

A STUDY
OF THE
NEOPLASTIC DISEASES
OF THE
LOWER ANIMALS
VOL. 1


WILLIAM H. FELDMAN

T H E S I S

A S T U D Y
OF THE
N E O P L A S T I C D I S E A S E S
OF THE
L O W E R A N I M A L S

Submitted by
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for the Degree of Master of Science
Colorado Agricultural College
Fort Collins, Colorado
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THIS THESIS HAS BEEN READ
APPROVED AND RECOMMENDED
FOR CREDIT



Head of the Department of Pathology

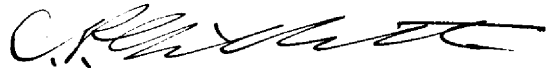
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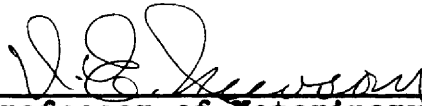
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THE DEGREE OF MASTER OF SCIENCE



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II. ACKNOWLEDGEMENTS

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III. INTRODUCTION

A. The Status of Our Present Knowledge of the Neoplastic Diseases of the Lower Animals.

In the strictly academic sense but little attention is given to the study of tumors in the average veterinary curriculum. Neoplasms are studied at the end of the course in general pathology and as a consequence but little time for their study is available. It is not surprising, therefore, that our information on these diseases is so meager. The statistical field has been entirely neglected and a good share of our knowledge pertaining to the microscopic anatomy of the growths of the lower animals has been gotten from human material. Then, again, we have an attitude of more or less indifference on the part of many practitioners which suggests that but few of them are especially interested in furthering our knowledge of this subject. This they could well do by exhibiting a spirit of cooperation to the end that all growths removed at operations be offered for microscopic examination and all post mortems be considered an opportunity to search out neoplasms which may or may not have been evident before death. To the average practitioner a neoplasm is something to be treated and not necessarily diagnosed.

As a consequence of our inability to secure specimens in the field we have had to depend quite largely

upon material from the packing house. Much of it has been good but we are frequently denied a full appreciation of a specimen for lack of correct and specific data dealing with the age of the animal, its sex, color, breed, the tumor's location, size, etc. The strenuous routine of the veterinary inspector allows too little time to record these things and label and properly preserve the specimen. Yet the wealth of material from such sources, if collected and studied for a period of years would do more than any other thing to reveal the correct status of the incidence of the various types of neoplasms in the different species of live stock.

Tumorous material as it comes to the average laboratory is usually far from ideal for a problem of this kind. Often it is sent in a fresh state without a fixation fluid and as a consequence it arrives in a semiputrid condition in which state it is impossible to secure satisfactory material for study. The case description and clinical data is seldom adequate. Too often the specimen is labeled in a meaningless manner as "tumor, abdominal cavity" or "cancer, cow" or "growth, head of horse." Such descriptions are of no value to one interested in a detailed study of these interesting formations. Even in our own laboratory we have been unable to use a great deal of material because the lack of clinical information was so

great as to seriously impair the value of the specimen for study purposes.

For teaching purposes very few laboratories of veterinary pathology have a complete collection of tumors of the lower animals and as a consequence the class must depend upon material secured from a human source which has been added to make up the deficiencies. This, I feel, is regrettable for while the two classes of tumors, human and animal, do have many features in common there are certain differences of a clinical nature that make it desirable in every instance to study animal material rather than human. This only emphasizes the infrequent appearance of certain types in the lower animals and is mentioned in no sense to be critical of such a practice. Many such deficiencies could, however, be remedied if a serious attempt were made to secure more material. It is only by asking that all available tumors be sent to the pathologist for diagnosis that the rarer forms are apt to be encountered. Even then one must be patient. I have attempted for four years to secure certain of the rarer forms without success but if I can continue collecting and classifying these growths it is probable that my efforts will be rewarded.

Another factor of considerable importance in hindering our advance in this subject is the comparatively few workers in animal pathology who can spare the time from more urgent duties to collect and analyze a representa-

tive number of neoplasms. The trained pathologist is usually engaged in something of more economic importance and the graduate student seldom has the mature judgment born of experience to creditably perform such a task.

Most subjects which have been extensively studied are usually represented by a goodly number of printed works. This is particularly true in the field of medicine. We have bacteriologies by the score, dozens of pathologies, many containing excellent descriptions of the tumors of man, and any number of splendid volumes dealing with the practice of medicine. Yet we have practically nothing descriptive of the neoplastic diseases in the lower animals, aside from what the Germans have contributed. A. T. Kinsley has probably presented the best English description we have. While Kinsley deserves considerable praise for his contribution it is in no sense an exhaustive treatment and is far from complete. Of course, it is now many years since it appeared and since it has not been brought down to date it loses some of its value. The English translation of Kitt's, Text Book of Comparative General Pathology, contains some good material but like Kinsley's treatise it is in need of revision. These are about the only sources to which the student can turn when assistance is required in dealing with the animal tumors.

Even the case reports in the available literature

have not been frequent. A thorough search through the various journals for the past twenty years on file in our library produced but a few over two hundred cases of neoplastic diseases. A large number of these originally occurred in foreign publications which fact further reduces the number of cases reported by our own workers.

To sum-up the present status of our information on tumors in the lower animals one might say that our knowledge of the subject is somewhat limited due largely to several factors. First, there is lack of interest on the part of the animal pathologist as a result of which but little special effort is made to collect material and obtain statistical information. Second, the usual routine of most laboratories is so heavy as to discourage special work of this nature and funds are usually so limited as to prohibit the employment of a special worker for a purpose of minor importance as compared to problems of greater economic interest. Third, the interest in morphological pathology is not particularly great among many pathologists and this phase of pathology is usually shunned entirely by the under graduate. While this attitude obtains we cannot hope that the study of neoplasms will become popular. Lastly, the difficulty in obtaining suitable specimens in sufficient numbers is a serious obstacle and renders a truly comprehensive piece of work difficult.

B. Tumor Incidence in the Lower Animals.

One of the greatest obstacles to a proper study of tumors in the lower animals is the lack of statistical data as to the total incidence in the various specimens of the different types of the disease. There is a great wealth of statistical evidence dealing with tumors in man but veterinary literature is woefully lacking in this regard. This is due largely to the fact that unlike the student of human medicine we have no central agency of vital statistics to analyze and tabulate the results obtainable from death certificates. Our information must come from animal clinics such as veterinary hospitals and institutions where accurate records are kept. The individual practitioner can contribute but little in this regard, although his carefully kept records for a number of years, if available, would have considerable value.

In reviewing the meager data on the frequency of tumors in the lower animals one is impressed with the fact that tumors are fairly common. The frequency of their occurrence is indicated by Kinsley's statement (1) that of 127 animals presented at the clinic of the Kansas City Veterinary College during one term, twelve were affected with neoplastic formations.

H. Martel, Chief of the Sanitary Veterinary Service, City of Paris, in an annual report (2) gives the

results of statistical studies on the frequency of cancer among horses killed in abbatoirs. Of 39,800 carcasses examined, mares constituted 2,000, geldings, 16,200; while 3,600 were stallions. Out of this number 184 were affected with cancer, distributed as follows: 86 in mares, 43 in geldings; 55 in stallions. The melanotic sarcomas were not counted since Martel writes, "It is extremely rare to find white or grey horses entirely free from melanotic tumors." Most of the cases were in subjects fifteen years or older, while 118 horses of dark color were affected and 66 were found in whites and greys. Generalization was observed in 66 cases. As to locations affected, Martel found the 184 cases distributed as follows: kidney, 62; testicles, 50; mammae, 45; intestines, 9; bladder, 6; ovary, 3; lungs, 2; uterus, 1; sheath, 1; jaw, 1. The locations of five were not established. As to multiplicity, both testicles were involved in ten of the 50 cases, while out of the 45 mammary tumors both glands were affected in six cases. The above figures are valuable but would be more so, if the various histological types found were classified. From these figures it is evident that about one-half of one per cent showed malignant epithelial tumors and since cancer alone is mentioned the total tumor incidence must have been much higher. The frequency of the disease in the kidneys, mammae and testicles is interesting for in these organs were located one hundred fifty seven out of the one hundred eighty

four cancers reported. Martel's figures also show a possible relationship between pigmentation and cancer since nearly two-thirds of the tumors occurred in the dark coated animals. This conclusion is perhaps not justified for no information is given as to the total number of dark and light horses respectively in the entire series studied (39,800).

Statistics from the Veterinary High Schools of Berlin, Dresden, and Munich (3) show that one and one-half per cent of all horses, four and one-half per cent of all dogs, and nearly twenty per cent of all bovines presented for treatment were suffering from tumors.

Bemis (4) of Iowa reported that out of a clinic of 2,754 surgical cases, true tumors were observed in twenty-seven per cent with about one-fifth of the cases malignant. Bemis's figures on incidence are considerably higher than others available.

In Dr. Kingman's clinic in one series of three thousand cases there were thirty-one cases in which true tumors were observed. This compares favorably with the German figures first quoted.

A surprisingly large number of fowls are victims of tumors and while reliable statistics dealing with this phase of tumor incidence are scarce, every poultry pathologist realizes that the percentage must be high; higher in fact than in the mammals. In a recent article by Schneider (5)

based on autopsies of all birds dying in a population of eleven thousand individuals she reports the annual tumor rate for fowls between the ages of six months and eighteen months to be between two and three per cent.

Trotter (6) made an interesting report on malignant growths in cattle, from his study of three hundred cattle suffering from malign tumors. In the three hundred individuals Trotter found two hundred seventy-nine carcinomas, and twenty-six sarcomas. (The difference in the total number of tumors in this instance was due to the fact that three of the animals had two primary growths while in one three primary tumors were found). Only two of Trotter's cases were males (steers) while two hundred ninety-eight were cows. Three cases were animals from one year to three years old while the rest, two hundred ninety-seven, were "aged." The locations of the tumors in Trotter's series were as follows: liver, 233; rumen, 25; thymus, 16; intestines, 10; lung, 8; ovaries, 5; bone, 1; skin, 1; eye, 4; vulva, 3; lymph glands, 3; kidney, 1; gall bladder, 1; uterus, 1; fascia, 1; salivary glands, 1; undetermined, 2.

The above statistics, while not in any sense exhaustive, should be sufficient to emphasize the fact that tumors of the lower animals are not uncommon but instead that they are rather frequently seen. The diagnosis of

internal neoplasms in animals has not achieved the refinement practiced by the human physician and as a consequence the student of animal pathology is materially handicapped in having to depend largely upon an occasional autopsy for the chance discovery of internal tumors. Most animals dying on the farm are never autopsied and as a result comparatively few internal tumors are reported. In human medicine, on the other hand, internal neoplasms are usually diagnosed during life and an operation undertaken to rid the victim of the growth. To the number of tumors added to the human statistics from this source we have not a few added as the result of post-mortem examinations to determine the cause of death in some obscure ailment. Then again, there is a greater interest on the part of the human physician and surgeon because of the attention neoplastic diseases command by their position in the annual mortality rates. Any disease that annually causes the death of between 90,000 and 100,000 of our population stimulates a certain earnestness on the part of those charged with the alleviation of human suffering and as a consequence we notice a cooperative effort toward the common goal that veterinarians usually fail to show.

While tumors of the lower animals do not occupy the same relative position of importance as tumors of man yet there is enough of practical worth to be learned to

warrant a more sympathetic attitude on the part of veterinarians in general toward this neglected field of pathology.

References:

Kinsley, A. T. A Text Book of Veterinary Pathology, 3d Edition, p. 369. 1916. Alexander Eger, Chicago.

Editorial Comment, Cancer in Horses. Amer. Vet. Rev. 44:299. 1913-14.

Carcinoma, Surgical Items Department. Amer. Vet. Rev. 32: 528. 1907-08.

Bemis, H.E., Tumors Encountered in Veterinary Practice. Amer. Vet. Rev. 41:588. 1912.

Schneider, Margaret. On the Frequency of Spontaneous Tumors in the Domestic Fowl. Jour. Exper. Med. XLIII, No. 3: 433. March, 1926.

Trotter, I. M. Malignant Diseases in Bovines. Abst. from Jour. Comp. Path. and Ther. in Amer. Vet. Rev. 39:365. 1911.

C. Purpose of the Present Work:

This work, as set forth in the petition to the Committee on Advanced Degrees, was undertaken with the idea of contributing something of value to the rather meager available information dealing with the histopathology of new growths as they occur in the lower animals.

Strictly interpreted, according to the above the work would necessarily have been limited to a morphological study. While the emphasis has been placed on this phase of oncology throughout, yet a few other aspects of the subject have been considered, particularly as to incidence, points of origin and location.

From the morphological standpoint, a correct description of a great many of the tumors of the lower animals is much needed. Such tumors as the lymphocytomas (leukemia) of chickens, the large frequent kidney tumors of swine, mesotheliomas, and lymphosarcomas have been too inadequately described to enable the student of this phase of pathology to obtain a comprehensive idea of their structure.

The object has been in every case to write a careful and complete word picture of the actual morphology presented, disregarding what the human pathologist and others may have written about similar growths with the attitude that every neoplastic specimen is individualistic in many respects. While those of the same group are alike,

yet there are many individual differences which are worthy of consideration.

It is said that "one picture is worth a thousand words," so in order to make the written descriptions more intelligible, photomicrographs of the described fields were attempted. I feel that they constitute an invaluable part of the treatment accorded the various individual specimens.

We are woefully lacking in accurate criteria dealing with the gross anatomy of the new growths as encountered in the lower animals and I have attempted to bridge over this deficiency by prefacing each microscopic description by a few remarks descriptive of the gross appearances and, where possible, to add a photograph of the entire specimen.

A review of the available literature was also intended in order to supply a bibliography on the subject for those who might be interested.

Summing up then, the purpose of the studies which follow was to determine by actual examination, gross and microscopic, the true pictures presented by the various types of neoplastic formations encountered in the lower animals and incidentally to record what information became available bearing upon the incidences and locations of the different groups.

D. Collection of Material and Procedure.

In contemplating this study it was appreciated that in order to secure a representative number of the various types of tumors the cooperation and aid of practicing veterinarians and meat inspectors would be essential. The material we had on hand was rather meager, a great deal of it was old and most of it without sufficient clinical history to be of any real value. In fact, out of the one hundred cases described in this report only two were selected from our stock collection.

In order to solicit the assistance of those most likely to encounter tumors in their daily routine a form letter was addressed to thirty-five practicing veterinarians, most of whom were located in Colorado. Invitations to send in material were also sent to a half dozen or so of our graduates in the Government Meat Inspection Service and to a few veterinarians employed in clinical laboratories. In addition, the assistance of Drs. H. E. Kingman and James Farquharson of our college Veterinary Hospital was secured.

The response from the practitioners was somewhat disappointing. Ten or twelve have sent in one specimen, while four or five have supplied a goodly number. A large share of the material was obtained from packing house cases, although not a few were obtained thru the kindness of other laboratories and our college Veterinary Hospital.

Our own laboratory during the past two years has been a fruitful source, particularly of chicken tumors.

A summary of the source of the material is as follows:

From practicing veterinarians	45
From packing house sources	38
From the College Veterinary Hospital	25
Other laboratories	33
Our laboratory	16
	<hr/>
Total specimens received	157

This total included a number of specimens that were found not to be tumors when subjected to a microscopic examination and others that were not suited for study due to the lack of preservation and fixation. The total number of actual tumors received was 132. From this group the one hundred specimens that gave the best sections and had the most representative clinical features were selected for the detailed writeups.

The various individuals who so kindly cooperated in collecting the material were furnished with clinical data charts to facilitate the assembling of the clinical history and other facts that could only be gathered by a person present at the time of the tumor's removal. A copy of the chart used is inserted.

*No. _____
*D.No. _____

TUMOR STUDIES

Clinical Record.

 Clinician _____ Address _____
 Clinician's case number or owners name. _____
 Species _____ Breed _____ Sex _____ Age _____ Color _____
 HISTORY (complete) when first observed _____ Approximate size
 when first seen _____ Single or multiple _____
 Circumscribed or diffuse _____ Hard or soft _____
 Contributory causes such as continued irritation; sharp blows
 wounds etc. at point of origin _____

 Previous removal _____ (give method used; knife, drugs,
 torsion etc. _____) Impairment of function _____
 _____ General physical condition _____
 of subject _____ Date of present removal _____
 Subject living or dead at time of removal _____
 Method of removal _____ Exact anatomical location of
 tumor _____
 Other structures involved and to what extent _____

MACROSCOPTIC DESCRIPTION OF TUMOR AT REMOVAL
 Exact size in inches _____ (_____ mm); Shape _____
 Color _____ Consistency _____ Presence or absence
 of capsule _____ Attachment of tumor by (a) Pedicle _____
 or by (b) connective tissue over part or whole of surface _____
 _____; Surface smooth or
 roughened _____ Ulceration _____ Character of
 discharge _____ . Vascularity _____
 _____ Cysts _____ Fluids _____
 Pigments _____ Hair on surface if ex-
 ternal tumor _____ Additional data _____
 Clinical diagnosis _____
 *Pathological diagnosis _____
 *Recurrence record _____
 *Remarks _____

Shipping directions: We desire the entire tumor, and if growth is of such size that it will go into a pint or quart Mason jar this makes a very good container. A solution of 10% formalin should always be added to insure fixation and preservation. In case of unusually large tumors cut off a small portion for shipment in formalin and pack the rest in borax. Address to Pathology Lab. Colo. Agri. College, Fort Collins, Colo. Ship by express collect.

*These spaces for the pathologist to fill out.

For the most part those sending in material filled out the charts to the best of their ability although in a few instances considerable correspondence was necessary before certain obscure points could be cleared up.

As soon as the material arrived at the laboratory it was photographed, if demonstrable features were present. If entire, it was also weighed and the weight recorded. Most of the material which was received from a distance did not represent the entire specimen. Due to transportation difficulties usually but a small portion was sent.

In those previously preserved, the fluid was changed for a fresh solution of ten per cent formalin and often a few days or weeks the material (except in special cases such as fat tumors) was preserved in eighty per cent alcohol.

Practically all the material was embedded and blocked in celloidin and sections obtained which were stained with hemotoxylin and eosin. In a considerable number of instances where important differentiation was desired sections were also stained by Van Giesens' method. The fat tumors were stained by Scharlach R which proved a very satisfactory method.

The sections were then studied and written up according to the following scheme:

(a) The Clinical Data: This includes a brief resume of the case history, the location of the tumor, the

species, sex, age, color, etc. of the animal from which the growth was derived and any thing else that had a clinical bearing upon the case, using the data sheet as the source of information.

(b) Gross Appearance: Here is recorded the description of the gross anatomy of the tumor, its size, shape, color, consistence, capsule, blood supply, ulceration, type of attachment, etc.

(c) Microscopic Description: A careful, thorough and complete detailed writeup was then made of the microscopic morphology presented.

(d) Diagnosis: From the facts obtained in the above portions of the study a diagnosis was made which utilized Mallory's system of nomenclature, as far as possible. It was found, however, that Mallory's nomenclature was inadequate at times and for such cases names were supplied in keeping with the same scheme.

After the description had been completed and the tumor diagnosed, photomicrographs were made of the fields best representing the diagnostic features of the tissue in question. In most of the studies, low as well as high power pictures were made. In a very few instances the condition of the stained material was such as to make satisfactory photomicrographs impossible. I found this difficulty particularly true with some of the chicken tissues where I was unable, by repeated attempts, to get preparations with

the proper differentiation. Upon the suggestion of Dr. Carl Weller, Medical School, University of Michigan, I substituted bluish eosin for the yellowish in my hemotoxylin and eosin stains with most gratifying results.

After securing acceptable photographic negatives, black and white prints were made on the various grades of Azo paper depending upon the degree of contrast desired.

The photography connected with this phase of the work I found quite fascinating and while at first progress was slow the work was always interesting and ever new.

E. Classification of the New Growths.

In order that one may better appreciate the terminology used in the diagnosis of the various cases which follow, a few words explanatory of the classification used, would be proper at this time.

Any attempt to systematize the new growths immediately leads one into a maze of difficulties. Every author has his own pet scheme and after reviewing a number of them the uninitiated usually arrives at a state of complete bewilderment. Of the various attempts to classify the neoplasms, that of Mallory appeals to me as both logical and practical. Mallory bases his classification upon the histological identity of the type cell, feeling that most tumors arise from cells having the same parentage as those constituting normal tissues.

Under this system the naming of the specific kinds of tumors becomes easy, for by adding the word, blastoma, to the name of the type cell giving rise to a tumor a distinctive and significant title results. For example, a tumor arising from the fibroblast becomes a fibroblastoma. If the tumor be a fibroblastoma and is clinically and histologically benign, it can be more specifically termed a fibroma, while, if it shows a tendency to grow rapidly and to infiltrate and destroy adjacent tissues and has the histological features suggestive of malignancy, the growth should be called a fibrosarcoma, the word sarcoma being appended to signify that the tumor is of malign character. In case the tumor be epithelial in nature, the general term would be epithelioblastoma with adenoma or papilloma representing the benign forms while the malignant epithelial new growths are known as carcinomas.

In addition to tumors which arise from cells normally found in a given tissue we have a few which arise from congenially misplaced tissue and these are placed under the heading of teratomas.

The main objection to Mallory's scheme is the difficulty one has in recognizing the type cell in every instance. In very young, rapidly growing tumors the cells often fail to reveal sufficient differentiating features to enable one to identify them and as a consequence we may have honest

differences of opinion whether, for instance, a tumor be a carcinoma or an endothelioma. Complete clinical data and a knowledge of the various embryological aspects of tumor formation will, however, often point the way to the correct diagnosis.

Classification of Tumors

I Fibroblastoma

- Varieties (a) Fibroma
(b) Fibrosarcoma

II Myxoblastoma

- Varieties (a) Myxoma
(b) Myxosarcoma

III Chondroblastoma

- Varieties (a) Chondroma
(b) Chondrosarcoma

IV Osteoblastoma

- Varieties (a) Osteoma
(b) Osteosarcoma

V Lipoblastoma

- Varieties (a) Lipoma

VI Leiomyoblastoma

- Varieties (a) Leiomyoma
(b) Leiomyosarcoma

- VII Endothelioblastoma
 - Varieties (a) Endothelioma
 - (b) Hemangioma
 - (c) Lymphangioma
- VIII Mesothelioblastoma
 - (a) Mesothelioma
- IX Lymphoblastoma
 - Varieties (a) Lymphoma
 - (b) Lymphocytoma
 - 1. Leukemia
 - 2. Aleukemia
 - (c) Lymphosarcoma
- X Myeloblastoma
 - (a) Myelogenous leukemia
- XI Melanoblastoma
 - Varieties (a) Melanoma
 - (b) Melanosarcoma
- XII Rhabdomyoblastoma
 - Varieties (a) Rhabdomyoma
 - (b) Rhabdomyosarcoma
- XIII Glioblastoma
 - Varieties (a) Glioma
 - (b) Gliosarcoma
- XIV Neuroblastoma
 - (a) Neuroma

XV Epithelioblastoma

Varieties (a) Papilloma

(b) Adenoma

(c) Carcinoma

1. Adenocarcinoma

3. Adamantinoma

(d) Hypernephroma (Grawitz tumor)

XVI Teratogenous-blastoma (Teratomas)

(a) Cholesteatoma

The above classification contains some additions to Mallory's original scheme and a few deviations were also thought advisable. Those groups particularly affected are the mesotheliomas and the lymphoid tumors. Perhaps a few words in support of the nomenclature selected for these tumors would be fitting at this place.

Mesothelioblastoma.--The controversial perplexities that have grown out of the attempts at classification of the tumors arising from the middle or mesodermal layer of the embryo are most formidable, yet in face of it all there seems to be about as much lack of agreement as ever. Each system of classification has its own adherents who succeed in proving a very good case to substantiate their views and one cannot go through the mass of evidence which is offered pro and con without a feeling of more or less uncertainty that is born of the haze of argument.

The tendency on the part of some has been to include all tumors whose type cell springs from the cells which line the blood and lymph vessels, the arachnoid space, and which cover the serosa of the thoracic, peritoneal and pericardial cavities, under the one heading of endothelioma. Others would remove from endothelioma those tumors built up from the cells which normally clothe the serous membranes and would designate these as mesothelioma.

The term mesothelioblastoma seems a fitting designation. My reason for so naming these tumors is based upon the embryological origin of the tissue from which they arise. The embryogenesis of the cells lining the coelomic cavity is clearly shown by modern embryological teachings to be mesodermal. These cells are part of the mesothelial structure which consists of mesothelial cells and the underlying mesenchyma which in the later development of the embryo

is further differentiated into a supporting connective tissue.

In view of the histogenic origin it seems proper that tumors of mesothelial character be termed mesothelioma. This was the view of Adami (23), who placed the tumors of this variety under what he called lepidomas of the second order or transitional lepidomas. This writer also placed under the transitional lepidomas the endotheliomas, but considered them separately, reserving the term for those tumors originating from the cells lining the blood and lymph vessels. Mallory (24) also subscribes to this use of the term endothelioma, but in addition applies the term to those tumors which arise from the cells of the arachnoid space. Others, following Borst's classification, which is built on the basis of but three fundamental tissues: epithelium, endothelium and connective tissue, include the neoplasms of the mesothelium under the heading of endothelioma, differentiating the different varieties by their location and clinical manifestations, for example, pleural endothelioma, meningeal endothelioma, angio-endothelioma of the skin, etc. Zeckwer (25) in a recent (1924) contribution further endorses the use of the term mesothelioma and gives a splendid resume of the entire question of the nomenclature of these tumors.

Definition: A mesothelioblastoma may be defined as a neoplastic formation resulting from the autonomous

proliferation of the cells which normally clothe the serous membranes, or which are derived from the persistent mesothelium of the embryo.

Lymphoblastoma.--None of the other neoplastic diseases leads one into such a dilemma as those arising from the lymphoid elements or the cells of the lymphocytic series. The complexities confronting the student of these tumors are indeed formidable. This is true largely because of the absence of trustworthy criteria by which the several varieties can be differentiated. One criticism of the writers of the past in this regard is that they created such a great array of names for the various clinical subdivisions of the lymphoblastomas that one cannot but experience a sense of bewilderment in approaching some of the discussions dealing with such subjects as lymphocytoma, lymphoma, lymphadenoma, pseudoleukemia, lymphatic leukemia, round cell sarcoma, alveolar sarcoma, lymphosarcoma, et cetera.

While there are probably many sound reasons for so-naming certain clinical entities yet it does seem possible that out of such a maze of terms a histologically and morphologically sound classification could be worked out.

As far as the lower animals are concerned I can see no good reason for further complicating the subject by trying to make the tumors of this type fit such a nomenclature, not that I would offer anything new but I would prefer a

scheme with as few varieties as possible and would designate them by names selected from the above list.

Definition: A lymphoblastoma is a tumor composed of lymphoid cells often in the germinative stage.

Varieties: Simple Lymphoma. This is a slowly progressive benign enlargement of a lymph node. These growths may remain stationary for long periods of time and ordinarily do not exhibit any tendency to metastasize or infiltrate the surrounding tissues. They usually consist of an overgrowth of small lymphocytes derived from the lymph follicles. The lymphocytic content of the blood is not disturbed.

Lymphocytoma. This type originates from lymphocytes in the germinative stage. The cells being immature, they rapidly undergo mitosis and malignancy results. The cells may grow and multiply in the blood stream in which case the tumor is known as lymphatic leukemia or they may be confined to various organs and lymph nodes with or without the blood picture of leukemia. Leukemia in chickens and pseudoleukemia in dogs belong here.

Lymphosarcoma. A highly malignant tumor arising according to Ewing (49) from either the reticulum cells of the germ centers and pulp cords or the lymphocyte. It begins as a locally destructive process of the lymphoid tissue with wide spread metastasis by the lymphatics and blood stream and becomes a rapidly fatal disease.

The condition described as Hodgkin's disease has been frequently reported in the lower animals particularly in dogs. While this disease exists as a separate entity in the human where it is considered by many as a granuloma with perhaps some obscure relationship with tuberculosis, I seriously doubt its existence in the lower animals. At least there seems to be insufficient evidence to support such a contention. Most of the conditions described as Hodgkin's disease could well be considered malignant lymphocytomas or lymphosarcomas. In most of the case reports describing the disease in animals the diagnosis has been made upon the symptoms presented and the gross anatomy with the pathologic histology entirely neglected. The microscopic description of Hodgkin's disease is fairly specific and differs sufficiently from the true lymphoblastomas to permit of their being considered separately. Some human pathologists maintain that tuberculosis follows Hodgkin's disease "like a shadow" and the finding of acid fast bacilli in many of the lesions seems to substantiate the infectious origin of this condition.

Adamantinoma. The term adamantinoma also appears as a sub-group under carcinoma. While the cells making up this tumor are unmistakably epithelial in nature they usually present features that separate the tumor from the ordinary carcinomas. The occurrence of the cells in irregular spherical clumps or nests and not in elongated processes or

columns is the essential histological difference (Fig. 1 and 2). Ewing (1) feels that these growths originate from the remains of the enamel organ, probably from the parodontal epithelial debris and that the above term is proper.

Ref. Ewing, James: Neoplastic Diseases (1919) p. 688,
W. B. Saunders Company, Philadelphia.

Hypernephromas. The placing of the hypernephromas under epithelioblastoma, I feel, is correct because of their epithelial nature. Of course, they differ considerably from the usual picture of carcinoma and it is best to describe them separately, but the histogenesis of the type cell justifies the placing of this tumor under the above heading.

Adamantinoma and Carcinoma

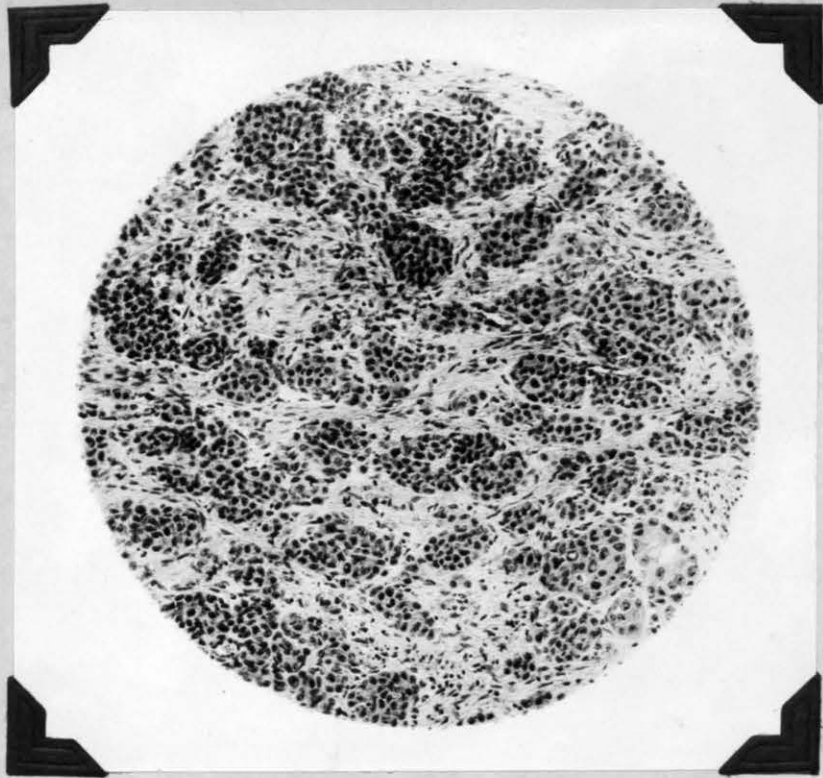


Fig. 1. (T.134) Adamantinoma - Horse - Showing irregularly spherical nests of cells.

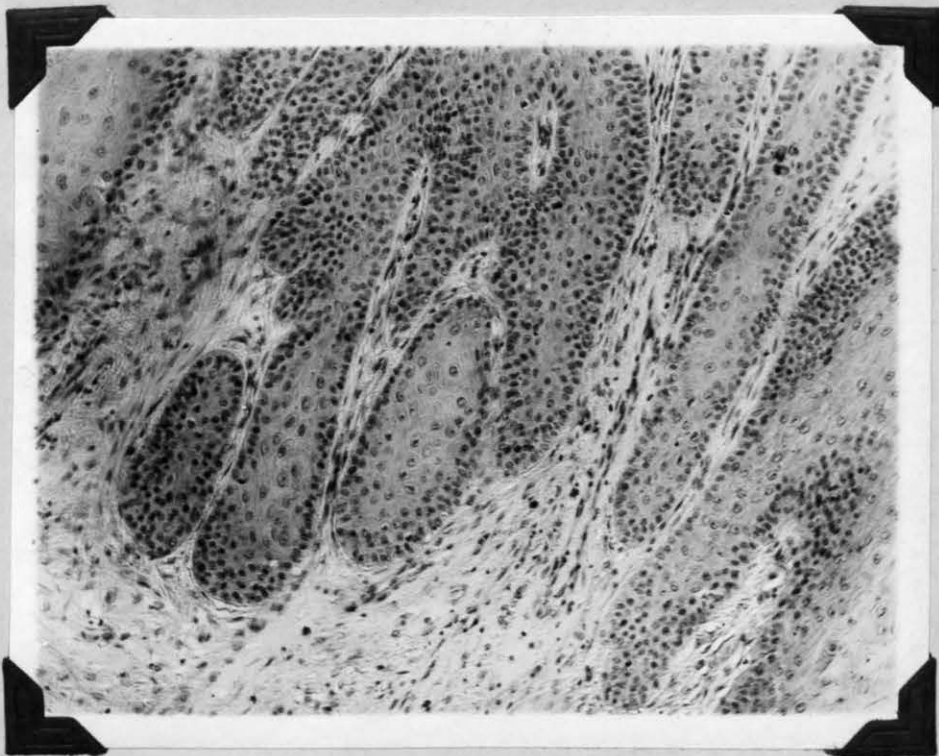


Fig. 2. (T.64) Carcinoma of the penis of a horse showing a typical carcinomatous structure in the elongated columns of cells which are pushing into the stroma.

