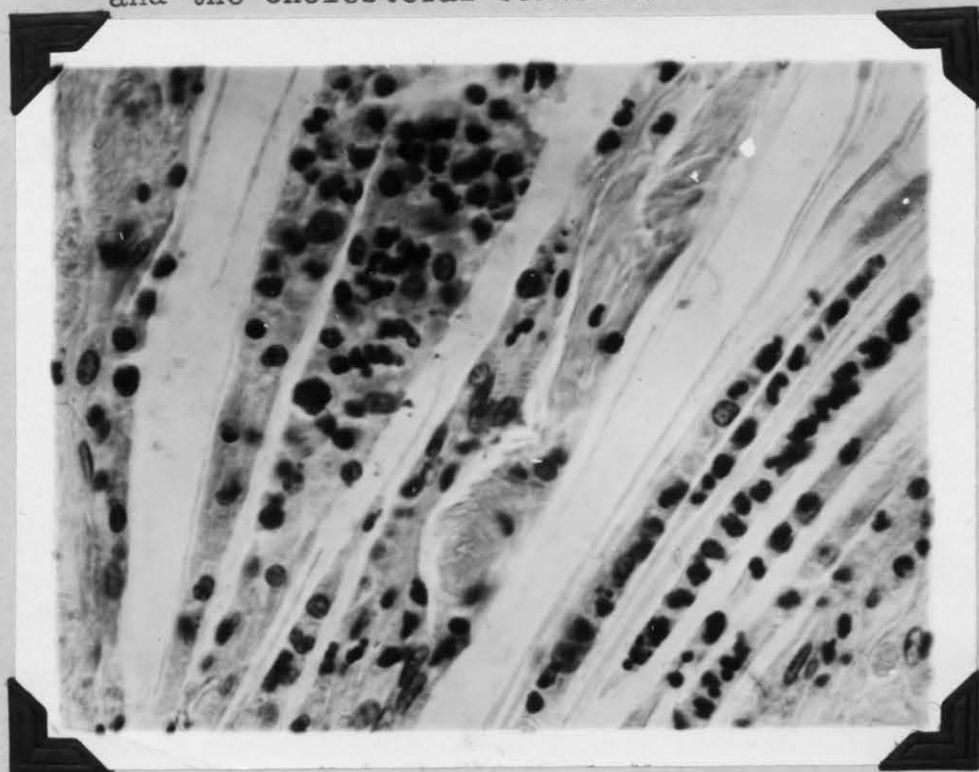


Fig. 3 (T.166) Cholesteatoma of the Brain of a Horse.  
High power photomicrograph showing the laminated structure of the stroma and rows of squamous cells.

V. SUMMARY

The one hundred thirty two (132) tumors received were distributed among the various species as follows.

Kind of tumor	Mule	Horse	DOG	Bovine	Sheep	Swine	Fowl	Mouse	Rabbit	Total
Fibroma	3	5	-	5	-	-	-	-	-	13
Fibrosarcoma	3	3	1	2	-	-	-	-	-	9
Hypernephroma	-	-	-	4	-	-	-	-	-	4
Lipoma	-	1	1	-	-	-	-	-	-	2
Leiomyoma	-	-	-	2	-	-	1	-	-	3
Endothelioma	-	-	1	1	-	-	1	2	-	5
Mesothelioma	-	1	-	1	-	-	-	-	-	2
Myxoma	-	-	-	1	-	1	-	-	-	2
Myxofibroma	-	-	1	-	-	-	-	-	-	1
Melanoma	1	2	-	4	-	2	-	-	-	9
Melanosarcoma	-	2	1	-	-	1	-	-	-	4
Lymphocytoma	-	-	1	-	-	-	9	-	-	10
Lymphosarcoma	-	-	4	2	2	2	2	-	1	13
Lymphoma	-	-	-	1	-	-	-	-	-	1
Embryonal Carcinoma	-	-	1	-	-	-	-	-	-	1
Carcinoma	-	11	1	15	-	-	1	-	-	28
Adamantinoma	-	1	-	-	-	-	-	-	-	1
Adenocarcinoma	-	1	1	2	-	9	3	-	-	16
Adenoma	-	-	3	-	-	-	2	-	-	5
Papilloma	-	-	1	1	-	-	-	-	-	2
Cholesteatoma	-	1	-	-	-	-	-	-	-	1
Total	7	28	17	41	2	15	19	2	1	132