IV. CASE REPORTS

Being a detailed description of one hundred separate cases of neoplastic disease of the lower mammals and the domestic fowl, together with many photographs of the gross and microscopic features.

STUDY NUMBER ONE

TUMOR NUMBER 11

Fibroma -- Neck of a Cow

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

Clinical Data: An old red cow of a mixed breed was presented at Armour and Company for slaughter. A flattened oblong circumscribed tumorous mass was removed after death from the lateral side of the neck behind the ear.

Gross Appearance: The tumor was divided into three lobes. It was rather flattened, being about 1.5 cm. in thickness by 7.5 cm. broad by 12.5 cm. long. The surface was roughened and covered with hair. It was quite firm in consistency. (see Fig. 1).

Microscopic Description: A very compact, closely knit structure was presented under the low power. The tissue was decidedly fibrous in character and the cellular portion of the tissue was in the minority. Collagen material was very abundant, the strands of which ran both transverse and longitudinal. The nuclei were small and had a pinched, compressed appearance. Blood vessels were well distributed and most of them possessed well defined walls, some taking on the proportions of arteries. Nowhere were mitotic figures observed. In fact, there was no evidence whatever to indicate a malign progressiveness.

Study Number One-2

Diagnosis: This was an adult fibrous connective tissue tumor of considerable standing judging from the adult character of the tumor tissue and the well formed blood vessels together with the lack of any aggressive features. A simple fibroma durum.



STUDY NUMBER TWO

TUMOR NUMBER 20

Multiple Fibroma -- Skin of a Mule

This case was that of Dr. H. E. Kingman, Veterinary Hospital, Colorado Agricultural College, Fort Collins, Colorado.

Clinical Data: The animal was a two year old black mule. About one year before removal hard circumscribed nodules began to develop apparently in the skin. These grew and increased in number until tumors were present on the forearm, at the point of the shoulder, above the right eye, around the anus, and at the base of the tail. Those at the anus spread down the ventral margin of the tail for a distance of about six inches. The larger tumors were at the base of the tail, the tumors becoming smaller at the more distal portion. Those over the forearm followed the leg down its anterior border to the knee.

Gross Appearance: These tumors varied in size from 1 cm. up to 10 cm. in diameter. They were hard, oval, quite vascular formations which were devoid of hair and which were apparently encapsulated by the skin over the external surface. The tissue was quite dense in texture and the surface was somewhat roughened by deep fissures which ran over it in an irregular manner.

Microscopic Description: This was a connective tissue tumor made up of fibroblasts and their products. It was very cellular and abundantly supplied with blood vessels of variable size; some being quite large. Some of the larger veins showed thrombi

Study Number Two-2

formation in the unorganized stage. The cells and nuclei were rather spindle shaped. Some areas of the tumor were involved in an acute inflammatory reaction which was evidenced by the presence of a large number of polymorphs and some little edema.

Diagnosis: The distribution of the tumors as put forth in the clinical data together with the histology revealed by the microscopic study would stamp this as a multiple fibroma strongly suggestive of a neurogenic origin. Although no nerve tissue was demonstrated in the sections studied it is possible that some of the material would have showed some if a more exhaustive search had been possible. Ewing suggests the neurogenic origin of most skin fibromas and fibrosarcomas. A multiple fibroma.

STUDY NUMBER THREE

TUMOR NUMBER 83

Fibroma -- Pectoral Region of a Horse.

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

Clinical Data: The animal was a three year old black mule; sex, male. Just before the removal of the tumor the animal had changed hands and as a consequence there was no available history dealing with the first appearance of the growth. The tumor was a firm, nodular, circumscribed swelling just under the skin over the superficial pectoral muscle. There was no evidence of a previous removal.

Gross Appearance: The nodule, which was somewhat oblong, measured about 5 cm. x 3.5 cm. and was of a very firm compact texture. It had a dirty white color streaked irregularly with narrow strands of a lighter color. The surface, which was smooth, was invested with a tough fibrous capsule which had a glistening appearance. There were no degenerative changes and the mass was not particularly vascular.

Microscopic Description: The tissue present in this tumor was largely fibroblastic in its origin and makeup. Fibroblasts were numerous and presented their longitudinal axes parallel to the strands of collagen fibrils which were abundant. (see Fig. 1). The type cell was small and had a drawn out compressed appearance which was especially noticeable in the peri-

Study Number 3-2

peripheral zone of the tumor. Chromatin material was scant and no mitotic figures were encountered. The strands of collagen material seemed to be grouped in units or bundles which crossed and recrossed other units. This gave the tissue the tangled, twisted, appearance that is so often seen in the slow growing fibroblastomas. Well developed blood vessels were common in the compact outer portion of the mass; smaller capillaries being the rule toward the central area. In some areas the red cells could be made out in intimate contact with the collagen material, no vascular covering being present.

Diagnosis: We have here a tumor possessing a very simple makeup, namely the fibroblast and its products. There is no reason to even suspect that the growth was malignant in any sense. It presents the usual features of a simple, encapsulated, expansively growing fibrous tumor. A fibroma.

Fibroma

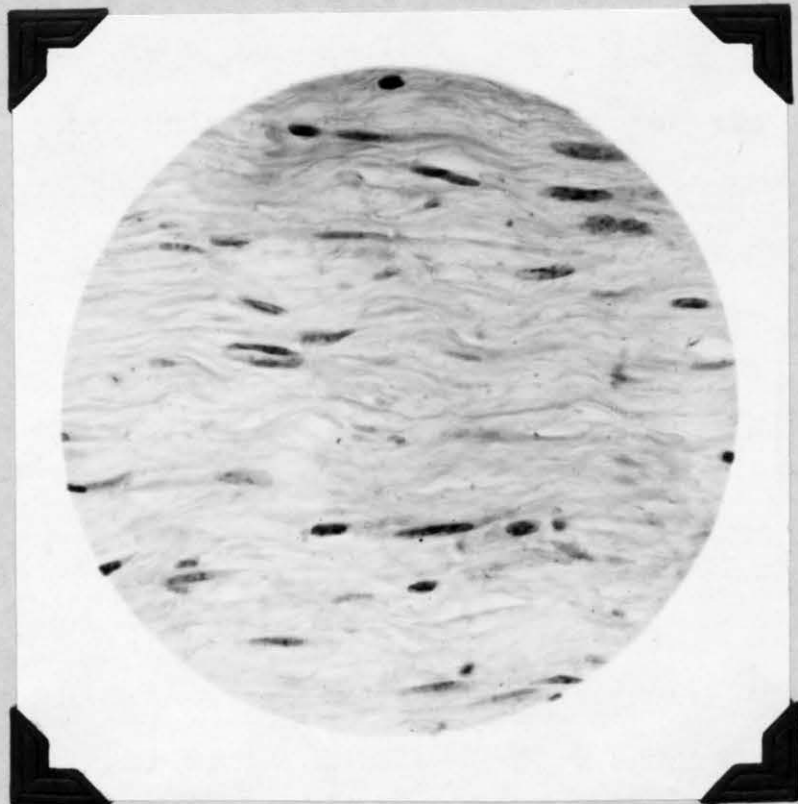


Fig. 1 (T.83) Fibroma.-- from the pectoral region of a Horse.

High power photomicrograph showing the abundant collagen substance and the compressed appearance of the nuclei.

STUDY NUMBER FOUR

TUMOR NUMBER 5

Fibroma -- Shoulder of a Horse

This material was received from Dr. M. J. Woodliffe, Denver, Colorado.

Clinical Data: The tumor was from a black Percheron mare. It was located on the face of the shoulder, midway between the top of the neck and the scapulo-humeral articulation. It was first observed eleven months before its surgical removal.

Gross Appearance: No data is available as to the size of this tumor. It had a very irregular shape and was of a greyish color. There was hair on the external surface which was considerably roughened. The texture of the growth was rather fine although the tissue was very compactly knit. It did not appear especially vascular.

Microscopic Description: This presented a very simple type of structure, involving but one type tissue, namely the products of the fibroblast. The fibroblastic cells were rather flattened or elongated in most instances and not evenly distributed throughout. The collagen material was greatly in excess and gave the tissue a rather firm or compact appearance. (see Fig. 1). Eosinophilic leucocytes were present in considerable numbers in certain fields. No mitotic figures or other evidence of progressiveness was seen.

Diagnosis: Being a simple structure made up of fibroblasts and their products, without any evidence of malign pro-

Study Number Four-2

gressiveness, would class this tumor with the fibromas. Since the bundles and strands of collagen are quite compact and tightly woven this could be correctly called fibroma durum.

Fibroma

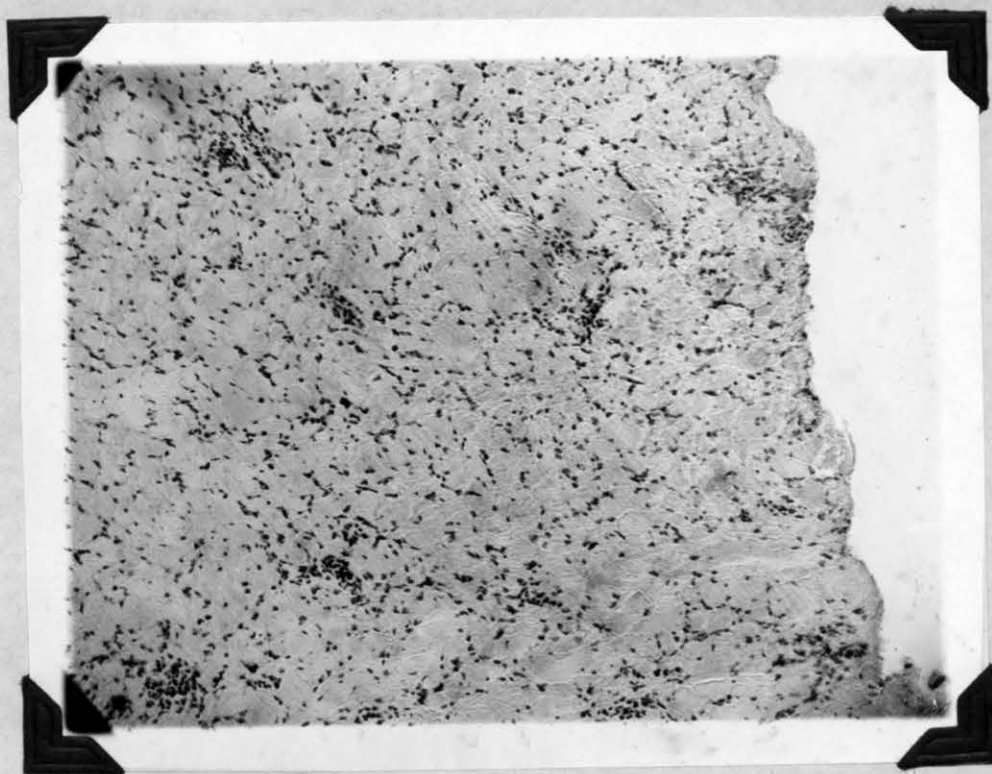


Fig. 1 (T.5) Fibroma.--From the Shoulder of a Horse.

Lower power view showing the excess of collagen material.

STUDY NUMBER FIVE

TUMOR NUMBER 90

Fibroma -- Penis of a Bull

This material was supplied by Dr. W. M. Decker, Monte Vista, Colorado.

Clinical Data: The animal was a nine months old Short-horn bull. About one month previous to the removal of the tumor a circumscribed growth about the size of a hen's egg was seen at the distal extremity of the penis. It was located in such a position and was of such a size as to make urination difficult. The tumor was removed surgically and the wound was treated by an application of nitric acid.

Gross Appearance: The mass was irregularly spherical and measured about 4 cm. in diameter. It had a red color and was rather fibrous to the touch and of firm consistence. A capsule was absent and the growth was attached by a pedicle. While the surface was roughened and free from hair and there was no evidence of suppuration, the mass was not especially vascular.

Microscopic Description: This was a typical fibrous tumor made up of the fibroblast and its products. There was considerable collagen material present which was laid down in compact strands running at many different angles. Examined minutely by subdued light the collagen fibrils appeared in wavy bundles. The fibroblasts were inclined to be atrophic and most of the nuclei were small and slender with a tendency to taper

Study Number Five--2

toward each end. A light coagulation necrosis was evident near the surface and in this area the blood vessels were congested. Blood vessels in the body of the tumor were scarce.

Diagnosis: This is a simple fibroma. There is nothing unusual about this tumor except the location from which it was removed and it is for this reason alone that this study was made. It is the only instance in my series that I have encountered a fibroma from the penis of a bull. This tumor was of more importance from the standpoint of the mechanical interference with urination than from any destructive tendencies. Malignant aggressiveness was not observed. A fibroma.

STUDY NUMBER SIX

TUMOR NUMBER 4

Fibrosarcoma -- Above the Eye of a Mule

This case was that of Dr. N. J. Miller of Eaton, Colorado.

Clinical Data: This tumor was from a seven year old brown mule; sex, female. It was a hard circumscribed formation located slightly above the outer canthus of the eye. It was observed about one month before its removal.

Gross Appearance: It was an oval formation about two cm. in diameter and was rather firm to the touch. The surface was raw and bleeding from rubbing on the bridle blind.

Microscopic Description: This tumor had a highly cellular make-up, the type cell being the fibroblast. These cells possessed a large well staining nucleus containing many chromatin granules scattered diffusely throughout the nuclear material. Mitotic division was commonly observed. The collagen fibrils were more abundant in some fields than in others, where they were quite scant. These fibrils were presented in a variety of positions. Some fields showed them lying in one plane but for the greater part they were in a twisted tangled mass with fibrils running in every conceivable direction. Multi-nucleated giant cells were observed while eosinophiles were very abundant, especially toward the exposed surface of the tumor. In the zone where the normal tissue could still be discerned there was evidence of considerable infiltrative capacity on the part of the neoplastic cells.

Study Number Six--2

Diagnosis: We have here a tumor belonging to the fibroblastomas that presents a decided malign appearance as indicated by the embryomonic type of cell and its infiltrative ability. Considering the type cell and aggressive behavior, I designate this as a fibrosarcoma.

Fibrosarcoma

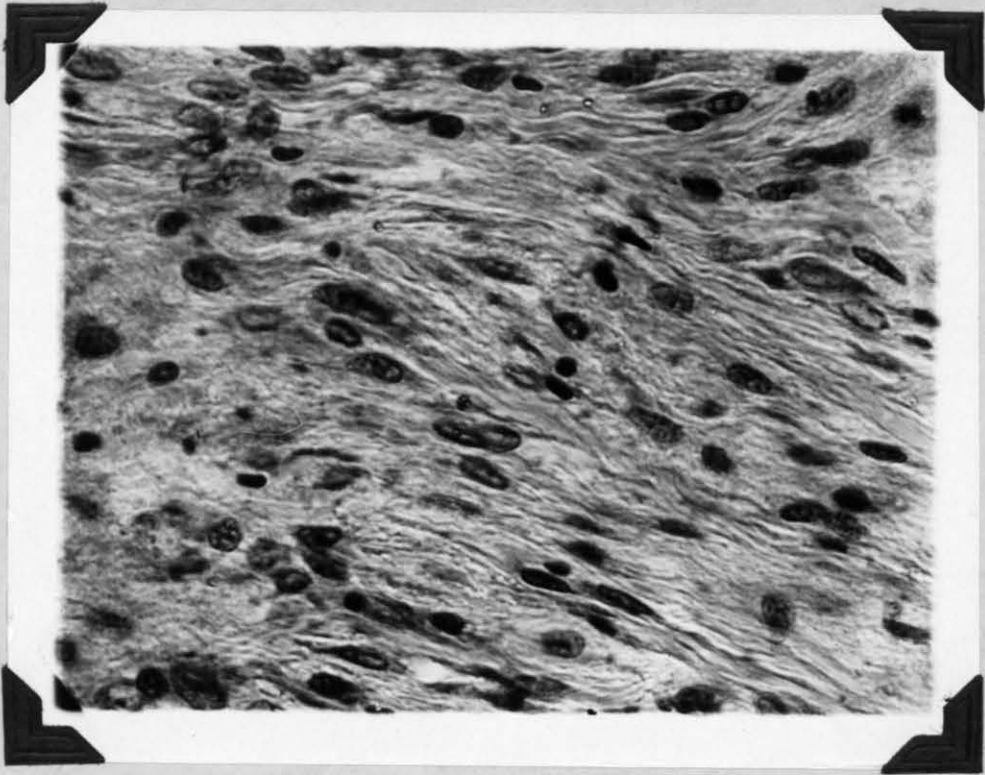


Fig. 1 (T.4) Fibrosarcoma.--Mule.

Low power View showing many collagen fibrils and fibroblastic nuclei.

STUDY NUMBER SEVEN

TUMOR NUMBER 10

Fibrosarcoma -- Mandible of a Bovine

Case of Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: A six year old Shorthorn bull was slaughtered for food and the veterinary inspector observed a tumor on the lateral side of the distal third of the mandible. This was removed for diagnosis.

Gross Appearance: This was a firm, circumscribed, encapsulated mass, somewhat oval in shape, measuring about 5 cm. x 6.5 cm. The surface was smooth and covered with hair. A cut surface showed the tumor to have a somewhat yellow color. It was but slightly vascular.

Microscopic Description: Sections studied under the low power showed this tumor to be a very cellular, compact, connective tissue structure. The type cell was the fibroblast and the collagen material was disposed in a twisted irregular fashion. Heavy strands of connective tissue stroma served as trabeculae to separate the tumor into lobular-like divisions. Some areas of the structure showed considerable hemorrhage with fibrin formation. Well developed blood vessels were present in the denser stroma and small capillary channels filled with blood were evident throughout a good deal of the tumor-tissue proper.

Viewed under the high power the tumor cells were rather flattened and the nuclei were quite elongated. This gave the fibroblastic cells a certain spindle shape. The chromatin gran-

Study Number Seven--2

ules could be clearly seen and minute vacuoles were frequent between the strands of collagen fibrils. A few mitotic figures were present. (see Fig. 1).

Diagnosis: This is a rather slowly malignant fibrous connective tissue type of tumor. A fibrosarcoma.

Fibrosarcoma

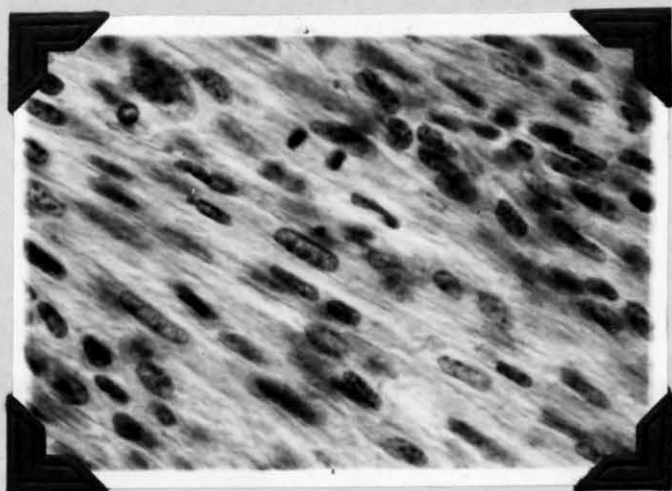


Fig. 1 (T.10) Fibrosarcoma.--From the lateral surface of the mandible of a bovine.

High power photomicrograph showing one fibroblast in mitosis.

STUDY NUMBER EIGHT

TUMOR NUMBER 95

Fibrosarcoma -- Leg of a Dog

This specimen was obtained by one of the senior veterinary students in August, 1924.

Clinical Data: The animal was a three year old Bull dog; sex, male. Some time previous to the appearance of the growth a cactus thorn was removed from the affected area. This had been present some little time and after its removal a swelling about the size of a pea developed. As it gradually got larger it was incised and some pus escaped. The nodule continued to increase in size and eventually became the size of a door knob. It was located on the lateral surface of the elbow joint. (see Fig. 1). A second nodule developed in the proximal medio-dorsal area of the antibrachium. This was somewhat smaller than the tumor on the elbow joint but was similar in consistence and in relation to the tissues underlying the skin. As the owner did not desire to assume the expense of an operation the dog was destroyed and the masses removed for study.

Gross Appearance: The exact size and weight of these nodules was not determined. They were oval in shape with a slight tendency towards lobulation. They were a dirty grey in color and firm of texture. A capsule was not present and the growths were attached to the subcutaneous tissues by connective tissue. The base was broad and well rooted in the underlying tissues. The tumors were moderately vascular.

Study Number Eight--2

Microscopic Description: Sections were prepared and stained in hemotoxylin and eosin; others were stained by Van Gieson's method. The material was richly cellular with very little separate stroma in evidence. (see Fig. 2).

The type cell was the fibroblast which was proliferating in a wild and aimless fashion. A minimum amount of collagen material was present but the great bulk of the tissue consisted of fibroblastic cells and not their products. Most of the nuclei were oval while the cells proper presented a spindle appearance. They were disposed in every conceivable direction, design or system being entirely lacking. Many of the nuclei were vesicular in appearance and most of them contained ill staining chromatin matter in the form of fine granules. Mitosis was a constant feature and a few rather large blood vessels were present in certain of the fields. A few areas also showed large accumulation of lymphocytes but these cells were not distributed throughout the tumor generally.

Diagnosis: Being of a fibroblastic nature with considerable evidence of malignancy, this growth must be considered as belonging to the fibrosarcomas. From the clinical picture presented and the microscopic histology I feel that this growth would have caused serious consequences in a short time had the animal been permitted to live and the tumor left intact. Here again we witness the development of a true neoplastic structure following

Study Number Eight--3

an irritation. Perhaps the same agent that provoked the inflammatory reaction following the entrance of the cactus thorn also caused the fibroblasts of the areas to lose their usual equilibrium and to assume a lawless career. A fibrosarcoma.

Fibrosarcoma.



Fig. 1 (T.95) Fibrosarcoma.--Of the Leg of a dog.

Fibrosarcoma.

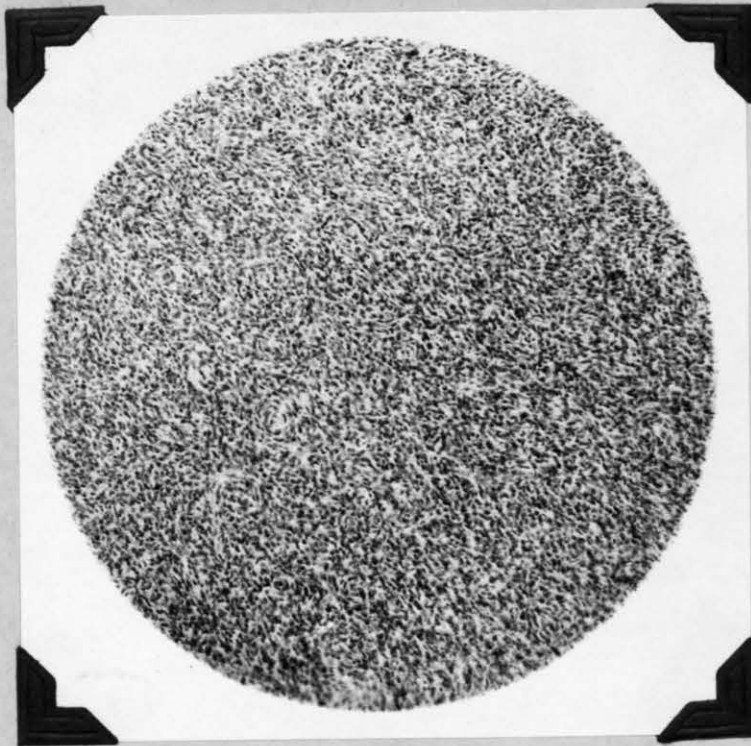


Fig. 2 (T.95) Fibrosarcoma of the Leg of a Dog.
Lower power view showing richly cellular character of the tumor.

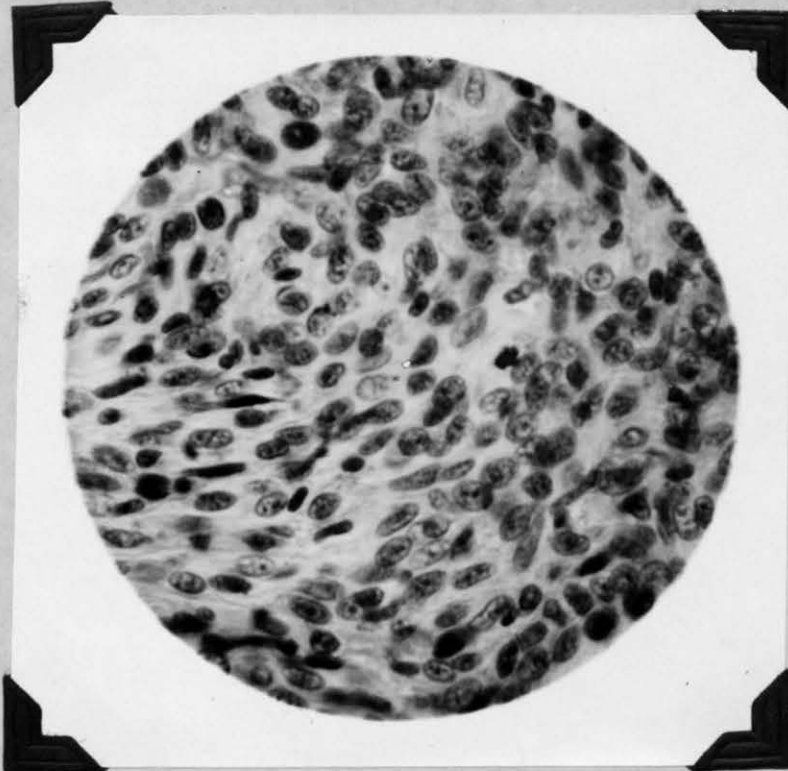


Fig. 3 (T.95) Fibrosarcoma of the leg of a dog.
High power photomicrograph of some material as Fig. 2, showing the embryonic appearance of the cells.

STUDY NUMBER NINE

TUMOR NUMBER 103

Fibrosarcoma -- Glans Penis of a Bovine.

This tumor was received from Dr. Geo. W. Cooper, Keenesburg, Colorado.

Clinical Data: The animal was a two year old Hereford bull. About eight months previous to its last removal a tumor about one inch in diameter was noticed on the distal portion of the penis. This was removed by the knife. The growth which had been removed twice before showed a tendency to reoccur and it became necessary to remove it the fourth time nearly nine months after the third operation. During the fourth removal the cautery was used in addition to the scapel. Before the last removal the growth nearly covered the end of the involved organ.

Gross Appearance: The mass was somewhat dome shaped and measured 7 cm. by 4 cm. at its greatest diameters. It had a semicircular depression at the base. The surface was quite uneven and ulcerated. (see Fig. 1) The tumor was quite compactly knit and was firm to the touch. The color was a dirty greyish white and a fresh cross section showed many small white strands of tissue running in every direction. A few fissures cut deeply into the mass from the surface. The growth apparently had been attached rather broadly to the underlying tissue of the penis. No capsule was present.

Microscopic Description: This tumor consisted largely of fibroblastic elements with the fibroblast abundantly present.

Study Number Nine--2

It presented many different phases of development from the young embryonic stage to the adult almost atrophic type. Collagen fibrils were abundant in some fields and scant in others. They were disposed in a tangled, twisted fashion so that a cross section of the tumor showed them cut at every conceivable angle. Some very large nuclei were seen in nearly every field. These were decidedly hyperchromatic, the chromatin granules staining very distinctly. While a great many suspicious forms were seen no instance of mitotic division was observed. At the edge, where the tumor was attached, columns of compressed atrophic epithelial cells were present. (see Figs. 2 and 3). These were, no doubt, remnants of normal epithelia of the region. The fibroblastic encroachment upon this tissue indicated something of the degree to which the tumour elements had united to the organ beneath. There was no attempt towards encapsulation. There was a little hemorrhage near the above mentioned epithelial remains but this was not extensive. Blood vessels were not numerous nor large.

Diagnosis: From the history, four removals, and the general appearance of this growth I am inclined to regard it as having malignant tendencies. While actual mitosis was not observed yet there were many other features suggestive of a malign disposition. The large number of cells compared to the matrix and the embryonic appearance of many of them are associated with the malignant forms of fibroblastoma. The apparent infiltrative

Study Number Nine--3

behavior of the tumor in the region of the epithelium of the penis also supports a diagnosis of malignancy as does the absence of a capsule. A fibrosarcoma.

Fibrosarcoma.



Fig. 1 (T.103) Fibrosarcoma.--
Glans Penis of a bull.

Gross Specimen showing the uneven
ulcerated surface.

Fibrosarcoma

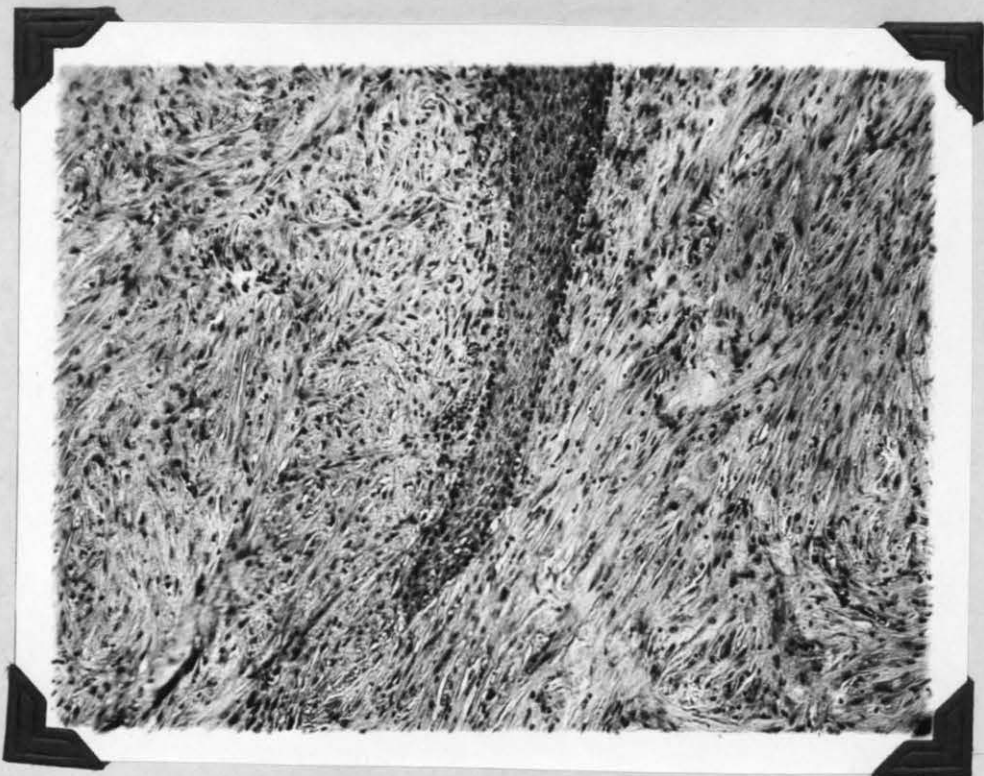


Fig. 2 (T.103) Fibrosarcoma.--Glans Penis of a Bull.

Low power photomicrograph showing the tumorous element surrounding a projecting column of epithelial cells.

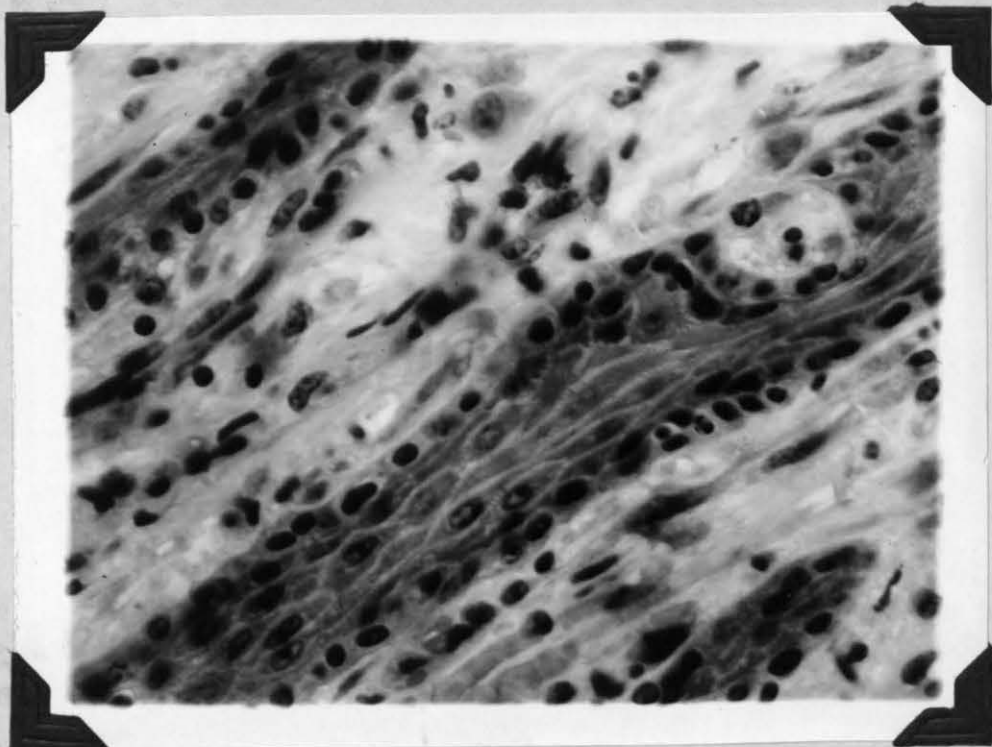


Fig. 3 (T.103) Fibrosarcoma.--Glans penis of a bull.

High power view of same material as figure two showing the column of compress atrophic epithelial cells.

STUDY NUMBER TEN

TUMOR NUMBER 125

Fibrosarcoma -- Vesico Genital Pouch of a Cow

This tumor was sent to our laboratory by Dr. Chas. Davis, Veterinary Inspector, U. S. Bureau of Animal Industry, Denver, Colorado.

Clinical Data: This was a packing house case. A cow, age and breed not stated, was slaughtered for food after having passed the usual ante mortem inspection. The carcass was in good condition and the only abnormality discovered was a large tumor involving the left vesico-genital pouch. This was removed and forwarded to our laboratory for a diagnosis.

Gross Appearance: The tumor was an elongated, somewhat cylindrical mass, 24 cm. long by 13 cm. in diameter. (see Fig. 1). It weighed 2200 grams. The surface, which was smooth, was covered by a capsule, and the mass was attached at one end by a pedicle. It was firm in consistence and greyish red in color. No cysts were found. A cut surface of the tumor presented a mottled appearance with greyish strands of dense fibrous tissue separating whorls of flesh pink tissue of variable diameters. The capsule appeared to be a deflection of the peritoneum.

Microscopic Description: This tumor consisted of fibroblastic elements arranged in a closely organized, compact manner. Fibroblasts were numerous but were not particularly large. The strands of collagen fibrils ran in every direction and many fields presented a tangled, twisted appearance. A definite stroma or framework was lacking. Mitotic figures were

Study Number Ten--2

abundant (see Fig. 2) as were blood channels. The blood passages were fairly large and of a very primitive structure. They consisted of a layer of endothelial cells resting directly on the collagen material, a basement membrane not being present. All of the vessels were empty due probably to the bleeding of the animal during slaughter.

Diagnosis: This is a type of fibroblastoma known specifically as fibrosarcoma. This case is of particular interest because of a number of unusual features. First, the location is unusual to say the least. This type of tumor must be of rare occurrence in the location occupied here. Second, the fact that the mass was pedunculated and encapsulated would probably account for the tumor being localized or limited in its effect. No doubt, in time it would have attained enormous dimensions and still have remained encapsulated. Again, a colony of actively proliferative tumorous cells with the body is a constant threat which may at any time destroy tissue so extensively as to endanger the life of the individual.

A malignant tumor whose structure constitutes a serious obstacle to its fullest development.

Fibrosarcoma



Fig. 1 (T.125) Fibrosarcoma of the vesico genital pouch of a cow.
Cut surface showing mottled appearance.

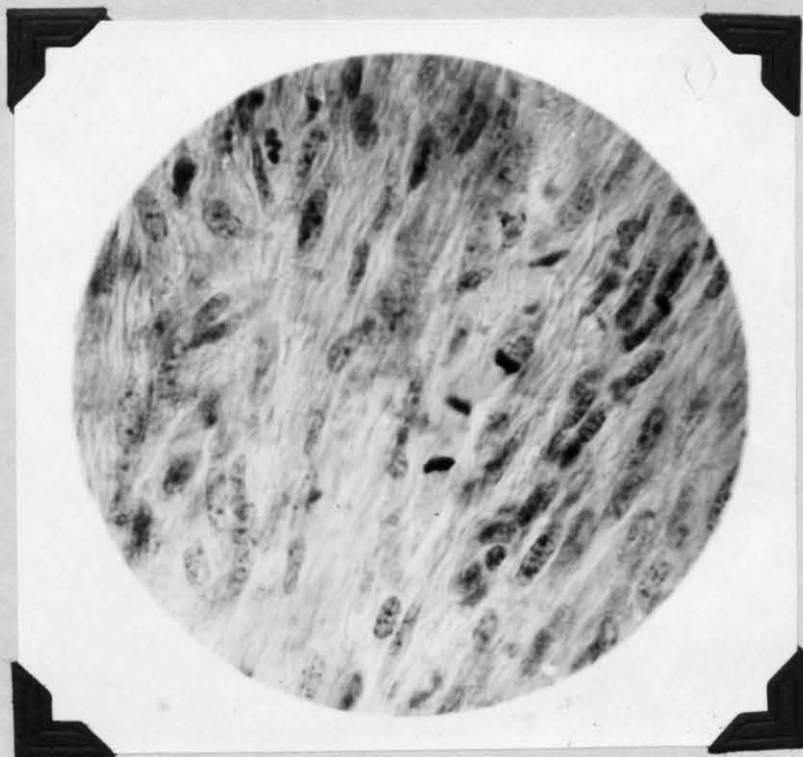


Fig. 2 (T.125) Fibrosarcoma of the vesico genital pouch of a cow.
Photomicrograph of a high power view showing mitotic figures.

STUDY NUMBER ELEVEN

TUMOR NUMBER 161

Fibrosarcoma -- Concha of a Horse

This was a case of Dr. H. E. Kingman's, Fort Collins, Colorado.

Clinical Data: The subject was a nine year old draft mare; color, white. One year previous to the admission of the animal to the Veterinary Hospital the owner observed a small nodular swelling at the lower external, posterior border of the concha (see Fig. 1). This grew rather slowly until it was finally removed surgically. Considerable evidence of vascularity was noticed during the operation.

Gross Appearance: The growth was somewhat conical shaped and was as large as a big apple, measuring from the base to the peak 8 cm., while its greatest transverse diameter was 6.8 cm. The mass weighed three hundred grams and was very firm to the touch. The base of the tumor was covered with hair but the bulk of the surface was hairless and very much roughened and lobulated in appearance. The surface gave off a thin discharge. The interior of the growth showed some well defined cysts of small capacity in the lower portions of the mass. These apparently had no excretatory ducts. In color the tumor was a dark brown to black externally, while the interior was a yellowish white.

Microscopic Description: This was a highly cellular connective tissue new growth in which the type cell was the fibroblast. The tumor consisted of a few broad fibrous septa in which

Study Number Eleven--2

were found the larger vessels. Between these fibrous structures fibroblasts were arranged in a diffuse manner with finer strands of connective tissue scattered through most of the tissue parenchyma. The fibroblasts were rather embryonic in type and were oval to spindle shaped. Most of the nuclei were oval in contour and some possessed an excessive amount of chromatin. Mitosis was a common feature and eosinophiles and lymphocytes were frequently observed. In the midst of the tumor parenchyma smaller blood channels could be seen, all of which were filled. A considerable portion of the tumor showed small clear spaces between the cells which were suggestive of fluid. A number of well defined cystic cavities were filled with a pink homogeneous substance. These were very irregular in outline and were not lined by a special type of cell. In fact, lining cells, as such, were absent, the cells of the tumor parenchyma being in contact with the contents of the spaces but without a lining arrangement. These openings were probably filled with the secretion from some skin gland due to the natural secretory outlet being occluded by advancing neoplastic tissue.

Diagnosis: We have here a malignant connective tissue tumor in which the type cell is the fibroblast. Such a growth would be called a fibrosarcoma. This study is of particular interest because of the tumor's location.

Fibrosarcoma



Fig. 1 (T.161) Fibrosarcoma.--
Concha of a Horse.

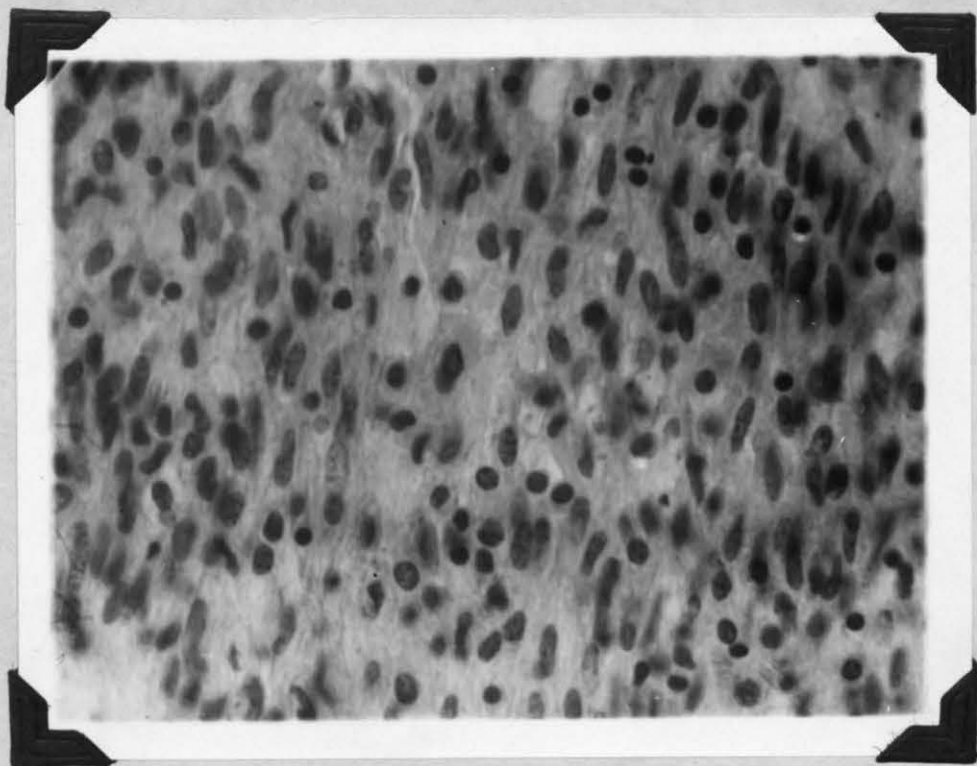


Fig. 2 (T.161) Fibrosarcoma.--Concha of a Horse.

High power photomicrograph showing the embryonic fibroblasts arranged in a diffuse manner.

STUDY NUMBER TWELVE

TUMOR NUMBER 13

Myxofibroma -- Mediastinum of a Dog

This case is from the practice of Dr. M. J. Woodliffe, Denver, Colorado.

Clinical Data: The subject was a male Spitz dog about six years old. About one year before the dog was destroyed he showed symptoms of labored breathing. He gradually got worse and was finally destroyed upon the advise of the veterinarian. At the post-mortem examination a large mass was found in the mediastinum. The tumor was so large as to push the lungs to the sides of the thorax. The growth had a lardaceous appearance and clinically it was diagnosed as a lipoma.

Gross Appearance: The mass weighed 1440 grams (about three pounds) and the portion received at the laboratory was covered by a white glistening capsule which was firmly attached to the underlying tissues. The mass was somewhat greasy or lard-like to the touch. Where it was cut it had a streaked appearance, small faintly yellow areas being mixed with the greyish white which made up the bulk of the tumor.

Microscopic Description: Under the low power a distinct connective tissue capsule of considerable thickness was evident. This merged directly into highly cellular tissue of a fibroblastic nature. In ill defined areas scattered promiscuously throughout the tumor were fairly large clear areas that took a faintly pink stain with eosin. (see Fig. 1). This sub-

Study Number Twelve--2

stance was not of the same density in its entirety but varied in its compactness considerably. Some well formed blood vessels were present in the connective tissue stroma.

Under the high power objective the cellular areas were composed of cells very similar in appearance to fibroblasts (see Fig. 2). The majority were oval and spindle shape and a minimum amount of collagen material was present. Mixed in with the tumor cells were large numbers of small round cells with intensely stained nuclei. Some of these resembled lymphocytes while others possessed the identifying features typical of plasma cells. A few endothelial leucocytes were also present.

The light pink staining areas appeared to be made up of a mucous substance and consisted of a fibrillar material layed down in an irregularly twisted fashion. A few tumor cells were found in these areas. They appeared to be less elongated than those encountered in the areas apart from the mucous material. The presence of the round cells was noted in the mucous areas although they were less abundant. In the mucous substance were also observed small concentric calcium deposits.

Diagnosis: This is a tumor made up of the products of the fibroblastic cells which produced mucin in addition to the usual collagen, fibroglia and elastic fibrils. The difficulty here lies in the attempt to differentiate primary myxoma from a fibroma that was undergoing a mucous degeneration. However, the type cell differs so little that it appears to me that this tumor

Study Number Twelve--3

could well be called a myxofibroma. There was nothing to indicate a progressive malignancy, the danger from this tumor being in its mechanical interference with the organs of respiration.

Myxofibroma

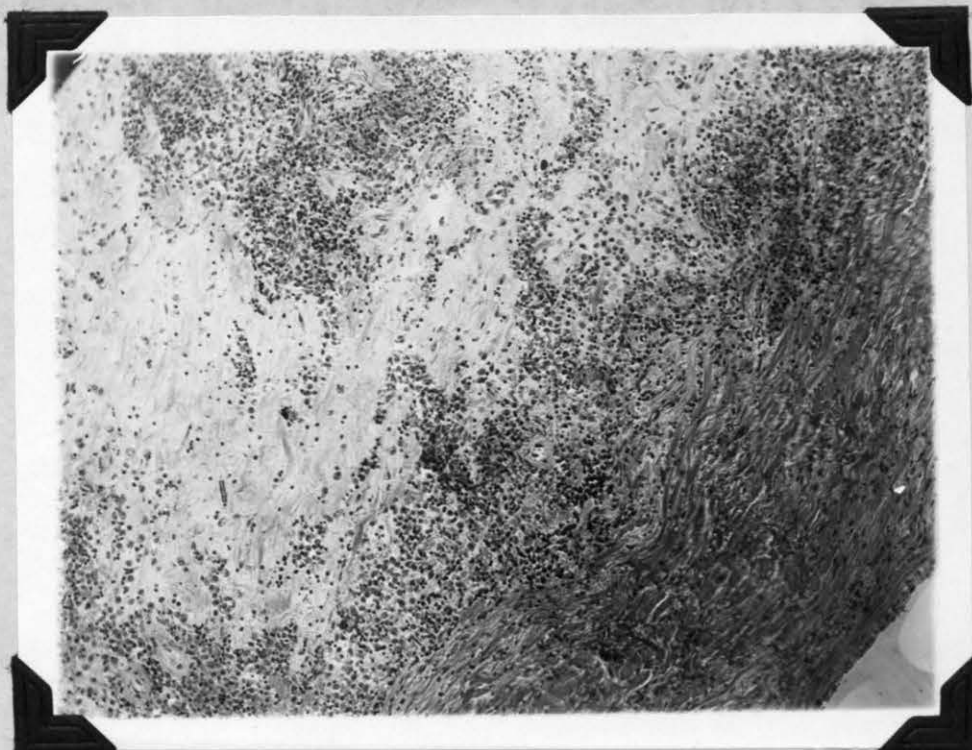


Fig. 1 (T.13) Myxofibroma of the Mediastinum of a dog.
Low power photomicrograph showing the mucinous substance under the thick fibrous capsule.

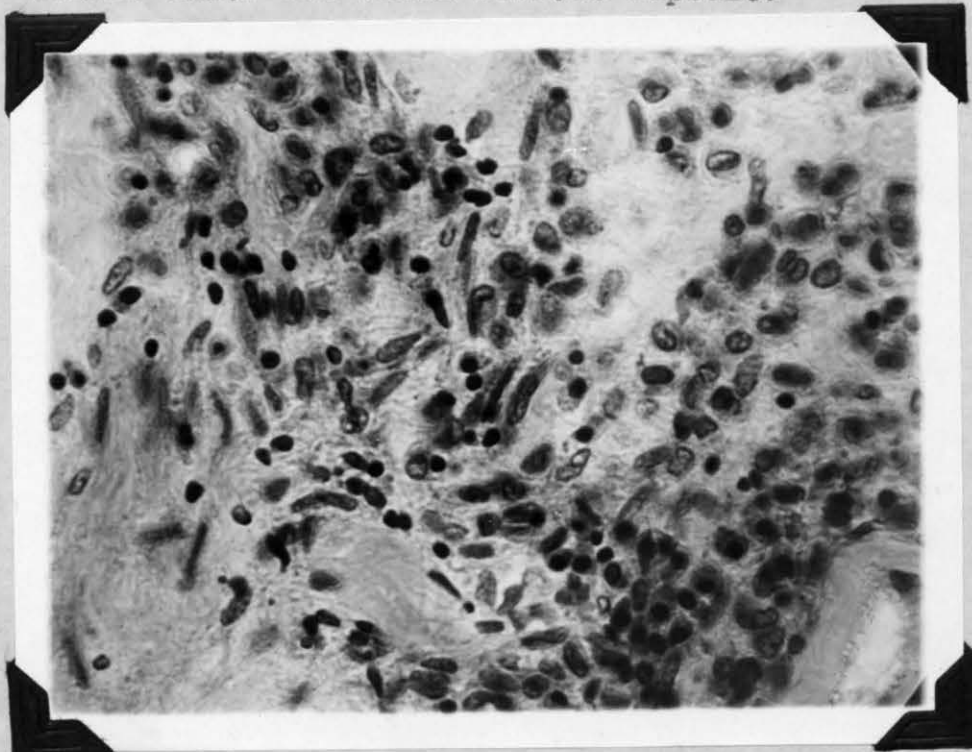


Fig. 2 (T.13) Myxofibroma of the Mediastinum of a dog.
High power view showing the character of the cells.

STUDY NUMBER THIRTEEN

TUMOR NUMBER 42

Lipoma -- Hip Joint of a Dog

This material was from a case in the practice of Dr. James Farquharson, Fort Collins, Colorado.

Clinical Data: The animal was a three year old male dog of a sable and white color. Sometime before the tumor arose the animal fell out of an auto and struck the region of the left hip on a piece of wood. In passing in and out of the owner's home the part was also subjected to more or less trauma from the screen door. A tumor developed under the skin over the left hip joint and extended into the fatty tissues between the muscles. This was removed surgically.

Gross Appearance: The mass, which was oval in shape, measured 7.5 cm. x 6 cm. and weighed 85 grams. It was fairly firm to the touch and when cut showed a grayish-white color. The surface was slightly ulcerated, probably due to the constant abuse from the screen door. The tumor had a greasy appearance and the blade of the knife used to cut it had grease or fat deposited upon it after passing thru the tissue.

Microscopic Description: This material was preserved in ten per cent formalin and portions were removed and sectioned on the freezing microtome. These were afterwards stained with Scharlach R for microscopic study. The tissue gave the typical yellowish red reaction for fat. Some attempt at a lobular arrangement was evident. Interposed between the lobules were

Study Number Thirteen--2

strands of a very fine fibrillar connective tissue. The fat cells were rather large, polyhedral structures that were loaded to capacity with fat. The cell outlines were very distinct but nuclei were not apparent. Upon rupture of the cell walls a great number of fat globules of varying size were released. No blood vessels were seen.

Diagnosis: Subcutaneous lipoma.

Note.--This material did not lend itself to the preparation of suitable slides for photographs.

STUDY NUMBER FOURTEEN

TUMOR NUMBER 121

Subcutaneous Lipoma -- Horse

This material was sent to our laboratory by Dr. George W. Rueter, Berthoud, Colorado.

Clinical Data: The animal was a three and one-half year old Percheron gelding. When the animal was about one year old an abscess occurred over the hip joint. This was drained and apparently healed. Some time later the horse received a kick in the region where the abscess had formed and apparently as a consequence of the trauma a "bee hive" or dome shaped circumscribed swelling developed which eventually reached a diameter of 15 to 18 inches. This was removed and the animal made an uneventful recovery and, to date (eighteen months later) it has not recurred.

Gross Appearance: The growth was located under the skin and was in contact with connective tissue over most of its surface. It was white in color and quite firm to the touch. The tissue had a decided fatty appearance and imparted a greasy film to the blade when cut with a knife. At the time of removal the tumor appeared to be quite vascular.

Microscopic Description: This tumor had a very simple construction consisting of large fat cells and a few delicate strands of connective tissue quite irregular in their distribution. Most of the fat cells were polyhedral in shape and of a rather large size (see Fig. 1). No embryonic types were seen. A definite blood supply could not be determined which was unusual in

Study Number Fourteen--2

view of the vascularity reported in the clinical sheet. A few foci of small lymphocytes were seen.

Diagnosis: This is a tumor consisting of adipose tissue and is properly called a lipoma. The cause of this tumor permits of some speculation and one cannot ignore the influence of trauma in explaining its origin. Ewing (1) remarks that congenital tissue predisposition appears to be an important factor in the origin of most lipomas and that trauma often acts as the exciting feature in subjects with a local or general predisposition. In this case we observed first, an abscess in the location where the tumor developed. This healed. Second, the animal suffered a kick in the same area after which the tumor developed. While a predisposition on the part of the tissues to proliferate beyond the limits of propriety cannot be proven, yet by assuming it may have existed, the part played by trauma becomes a role of importance. The facts in this study at least tend to support this explanation. A lipoma.

Ref.--(1) Ewing, James. Neoplastic Diseases (1919) p. 176. W. B. Saunders Company, Philadelphia, Pa.

Lipoma



Fig. 1 (T.121) Subcutaneous lipoma of a horse.

Low power photomicrograph showing the large polyhedral fat cells.

STUDY NUMBER FIFTEEN

TUMOR NUMBER 30

Leiomyoma -- Wall of Uterus of a Hen

This was a laboratory case.

Clinical Data: The carcass of a hen that had been dressed for cooking was brought to the laboratory to determine the nature of a nodular out growth in the wall of the uterus. The carcass was that of a well developed bird in apparent health at the time of slaughter.

Gross Appearance: The tumor was spherical in shape, gray in color and weighed 36 grams. In diameter it measured 5 cm. The mass was encapsulated and attached to the oviduct by means of a pedicle. A cross section of the tumor presented a peculiar formation made up of definite strands of light colored tissue interlaced with each other in a fantastical manner. These strands were somewhat loosely arranged with spaces of variable sizes existing between them. The mass was rather soft to the touch.

Microscopic Description: Sections prepared from this material showed the same openness of structure that was observed in the gross specimen. The tissue proper had a rather compact texture and was in the form of bundles which were presented in both a longitudinal and transverse manner. (see Fig. 1). Because of the location of this neoplasm a smooth muscle tumor was suspected but with the ordinary hemotoxylin and eosin stain it was impossible to definitely determine if I was dealing with a leiomyoma or a myofibroma. Fresh sections were cut and stained by

Study Number Fifteen--2

Van Gieson's method and the true character of the growth became evident. The various bundles or units making up the tumor stained a light yellow which was typical for smooth muscle when treated with Van Gieson's stain. These were separated from one another by irregular strands of tissue which stained a bright cherry red by the above method indicating this to be fibrous connective tissue. (see Fig. 2). Blood channels were quite frequent and were located in the connective tissue between the muscle bundles. These channels varied in size from small arteries to minute capillaries and ran parallel to the muscle bundles. The individual cells of the tumor were oval in shape with a rather clear cytoplasm containing a small nucleus that failed to stain well and which contained a few minute chromatin granules. No evidence of mitosis or other features of malignancy were seen.

Diagnosis: This is a tumor made up of elements of smooth muscle and should be called a leiomyoma. A non-malignant growth.

Leiomyoma



Fig. 1 (T.30) Leiomyoma.--Wall of the uterus of a hen.
Low power photomicrograph.



Fig. 2 (T.30) Leiomyoma.--Wall of the uterus of a hen.
Low power photomicrograph of a section stained by Van Gieson's stain. The darker strands of connective tissue are clearly shown.

STUDY NUMBER SIXTEEN

TUMOR NUMBER 33

Leiomyoma -- Lining of Uterus of a Cow

This material was received from the laboratory of the U. S. Bureau of Animal Industry, Denver, Colorado.

Clinical Data: The record in this regard is somewhat lacking. According to the available information a cow from the Star Valley in Qyoming was shipped to Denver for slaughter. A post-mortem examination of the uterus showed the interior of this organ to contain a large number of tumors ranging in size from a walnut to half the size of a man's head.

Gross Appearance: The data describing the gross features of this tumor was even more meager than that pertaining to the clinical history. Further than indicating that the growths were variable in size, as indicated above, and were oval in shape with a smooth surface, very little that was descriptive of the neoplasms was available. In color they were a very light yellow and of a firm tough consistency. A well define capsular covering was present which stripped off with difficulty.

Microscopic Description: Sections were stained with hemotoxylin and eosin and by Van Gieson's stain. The latter showed by far the greatest differentiation and consequently were chosen for the microscopic study of this specimen. The tumor was rather simple in structure, consisting of strands of smooth muscle tissue (stained light yellow by Van Gieson's) interlaced with rather coarse collagenous fibrils (stained light red by Van Gieson's). The connective tissue was very irregular-

Study Number Sixteen--2

ly disposed as to its relationship with the muscle tissue but was quite evenly distributed throughout. The muscle cells had a peculiarly pinched appearance and were somewhat spindle shaped. (see Fig. 1). Most of the nuclei were about two and one-half to three times as long as broad. Some, however, were a great deal longer and resembled an oat kernel in contour (see Fig. 2). The nuclei took a deeply basic stain. Chromatin granules were not discernible by either of the staining methods used. Both collagen and muscle fibrils were laid down in wavy bundles and were in very intimate contact with each other. A generous blood supply was insured by many small vessels and capillaries found for the most part in the substance of the connective tissue of the tumor. There was no evidence of any malignant tendencies.

Diagnosis: The reaction of the tissue when subjected to Van Gieson's stain together with the location of the growths and the arrangement of the histological elements would class this neoplasm with the myomas or muscle tumors. Since there was complete absence of any striations and as the tumors probably arose from the muscular elements of the uterus the term leiomyoma would be fitting. Tumors from this region are often designated clinically as myofibromas or as fibromyomas, these terms being used to indicate that the tumor consisted of a mixture of fibroma and myoma. It is likely that if every tumor that is clinically a myofibroma were examined by appropriate staining methods that a goodly number would be designated as simple lei-

Study Number Sixteen--3

myomas. It is my opinion that the fibroblastic elements of this tumor (No. 33) are not in sufficient quantity to influence its classification. I would call this a leiomyoma.

From the clinical data one would surmise that we were dealing with a multiple manifestation of this neoplasm. However, since there was no opportunity to examine any of the other formations their exact identity will have to remain a matter of conjecture.

Leiomyoma

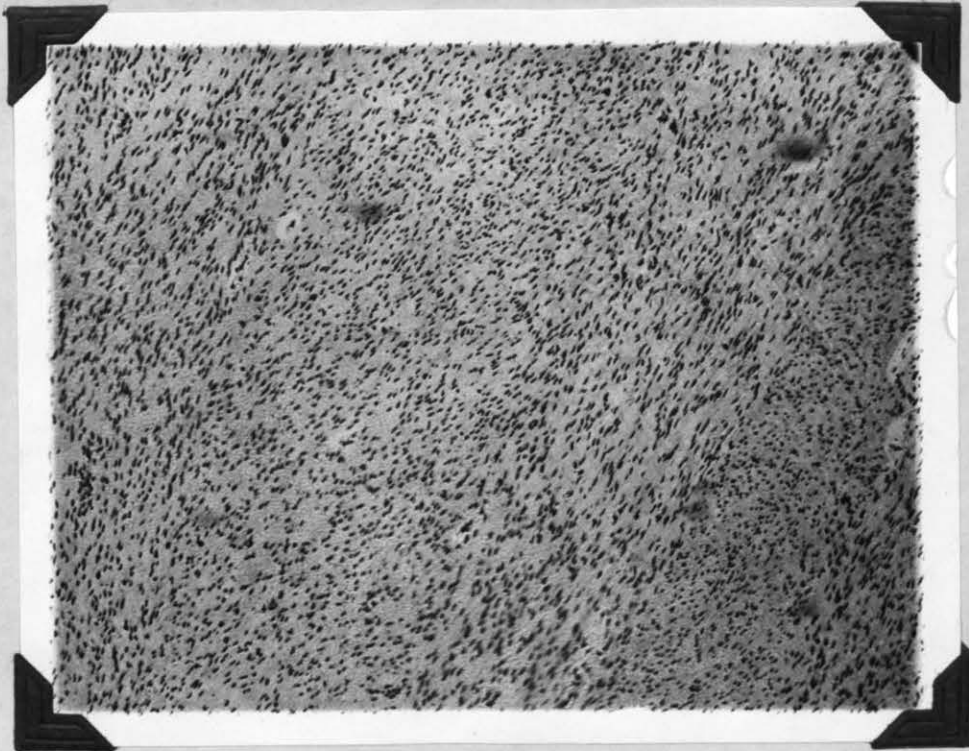


Fig. 1 (T.33) Leiomyoma of the lining of the uterus of a cow.
Lower power photomicrograph.

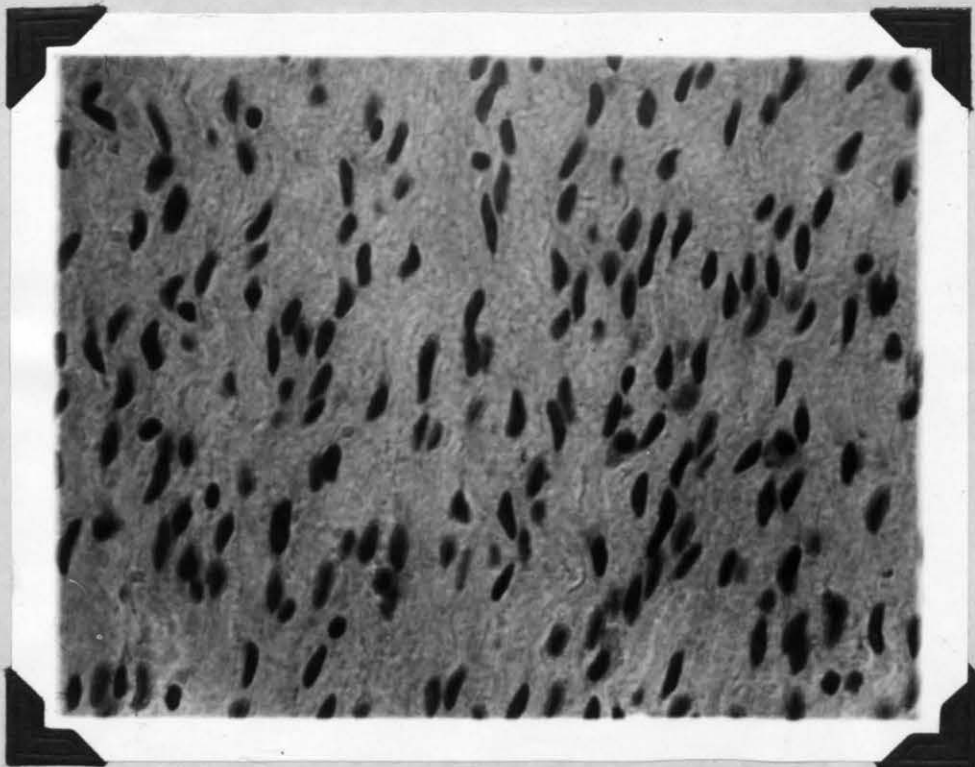


Fig.2 (T.33) Leiomyoma of the lining of the uterus of a cow.
High power photomicrograph showing the compact structure of the neoplastic tissue and the oat kernel contour of the nuclei.

STUDY NUMBER SEVENTEEN

TUMOR NUMBER 159

Leiomyoma -- Uterus of a Bovine

A tumor received from Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: A three year old Hereford cow was presented for slaughter after having passed the usual ante-mortem inspection. When the carcass was eviscerated a large tumorous mass was found in the anterior uterine wall. No other abnormalities were detected.

Gross Appearance: The mass was flesh pink in color and rather soft in consistency. A capsule surrounded the growth which was imbedded rather firmly in the connective tissue of the uterus. It was somewhat spherical in its general contour and had a diameter of 4.5 cm. The surface of the mass was smooth and the growth appeared quite vascular. It was not weighed.