The epithelial tumors occurred as follows:

	Mule	Horse	Dog	Bovine	Sheep	Swine	Fowl	Mouse	Rabbit	Total
Carcinoma	1	11	1	15	1	1	1	1	1	28
Adenocarcinoma	-	1	1	2	-	9	3	-	-	16
Adamantinoma	-	1	-	-	-	-	-	-	-	1
Adenoma	-	-	3	-	-	-	2	-	-	5
Papilloma	-	-	1	1	-	-	-	-	-	2
Embryonal Carcinoma	-	-	1	-	-	-	-	-	-	1
Total	-	13	5	18	-	9	6	-	-	53

Total number of epithelial tumors. . . . . 53

Total of non-epithelial tumors. . . . . 89

Total of all tumors. . . . . 132

Percentage of epithelial tumors . . . 40%

Number of malignant epithelial tumors. . . . . 46

Number of non-malignant epithelial tumors. . . . . 7

Percentage of epithelial tumors that were malignant 86.8%

Percentage of epithelial tumors that were not  
malignant. . . . . 13.2%

Percentage of malignant epithelial tumors to total  
number of tumors received. . . . . 35.6%



The malignant growths other than epithelial in nature.

	Mule	Horse	Dog	Bovine	Sheep	Swine	Fowl	Mouse	Rabbit	Total
Fibrosarcoma	3	3	1	2	-	-	-	-	-	9
Malignant Endothelioma	-	-	1	1	-	-	1	2	-	5
Hypernephroma	-	-	-	4	-	-	-	-	-	4
Mesothelioma	-	1	-	1	-	-	-	-	-	2
Melanosarcoma	-	2	1	-	-	1	-	-	-	4
Lymphosarcoma	-	-	4	2	2	2	2	-	1	13
Lymphocytoma	-	-	1	-	-	-	9	-	-	10
Total	3	6	8	5	2	3	12	2	1	47

Percentage of non-epithelial malignant tumors to total number  
of tumors received. . . . . 35.6

Malignant tumors, all varieties

	Mule	Horse	Dog	Bovine	Sheep	Swine	Fowl	Mouse	Rabbit	Total
Carcinoma	-	11	1	15	-	-	1	-	-	28
Adenocarcinoma	-	1	1	2	-	9	3	-	-	16
Adamantinoma	-	1	-	-	-	-	-	-	-	1
Embryonal Carcinoma	-	-	1	-	-	-	-	-	-	1
Hypernephroma	-	-	-	4	-	-	-	-	-	4
Fibrosarcoma	3	3	1	2	-	-	-	-	-	9
Endothelioma	-	-	1	1	-	-	1	2	-	5
Mesothelioma	-	1	-	1	-	-	-	-	-	2
Melanosarcoma	-	2	1	-	-	1	-	-	-	4
Lymphosarcoma	-	-	4	2	2	2	2	-	1	13
Lymphocytoma	-	-	1	-	-	-	9	-	-	10
Total	3	19	11	23	2	12	16	2	1	93

Percentage of total tumors that were malignant. . . . . 70.4

Non-malignant growths--all varieties

	Mule	Horse	Dog	Bovine	Sheep	Swine	Fowl	Mouse	Rabbit	Total
Fibroma	3	5	-	5	-	-	-	-	-	13
Lipoma	-	1	1	-	-	-	-	-	-	2
Leiomyoma	-	-	-	2	-	-	1	-	-	3
Myxoma	-	-	-	1	-	1	-	-	-	2
Myxofibroma	-	-	1	-	-	-	-	-	-	1
Melanoma	1	2	-	4	-	2	-	-	-	9
Lymphoma	-	-	-	1	-	-	-	-	-	1
Adenoma	-	-	3	-	-	-	2	-	-	5
Papilloma	-	-	1	1	-	-	-	-	-	2
Cholesteatoma	-	1	-	-	-	-	-	-	-	1
Total	4	9	6	14	-	3	3	-	-	39

Percentage of total tumors that were non-malignant. . 29.6

Points of Origin and Location.

A summary of the locations occupied by the one hundred thirty-two tumors shows that the following were involved one or more times.