Microscopic Description: This was a very cellular structure with the outlines of the individual cells difficult to discern. The cytoplasm of the cells stained acidophilic. By Van Gieson's stain great numbers of delicate fibrils were seen to be present running longitudinal to the long axis of the cell which was elongated or somewhat spindle shaped. The nuclei were rather small and of a uniform slender oval appearance (see Fig. 1). They contained a large number of fine granules evenly scattered throughout. The cells and their products resembled those of smooth muscle and this was further substantiated by the reaction to Van Gieson's stain. By this method one could see many coarse

Study Number Seventeen--2

collagen fibrils intertwined with those of muscle cells. The cells were organized into units or bundles which ran in every direction and a cross section showed the cells to be cut at every conceivable angle. Large strands of connective tissue appeared promiscuously and served as a stroma for many well formed blood vessels all of which were filled. No mitotic figures were seen.

Diagnosis: We have here a tumor whose type cells tend to differentiate into smooth muscle cells and in the absence of any evidence of aggressiveness I would designate this as a leiomyoma.

Tumors of this kind are difficult to differentiate from fibroblastomas and usually special stains such as Van Gieson's are necessary before one can be sure of the tumor in question. In the human, leiomyoblastomas of the uterus are among the largest encountered by the surgeon. It is for this reason that this tumor is of some interest.

Leiomyoma

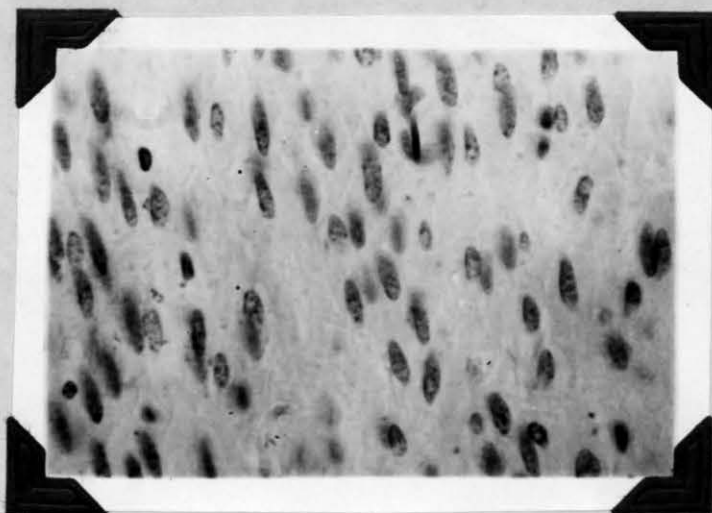


Fig. 1 (T.159) Leiomyoma of the uterus of a bovine.

High power photomicrograph showing the slender oval nuclei.

STUDY NUMBER EIGHTEEN

TUMOR NUMBER 22

Multiple Hemangio-Endothelioma -- Skin of a Cow

This was a tumor from the practice of Dr. J. R. Grigsby, Wray, Colorado.

Clinical Data: The animal was a six year old brindle cow. Three months previous to the animal's death small multiple circumscribed nodular swellings were observed under the skin. At the time of the animal's death five nodular formations were found at various places over the surface of the body. Except for a very severe cough, the animal's condition was good in the early period of the disease but rapidly declined until the end. It was also observed that there was a lessened milk secretion as the disease progressed. The tumor received at the laboratory was removed from under the skin of the flank. Unfortunately the carcass of the animal was not opened for examination. A letter from the owner stated that the animal died from the effects of the removal of the tumor.

Gross Appearance: The growths were quite variable in size but there was no specific information as to their exact measurements. In fact, practically no data was available on the clinical sheet relative to the macroscopic description of these tumors. The material received was of a gray color, quite soft to the touch; and the outer portion was in contact with a capsule which could be peeled off without difficulty.

Study Number Eighteen--2

Microscopic Description: This tumor presented a very interesting type of structure made up of a rather peculiar cells. In general one might say that there were two types of architecture represented, one in which the cellular elements assumed a rather compact form of structure and one in which the elements were arranged in such a manner as to form spaces or cavities of variable sizes and shapes. Perhaps some of these so-called cavities were spaces once occupied by the subcutaneous fat. However, since the material had all been preserved in alcohol for a time, it was not suitable for the application of a specific fat stain. (see Fig. 1).

A high power study of the type cell revealed a structure quite similar in many respects to the ordinary endothelial or mononuclear leucocyte. They had well defined cell outlines with acidophilic cytoplasm and crescent or horse-shoe shaped nuclei. While the type of cell just described was in predominance other shapes were common. Many were smaller with spherical nuclei and a great many others had elongated or spindle shaped nuclei. Intercellular stroma was scant and appeared mostly between the rows of tumor cells lining the cavities or spaces (see Fig. 2). Many of the tumor cells lining these open structures were distinctly spindle-like in contour, while others were flattened like vascular endothelium. The number of rows of cells constituting the walls of the open spaces varied from one

Study Number Eighteen--3

to many (see Fig. 2). Some red corpuscles were seen scattered among the cells and some of the larger cavities were filled in such a manner as to suggest thrombi of the organized variety. No mitotic division of any of the cells was observed.

Diagnosis: This tumor does not belong to those neoplasms whose histological makeup renders clean cut diagnoses as to their true identity. The type cell is unusual in my experience. After due consideration I believe we have here a tumor belonging to a somewhat complex class of new growths known as endothelioblastoma. The general appearance of the cell and its architectural behavior would indicate that it had a common origin with the endothelium of the blood vessels. This view is further substantiated by Ewing's (1) observation that multiplicity is a common characteristic of endotheliomas. The tumors in this case were many and distributed over a good share of the body. In the absence of information to the contrary I feel that this tumor should be called a hemangio-endothelioma. There was no large amount of blood present such as one would expect in a tumor of this name, however, Ewing remarks that blood may be absent in these tumors due to some factor interfering with the circulatory supply. Mallory (3) holds that this type of tumor occurs most frequently in the skin and subcutaneous tissue and that they appear to rise (4) within the larger blood vessels. As to the etiology of these multiple growths, Ewing (5) presents

Study Number Eighteen--4

the opinion that they develop from adult endothelium under the influence of chronic irritation.

As to the possible exciting forces in the case at hand nothing can be offered. Possibly a congenital predisposition may have been an important factor. The study of this case during the life of the animal might have shed some light on a number of interesting points.

Ref.--(1) Ewing, James. Neoplastic Diseases, p. 300. W. B. Saunders and Co., Philadelphia (1919).

(2) Ewing, James. Neoplastic Diseases, p. 297. W. B. Saunders and Co., Philadelphia (1919).

(3) Mallory, F. B. The Principles of Pathologic Histology, p. 319. W. B. Saunders and Co., Philadelphia (1914).

(4) Mallory, F. B. The Principles of Pathologic Histology, p. 317. W. B. Saunders and Co., Philadelphia (1914).

(5) Ewing, James. Neoplastic Diseases, p. 303. W. B. Saunders and Co., Philadelphia (1919).

Hemangio-Endothelioma

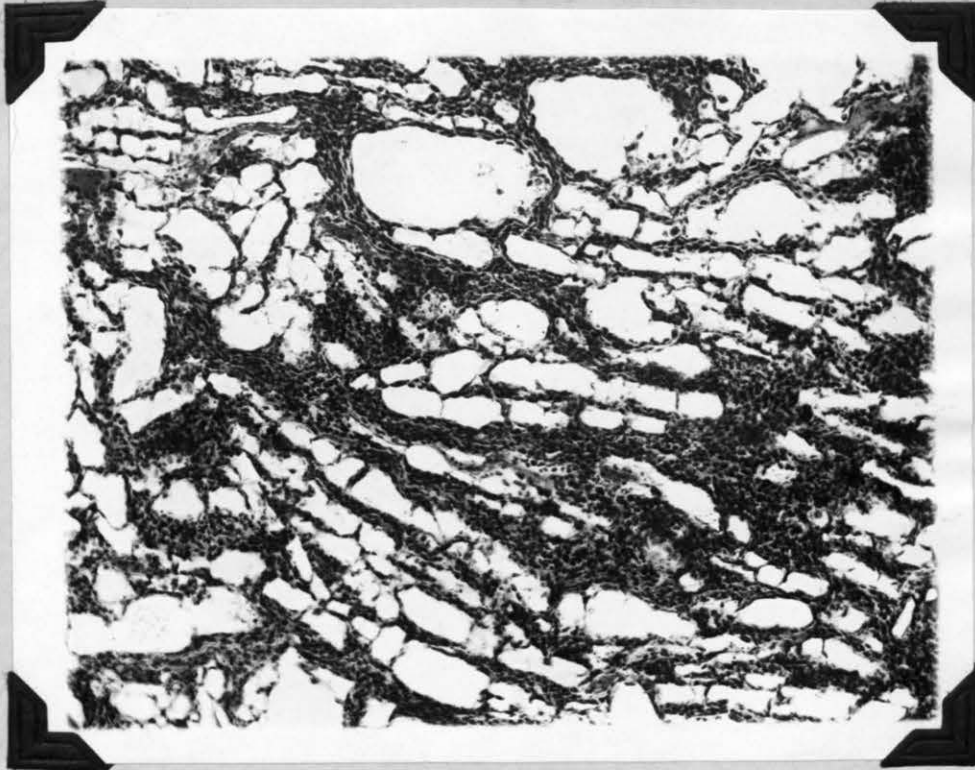


Fig. 1 (T22) Hemangio-endothelioma.--Skin of a cow. Low power photomicrograph showing the spaces between the cellular elements of the tumor.



Fig. 2 (T. 22) Hemangio-endothelioma.--Skin of a cow. High power photomicrograph showing the tendency on the part of the tumor cells to produce spaces or cavities.

STUDY NUMBER NINETEEN

TUMOR NUMBER 114

Malignant Endothelioma -- Thoracic Wall and Lungs of Dog

The data on this study was made available through the courtesy of Dr. I. E. Newsom. A clinical report of the case appeared in the Jl. Amer. Vet. Med. Assn., Vol. 52, p. 703, 1917-18 under the joint authorship of Drs. Newsom and Kingman.

Clinical Data: The animal was an old shepherd dog. He had a habit of nosing the screen door open and as he passed through, the door, which was equipped with a rather stiff spring, usually struck the animal a sharp blow on the right side of the chest wall. A circumscribed swelling, which was first noticed by the owner four months previous to the animal's death, gradually developed over the right thoracic area.

A small cannula was thrust into the enlargement from which a stream of blood escaped. While the cannula was permitted to remain in the mass for some minutes, during which time blood continued to flow, the tumor showed no diminution in size. To quote direct from Drs. Newsom and Kingman's report, "The animal was anesthetized and Monsel's solution was injected through the cannula. The tumor was then dissected out with very little hemorrhage resulting. Because of the enormity of the denuded area and the age of the animal, destruction was advised and carried out."

A post-mortem examination showed the lungs to be studied with a multiple nodular formation and a large tumor was found in the posterior mediastinum.

Study Number Nineteen--2

The thoracic and mediastinal tumors as well as the lung nodules presented the same gross appearance. No other lesions were discovered.

Gross Appearance: The thoracic tumor measured about 20 cm. in width, 35 cm. in length and 11 cm. in thickness. It was located under the skin and was quite soft in consistency except for a small area in the posterior portion. It was apparently firmly attached to the tissues of the involved part. The lungs were greatly altered in appearance due to their extensive involvement by nodules of variable size. These swellings varied in their diameters from 0.2 cm. up to 5 cm. They were promiscuously distributed throughout all portions of both lungs and the majority were elevated to a considerable extent above the surface of the organ. (see Fig. 1). The nodules were covered by a deflection of the pleura.

The mass in the mediastinum was nearly the size of a man's fist and was oval or oblong in shape. It possessed a capsular covering.

Microscopic Description: (Note.--The only material I had the opportunity of studying was sections made from the large tumor on the wall of the thorax.) Broad connective tissue septa were given off from the capsular structure and gave the material a lobulated appearance. The compartments thus formed were occupied by endothelial cells resting upon a minimum amount of stroma.

Study Number Nineteen--3

The tendency on the part of the endothelial cells was to form cavities varying in size from small alveolar-like spaces to large cavernous openings, many of which were filled with blood although the majority contained a serous-like fluid (see Fig. 2). Many of the fields were extremely cellular and the proliferation of the endothelial cells so profuse as to almost completely fill the cavity. The cells of many of these cavities appeared to push into the lumina from one side, and by gradually proliferating to eventually fill most of the interior but still retaining union with the parent cells by a neck or isthmus (see Fig. 3). Most of the spaces in the more cellular portions were lined by a fold-like deposition of the endothelial cells in a single layer and as a consequence these spaces were very irregular as to size and shape, many of the openings appearing as mere slits (see Fig. 4). Mitosis was an interesting and common feature in those fields showing the greatest cellular constituency.

The type cell was oval or polyhedral depending upon the position it occupied, where in a single layer, lining a cavity, or in a diffuse nest-like mass with others. It was a fairly large cell whose cytoplasm was clear and inclined to take a slight basic stain. The nuclei were large and for the most part oval in shape and possessing considerable chromatin in the form of fine granules.

The blood supply to the mass was by way of large well developed vessels in the fibrous septa. Most of the blood con-

Study Number Nineteen--4

tained in these vessels and in the spaces formed by some of the endothelial cells were much changed from the normal. A good deal of it appeared to be undergoing necrotic changes which perhaps may have been due to the large amount of Monsel's solution used before the operation.

Diagnosis: We are dealing here with a tumor whose cells tend to form cavities some of which contain blood while many do not. This feature and the general plan of structure presented assist in arriving at a diagnosis of endothelioblastoma. The clear cytoplasm mentioned by Ewing (1) I did not find and the flattened cells said by Mallory (2) to be a prominent feature of this class of tumors were not present in large numbers. The tendency of many of the cavities to send papillary projecting masses of cells into the lumina which was a striking feature in this material is also mentioned by Mallory as a feature rarely occurring in this type of tumor.

There can be no question about the malignancy of this growth since the abundance of mitotic figures and the infiltrating tendency of the cells as well as their tendency to pile up in diffuse masses readily explains the lung and mediastinal lesions. The remarkable thing is that the liver and kidney were apparently free of any involvement.

As to the histogenesis, one cannot help being impressed with the possibility of the disease arising as a direct con-

Study Number Nineteen--5

sequence of the constant trauma from the screen door mentioned in the history. The initial lesion was perhaps a bruised and ruptured capillar or venule which after repeated attempts at regeneration eventually assumed an independent manner of growth which became more aggravated and unrestrained with each succeeding injury. Metastasis to the lungs was probably via the blood stream. Perhaps the mediastinal tumor arose from the lung foci. A malignant endothelioma.

Ref.--(1) Ewing, James. Neoplastic Diseases, p. 300. 1919. W. B. Saunders Company, Philadelphia.

(2) Mallory, Frank B. The Principles of Pathologic Histology, p. 310-312. 1914. W. B. Saunders Company, Philadelphia.

Endothelioma



Fig. 1 (T.114) Malignant Endothelioma.--
Thoracic Wall and lungs of a dog.

Photograph showing the distribution of the
tumors throughout the lungs. (Photographed
by Dr. Edward Alkire.)

Endothelioma.

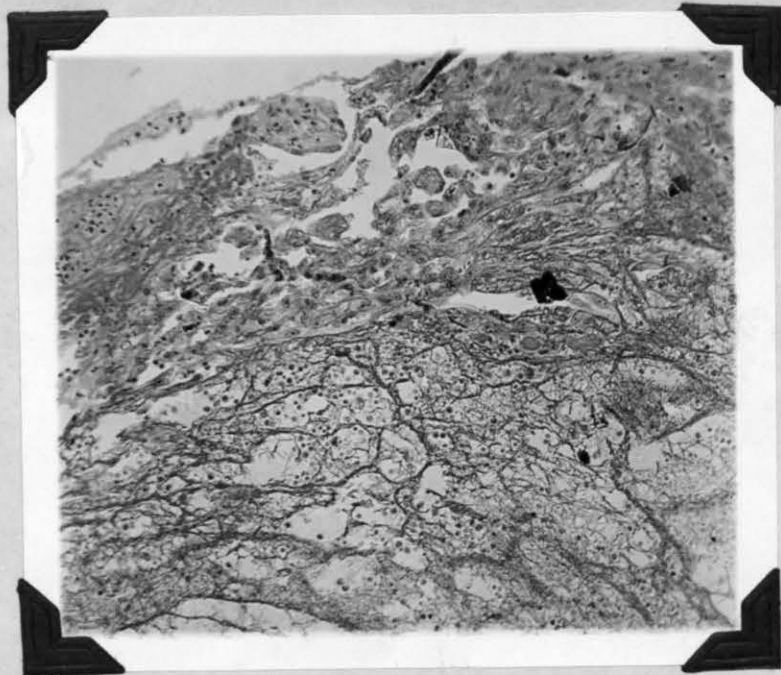


Fig. 2 (T.114) Malignant Endothelioma.--
Thoracic Wall and lungs of a dog.

Low power photomicrograph showing the tendency
to form alveolar spaces (Photomicrographed by
Dr. Edward Alkire.)

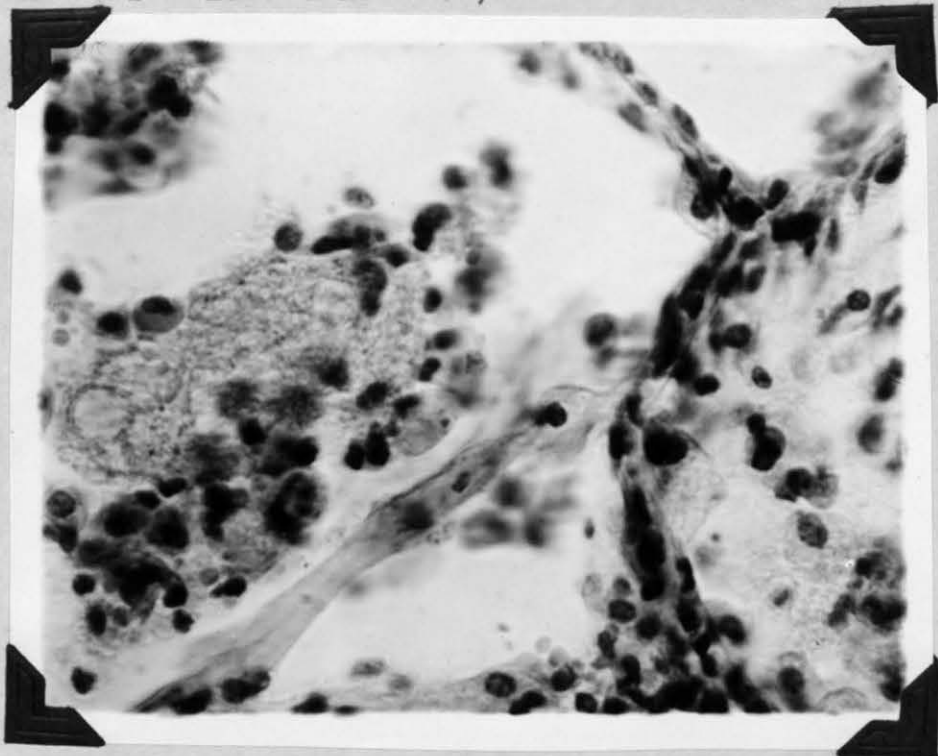


Fig. 3 (T.114) Malignant Endothelioma.--Thoracic
wall and lungs of a dog.

Photomicrograph showing endothelial cells occupying
an alveolar space.

Endothelioma



Fig. 4 (T.114) Malignant Endothelioma.--Thoracic wall and lungs of a dog.

Photomicrograph showing the overgrowth of the tumor cells with many of the alveolar openings appearing as slits.

STUDY NUMBER TWENTY

TUMOR NUMBER 133

Subcutaneous Malignant Endothelioma -- Mouse

Material for this study was received from Dr. Louise G. Rabinovitch of Golden, Colorado.

Clinical Data: This was one of a number of tumors Dr. Rabinovitch saw develop in experimental mice, which had been fed a certain ration. The incidence of tumors in mice fed exclusively on this ration was so frequent as to lead Dr. Rabinovitch to believe that the growths developed as a direct result of the diet. Due to lack of control conditions this contention cannot at this date be substantiated.

The animal was a large white mouse with an irregularly shaped nodular growth on the antero-lateral portion of the hip, just posterior and slightly above the flank. The growth was covered with hair and was firmly adherent to the underlying tissue. The mouse was chloroformed and the tumor removed. It proved to be highly vascular and considerable hemorrhage resulted when the mass was incised. The mass was handled aseptically and placed in a sterile salt solution and macerated preparatory to the injection of bits of the tissue into other mice in an attempt at transplanation. Ten mice were inoculated subcutaneously in the axillary space. These animals were kept under observation for three months with negative results. The ten mice were destroyed and a search made of the lungs, kidneys, and livers but in no instance was a tumorous growth discovered.

Study Number Twenty--2

Gross Appearance: The tumor was about the size of a pecan, greyish pink in color and possessing an irregular knotted surface. It was fairly firm in consistency and presented a broad base of attachment. Extreme vascularity was evident. The growth was covered over the entire exposed surface by unbroken skin. No signs of metastasis was seen either externally or internally.

Microscopic Description: The tissue consisted of a large number of irregularly shaped compartments of different sizes which were filled in most cases compactly, by the cells of the tumor's parenchyma (see Fig. 1). The dividing walls or septa were made up of dense fibrous tissue and many were of generous size. A few of these structures carried the small blood vessels all of which were filled. The arrangement of the cells in many of the compartments was peculiar in that they showed a tendency to form spaces or tubules many of which contained red blood corpuscles (see Fig. 2). Many of the openings were in the midst of compact nests of cells while others were quite alveolar in type with walls consisting of two slender rows of cells. A considerable number of these spaces contained blood; some were entirely filled, others only partially so. The blood in some of the larger alveolar spaces was undergoing disintegration and had the appearance of having been out of the circulation. A good share of the spaces not occupied by blood contained a clear homo-

Study Number Twenty--3

geneous material similar to blood plasma or serum. In one portion of the section an area was found where the cells were arranged in nest-like fashion similar to the manner of cell arrangement in carcinomas. Occasionally though, even here the same tendency to form spaces was evident. A few almost cyst-like cavities were observed just under the skin in a few of the sections.

The type cell was for the most part polyhedral to spherical in shape. A few cells were seen which were almost spindle like. The nuclei were a little more than half the size of the entire cell and were oval in shape. Many of the cells, particularly those that were compactly arranged within the larger compartments, had a clear cytoplasm. The cytoplasm of the majority of the cells was inclined to take a slightly basic stain, and for this reason sharp differentiation was impossible to be obtained by ordinary staining methods. An intercellular reticulum was not discernible. Mitotic figures in all stages were abundantly present (see Fig. 3).

Diagnosis: The type cell as above described is similar to cells constituting a group of tumors known as endotheliomas. In the above tumor this cell consistently attempted to reproduce blood channels; often, of course, due to its rapid growth, the cells filled the spaces which were formed earlier and solid nests of cells resulted. The character of the cell and its peculiar

Study Number Twenty--4

behavior in attempting to reproduce blood spaces would put this tumor in the above group. The overgrowth of the cells and the rapidity of their proliferation as indicated by the numerous mitotic figures would stamp this as a malignant new growth of vicious possibilities. A malignant endothelioma.

Endothelioma

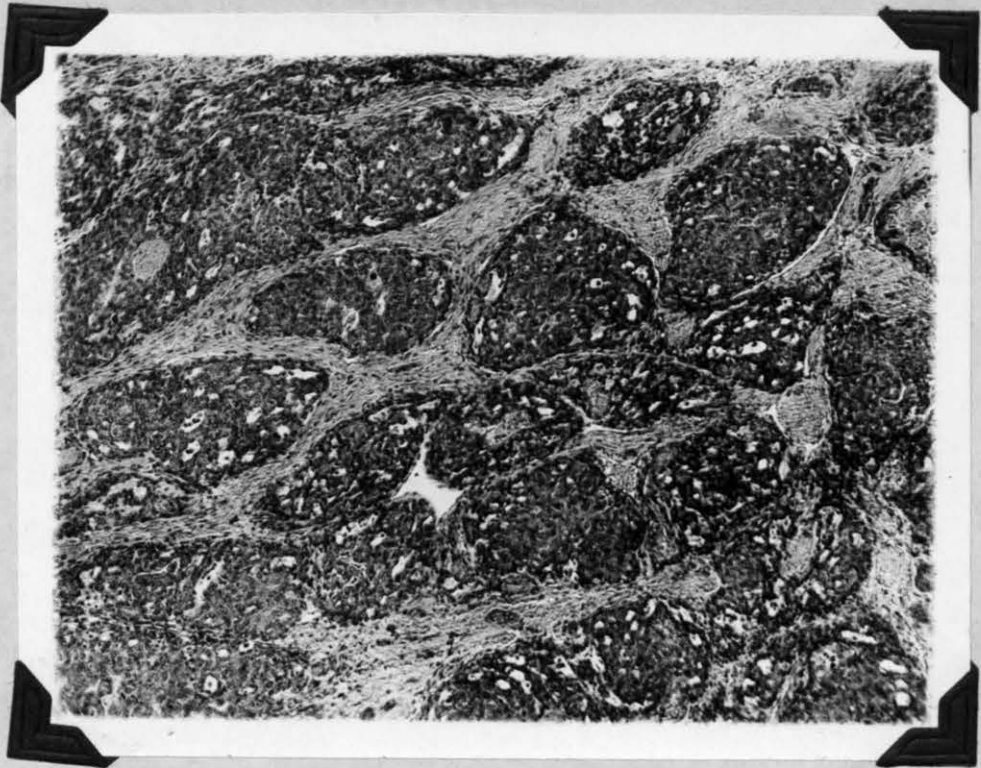


Fig. 1 (T.133) Malignant Endothelioma.--Subcutaneous tissue of a mouse. Lowpower photomicrograph showing the tumor cells in irregular compartments.

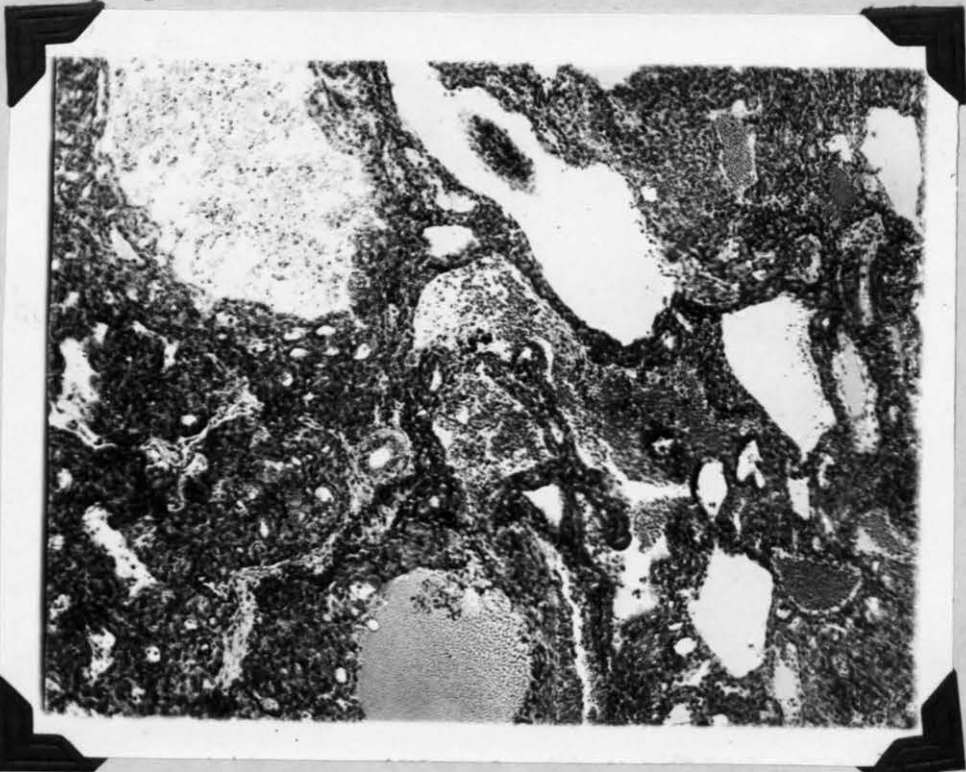


Fig. 2 (T.133) Malignant Endothelioma.--Subcutaneous tissue of a mouse. Low power photo micrograph showing many spaces containing red blood corpuscles.

Endothelioma

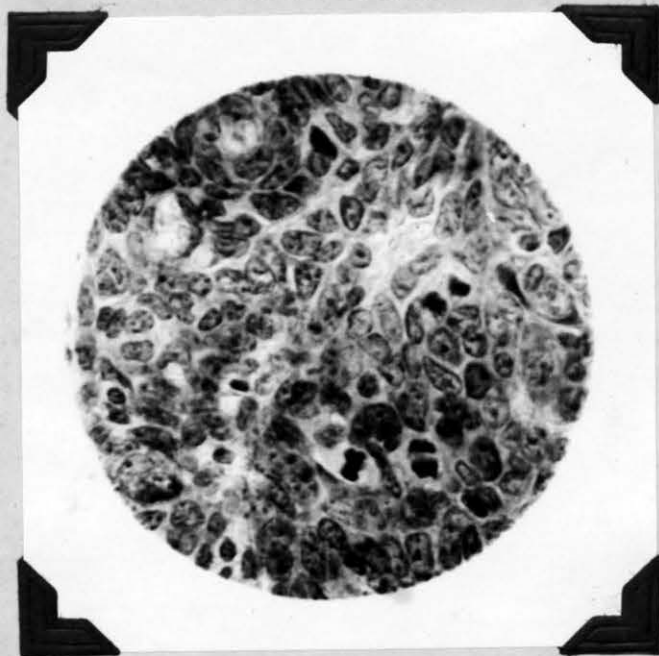


Fig. 3 (T.133) Malignant Endothelioma.--Subcutaneous tissue of a mouse.

High power photomicrograph. A number of mitotic figures are shown.

STUDY NUMBER TWENTY-ONE

TUMOR NUMBER 49

Malignant Mesothelioma -- Thoracic Cavity of a Horse

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

Clinical Data: A grade male horse, age ten years, color bay, was brought to the Veterinary Hospital of the Colorado Agricultural College because of a pronounced edema of the ventral portion of the thorax (see Fig. 1). The animal was in good condition otherwise and continued to eat and drink as usual up to the time of death. The cause of the edema remained rather obscure and the condition did not improve with treatment but progressively became aggravated. Feeling that further therapeutic efforts would be useless the animal was finally destroyed.

A post-mortem examination was performed with an hour after death and a large tumorous mass was found at the anterior thoracic aperture which involved in a very intimate way the esophagus, common carotid arteries and the jugular veins (see Fig. 2). Smaller nodular formations were also found firmly attached to the parietal pleura of the right side. These nodules were multiple and quite firm and of a greyish white color. In size they were comparable to a kidney bean.

Gross Appearance: Those tumors occurring on the pleura were flat or nodular formations with irregular contours and measuring from 0.5 cm. to 2.5 - 3.0 cm. in diameter of their greatest dimension. They were firm to the touch, grey in color and covered by a capsule which appeared to consist of a deflection of the

Study Number Twenty-One--2

of the serosa of the thoracic wall.

The large tumorous mass (see Fig. 2) weighed nine hundred grams and had a circumference of fifty-five centimeters. The color of the mass was a dirty white and a close view of a freshly cut surface showed it to be more or less mottled in appearance. The tumor was a compact closely knit structure, the tissue of which did not yield readily to traction.

Microscopic Description: Sections were obtained from the smaller nodules of the chest wall and from the larger mass. The same type of structure was present throughout. The tumor consisted of a fairly abundant fibrous stroma arranged in such a manner as to form quite definite alveoli within which were the tumor cells (see Figs. 3 and 4). Many fields showed the neoplastic cells arranged in compact rows due to the plane in which the tissue was cut. For the most part the cells were in intimate relation with the connective tissue of the stroma and in many instances the exact line of separation was not clear. For the most part the fibrous stroma was not very cellular and considerable interlacing of the strands was common. The type cells of this growth presented considerable variation as to appearance. They were, for the most part, irregularly spherical and somewhat flattened with a minimum amount of cytoplasm which appeared finely granular. Occasionally, however, a cell with a clear cytoplasmic structure was encountered. Most of the nuclei

Study Number Twenty-One-3

occupied a considerable portion of the cellular bulk. They were very irregular in form and apparently differed in their ability to stain, a few staining intense while the majority were lighter. (see Fig. 5). A finely granular chromatin material was observed. While mitotic figures were abundantly in evidence intercellular fibrils did not appear to be present (see Fig. 6). Large blood channels were few the tumorous tissue depending upon small capillary vessels in the connective tissue. These, however, were scarce.

Diagnosis: This is a tumor belonging to a class over which there has been considerable controversy. Tumors springing from tissues covered with mesothelial cells have been variously called mesotheliomas, endotheliomas, and alveolar sarcomas, while Kitt considered new growths of the serous surfaces as being true cancers or epithelial in nature. The difference of opinion as to the embryogenesis of these cells and the scarcity of special characteristics by which the adult mesothelial cell can be differentiated from many cells found in sarcomatous and carcinomatous tumors has been responsible for a great deal of confusion that has arisen in the nomenclature and classification of these tumors.

Considering the modern view explanatory of the embryogenesis of the tissue involved, the term mesothelioblastoma seems a fitting designation for tumors of this kind. My reason for so naming this tumor is based upon embryological origin of the tissues from which it must have arisen. The embryogenesis of the

Study Number Twenty-One--4

cells lining the coelomic cavity is clearly shown by modern embryological teachings to be mesodermal. These cells are part of the mesothelial structure which consists of mesothelial cells and the underlying mesenchyme which in the later development of the embryo is further differentiated into a supporting connective tissue. With this in mind it seems proper that this tumor and all tumors of mesothelial character be termed mesothelioma. Adami (1) held the same view and Dr. F. B. Mallory in a personal communication to me subscribes to the same idea. This tumor could be more specifically called a malignant mesothelioma. While mitotic figures were numerous and the tumor had a capacity for considerable growth it is interesting to note that there was no indication of metastasis to the lungs or outside of the thoracic cavity. It is my opinion that tumors of this class are dangerous more from pressure interference than from any systemic effect such as one would expect from carcinomas or sarcomas, which exert their malignant influence by actual invasion and destruction of the parenchyma of the vital tissues.

Ref.--(1) Adami, J. George. Principles of Pathology, p. 703.
Lea and Febiger, Philadelphia and New York. 1910.

Mesothelioma

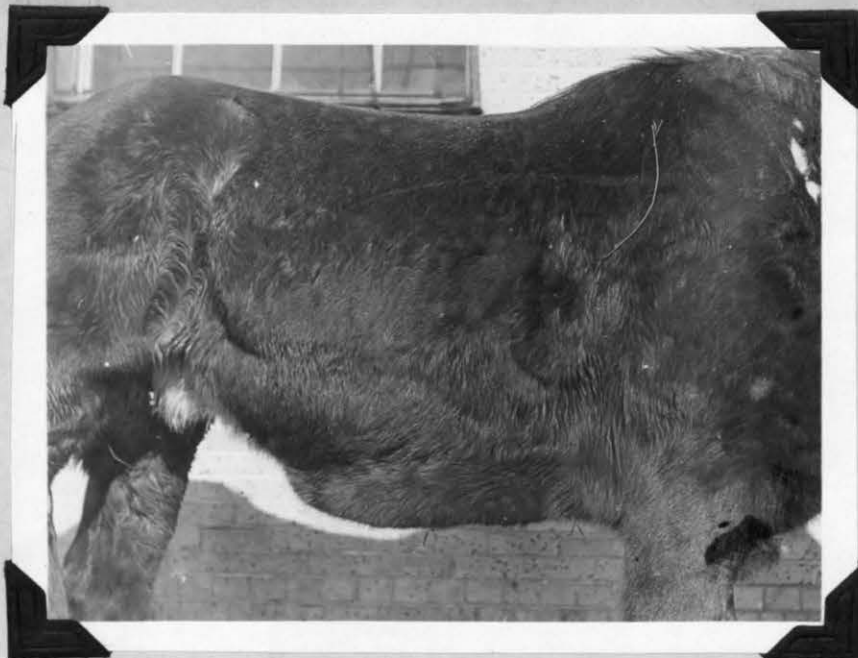


Fig. 1 (T.49) Malignant Mesothelioma of a Horse.
Photograph showing the pronounced edema of the ventral portion of the thorax.

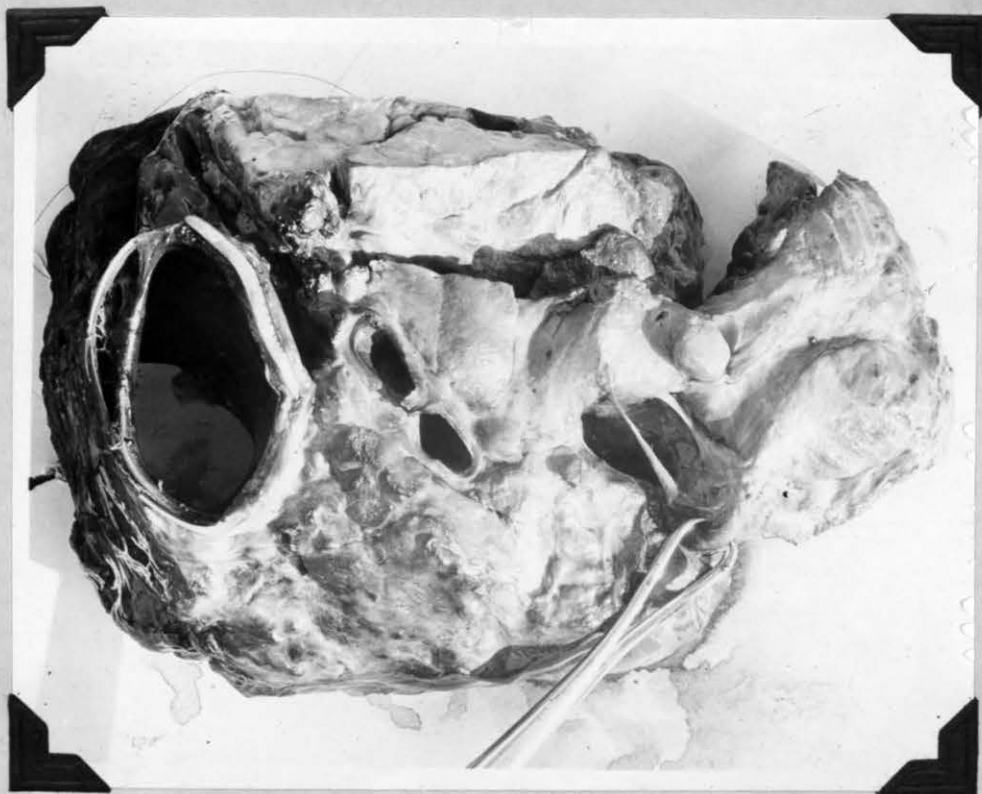


Fig. 2 (T.49) Malignant Mesothelioma of a Horse.
Photograph of the large tumorous mass showing involvement of the esophagus, common carotid arteries and the jugular veins.

Mesothelioma

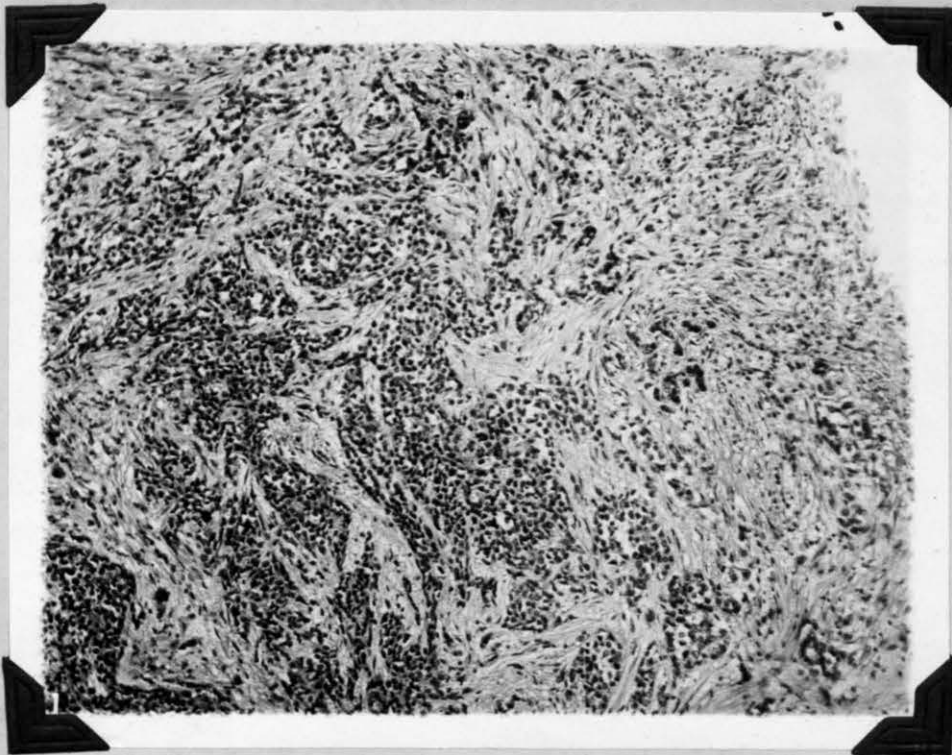


Fig. 3 (T.49) Malignant Mesothelioma of a Horse.

Lowpower photomicrograph showing the abundant stroma and the irregular nests of tumorous cells.



Fig. 4 (T.49) Malignant Mesothelioma of a Horse.

High power photomicrograph showing the alveolar arrangement of many of the cells.

Mesothelioma

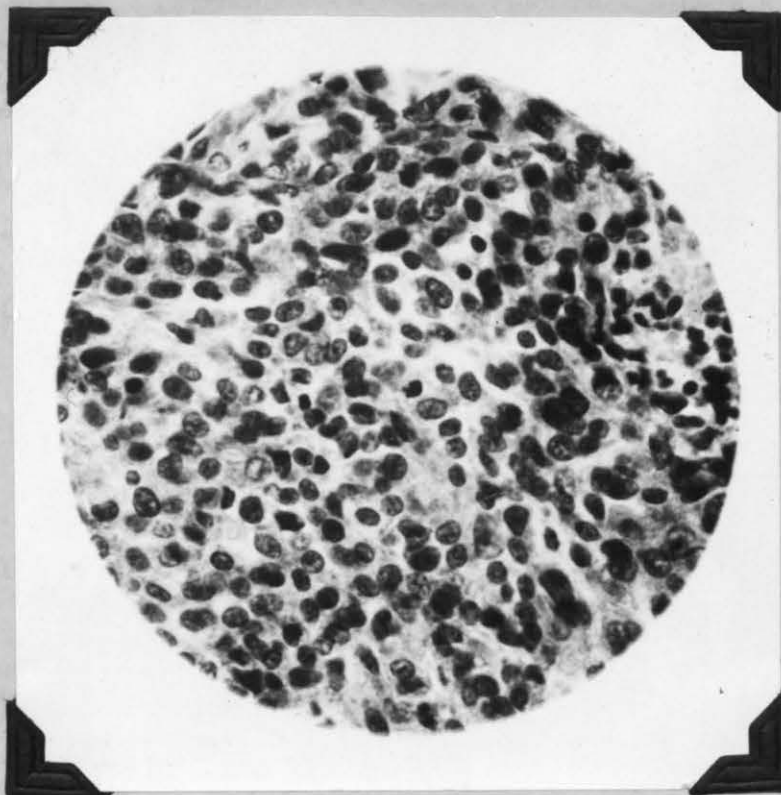


Fig. 5 (T.49) Malignant Mesothelioma of a Horse.
High power photomicrograph showing the irregular deeply staining nuclei.

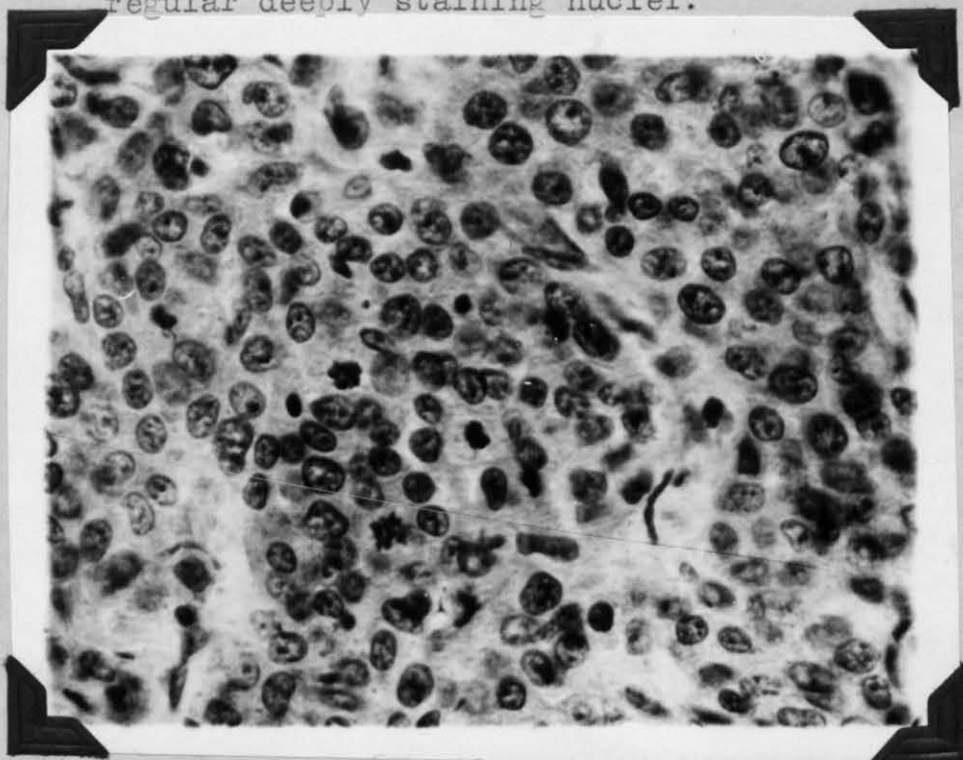


Fig. 6 (T.49) Malignant Mesothelioma of a Horse.
High power photomicrograph showing two cells in mitosis.

STUDY NUMBER TWENTY-TWO

TUMOR NUMBER 59

Malignant Mesothelioma -- Adrenal Cortex of a Cow

Material for this study was received from Dr. G. G. Feldman, Veterinary Inspector in the United States Bureau of Animal Industry stationed at Spokane, Washington.

Clinical Data: A four year old Hereford cow was slaughtered for food and during the customary post-mortem examination of the carcass a tumor was observed in the position usually occupied by the right adrenal gland. The carcass was apparently normal otherwise, the examination showing the animal to have been in good physical condition before death.

Gross Appearance: The mass was oval in shape and measured about 5 cm. x 8 cm. It was yellow in color, soft in consistency and was covered by a glistening capsule which in turn was imbedded in the connective tissue of the region. The surface was somewhat roughened and when the mass was cut it appeared to possess a number of small cavities or cysts from which a viscid, mucous-like fluid escaped. The structure was fairly vascular.

Microscopic Description: The adrenal structure was practically obliterated and it was only in the outer zone of what had been the cortical portion of the gland that cells resembling those of the zona fascicularis could be made out. They were disposed parallel to the strands of connective tissue making up the outer wall of the structure and not at right angles to the capsule as in the normal gland (see Fig. 1). The cells were smaller

Study Number Twenty-Two--2

than usual and showed the effect of pressure exerted by the underlying neoplastic elements. Cells of the glomerular zone were not seen.

The tumor was unevenly divided into compartments of variable size by strong bands of connective tissue. Smaller septa from these fibrous bands further cut the tumorous mass into smaller alveolar units which, however, were not constant.

The substance of the tumor was broken by rather large "lakes" filled with a dark pink homogeneous material as stained with hemotoxylin and eosin. Most of this material gave the reaction of epithelial hyalin when treated by Van Gieson's stain while some of the smaller accumulations gave the bright yellow color of mucin by the same method. These spaces were lined with a flattened type of epithelial cell and a very thin stroma was present between them and the cells of the tumor proper (see Fig. 2). A few cells similar in structure to those making up the tumor parenchyma were observed in the substance of these lake-like areas.

The tumor cells were fairly large oval structures with a rather large nuclei. The cytoplasm of many of the tumor cells was clear or vacuolated. A great many of the nuclei took the nuclear stain lightly and while many showed numerous chromatin granules others were devoid of this material. It was observed that the substance of many of the nuclei was divided by indistinct lines into a number of small vesicles. The nuclei varied

Study Number Twenty-Two--3

considerably in shape, from almost spherical to a decided oval. Mitotic division was frequently observed. Blood channels were few and appeared to be limited to the broad connective tissue septa.

Extensive deposits of mineral salts were present in practically all the sections. This occurred in equal amounts in the bands of connective tissue and the parenchyma of the tumor.

Diagnosis: The cells of this tumor resembled quite closely those encountered in a hypernephroma of the kidney and appear to have had their origin in the fascicular zone of the adrenal cortex. Ewing (1) and Adami (2) would designate tumors of such an origin as mesotheliomas. Adami (2) also suggests that, since there appears to be more or less lack of agreement in the nomenclature of different writers when dealing with these tumors, they should be placed under the heading of hypernephroma. It is interesting to note, however, that Ewing in spite of his designation of the tumors of the adrenal cortex as mesotheliomas goes on in the same chapter to describe and discuss them under the titles, adenoma and carcinoma.

In view of the histogenesis of the cells involved and their proliferative behavior it would be correct to call this tumor (#59) a malignant mesothelioma. However, there is no evidence that the growth was particularly aggressive. To the con-

Study Number Twenty-Two--4

trary the large areas of calcification together with the cystic degeneration present would indicate a certain retrogression. A malignant mesothelioma.

Ref.--(1) Ewing, James. Neoplastic Diseases. 1st Ed. P. 746. W. B. Saunders Company, Philadelphia, 1919.

(2) Adami, J. Geo. and Nicholls, A. G. Principles of Pathology, Vol. II, 2d Ed., p. 737-738. Lea and Febiger, Philadelphia and New York, 1911.

Mesothelioma



Fig. 1 (T.59) Malignant Mesothelioma of the Adrenal Cortex.
Low power view showing tumor cells in short rows running parallel to the the stroma which is unusually heavy.

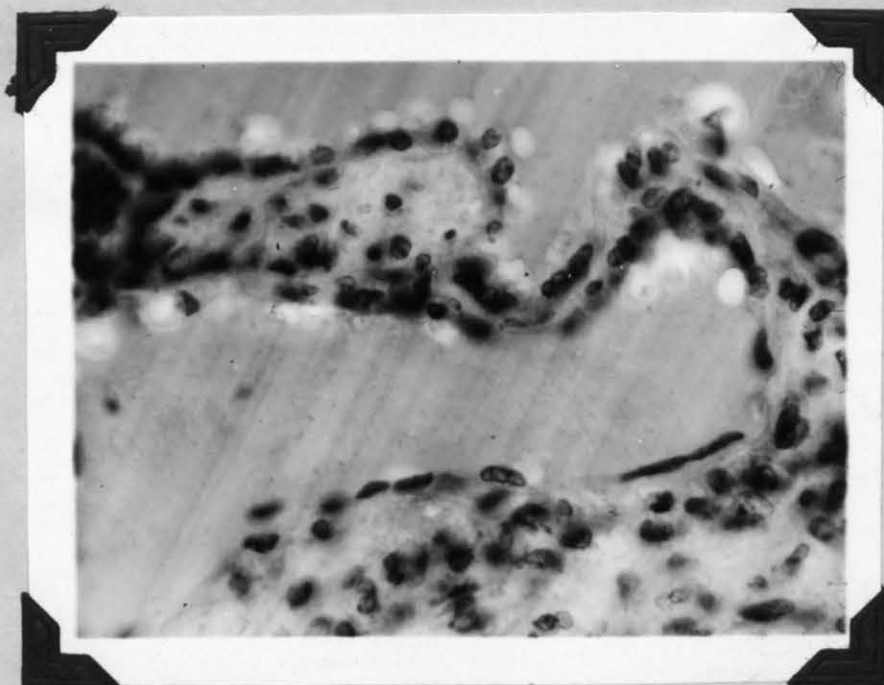


Fig. 2 (T.59) Malignant Mesothelioma of the Adrenal Cortex.
Cystic cavities lined with flattened epithelium and filled with a homogeneous material.

Mesothelioma

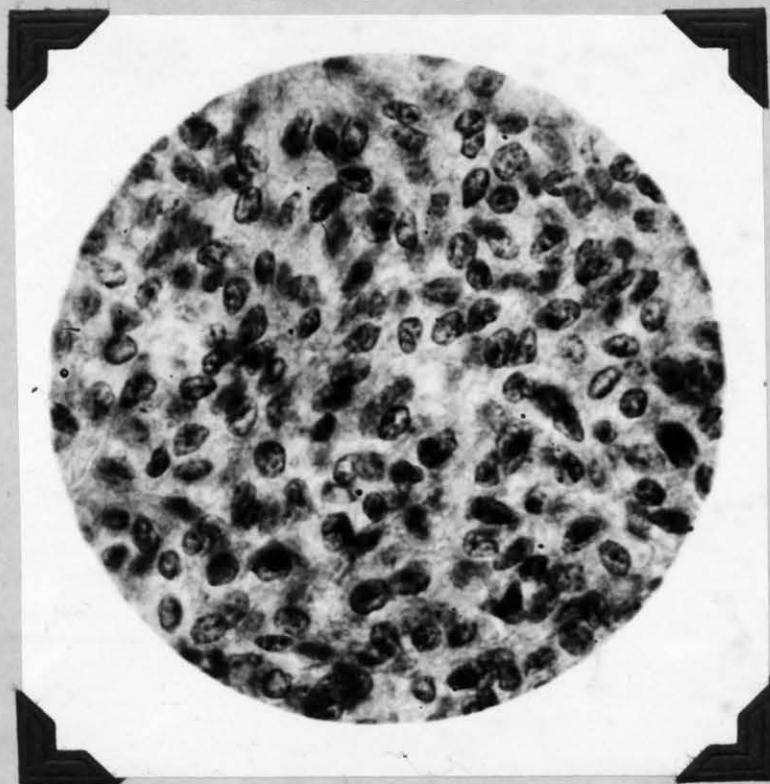


Fig. 3 (T.59) Malignant Mesothelioma
of the Adrenal Cortex.

High power photomicrograph of the tumor
cells showing many of the nuclei contain-
ing vesicles.

STUDY NUMBER TWENTY-THREE

TUMOR NUMBER 2

Simple Lymphoma -- Abdominal Cavity of a Bovine

This tumor was received from Dr. Geo. H. Glover, who observed it while examining a carcass of a beef at a Fort Collins packing house.

Clinical Data: The animal was a seven year old grade cow. There was no data as to any ante mortem disturbances arising from the tumor which was attached in the region of the internal iliac glands.

Gross Description: The growth was an encapsulated mass weighing 1500 grams. It was somewhat pear shaped and measured about 15 cm. at its greatest diameter (see Fig. 1). It was of a grey color and of a very firm consistency. It had a pedicle form of attachment, a smooth surface and it appeared quite vascular. A freshly cut surface presented a peculiar granular appearance.

Microscopic Description: Under the low power the tumor appeared to be made up of small round lymphoid cells resembling very closely the lymphocytes of normal lymph nodes. The arrangement of these cells was typically follicular. In the areas between the follicles the tumor cells were largely obliterated by a homogeneous, waxy substance which gave the characteristic Van Gieson reaction of amyloid. This substance was diffusely distributed throughout and seemed to make up the bulk of the tumor (see Fig. 2). Its effect upon the individual remaining cells

Study Number Twenty-Three--2

was largely that of atrophy. Connective tissue stroma was scant as was also supporting reticulum although well defined blood vessels were fairly common. Wherever found, the blood vessels showed the same amyloid deposition in evidence throughout the tumor mass. No mitosis was observed.

Diagnosis: Being a slow growing non-progressive encapsulated formation made up of lymphocytes would stamp this as a simple lymphoma.

Lymphoma



Fig.1 (T.2 (Simple lymphoma from the region of the iliac glands of a bovine.

Photograph of the gross specimen.

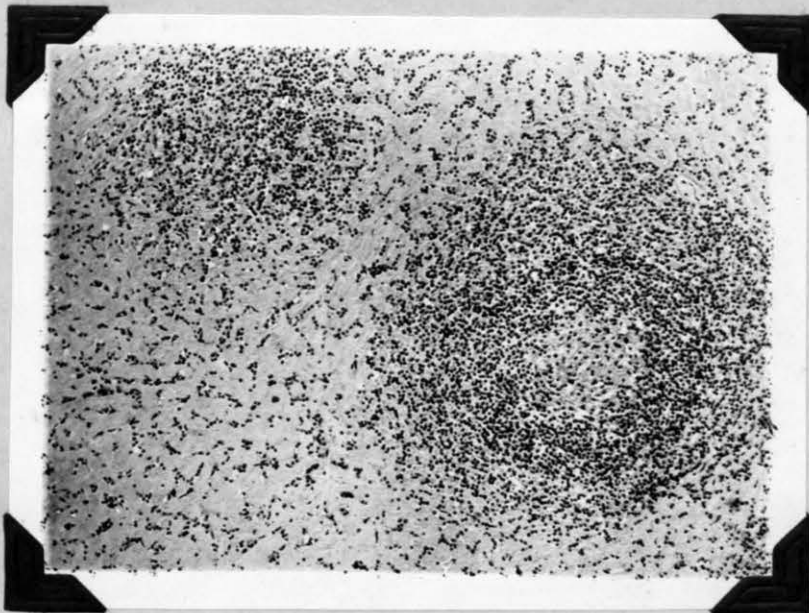


Fig. 2 (T.2) Simple lymphoma from the region of the iliac glands of a bovine.

Low power photomicrograph showing the amyloid degeneration and its replacement of much of the tumorous substance.

STUDY NUMBER TWENTY-FOUR

TUMOR NUMBER 48

Aleukemic Lymphocytoma -- Liver of a Chicken

This material was from a chicken sent to our laboratory to determine the cause of death.

Clinical Data: The bird was a six months old White Leghorn in fair condition. There was no information as to the duration of the ailment which resulted in the chicken's death. The only data available was the statement that the bird had been found dead on the roost.

Gross Appearance: The only abnormality observed was a greatly enlarged liver. The organ was three or four times the normal size and contained a yellowish gray tissue scattered rather diffusely throughout its substance. The liver was somewhat more firm than normal and on cut sections distended blood vessels were plainly seen.

Microscopic Description: A very striking feature of the sections of liver prepared was the extreme congestion of all the blood channels of the organ. It appeared as though the smallest capillaries were engorged to ten times their normal capacity. The contents of the vessels consisted entirely of red corpuscles, no leucocytes being seen.

Histologically the liver was considerably altered in appearance. Many of the common landmarks such as the hepatic trinitities were undiscernible and the various lobules were in-

Study Number Twenty-Four---2

distinctly outlined. Many of the liver cells were undergoing a pressure atrophy due to the influence of tumor cells within most of the sinuses and around the large blood vessels. Apparently a considerable number of liver cells had been replaced by the cells of the neoplasm. There was nothing particularly consistent or systematic about the manner in which the tumorous cells were disposed in the substance of the liver. They appeared to have been influenced but little by the structural design of the organ and further than that they were found most frequently within the sinuses, their disposition was rather promiscuous.

The tumor cells resembled very closely the large lymphocytes of chicken's blood. Most of them were irregularly oval in shape and were possessed of but scant cytoplasm. The nuclei were well stained and of the same general contour as the entire cell. As mentioned by Warthin (1) a good many of the nuclei were slightly eccentric in position. Chromatin material was abundant and granular. A careful search failed to reveal any mitotic figures.

Diagnosis: We have here a neoplasm resulting from some disturbance of lymphocytic cells of the blood which condition has been variously described by different authors. There can be no doubt, however, as to the true neoplastic nature of this process, although it may vary in the extent of its involvement in every case. Apparently there are, as Warthin (1) points out, two distinct clinical types of the disease, the leukemic

Study Number Twenty-Four--3

and the aleukemic. We have had occasion to observe both in the past three or four years. Warthin suggests the possibility of the two types being different stages of the same condition, which seems possible.

In this tumor (No. 48) we have no apparent increase of the leucocytes within the blood vessels. It is perhaps unfortunate that no blood smears were obtainable in this case. However, any appreciable increase in white cells is usually evident in the larger vessels and are readily seen in sections stained by hemotoxylin and eosin.

While mitotic figures were not seen in this material this tumor is essentially malignant in its influence upon the parenchyma of the involved organ. It was distinctly infiltrative in character with considerable disappearance of liver cells. Those cells remaining showed atrophy due to the pressure interference of the accumulating lymphocytes. The increase in the size of the organ was not due to any increase in the normal elements of the liver but to a replacement of liver tissue by the infiltrative lymphocytes.

This would be considered a tumor of the aleukemic type and following the nomenclature proposed by Warthin this could be called an aleukemic leucoblastoma. I think the name aleukemic lymphocytoma would serve as well, since the use of the word lymphocytoma indicates the specific leucocyte involved while the word

Study Number Twenty-Four--4

leucoblastoma refers to any tumor made up of white blood cells and not necessarily lymphocytes specifically. Dr. Warthin refers to the leukemic type of this disease as leukemic lymphocytoma, so I can see no special objection to the name I have used for the aleukemic form. Aleukemic lymphocytoma.

Ref.--(1) Warthin, A. S. Leukemia of the Common Fowl. Reprint from the Jour. of Inf. Dis. 4, No. 3: 369-381. 1907.

Lymphocytoma



Fig. 1 (T.48) Aleukemic lymphocytoma.--Liver of a chicken.

Lower power photomicrograph showing the rather promiscuous disposition of the tumor cells.

STUDY NUMBER TWENTY-FIVE

TUMOR NUMBER 51

Leukemic Lymphocytoma -- Chicken

This material was received from Dr. Frank Mathews, Lafayette, Indiana.

Clinical Data: Information on the clinical phase of the record was very meager. One half of the liver, a kidney and the spleen of a Barred Rock hen were submitted to our laboratory for diagnosis. There was no information as to cause of death.

Gross Appearance: Spleen.--Aside from being slightly enlarged there were no external features that would point to anything unusual in so far as this organ was concerned. However, when the organ was cut in half a large number of pin point areas were brought into view. These were greyish white in color and resembled somewhat very early miliary tubercules except that there was no evidence of necrosis.

Kidney.--The kidney was considerably enlarged and the surface was quite roughened as a consequence of which the contour of the organ was somewhat altered. When cut, the organ presented a number of greyish white areas of variable dimensions located, for the most part, in the medullary portion. They were about the size of a pin head and very irregular in shape.

Liver.--As only a portion of the liver was received it was not possible to determine the exact size or weight of this organ. Apparently it was greatly enlarged since the part received was greater in volume than the entire liver from a normal bird.

Study Number Twenty-Five--2

A part of the material showed the complete absence of hepatic tissue which had been replaced by a rather firm yellowish white material. Other portions showed more or less liver tissue with the yellowish-white substance scattered throughout. Where the liver and neoplastic tissue appeared in about equal amount a cut surface had a mottled appearance. The capsule of the organ was intact over the entire surface.

Microscopic Description: Spleen.--The splenic pulp was considerable lessened in amount and altered in appearance. Scattered throughout the entire parenchyma were oval accumulations of large lymphocytic cells. These masses of cells were of such size and of such abundance as to leave but a small amount of splenic pulp between them (see Fig. 1). The cells making up the masses were irregularly spherical and were lying in apposition. Those in the margin were in contact with remains of the splenic pulp, there being no evident separating tissue. They were larger in size and they stained more deeply than the cells of the splenic nodules. In some of the accumulations a few vacuoles were seen between the cells. A mitotic figures were present.

Kidney.--This organ showed some large areas of the same type of cell observed in the spleen. The larger accumulations were in the zone between the cortical and medullary portions of the organ and revealed a distinct invasiveness towards the surrounding tissue (see Fig. 2). As in the spleen the cells were closely packed and in their midst no remains of kidney tissue

Study Number Twenty-Five--3

were discernible. Mitotic figures, while present, were not particularly abundant. The tumor cells were also invading a large number of the glomeruli (see Fig. 3). In fact, most of these structures were so affected. While some showed the presence of but few lymphoid cells others were packed to capacity. At various places in the kidney tumor cells were present in the inter-tubular spaces, and the resultant pressure produced some distortion of the tubules. The vessels were highly engorged and contained in addition to red corpuscles some cells resembling those of the neoplasm.

Liver.--Sections of the liver showed the parenchyma of this organ to have been also entirely replaced by the neoplastic cells. They were practically everywhere and many entire lobules were entirely devoid of liver cells. The remaining cells of the parenchyma existed in the form of slender cords (see Fig. 5). The effect of the pressure from the encroachment of the tumor cells was very apparent upon the cells of the organ. However, no fatty changes or other retrogressive alterations were observed.

In the liver sections, the type cell of this tumor was seen to the best advantage. It was a fairly large cell resembling quite closely the large lymphocyte of chicken's blood. The nucleus stained rather deeply and filled most of the cells interior. In shape the cells were oval to spherical and the nuclei possessed the same general contour as the cells to which they

Study Number Twenty-Five--4

belonged. Most of the nuclei showed a slightly eccentric position. The nuclei were also possessed of rather coarse chromatin granules. Mitotic division was frequently observed.

Diagnosis: This is clearly a tumor whose type cell was probably derived from the blood forming elements. This cell has much in common with the large lymphocyte of chicken's blood and it is unfortunate that no blood smears were obtained.

Throughout, there was every indication of a malignant behavior on the part of the tumor cells. They showed mitotic division, infiltration into the surrounding tissue and metastasis to other organs. It is probable that the disease was primary in the liver for here the greatest growth and destruction was evident. The presence of the disease in the kidney and spleen would, of course, point to a metastasis by way of the blood stream. In the kidney particularly was this revealed. The majority of glomeruli being involved would indicate that the capillaries of these structures were the route of transit of the tumor cells. The crystalloid eosinophiles observed by Warthin (1) in a similar case were not seen in this material. Following Warthin's terminology this tumor would be called a leukemic lymphocytoma, which is a fatally malignant tumor that appears to arise from the lawless activity of the large lymphocyte. Once this cell finds fruitful soil it assumes an invasive attitude that becomes highly destructive. A leukemic lymphocytoma.