Eye	Oviduct
Esophagus	Kidney
Lip	Sub-lumbar region
Brain	Hip
Jaw	Testicle
Concha	Spinal canal
Glans penis	Pharynx
Leg	Prepuce
Pectoral region	Adrenal body
Shoulder	Walls of thoracic cavity
Neck	Below ear
Mediastium	Region of flank
Lung	Abdominal Wall
Uterus	Poll
Spleen	Anus
Vagina	Thoracic Cavity
Axillary space	Mesentery
Lymph nodes	Intestines
Gizzard	Heart
	Naxal Cavity

The organs most frequently affected were the following:

Kidney	9
Eye and its appendages	20
Lung	6
Liver	8
Spleen	5
Lymph nodes	10
Intestines	4

The kidneys were most often affected in hogs, the spleen and liver in chickens, and the eye in cattle and horses (twelve and seven times respectively). The lymph nodes were involved most frequently in the dog.

In many of the cases two or more organs were affected by the same tumor such as, the lungs and the lymph nodes, or the liver, spleen and kidneys.

The incidence of the disease was apparently not influenced by sex, tumors occurring with equal frequency in the male and female. While in a few instances there were more females than males represented, this occurred in the case of old cows, of which there are a larger number slaughtered than old males.

The influence of color was not suggested except in the case of melanoblastomas. All the horses affected with this tumor were grey, while the cattle and swine affected were red in color.

The age incidence could not be satisfactorily

determined for all groups of tumors due to the failure of the clinician to record the age in every case. The groups in which a sufficient number of ages were given enables me to offer the following.

Average age of animals affected with the following tumors:

**Carcinoma--**

Horse	10 years
Bovine	6 years
Canine	6 years
Chicken	2 years (one case)

**Lymphosarcoma--**

Canine	6 years
Sheep	2 years
Bovine	7 years

**Fibrosarcoma--**

Horse	8 years
Bovine	4 years
Canine	3 years (one case)

**Lymphocytoma--**

Chicken	1 year
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**Adenocarcinoma**

Hog (kidney cases)	2 1/2 years
Bovine	4 years
Avian	2 1/2 years
Horse	15 years (one case)

The number of different kinds of tumors that occurred in the various species follows:

Mule	3
Horse	10
Dog	12
Bovine	13
Sheep	1
Swine	5
Fowl	7

The different species gave rise to the following number of tumors:

Bovine	41
Horse	28
Fowl	19
Dog	17
Swine	15
Mule	7
Sheep	2
Mouse	2
Rabbit	1

The one hundred tumors included in the case reports were represented among the different varieties as follows:

Fibroma	5
Fibrosarcoma	6
Hypernephroma	2
Lipoma	2

Leiomyoma	3
Endothelioma	3
Mesothelioma	2
Myxofibroma	1
Melanoma	6
Melanosarcoma	3
Lymphoma	1
Lymphocytoma	7
Lymphosarcoma	13
Carcinoma	24
Adenoma	4
Papilloma	2
Adenocarcinoma	15
Cholesteatoma	1
	<hr/>
Total	100



## VI. DISCUSSION

From the available figures it is difficult to compare the frequency of tumors in the lower animals with the occurrence of neoplasms in man. That is, it is impossible, for instance, to say what per cent of the horse, dog, or bovine population is affected with tumors at a certain age, while the information available does permit of such a statement as regards the human. The figures, as unsatisfactory as they are, do, however, suggest that there are probably but slight differences as regards the total incidence of tumors in the two classes (man and animals.)

It is obvious that certain tumors appear with greater frequency than others and that there is quite a difference in the susceptibility of the various species towards neoplastic growth. In this series fifty-three cases or forty per cent were of this variety and of this total, malignancy was a feature in forty-six or 86.8 per cent. Malignancy seems to be the rule in the tumors of the lower animals as evidenced by the high percentage of malign growths in this study in which 70.4 per cent of all varieties possessed this feature.

The high incidence of malignant epithelial tumors is an interesting finding as is the fact that the epithelial malignancies practically equal the malignancies of all other kinds combined (forty-six epithelial malignant tumors and forty-seven non-epithelial malignant tumors).

A great many of the tumors such as the lipomas, mesotheliomas, lymphomas, myxomas, and cholesteatomas were encountered but once or twice, which would suggest that these forms are comparatively rare in the lower animals. A few others such as chondroblastomas, osteoblastomas, rhabdomyoblastomas, neuroblastomas, and glioblastomas I was unable to add to my collection, and by failure to get material of these varieties from others, I am convinced that they must occur but very infrequently.