Lymphocytoma.

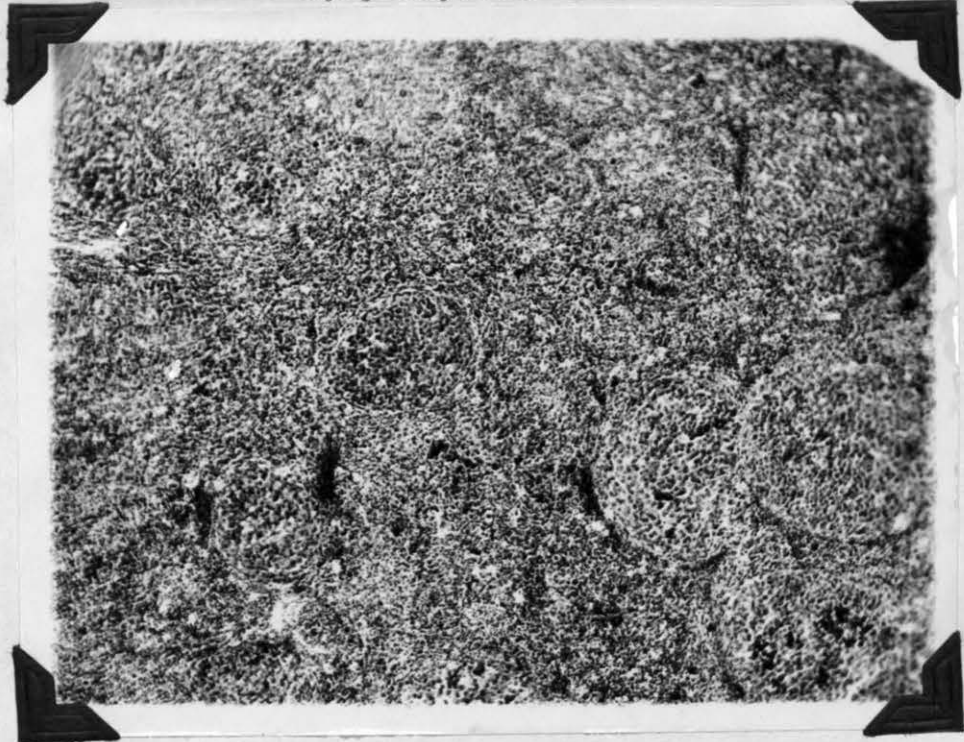


Fig. 1 (T.51) Leukemic Lymphocytoma.

Low power view of material from the spleen showing the lymphoid cells of the tumor arranged as nests or follicle. The splenic pulp has been largely replaced.

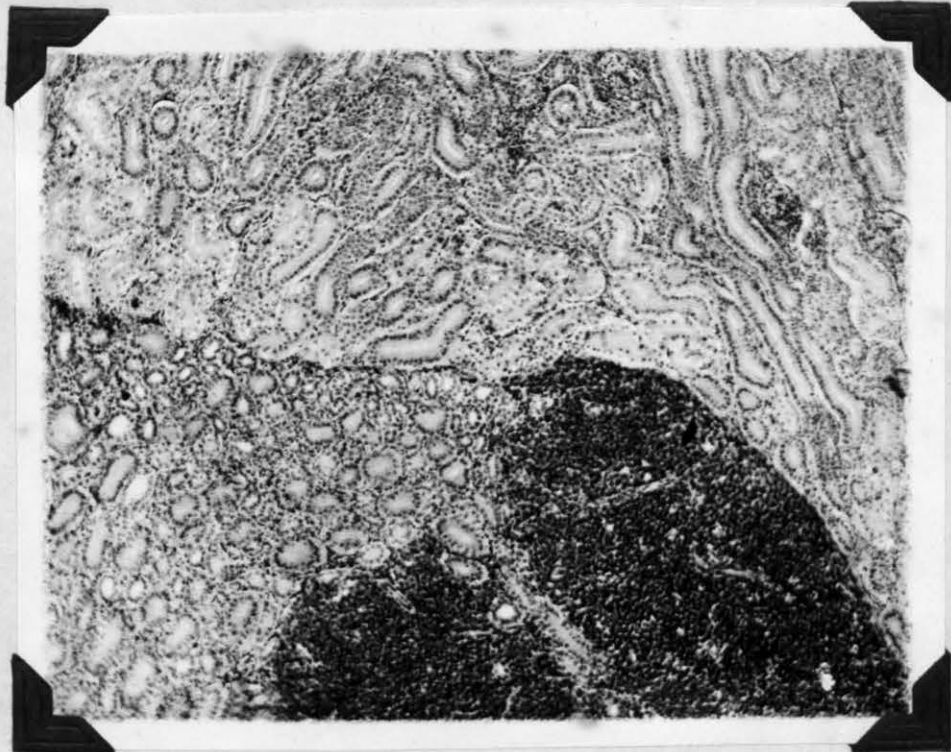


Fig. 2 (T.51) Leukemic Lymphocytoma.

Low power photomicrograph of kidney section showing the large accumulations of tumor cells in the kidney substance.

Lymphocytoma

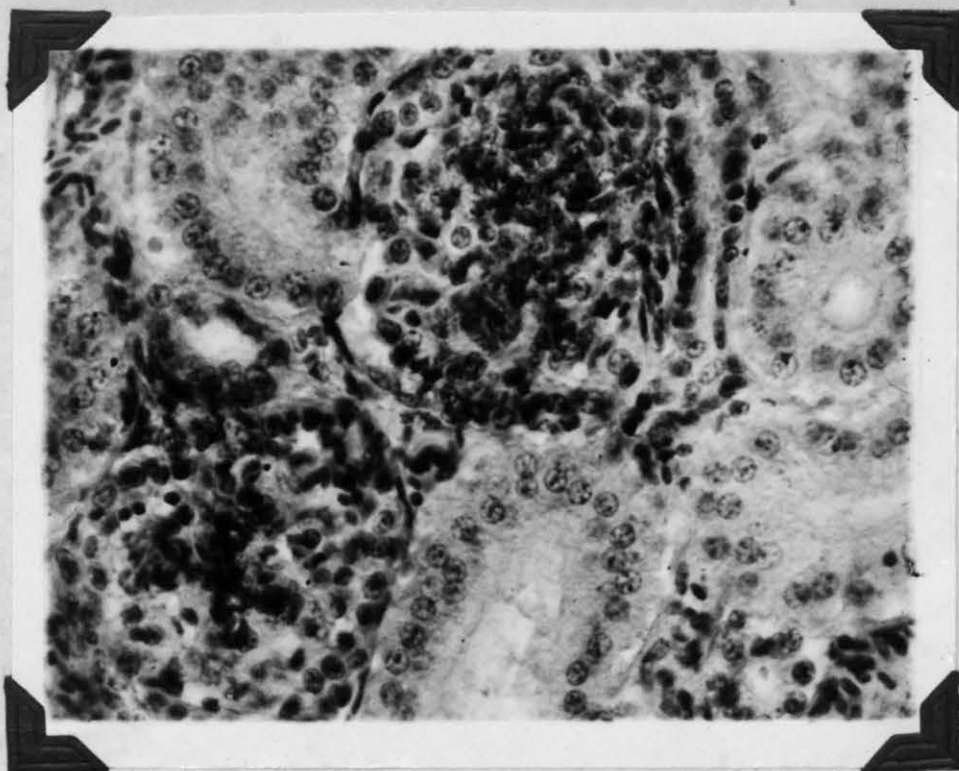


Fig. 3 (T.51) Leukemic Lymphocytoma.

High power photomicrograph from kidney material showing glomeruli invaded by the tumor cells.

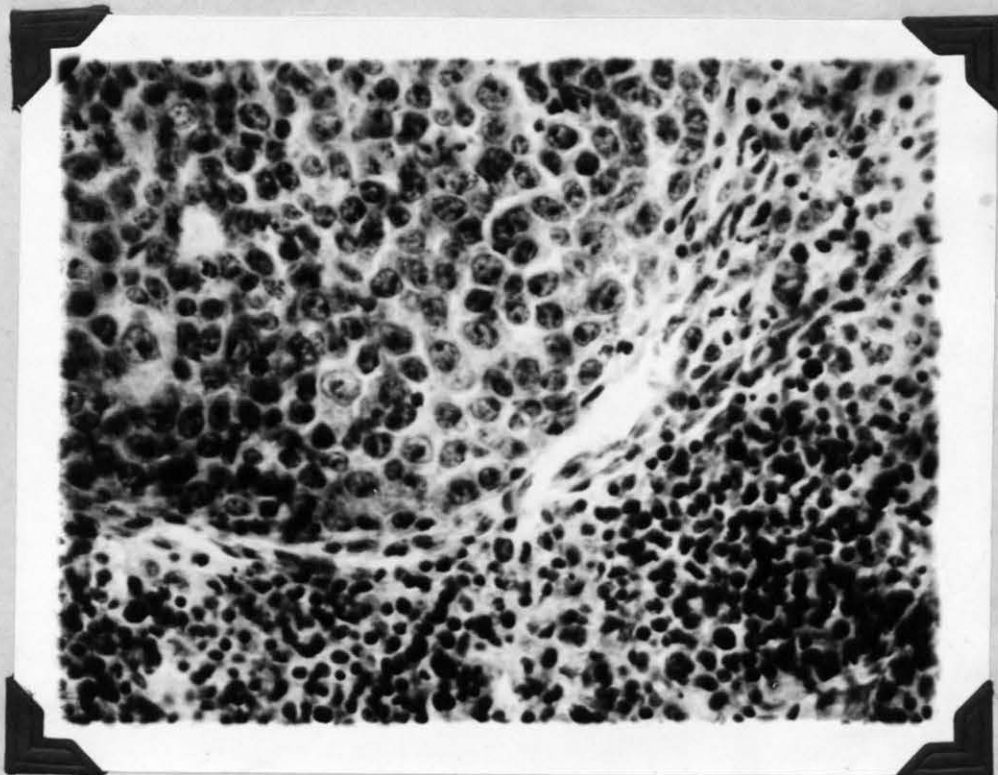


Fig. 4 (T.51) Leukemic Lymphocytoma.

High power photomicrograph showing a tumorous nodule in the spleen.

Lymphocytoma

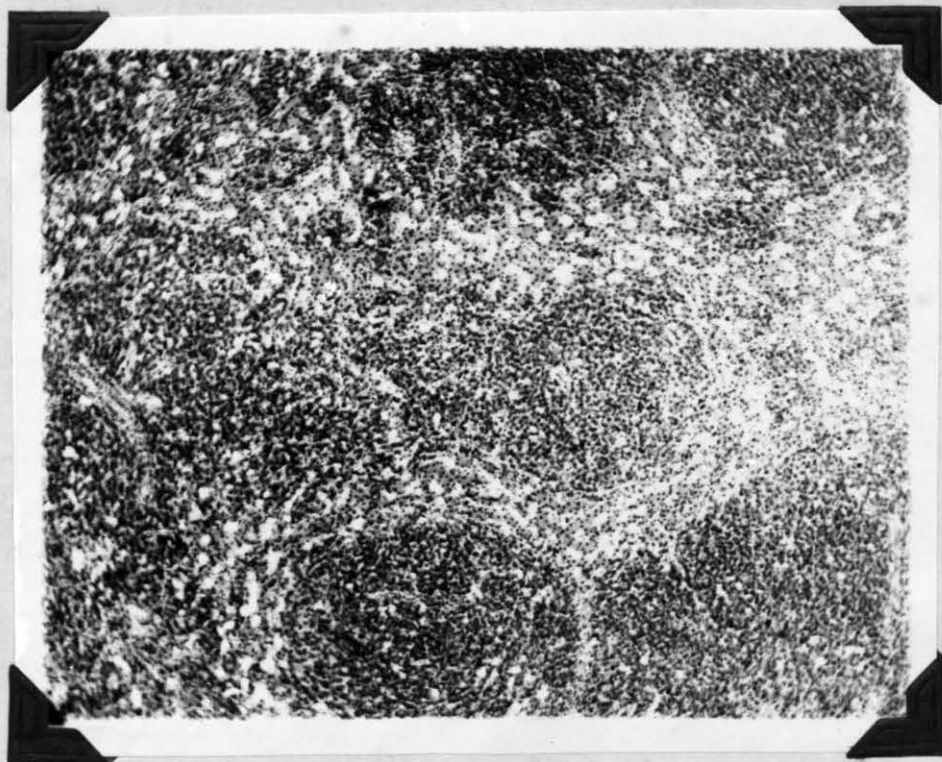


Fig. 5 (T.51) Leukemic Lymphocytoma.

Low power view of liver showing the nest-like accumulations of tumor cells which have largely replaced the parenchyma of the organ.

STUDY NUMBER TWENTY-SIX

TUMOR NUMBER 61

Aleukemic Lymphocytoma -- Chicken

This case was received at the Pathology Laboratory of the Colorado Agricultural College.

Clinical Data: A one year old Plymouth Rock hen in rather poor condition had for "some little time refused its food." A severe diarrhoea was noticed. After an illness of about two weeks the bird died. Upon postmortem the right kidney and liver were found studded with tumorous nodules.

Gross Appearance: An examination of the involved organs showed that the tumorous cells had replaced most of the normal tissue. The tumors were diffusely imbedded in the substance of the organs and a distinct line of separation between the tissue of the organ and the tumor was difficult to follow. The neoplastic material was firm to the touch and gray in color. The surface was quite smooth.

Microscopic Description: Liver.--But little remained to identify the sections as portions of the liver. Tumor cells were practically everywhere and the only place that the liver cells could be made out was in the interlobular zones and even here the cells were not numerous and those present were disposed in narrow strands with frequent ruptures where the tumor cells had broken through. Isolated islands or groups of liver cells were often observed completely surrounded by the tumor. Many of the remaining liver cells were badly distorted, apparently from the effects

Study Number Twenty-Six--2

of the encroachment of the cells of the neoplasm. The capsule of the organ was intact but it was observed that the tumor cells had infiltrated under it in as much of it as was present in the various sections.

The tumor cells were of a medium size, oval to irregularly spherical in shape and with but scant cytoplasm. The nuclei stained fairly deeply and a fine granular chromatin substance was evident. Mitotic figures were abundant and no intercellular fibrils were seen. The only stroma that was apparent was that which remained from the structure of the involved lobules. The blood supply seemed to be derived from the original vessels in the interlobular stroma and no noticeable increase in the number of leucocytes in the blood vessels was observed.

Kidney.--This organ was even more extensively involved than the liver. Large areas consisted almost entirely of tumorous tissue with but scant remains of the uriniferous tubules present, the cells of which were decidedly atrophic. The neoplastic elements had replaced practically all of the interstitial substance of the organ and were in intimate contact with the epithelia of the remaining tubules (see Fig. 1). The tumor revealed a lawless infiltrative type of growth, spreading into the interstitial substance (see Fig. 2). The Malpighian bodies were also atrophic, apparently as a result of the pressure exerted by the surrounding tumor cells. The glomeruli were free of neoplastic cells and their capillaries were contracted in marked contrast

Study Number Twenty-Six--3

to the larger vessels of the organ which were in a state of pronounced congestion. No instance was observed where cells of the tumor were breaking into the lumina of the uriniferous tubules, the epithelial elements being more successful in resisting their invasion than the interstitial elements. While the blood vessels were decidedly hyperemic yet rhexis was not observed. The contents of the blood vessels did not consist of more leucocytes than normal and lymphocytes were not prominent.

The type cell resembled that found in the liver. It was of medium size with a nucleus that occupied a slightly eccentric position. The cells were round in a general sense although some were more or less oval in contour and occasionally a cell with a polyhedral outline was seen. The cytoplasm was non-granular and scant, the nuclei occupying the greater portion of the cells interior. The nuclei possessed a minutely granular chromatin that was diffusely distributed. Mitotic figures were prevalent and constituted a striking feature. An occasional plasma cell was seen.

For some reason the spleen and left kidney, which were not macroscopically involved, were not preserved for study.

Diagnosis: Here we have to all appearances a malignant neoplasm with nearly every feature of viciousness common to this class of tumors. The type cell is undoubtedly lymphocytic and it would probably be correct to place this tumor under the head of lymphoblastoma. In the chicken we encounter two rather specific

Study Number Twenty-Six--4

types of lymphoblastomas in which the type cell resembles the large lymphocyte of the blood. In one, however, (leukemic lymphocytoma) the neoplastic cells are present in the blood stream and smears made show this cell to predominate. In the aleukemic type the blood does not show an increase in its lymphocytic content. The liver is usually involved in both types while in the leukemic form tumorous growths may be found in addition in the kidneys, spleen, cardiac muscle, bone marrow and hemolymph nodes (1).

In this tumor (No. 61) aside from the liver the only other organ involved was one kidney. The vessels were free of the neoplastic cells for while they probably served as the route of metastasis from the liver to kidney apparently the blood stream was unsuited for their continuous presence. The abundance of mitosis would indicate that the majority of the tumor cells were manufactured in situ. An aleukemic lymphocytoma.

Ref.--(1) Wharthin, A. S. Leukemia of the Common Fowl. Reprint from Jour. of Inf. Dis., 4, No. 3: 369-381. June, 1907.

Lymphocytoma

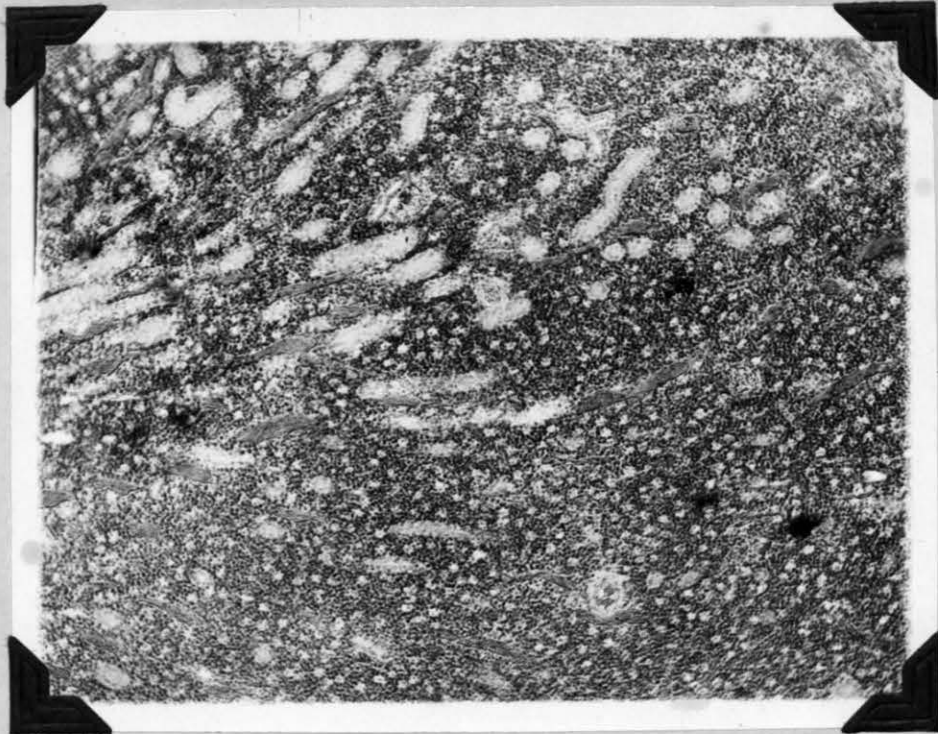


Fig. 1 (T.61) Aleukemic lymphocytoma.--Kidney of a chicken.

Low power photomicrograph showing the extent to which the tumor cells had replaced the elements of the kidney.

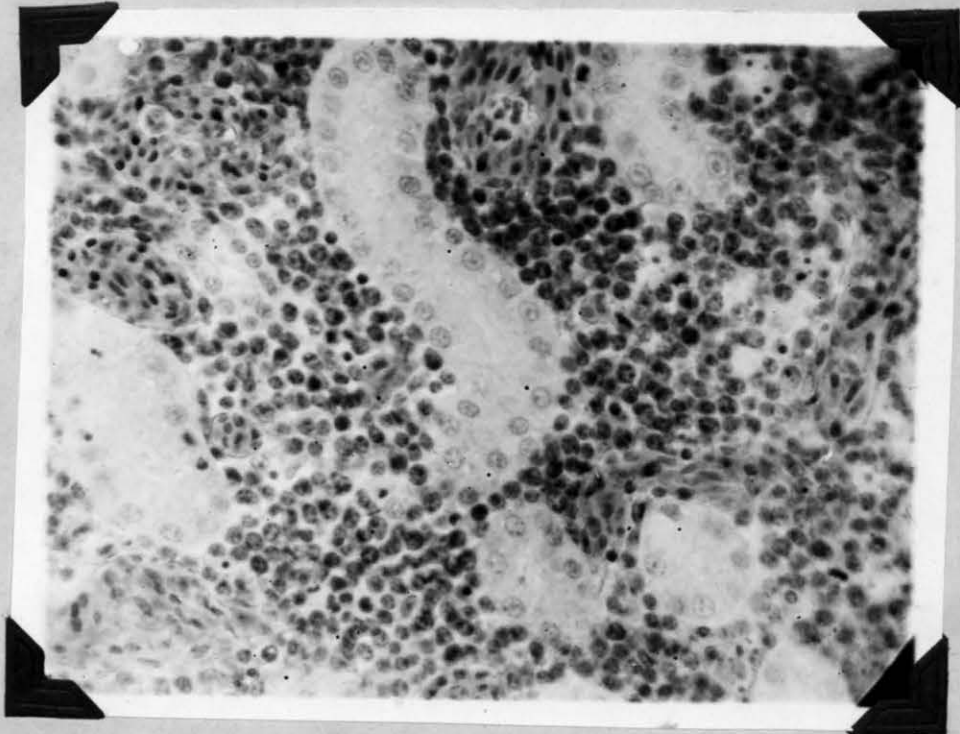


Fig. 2 (T.61) Aleukemic lymphocytoma.--Kidney of a chicken.

High power photomicrograph showing the position of the lymphoid cells in the interstitial spaces but not breaking thru the epithelial cells of the tubules.

STUDY NUMBER TWENTY-SEVEN

TUMOR NUMBER 76

Aleukemic Lymphocytoma -- Liver of a Chicken

Clinical Data: The animal was a one year old hen.

The bird had not been laying for some time and possessed a rather pale comb. On account of being a non-producer she was killed for food. The liver was found to be greatly enlarged and was brought to the laboratory for examination. No other lesion or abnormalities were noted.

Gross Appearance: The liver was quite large and weighed 275 grams. It was grayish white in color in striking contrast to the deep red or brown color of the normal fowl liver. Over the entire surface were innumerable small areas averaging in diameter that of a pin head. These were also apparent throughout the substance of the organ, freshly cut surfaces showing them to have a general distribution. None of the lesions extended above the level of the capsule. After fixation and alcoholic preservation all of the tissues assumed the same dirty white color and the tumorous areas were difficult to discern.

Microscopic Description: Under the low power, sections from this liver proved extremely interesting. Masses of round cells were practically everywhere and as a consequence the liver tissue was greatly diminished in amount. In fact the tumor cells exceeded in bulk the liver tissue that remained. The cell nests or masses were oval in contour with their periphery rather discretely outlined. This feature together with the fact that

Study Number Twenty-Seven--2

the masses took a basic stain made it very easy to distinguish the tissues of the organ from the neoplastic process (Figs. 1 and 2). Examined closely it was evident that the cell masses were occupying a lobular position and that the cells were not limited to the sharp confines of the peripheral capsular material so noticeable in Figs 1 and 2. In fact everywhere the cells were breaking thru this varrier and new metastatic foci were abundant (Fig. 3). There was very little liver tissue that did not contain the round cells of the tumor in the spaces between the cells of the parenchyma. This was such a constant feature as to suggest the periportal probability of the distribution of the tumor cells throughout the organ. The nests of cells were variable as to size, some being smaller than a lobule while others seemed to include parts of three and even four lobules. Where the nests were of any size all remains of liver tissue had disappeared.

In the spaces between the masses of tumor cells the liver tissue was atrophic and many areas showed the liver cells to be disposed in flattened columns with very little, if any, space between. Eosinophilia was a striking feature and was most noticeable in the areas where the round cells of the tumor were infiltrating into the adjacent liver tissue. The eosinophiles were practically all mononuclear.

Study Number Twenty-Seven--3

Examined closely with the high power the tumor cells proved to be irregularly oval to round of a size similar to small lymphocytes of mammals. They possessed rather large, deeply staining nuclei which occupied a slightly eccentric position. Chromatin material, which was abundant, had a finely granular consistence. Many of the nuclei possessed what appeared to be nucleoli. In especially thin sections a delicate fibrillar stroma could be seen. Mitosis was abundant, not only in the dense masses of tumor cells but in many cells in the scattered metastatic foci as well. The blood in the vessels present did not show any apparent increase in leucocytic content (see Fig. 4).

Diagnosis: Tumors of this variety are fairly commonly encountered in the fowl. They are undoubtedly of lymphocytic origin since the type cell is typical of that leucocyte. It is convenient to group these under two heads: the aleukemic and the leukemic forms. In the leukemic we find the tumor cells abundantly present in the blood vessels and Wharthin says they often outnumber all the other cells combined when viewed in vessels cut at right angles. Furthermore, in the leukemic type of the disease the kidney and spleen are usually involved in addition to the liver lesions.

The picture in this instance conforms closely to the aleukemic variety. The disease was actively spreading throughout the liver substance by direct infiltrative invasion of the

Study Number Twenty-Seven--4

tumor cells from the larger nests or nodules. The spread of the disease was apparently not dependent upon the blood vessels. In view of the wide spread distribution of the tumor cells and the abundant mitosis present one is struck with the possibility of the tumor cells eventually invading the blood stream and producing secondary foci in the kidney, lungs, and spleen. Whether this type could actually produce the true leukemic type is a matter of conjecture. Personally, I believe this often happens. This would be called an aleukemic lymphocytoma.

Lymphocytoma

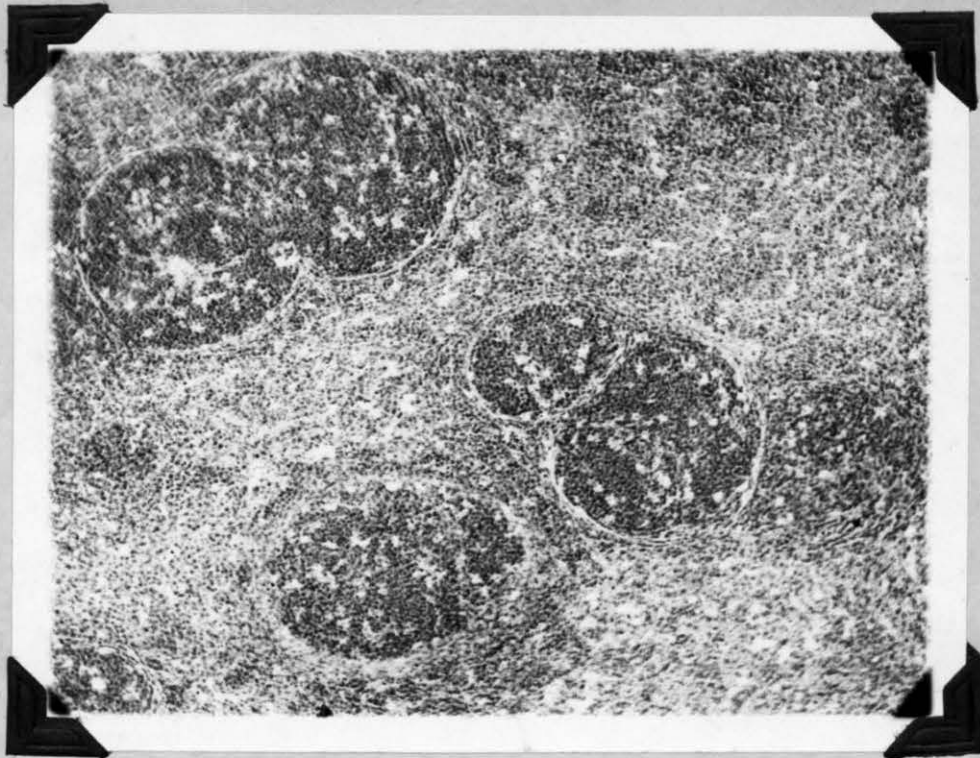


Fig. 1 (T.76) Aleukemic lymphocytoma.--Liver of a chicken.
Low power photomicrograph showing the sharply contoured cellular nests of the tumor nodules.

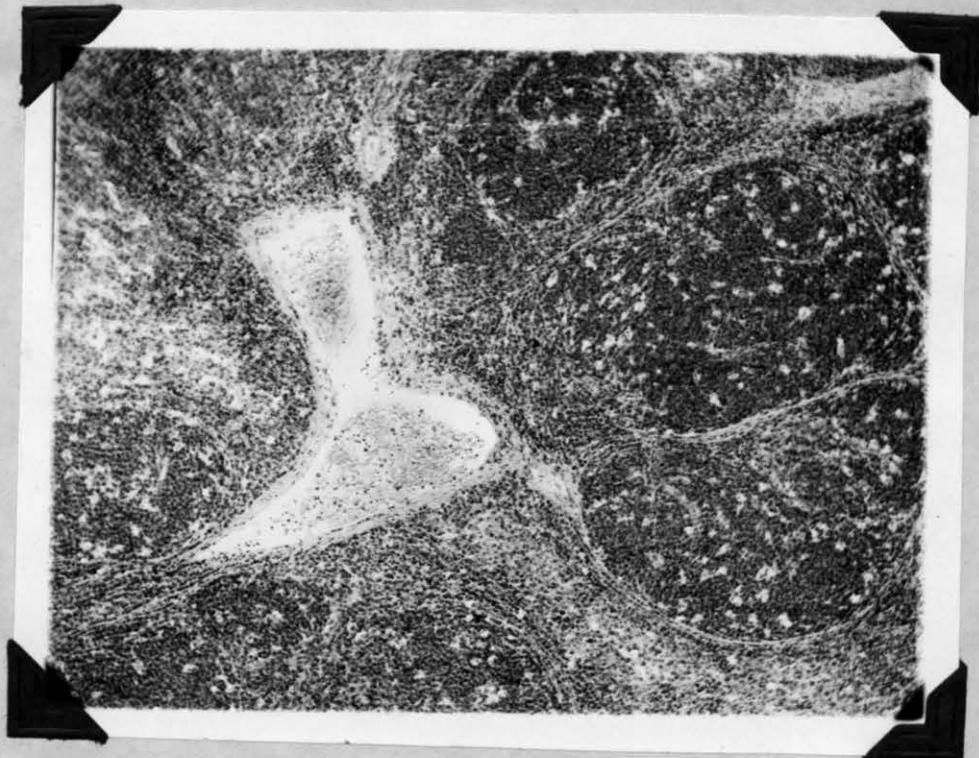


Fig. 2 (T.76) Aleukemic lymphocytoma.--Liver of a chicken.
Low power photomicrograph showing the sharply contoured cellular nests of the tumor nodules.

Lymphocytoma

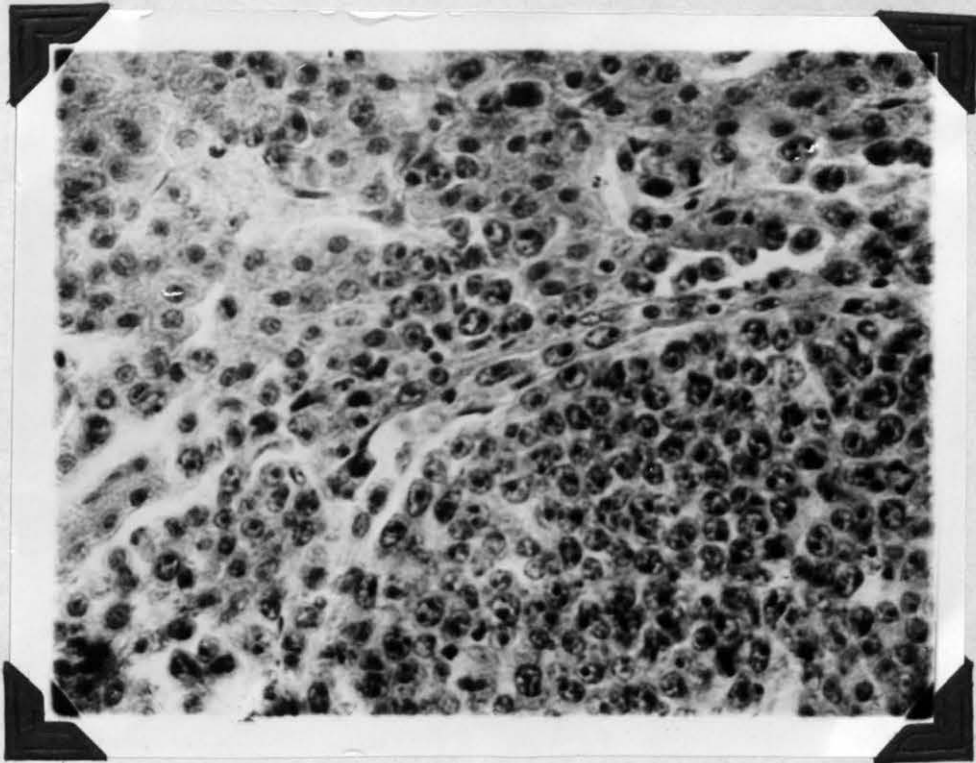


Fig. 3 (T.76). Aleukemic lymphocytoma.--Liver of a chicken.

High power photomicrograph of a metastatic nodule. Note the atrophic liver cells.

STUDY NUMBER TWENTY-EIGHT

TUMOR NUMBER 98

Multiple Malignant Lymphocytoma -- Dog

This case was brought to the Veterinary Hospital, Colorado Agricultural College, for treatment.

Clinical Data: The subject of this study was a male bull dog. The exact age was not determined but the animal appeared to be something over eight or ten years old. A previous history was not obtained and the only data of value was that which was secured while the dog was under observation at the hospital.

Physically the animal was in good condition and the only abnormalities were the enlarged condition of the following lymph nodes: submaxillary, superficial, middle and inferior cervicals, and the prescapular (see Fig. 1). These were involved bilaterally. It was felt that treatment would be of no avail and the dog was destroyed and a postmortem examination made. In addition to the above glands the mediastinals and the popliteals were likewise enlarged. The other organs and tissues were apparently normal except the spleen which was enlarged and weighed 270 grams. It contained a nodular swelling at one extremity of much the same consistence and color as the rest of the organ.

Gross Appearance: All of the glands represented the same general appearance. They were much enlarged and of a firm consistence. In color they were a dirty white.

Study Number Twenty-Eight--2

Microscopic Description: All of the nodes were sectioned and the same type of structure obtained in each. The usual lymph gland structure was missing and only in an occasional field could the remnants of lymph tissue be made out.

The material was extremely cellular and but a scant amount of stroma was discernible. This persisted as probable remains of trabeculae.

The type cell varied considerably in size being for the most part fairly large. They were imperfectly spherical in shape and possessed a large hyperchromatic nuclei that nearly filled the cells interior. Most of the nuclei were located slightly eccentrically and many mitotic figures were seen in practically every field. A small amount of delicate reticular substance occurred between the cells in some fields although this was not a prominent feature. Blood vessels ran in the stroma of the trabeculae and those that were filled did not contain more than the usual amount of leucocytes. Practically all the sections showed a pronounced invasive tendency on the part of the tumor cells. They were present in large numbers in the periglandular region but for the most part the adipose tissue remained intact (see Fig. 2).

The Spleen.--This organ was also greatly altered and very little remained of the splenic substance except the capsule. Many portions of the organ showed a marked fibrosis but the bulk of its makeup consisted of tumor cells such as were described

Study Number Twenty-Eight--3

above as occurring in the lymph nodes. Mitosis was also about as frequently observed. There was a good deal of hemoglobin in some areas and others showed a considerable "laking" of red corpuscles. Some of the blood vessels showed the presence of a number of large lymphocytes which resembled quite closely the cells of the tumor.

Diagnosis: None of the other neoplastic diseases lead one into such a dilemma as those arising from the lymphoid elements and the usual complexities that confront one in arriving at a logical and clean cut diagnosis of these conditions are present in this instance. It is unfortunate that a blood count was not made in this case. It might have assisted materially in a proper diagnosis. From the available evidence I am inclined to look upon this tumor as a lymphocytoma. The distribution of the disease, at widely separated positions such as the submaxillary and the popliteal glands and the spleen with the complete destruction of the glandular parenchyma would indicate this disease. The apparent freedom of the kidneys, lungs and liver from metastatic foci would support the contention that perhaps this tumor spreads by way of the lymph channels and rarely by the blood. However, it is difficult to account for the splenic involvement by any other means than the blood and it is likewise unsatisfactory to explain the involvement of the popliteal nodes by continuity, via the lymphatics unless the entire lymphatic system was

Study Number Twenty-Eight--4

affected. The locally invasive character of the growth and its pronounced destructiveness not only of the lymph nodes but of the spleen mark this as a tumor of considerable malignancy. A malignant lymphocytoma.

Lymphocytoma



Fig. 1 (T.98) Malignant Lymphocytoma of a Dog.
Photograph showing the enlarged lymph nodes of the head and neck but indistinctly.

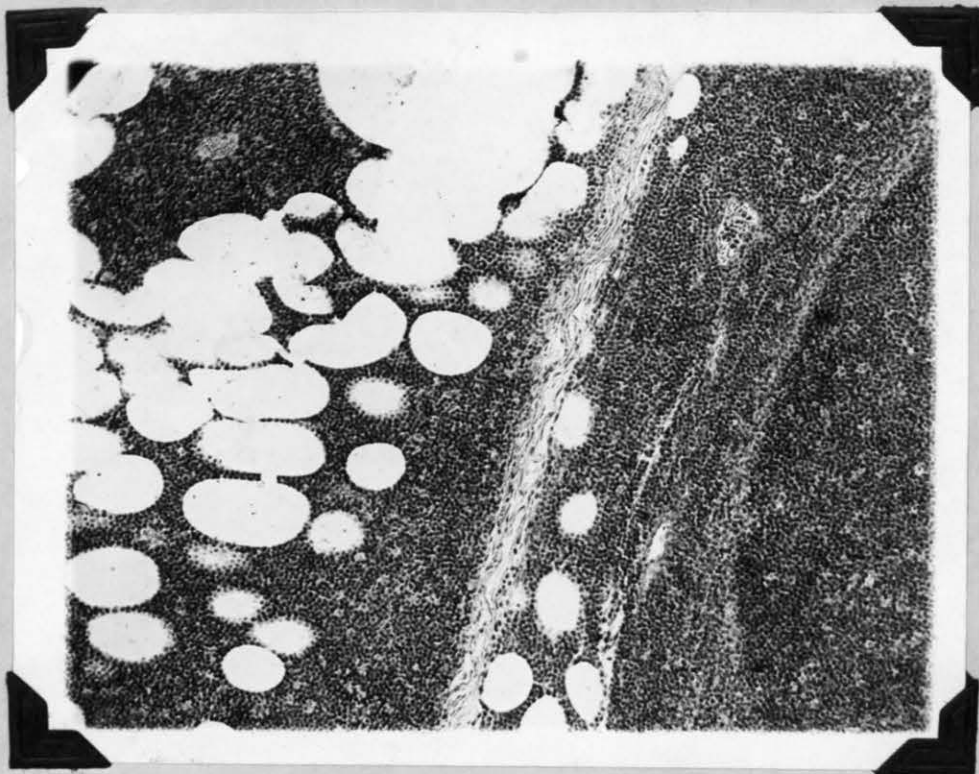


Fig. 2 (T.98) Malignant Lymphocytoma of a Dog.
Low power photomicrograph of popliteal gland, the periglandular invasiveness of the lymphoid cells.

Lymphocytoma

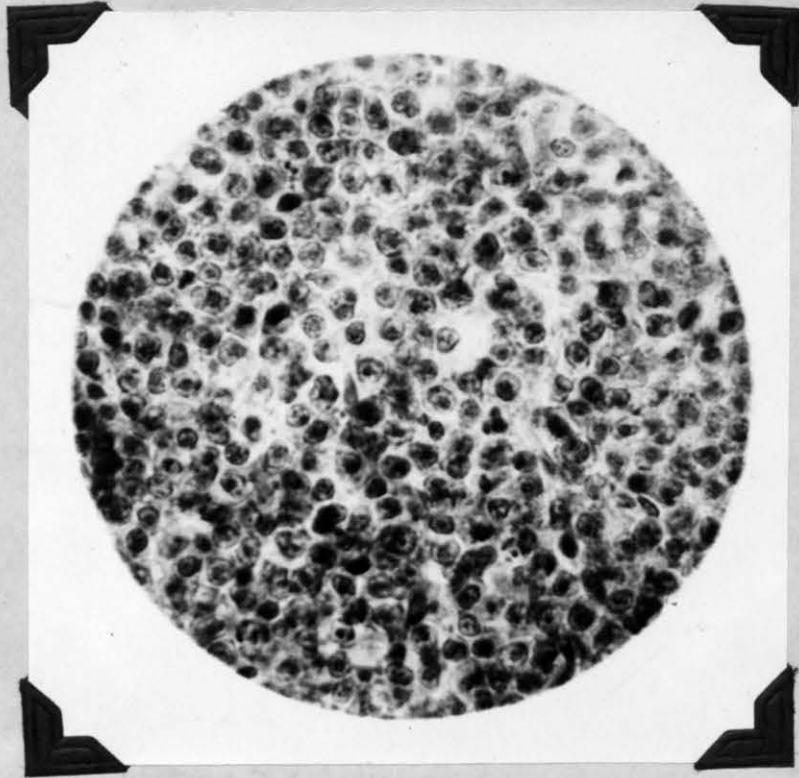


Fig. 3 (T.98) Malignant Lymphocytoma of a dog.

Photomicrograph showing uniform character of lymphoid cells. Material from the inferior cervical lymph node.

STUDY NUMBER TWENTY-NINE

TUMOR NUMBER 127

Aleukemic Lymphocytoma -- Chicken

This was a case presented at the Pathology Laboratory for diagnosis.

Clinical Data: The subject was a one year old Rhode Island Red hen. One week before the fowl's death it stopped laying and appeared droopy. Death resulted and the carcass was sent to the laboratory entire for a postmortem examination. An examination of the viscera showed the liver and spleen to be involved in a tumorous process. The liver was considerably enlarged and weighed 335 grams. Diffusely distributed throughout its substance was the firm, gray tissue of the neoplasm (see Fig. 1). The serosa of the organ covered the entire specimen. The spleen was affected in a very similar manner to the liver but not so extensively.

Microscopic Description: Liver.--Very few areas of normal liver tissue remained in the section studied. The liver cells were small and clearly showed the effect of pressure atrophy. The blood vessels were all hyperemic but there was no evidence of an increase in the total white cells present. In the zone immediately adjacent to the tumorous cells a considerable eosinophilia was observed. The tumor cells were disposed in solid sheets with all traces of liver tissue destroyed (see Fig. 2). An occasional strand of fibrous tissue was seen but a definite stroma was missing. The cells were of the round variety rather small in size and

Study Number Twenty-Nine--2

resembling the small lymphocytes. The nuclei were large and hyperchromatic. Mitotic figures were present but were not especially abundant.

Spleen.--Those areas of the spleen which were affected showed a complete replacement of the splenic parenchyma by the neoplastic cells and all that remained of the organ was a septa which were much smaller than normal. The same type of lymphoid cell that occurred in the liver was the type cell here. The blood vessels were also congested but contained no apparent increase of lymphocytes.

Kidney.--This organ was sectioned but no tumor involvement was seen. The same hyperemia observed in the liver and spleen was also present here. A marked eosinophilia was a feature of the medullary portion.

Diagnosis: This disease is rather typical of a class of frequently observed disturbances in the common fowl that might be termed lymphocytomas. It is convenient to group them under two heads: leukemic lymphocytomas and aleukemic lymphocytomas. In the first variety there is an increase of lymphocytes in the blood vessels (1) while in the second a vascular lymphocytosis is absent.

This tumor I feel belongs to the latter group and could be properly called an aleukemic lymphocytoma. This case is similar to a number of others already studied and offers no new features.

Ref.--(1) Warthin, A. S. Leukemia of the Common Fowl. Jour. Inf. 4, No.3: 369-381. June, 1907.

Lymphocytoma

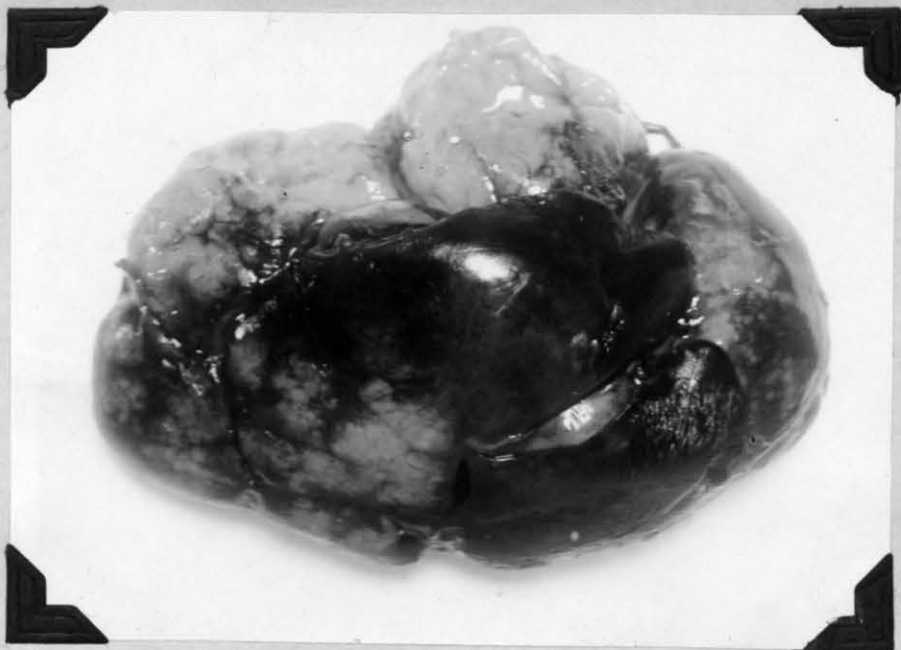


Fig. 1 (T.127) Aleukemic lymphocytoma.--
Liver of a chicken.



Fig. 2 (T.127) Aleukemic lymphocytoma.--
Liver of a chicken.

Low power photomicrograph of liver tumor showing the diffuse manner in which the lymphoid cells are distributed.

STUDY NUMBER THIRTY

TUMOR NUMBER 143

Malignant Lymphocytoma -- Head of Chicken

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

Clinical Data: The subject was a Barred Rock hen which had been presented at Dr. Mathew's laboratory for the diagnosis of a tumorous affection of the head. There was no other clinical information available.

Gross Appearance: The head was involved bilaterally in a tumorous process which gave the part a grotesque unreal appearance (see Fig. 1). The growth was behind and around the eyes and extended downward and backward to the parotid region where it appeared in a great roll or nodule. The head was at least twice its usual width and vision appeared to have been impossible or at least greatly impaired.

Microscopic Description: This proved to be a typical lymphoid tumor with the cells in compact formation and a very small amount of delicate stroma present (see Fig. 2). The cells resembled the large lymphocytes and were fairly uniform in size and shape. Their general contour was spherical to polyhedral and their outlines were fairly distinct. The nuclei, which were eccentrically located, were quite large and filled probably two-thirds of the cell's interior. They contained many coarse granules and a few nucleoli were present. Mitosis was a common feature. A very delicate reticulum could be seen in particularly

Study Number Thirty--2

thin sections where the cells were teased apart. The material was fairly vascular, the blood being carried in thin walled vessels in the midst of the tumor cells.

Diagnosis: It is indeed regrettable that a complete postmortem examination was not made of this fowl. A detailed necropsy record and some blood smears might have added a great deal of interest to this study. In the absence of additional clinical data the complete picture is difficult to reconstruct but I am impressed with the similarity of this tumor with the picture presented in the leukemic condition in fowls which are classed under the heading of lymphocytoma. This is clearly a malignant neoplasm but resembles in some respects a lymphosarcoma and perhaps it would not be far wrong to call it by that name. In view of the apparent relationship of this growth to the common chicken neoplasms above mentioned, I consider this a malignant lymphocytoma, possibly developing as a result of metastasis from the liver, spleen or kidney. A malignant lymphocytoma.



Fig. 1 (T.143) Malignant lymphocytoma of a Chicken.

Photograph of gross specimen, the grotesque appearance of the head.

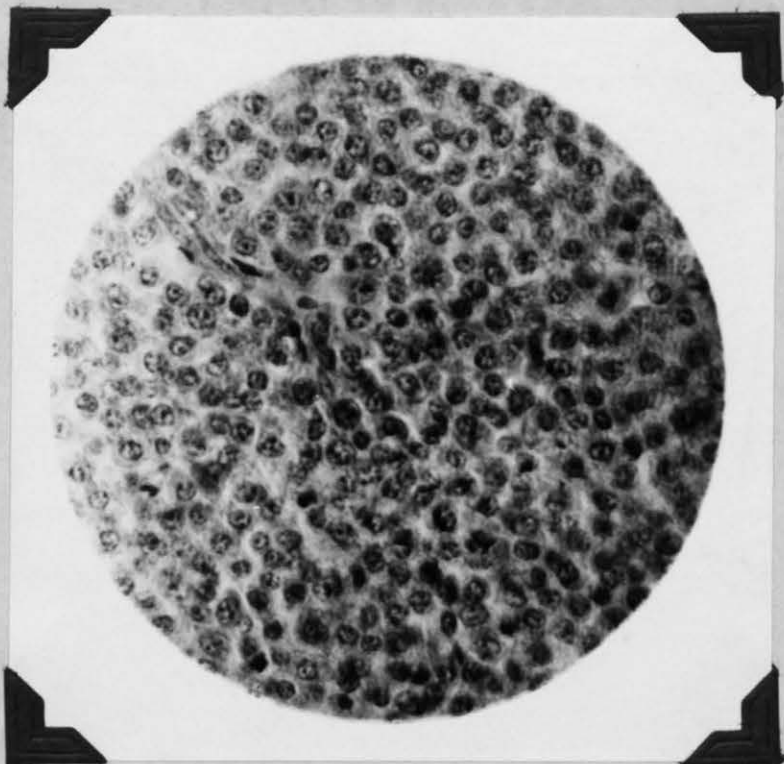


Fig. 2 (T.143) Malignant lymphocytoma of a chicken.

High power photomicrograph showing the compact arrangement of the lymphoid cells.

STUDY NUMBER THIRTY-ONE

TUMOR NUMBER 3

Lymphosarcoma -- Axillary Space of a Dog

This was a case of Dr. H. E. Kingman, Veterinary Hospital, Colorado Agricultural College.

Clinical Data: The animal was a fourteen year old brown pug dog; sex, male. A hard swelling back of the left elbow and on the chest wall appeared within a few days. This was removed once but soon recurred accompanied by a swelling of the axillary, pre-scapular, and prepectoral lymph nodes. The animal developed a generalized edematous condition and, as the case was considered hopeless, he was killed and a postmortem examination made. On necropsy two large ulcers were found in duodenum.

Gross Appearance: The tumorous mass from the side of the thorax resembled a turkey egg in size with hair over the exterior surface. It was diffusely attached to the underlying tissue by a rather broad base. It appeared quite vascular and was of a flesh pink color, quite firm to the touch. The deeper portions showed some intermingling of the tumor tissue with the normal tissue beneath indicating some progressiveness in this direction.

Microscopic Description: This was a very cellular structure with the supporting connective tissue having an alveolar arrangement. The alveoli or recesses were closely packed with lymphoid cells which, for the most part, were oval to spherical in shape. The entire cell was about twice the diameter of the nucleus, consequently considerable cytoplasm was present. The

Study Number Thirty-One--2

spherical nuclei showed chromatin granules in some quantity which were situated diffusely throughout. Some of the cells showed fine vacuoles, in some instances extending throughout the cytoplasm. Mitotic division was commonly observed. Another interesting feature was the presence in the tumorous tissue of certain mononuclear giant cells. Occasionally a giant cell with two nuclei was seen. A generous blood supply was provided.

Diagnosis: Being a new growth of rapidly proliferating lymphoid cells closely packed within the meshes of a loosely arranged reticular stroma together with the display of metastasis would qualify this tumor as a lymphosarcoma.

Note.--This material had been on hand for about eight years and apparently had lost its capacity to take a satisfactory differential stain. For this reason a number of attempts to make a photomicrograph of the tumorous tissue resulted in failure.

STUDY NUMBER THIRTY-TWO

TUMOR NUMBER 15

Lymphosarcoma -- Sublumbar Region of a Hog

This tumor was received from Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: This was a packing house case. A Duroc hog in apparent health was slaughtered and on postmortem examination of the carcass a diffuse multiple tumorous mass was removed from the sublumbar region. The tumor was of such size as to almost cover both kidneys.

Gross Appearance: The tumor was light gray in color; was fairly soft to the touch and appeared quite vascular. It was surrounded by a capsule which could be stripped off with difficulty and was well imbedded in the connective tissue of the part. In size it measured 13 cm. x 7 cm. x 30 cm.

Microscopic Description: Viewed with the low magnification remnants of what was once a lymph gland were seen. Trabeculae such as divide the gland into lobules were present as well as the remains of lymphoid tissue. A few large vessels containing blood were observed in the connective tissue septa. The trabecular structure was being encroached upon by the tumor cells which were forcing their way in row like formation between the strands of connective tissue (see Fig. 1).

A high power study of the sections showed the type cell to belong to the lymphoid series. It was very irregular in shape and slightly larger than the cells of a normal lymph node. Rec-

Study Number Thirty-Two--2

ticular tissue was promiscuously distributed between the lymphoid cells (see Fig. 2). The nuclei occupied practically all of the cellular bulk. While most of the nuclei stained quite well with hemotoxylin, a few stained but faintly. In these the chromatin granules were very apparent as small dark bodies scattered throughout the interior of the nucleus.

Mitotic figures were plentiful. In fact, examples of almost every stage of indirect cell division could be demonstrated in these sections. Red blood corpuscles in single columns were frequently encountered but no definite capillary walls were seen.

Diagnosis: This is a lymphoid tumor with all the features of a malignant growth. It is possible that it had its origin from one of the lymph glands of the sublumbar region and grew to such a size as to practically obliterate all but a few landmarks of the parent tissue.

An invasive destructive tumor consisting of atypical lymphoid cells laid down in an irregular reticular framework, a lymphosarcoma.

Lymphosarcoma

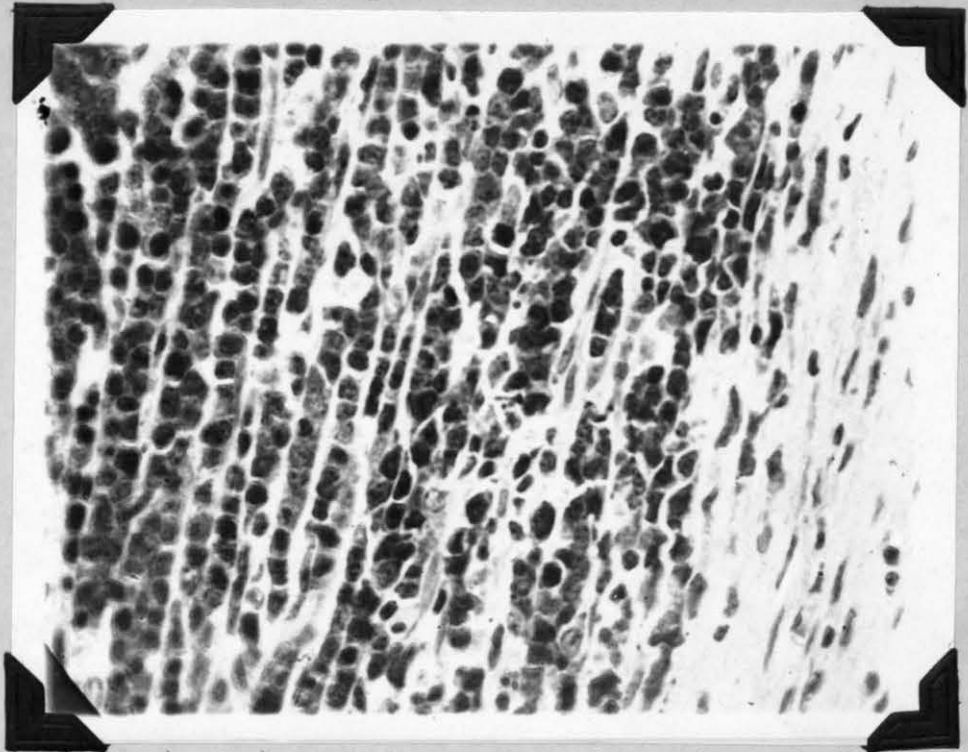


Fig. 1 (T.15) Lymphosarcoma from the sub-lumbar region of a hog.
High power photomicrograph showing the lymphoid cells of the tumor pushing between the strands of connective tissue in slender columns.

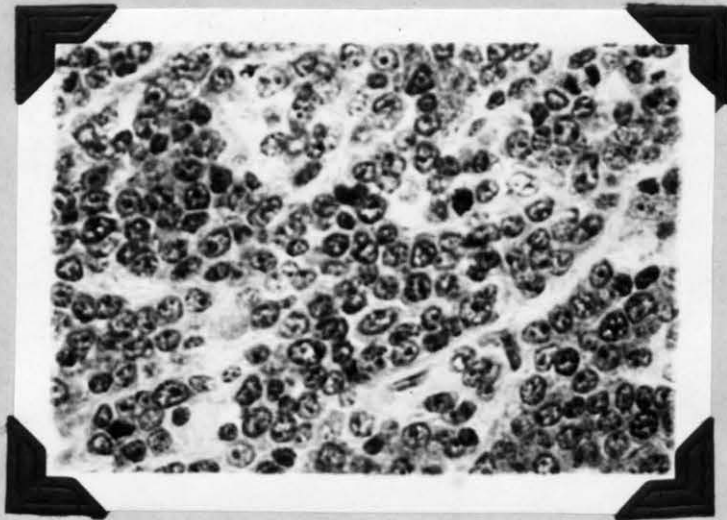


Fig. 2 (T.15) Lymphosarcoma from the sub-lumbar region of a hog.
High power view showing the reticular tissue between the lymphoid cells.

STUDY NUMBER THIRTY-THREE

TUMOR NUMBER 25

Metastatic Lymphosarcoma -- Lung of Rabbit

This tumor was forwarded to our laboratory by Dr. F. R. Beaudette, Kansas State Agricultural College, Manhattan, Kansas.

Clinical Data: A rabbit that had been used in immunization experiments suddenly died and on postmortem a large elongated tumor closely associated with the omentum was observed. The lungs also contained tumorous areas varying in size from 0.2 cm. to 1 cm. in diameter.

Gross Appearance: The abdominal tumor was not available and the only data concerning this mass that occurs in our records is the information that the tumor was about 25 cm. long and assumed an elongated shape. The lung material showed many distinct nodular formations elevated to some extent above the surface but covered with pleura. These nodules were somewhat irregular in shape and greyish white in color and quite variable as to size, the larger ones being nearly 1 cm. in diameter. They were firm but somewhat mealy in consistence. In the body of the lung smaller tumorous foci of about the same color and consistence as those nearer the surface were in evidence.

Microscopic Description: Sections were obtained from the elevated nodules and from the deeper portions of the lung containing the smaller foci. The lung tissue not involved in the neoplastic process showed considerable edema with many lymphocytes and mononuclears present, and a collapse of the respiratory

Study Number Thirty-Three--2

alveoli. The tumorous formations occupied prominent positions in the lung tissue. They were irregularly oval in contour and at places sharply separated from the tissues of the organ by delicate strands of connective tissue. Some lymphocytic infiltration was present in this zone. At other points the tumorous material was disposed in a diffuse manner so as to make the line of separation indistinct (see Fig. 1).

The tumorous areas seemed to obliterate practically all of the normal landmarks of the organ. The tumor was growing in a solid form with some tendency toward alveolar formation (see Fig. 2). Blood channels were fairly common in the connective tissue between the accumulations of cells.

Under the high power the individual tumor cells were revealed as being rather large in size and irregularly oval in shape. The nuclei were also large and filled most of the cells' interior. They were oval to spherical in outline and were abundantly supplied with chromatin material in the form of minute granules. Mitosis while occasionally seen was not a common feature. In many of the alveolar-like accumulations of cells those near the periphery of the structure assumed an elongated or spindle shape. Aside from the strands of connective tissue separating the cells into large groups no intercellular material could be demonstrated.

Diagnosis: This is probably the metastatic manifestation of a primary growth in some other part of the body. It is

Study Number Thirty-Three--3

possibly of a similar nature as the abdominal mass. From the nature of the type cell it is probable that this had its origin in some granular tissue of a lymphoid nature. The evidence would indicate this tumor to be a secondary lymphosarcoma.

Lymphosarcoma

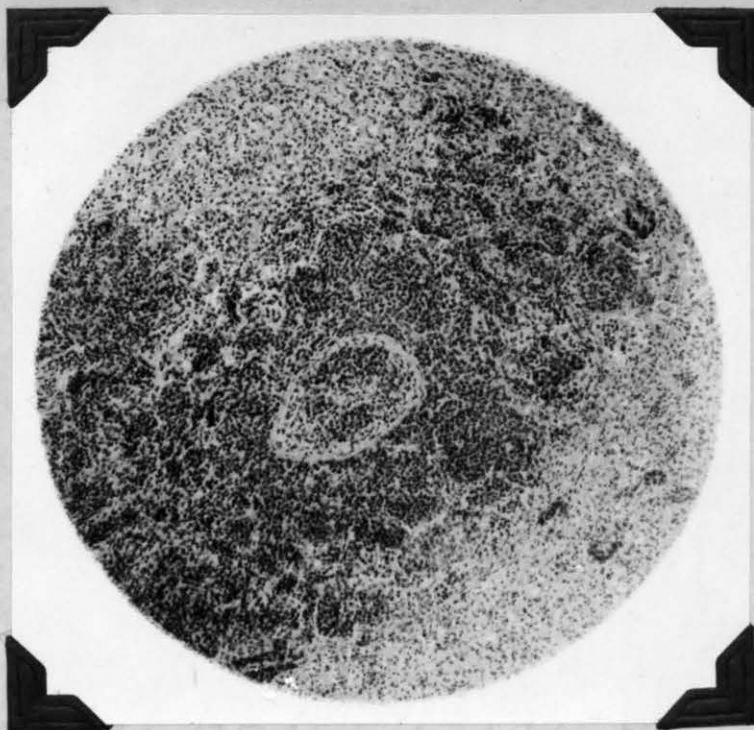


Fig. 1 (T.25) Lymphosarcoma.--Lung of a rabbit.
Low power view showing the diffuse manner in which the lymphoid cells were infiltrating the lung tissue.

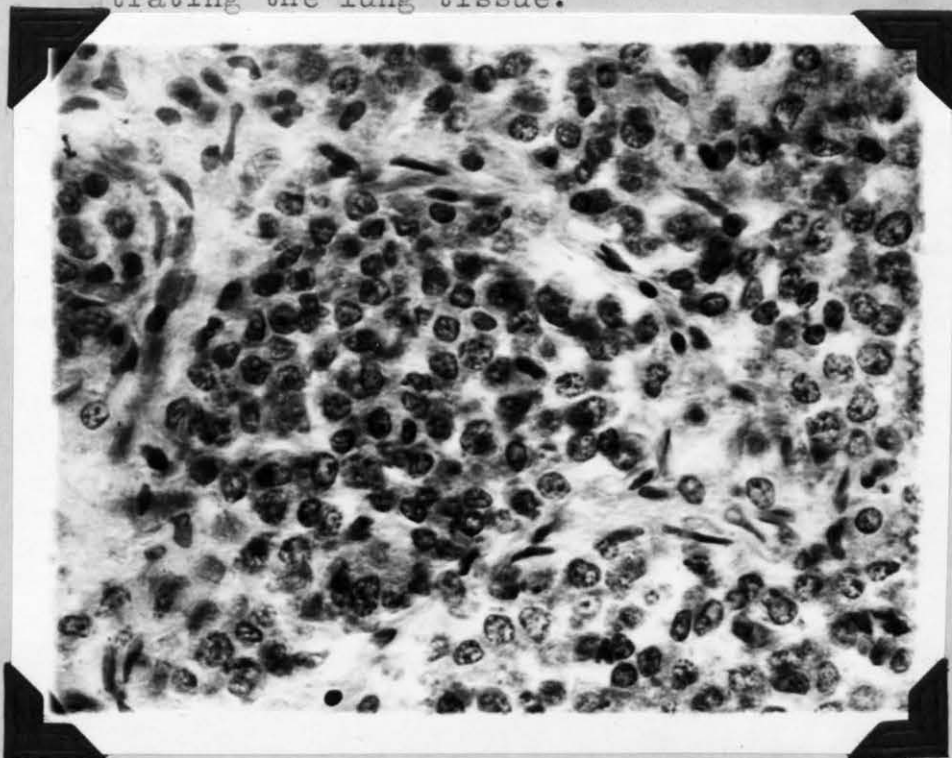


Fig. 2 (T.25) Lymphosarcoma.--Lung of a rabbit.
High power photomicrograph showing the tendency of the cells toward alveolar formation.

STUDY NUMBER THIRTY-FOUR

TUMOR NUMBER 56

Lymphosarcoma -- Cervical Lymph Nodes in a Chicken

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

Clinical Data: The tumor was from a Rhode Island hen. About two months before the bird's death a few pea sized nodules were observed along the entire length of the neck on both sides. The owner of the bird gave the information that two other birds had been lost previously both showing apparently the same condition. The nodules were situated just beneath the skin and some extended somewhat into the muscles and connective tissues of the region.