The relative infrequency of neoplasms in sheep is another interesting point brought out by these figures. Only two of the one hundred thirty-two in the total were found in this animal. It is difficult to account for this apparent rarity on any other basis than a special species insusceptibility. Of course, a great majority of sheep are slaughtered while lambs and other than congenital neoplasms would have but little opportunity to develop during the short life of the animal. Again, however, a considerable number of old ewes come to post mortem annually, yet available data bears out the figures of my series and one must conclude that sheep are relatively immune to tumorous proliferations.

The mule is likewise peculiar in some respects. While the fibroblastomas commonly occur in this animal other varieties must be rare. In the one hundred thirty-two cases reviewed, aside from the fibroblastomas, but one other tumor,

a melanoma, was found. The racially close horse, on the other hand, was found to be particularly susceptible to the epithelial growths in addition to those affecting the mule. In comparison with all other species the mule appears to be less subject to large numbers and varieties of tumors than any other domestic animal, with the exception of the sheep. On the other hand, the horse, bovine, and dog show the greatest susceptibility with the bovine heading the list.

The most frequent tumors of the dog as they appeared in the above tabulations were the adenomas and the lymphosarcomas, while in swine the familiar adenocarcinoma of the kidney comes first. Aside from this one variety of epithelioblastoma the hog is apparently but infrequently affected with the epithelial tumors. In my cases no other types appeared.

The common fowl is likewise infrequently affected with epithelial tumors and it is indeed rare that a true carcinoma is seen, (but once in my series). By far the greatest number of chicken tumors belong to the lymphoblastomas. In my collection of nineteen neoplasms of the domestic fowl nine were lymphocytomas (leukemia) and two were lymphosarcomas. In no instance have I encountered neoplasms in the turkey which fact seems unusual.

The bovine appears to be especially prone to tumors. In the cases previously listed forty-one tumors (about 31 percent of the total) were secured from cattle and thirteen

different types of tumors were represented in the total.

A large share of the epithelial malignant growths in the horse and bovine involved the eye and the appendages of that organ. Of the thirty-one epithelial growths affecting these two species, fifteen involved this organ with the disease apparently occurring most often in the bovine. The eye of the Hereford seemed to be particularly susceptible. The penis of the horse was also a common location occupied by carcinomas. Adenomas arise not uncommonly from the eye of the dog and the majority of the adenocarcinomas involved the kidneys of hogs (nine out of sixteen).

The distribution of the melanoblastomas is of some interest being, one in the mule, four in the horse, one in the dog, four in the bovine, and two in the hog. Most workers have found this tumor far more frequent in the horse than in any other species. While these cases were scattered among the different species, I do not think that the figures should alter the accepted opinion in this regard. The scarcity of this tumor in the horse in my series is probably due to the comparatively few tumors in the total (132) and the fact that melanotic growths are so frequent in the horse that they were not considered of sufficient importance to be worthy of microscopic study. Again, melanomas are the easiest tumors to diagnose in the gross and the curiosity which might have prompted the practitioner or meat inspector to send many other tumors to the laboratory for a diagnosis was absent in

the case of these pigmented growths. The occurrence of this tumor in the other species suggests that perhaps the bovine, hog, mule, and dog gives rise to more melanoblastomas than is ordinarily appreciated.

A tumor that is even more frequent than the cases in this report would indicate is the leukemic condition in chickens, more properly termed malignant lymphocytoma. In addition to those which appear in this work we have had a considerable number of these cases in our laboratory for diagnosis, during the past few months. In fact this is without question the most frequent neoplasm with which chickens may be affected. Of one hundred and one chickens passing through our laboratory during the past four months, eight, or eight per cent, showed this condition.

It is not presumed that the figures offered in this report on the incidence of the various tumors in the different species, are correct for the entire animal population represented. To the contrary, many of the percentages would probably be found decidedly erroneous if a sufficiently large number of specimens could be collected. They do, however, represent the approximate incidence in at least certain of the groups. This is more especially true with the epithelioblastoma and certain of the lymphoid tumors.

One cannot consider a work of this kind complete in any sense. A life time would be necessary for an individual

to assemble a sufficient number of tumors from the lower animals to give a real comprehensive idea of the exact situation. It is planned to continue with the collection already started and to make progress reports from time to time. Perhaps the data given here may be of value in conjunction with the work of others along the same line and if anything is added to the sum total of our knowledge of these little understood diseases by this study, I shall feel amply repaid for the effort.

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