Gross Appearance: The tumorous material was in the form of multiple nodules measuring on the average about 1.5 cm. in diameter. They were white in color and rather soft in consistency. Each was surrounded by a delicate capsule.

Microscopic Description: A very cellular type of structure was revealed in sections from this tumor (see Fig. 1). In fact, the supporting tissue of the mass was so scant in comparison with the bulk of tumor cells as to indicate the inability of the framework to keep pace with the more vigorously proliferating cells of the parenchyma. Slender partitions or septa of connective tissue were irregularly distributed throughout the mass and finer strands were in turn given off from these to ramify or become lost in the maze of cells which were so abundant.

Study Number Thirty-Four--2

A high power study showed the tumor cells to be dispersed in a diffuse manner and lying in a delicate reticulum (see Fig. 2).

While the cells presented some variation as to shape and size most of them were irregularly round and fairly large. The nuclei were of the same general contour as the cells of which they were a part. The nucleus was large and took up a considerable portion of the cellular substance (see Fig. 3). Chromatin granules while conspicuous were not numerous. Most of the nuclei presented a somewhat vascular appearance. Mitosis was a frequent feature. A generous blood supply was indicated by the many vessels running in the connective tissue septa. These were scattered throughout the various fields.

Well marked areas of coagulation necrosis were present in some of the sections studied indicating a certain retrogressive behavior in portions of the neoplasm (see Fig. 4).

Diagnosis: This is a tumor whose cells must have had as their original parentage, cells of lymphoid tissue. Perhaps they received their initial neoplastic proliferative impulse in the substance of the cervical lymph nodes. While nothing resembling the structure of a lymph node was observed in the material examined, the fact that the tumor extended along both sides of the neck would indicate the probability of a lymph gland involvement.

The microscopic picture is that of a lymphosarcoma with every indication of malignancy except that the actual metastasis

Study Number Thirty-Four--3

was not demonstrated macroscopically. It is possible that had the kidneys or perhaps the lungs been subject to microscopic scrutiny metastatic foci would have been revealed.

Too much credence should not be given the owner's opinion that the death of the other two birds was due to the same condition as described here. It would certainly be a very unusual coincidence, to say the least. A lymphosarcoma of the cervical lymph node.

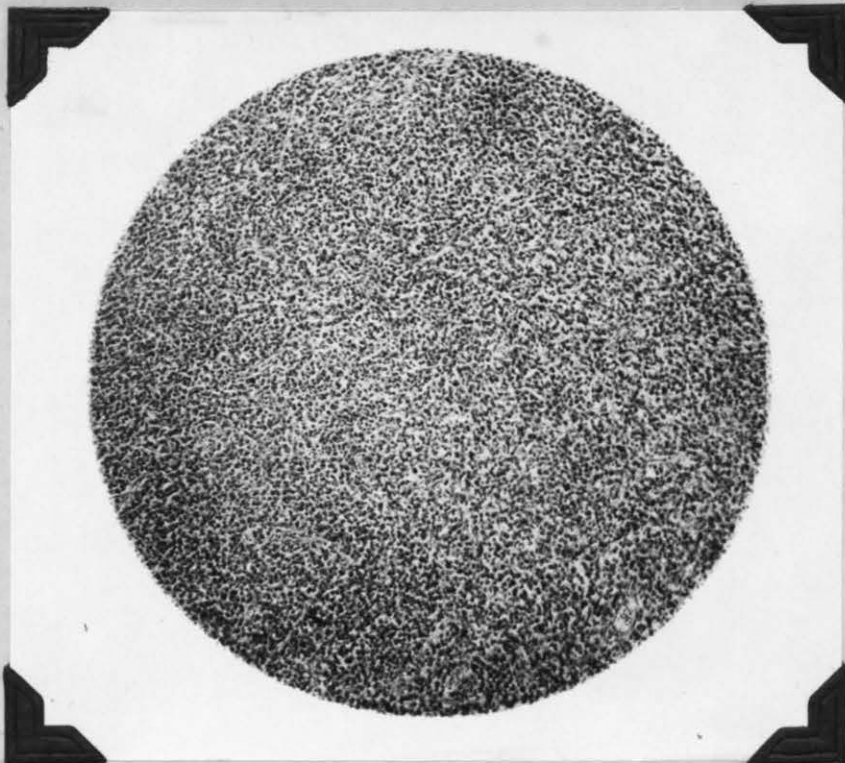


Fig. 1 (T.56) Lymphosarcoma of the cervical lymph nodes of a chicken. Lower power photomicrograph showing highly cellular type of structure.

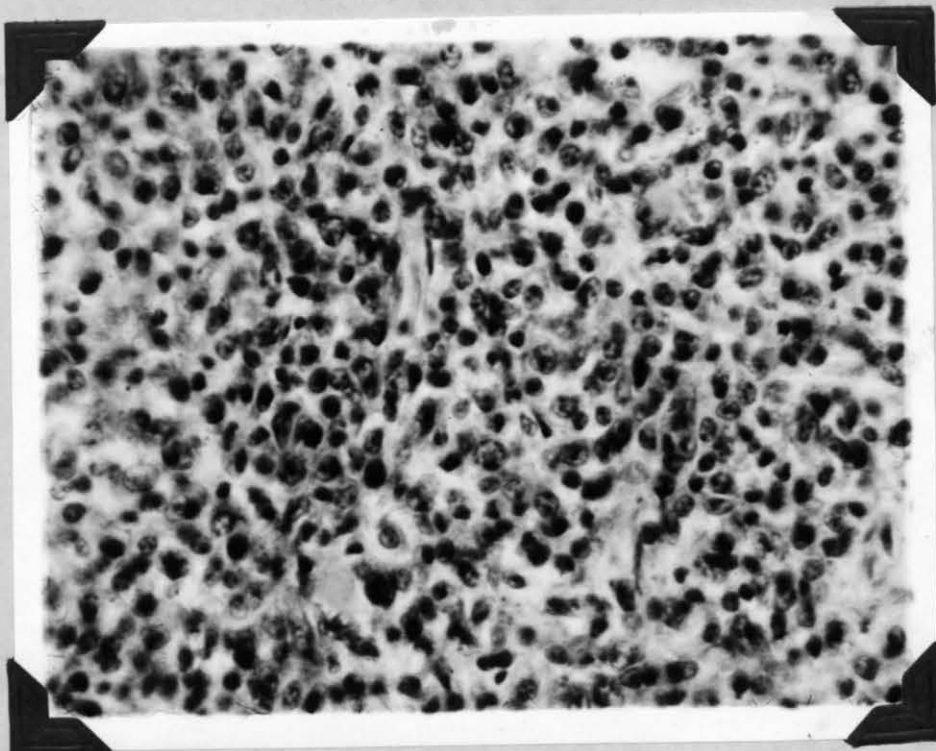


Fig. 2 (T.56) Lymphosarcoma of the cervical lymph nodes of a chicken.

High power photomicrograph showing tumor cells disposed in diffuse manner between delicate reticular tissue.

Lymphosarcoma

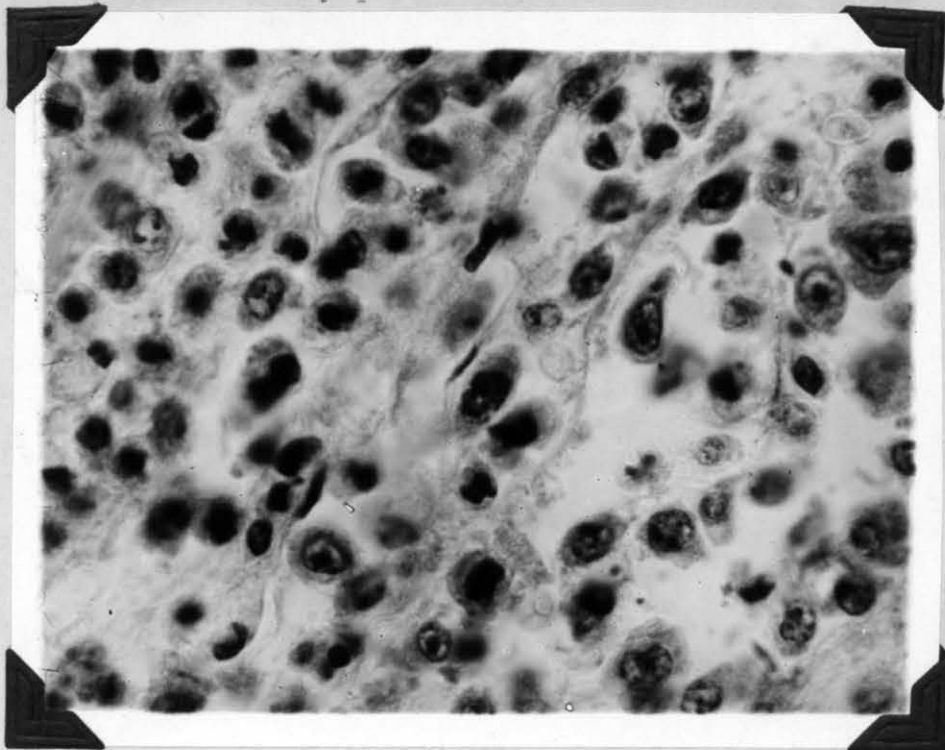


Fig. 3 (T.56) Lymphosarcoma of the Cervical Lymph Nodes of a Chicken. Oil immersion photomicrograph showing large nuclei and delicate reticular fibrils between the cells.



Fig. 4 (T.56) Lymphosarcoma of the Cervical Lymph Nodes of a Chicken.

Low power photomicrograph showing coagulation necrosis affecting many of the tumor cells.

STUDY NUMBER THIRTY-FIVE

TUMOR NUMBER 69

Lymphosarcoma -- Gizzard of a Chicken

This was a case presented at the laboratory of Veterinary for diagnosis.

Clinical Data: The animal was a Rhode Island Red hen, age eleven months. A few days before death she showed general dullness but no other symptoms were noticed. The bird was in good physical condition with the exception of a firm tumorous mass imbedded in the posterior external portion of the gizzard.

Gross Description: The tumor occupied a subepithelial and external position in the wall of the gizzard (see Fig. 1). It was oval in shape and measured about 6 cm. in diameter. It was firm in consistency and grey in color. The surface was somewhat roughened and was shrouded in the connective tissue of the region. The connective tissue was in rather compact layers which gave the structure a capsular appearance. The mass did not appear to be particularly vascular.

Microscopic Description: The main constituent of this growth was a cell of the lymphoid type. These cells were in diffuse masses which were cut at irregular intervals by strands of connective tissue of varying width. Delicate collagen fibrils were present between the lymphoid cells in certain areas but for the most part no intercellular substance was revealed. The type cell was of the small round variety although where the cells were greatly bunched and in contact with the connective tissue stroma

Study Number Thirty-Five--2

there was a tendency toward an oval or elongated contour. The nuclei took a deeply basic stain which had the effect of obliterating the chromatin granules in all except a few instances. Many of the nuclei seemed to occupy a slightly eccentric position. The amount of cytoplasm bordering the nuclei was about one-third the diameter of the entire cell. The cytoplasm which stained acid was clear, granules not being discernable. Mitotic figures, while often seen, were not of sufficient frequency to constitute a striking feature.

Well formed blood vessels were fairly numerous in the connective tissue structures and one area showed considerable hemorrhage. Considerable retrogression was in evidence and many large areas were practically devoid of tumor cells (see Fig. 2). Clear spaces were a common feature and more or less coagulation necrosis of the tumor parenchyma was easily demonstrable. In these areas the intercellular fibrils persisted. Wandering cells were commonly encountered in these retrogressive areas and an occasional eosinophile was seen.

Diagnosis: The type cell and its manner of growth would point to this tumor being a lymphosarcoma. My knowledge of the histology of the gizzard of the chicken is so meager that it is somewhat difficult to logically explain the histogenesis in this instance. I have observed, however, in a section of the normal gizzard, loaned by Dr. Bourne, that there appears to be small

Study Number Thirty-Five--3

nests of lymphoid tissue occupying a submucous position. Similar tissue is rather widely distributed along the alimentary canal of both mammals and fowls. This fact could account for the origin and position of this tumor which appears to be an unusual location for a rather common neoplasm. Apparently the growth was of mild aggressiveness since metastasis was not observed. The extensive necrosis would also favor this opinion.

A lymphosarcoma.

Lymphosarcoma



Fig. 1 (T.69) Lymphosarcoma.--Gizzard
of a chicken.
Photograph of the gross material.

Lymphosarcoma

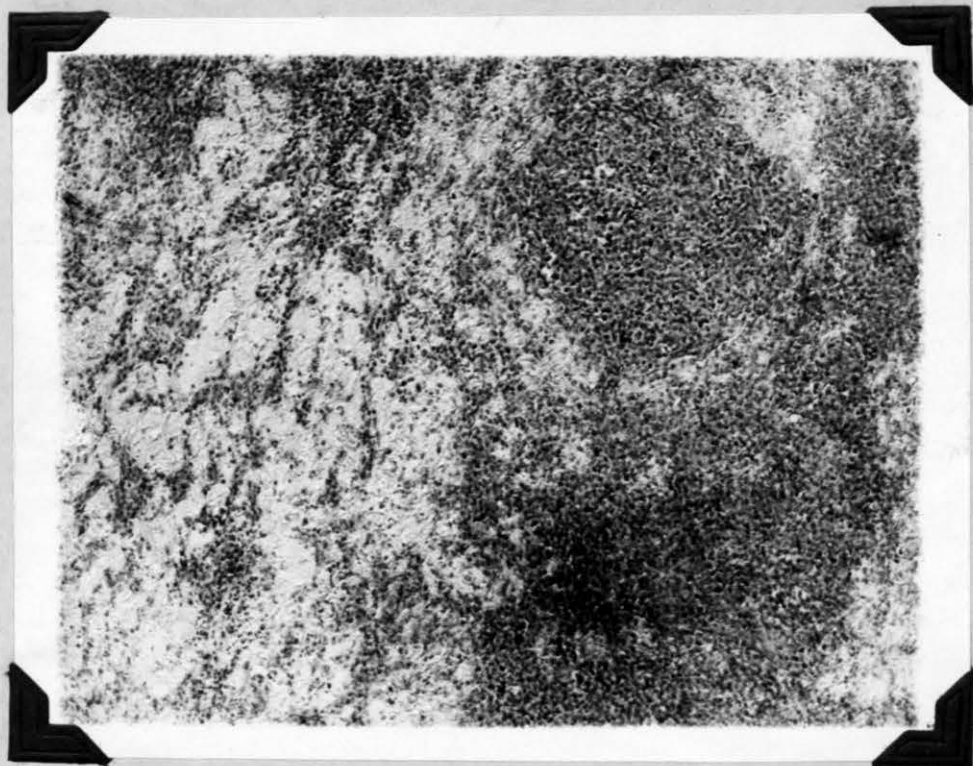


Fig. 2 (T.69) Lymphosarcoma.--Gizzard of a
Chicken.
Low power photomicrograph showing considerable
coagulation necrosis of the tumor parenchyma.

STUDY NUMBER THIRTY-SIX

NUMBER NUMBER 81

Lymphosarcoma -- Shoulder of a Sheep

This was a packing house case furnished by Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: The animal was a 16 month old Shropshire ewe that had been slaughtered for food. In the course of the usual postmortem examination of the carcass firm nodular swellings were observed bilaterally at the base of the scapula. These swellings were located somewhat superficially. It was observed that the pre-scapular lymph nodes were enlarged and slightly congested. Unfortunately, these enlarged lymph nodes were not included in the tissue sent to the laboratory. It was noted that the tumors occupied exactly similar locations on each side of the animal.

Gross Appearance: The tumors were practically identical, each being somewhat hemispherical in shape and measuring about 20 cm. x 20 cm. at their greatest dimensions. They were of rather firm consistence and of a circumscribed nature, being attached by connective tissue over their surfaces which were smooth.

No ulceration, pigments, or cysts were reported. The exterior was covered with wool. The fixed materials had a greyish white color and showed a well developed capsular structure.

Microscopic Description: The low power view revealed a highly cellular structure interrupted by narrow strands of connective tissue stroma as a consequence of which were formed incomplete compartments suggestive of alveoli (see Fig. 1). While the

Study Number Thirty-Six--2

parenchyma was unquestionably lymphoid in character, yet the structure of none of the material suggested the architecture of a lymph node.

The type cell was best studied under the high power. It was an oval or round cell with a clear pale pink cytoplasm. It possessed a rather large deeply staining nucleus and the chromatin material was quite granular and rather compactly disposed (see Fig. 2). In many of the cells the nuclei occupied a slightly eccentric position although this was not universal. Between the cells delicate strands of a reticular nature were a common feature and were apparently continuations of the larger strands of the fibrous connective tissue stroma. The fibroblasts of the stroma were much compressed and presented a thin drawn out appearance (see Fig. 3). Most of the lymphoid cells of the parenchyma were closely packed and mitotic figures were abundant (see Fig. 4). Blood vessels were infrequently seen. Most of the erythrocytes observed were in intimate association with the tumor cells. Some of the various channels showed an invasion of lymphoid cells that were suggestive of metastasis (see Fig. 5). The tumor cells in the veins resembled neoplastic thrombi. Veins so involved did not possess any red cells but were filled with a clear homogeneous material that resembled blood plasma. The walls of the veins were richly invaded by the tumor and this probably accounted for the presence of the lymphoid cells in the lumina (see Fig. 6). Mitosis was frequent in the cells occupying the veins. The cells in the veins were larger than those

Study Number Thirty-Six--3

of the tumor proper and the definite reticular substance was lacking.

Diagnosis: This tumor belongs to the lymphoblastomas. The type cell, its manner of arrangement, and its behavior would stamp this tumor specifically as a lymphosarcoma. Ewing (1) says that these tumors have a rather specific design, consisting of a diffuse growth of lymphoid cells, lying in a reticulum. The cells may be small or large with compact hyperchromatic nuclei. Ewing also remarks that these tumors are highly destructive to the surrounding tissue in which they arise and that in man fever is pronounced symptom, accompanied by a leucocytosis.

The bilateral manifestation in this case is unusual. Perhaps a common agent was concerned in the initial cause of each. (The evidence at the present time seems to suggest a long continued irritation of some sort as the most logical explanation for the origin of many of the lymphoblastomas.) It is regrettable that the prescapular lymphnodes were not available for study. The fact that they were both enlarged would suggest strongly their neoplastic involvement although the exact status must be purely speculative.

The invasion of the veins would point to the possibility of metastatic foci in the vital organs. Here again, however, I have no proof since material from the organs was not sent for examination.

Ref.--(1) Ewing, James. Neoplastic Diseases, p.367. W. B. Saunders Company, Philadelphia, Pa. 1919.

Lymphosarcoma



Fig. 1 (T.81) A lymphosarcoma.--Shoulder of a Sheep.
Low power photomicrograph showing highly cellular structure interrupted by narrow strands of fibrous stroma.

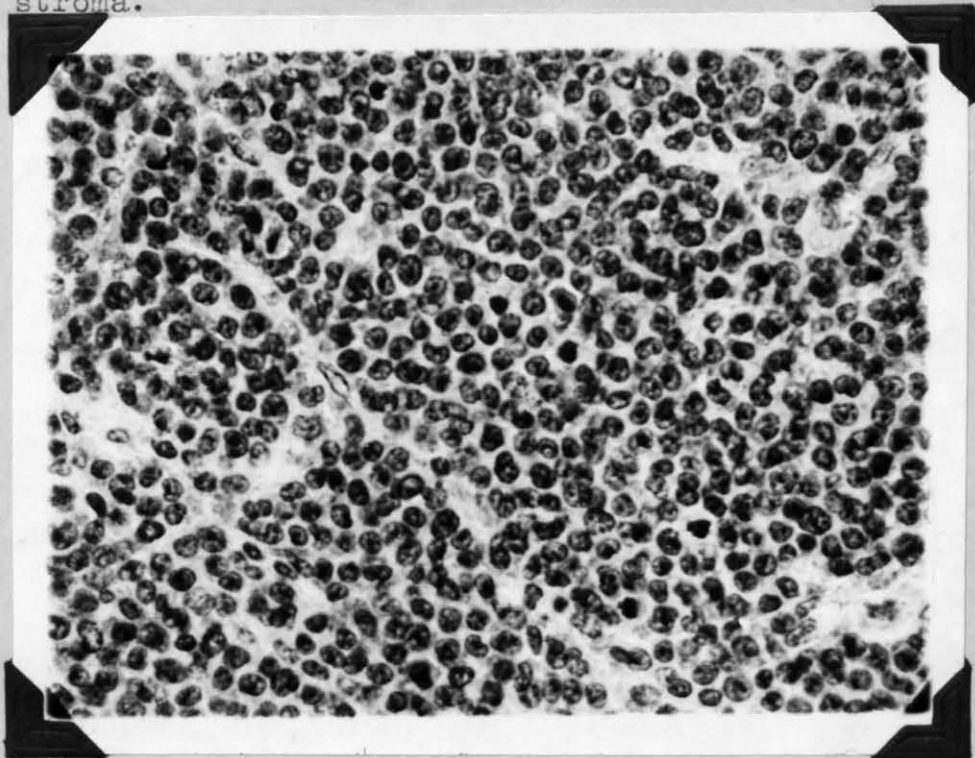


Fig. 2 (T.81) A lymphosarcoma.--Shoulder of a Sheep.
High power photomicrograph showing the uniform nature of the tumor cells.

Lymphosarcoma

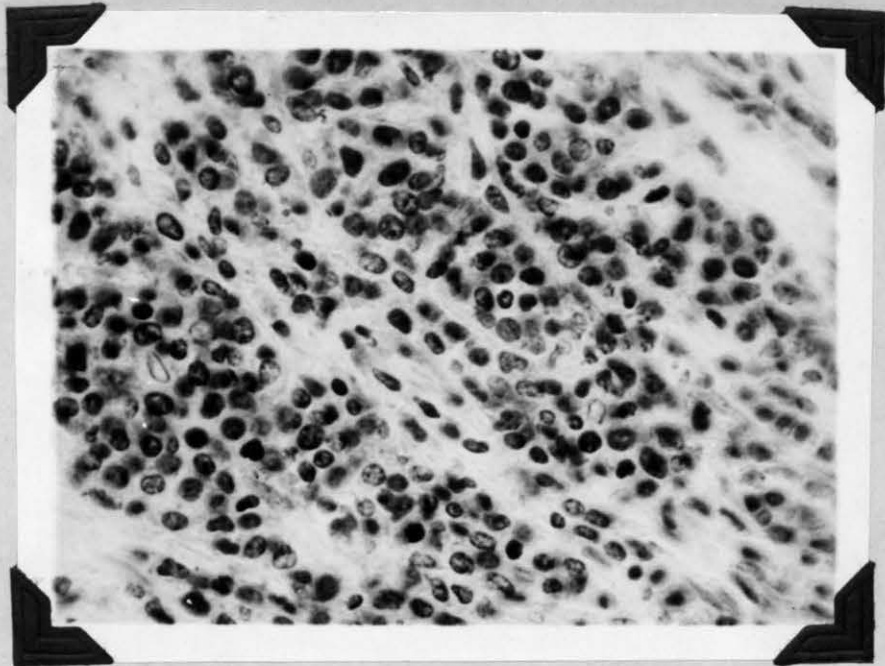


Fig. 3 (T.81) Lymphosarcoma.--Shoulder of a Sheep.
Photomicrograph showing the compressed condition of the fibroblasts of the stroma.

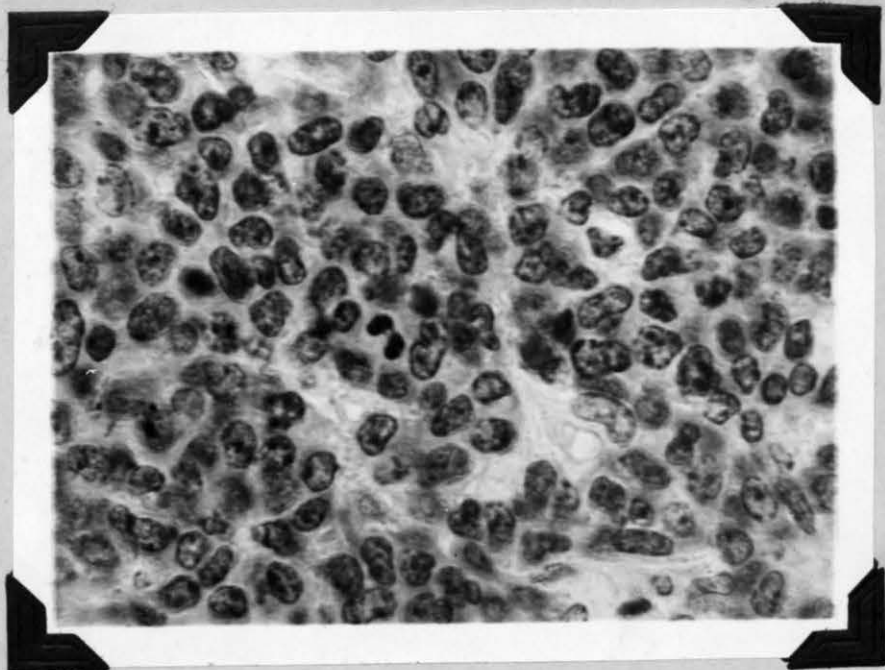


Fig. 4 (T.81) Lymphosarcoma.--Shoulder of a Sheep.
Oil immersion photomicrograph showing one cell undergoing mitosis.

Lymphosarcoma

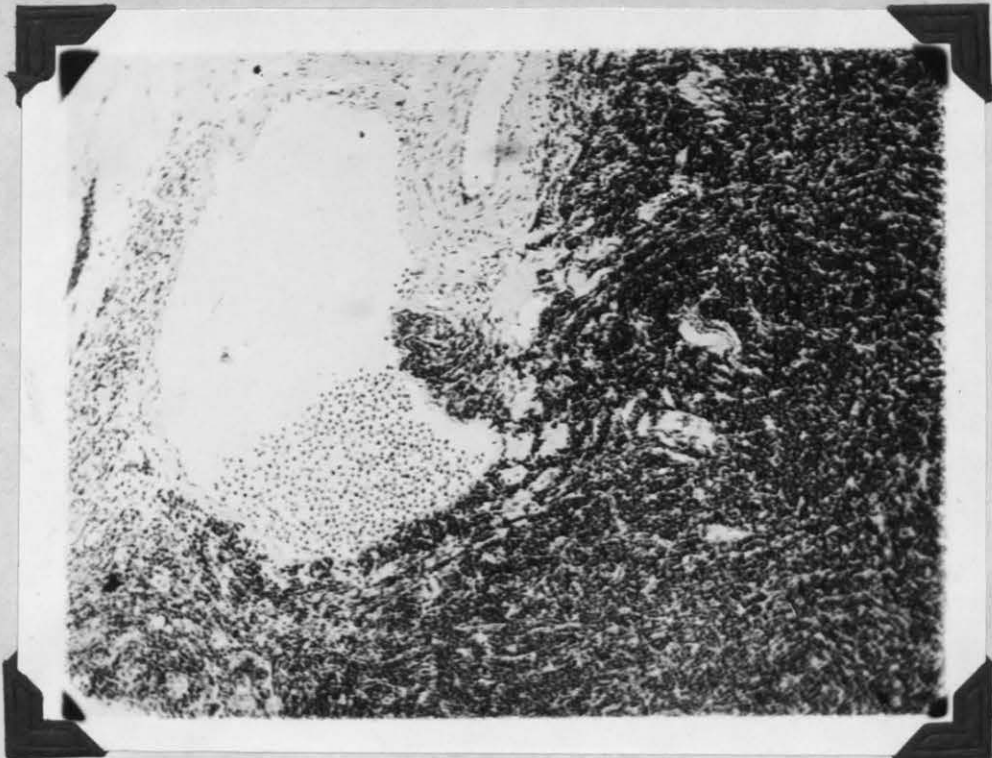


Fig. 5 (T.81) Lymphosarcoma.--Shoulder of a Sheep.
Photomicrograph showing faded out tumor cells in lumen of blood channel.

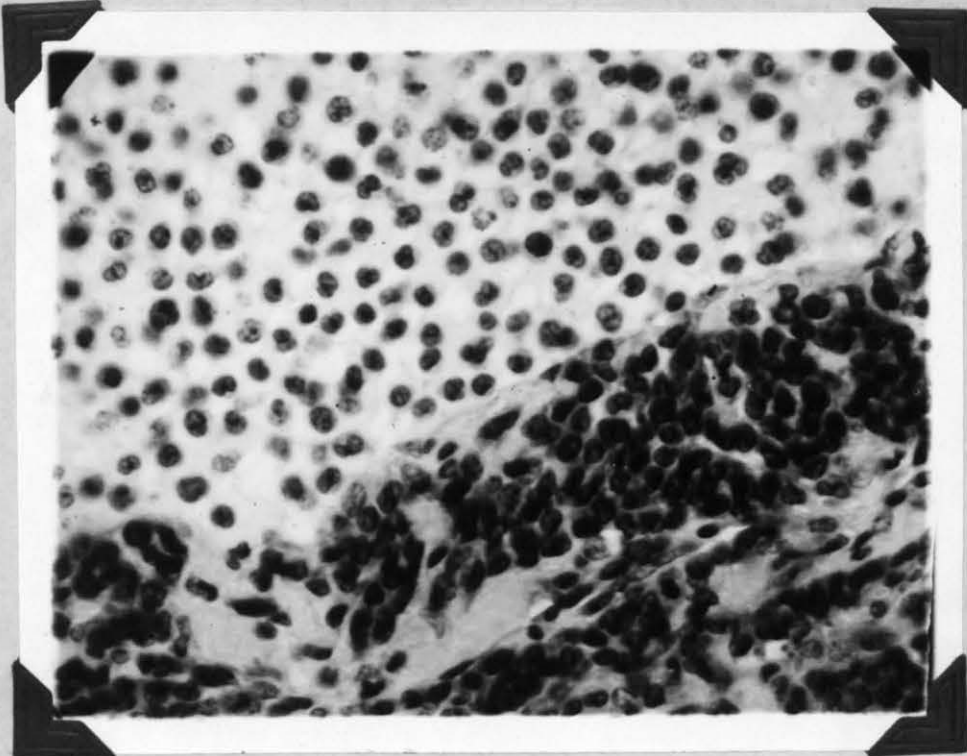


Fig. 6 (T.81) Lymphosarcoma.--Shoulder of a Sheep.
High power photomicrograph thru wall of a vein.
The wall of the structure is richly invaded by tumor cells, many of which are found in the lumen.

STUDY NUMBER THIRTY-SEVEN

TUMOR NUMBER 104

Metastatic Lymphosarcoma -- Kidney of a Bull

This tumor was received from Dr. E. E. Harnden, Stillwater, Oklahoma.

Clinical Data: The animal was a valuable five year old Shorthorn bull. Two years before the animal's death he was treated for actinomycosis of the brisket and apparently recovered. However, the animal finally died and a postmortem showed a generalized actinomycosis. (Note.--The specific location of the actinomycotic lesions was not given on the data sheet.) All of the thoracic and many of the mesenteric lymph nodes were enlarged as were several of the regional body glands. The precrural gland in left side was enlarged and infected. These swellings were all considered to be tumorous but for some reason I did not receive any of the lymph gland material for sectioning. One kidney contained a number of greyish white circular areas.

Gross Appearance: The kidney was apparently normal except for the presence of the greyish areas mentioned above. These areas were fairly numerous, one small portion of the surface showing seven such lesions (see Fig. 1). The tumors measured from 0.7 cm. to 1.5 cm. in diameter, and extended in some instances half way through the cortex of the organ. They projected slightly above the surface in a dome like manner but the kidney capsule was intact and apparently normal. The tumorous substance was soft but rather compactly disposed. While the kidney tissue was sharply contrasted from the tumorous material, the line of contact was rather jagged.

Study Number Thirty-Seven--2

Microscopic Description: Sections were obtained through one of the nodules and a portion of the adjacent kidney tissue. These showed the neoplastic process very clearly. The type cells resembled closely the lymphocyte. In the involved areas these cells were closely packed into the intertubular spaces and they had succeeded in obliterating practically everything else (see Fig. 2). In some areas even the last vestige of the tubules had disappeared and large fields of tumor cells occupied their position. Some had not disappeared but showed advanced atrophy of the lining epithelium.

The epithelium of the tubules and the cells of the glomeruli had successfully resisted any invasion by the tumor cells (see Fig. 3). They were only involved by the pressure of the cells from without, which while considerable was not sufficient to enable the cells to push their way thru. The blood vessels and the other interstitial elements were also obliterated. The tumor cells at the periphery of the lesion as well as the substance of the capsule were extremely atrophic. They were also considerably altered in shape being practically spindle like.

The tumor cells were imperfectly spherical in contour and possessed large nuclei which were hyperchromatic. A delicate stroma or reticulum was present but it had very little effect in separating the cells into units or alveoli. In fact there was no scheme or order maintained anywhere in the process. Mitotic figures were fairly common and a few small isolated foci of tumor cells were seen far out in the otherwise normal kidney substance.

Study Number Thirty-Seven--3

Diagnosis: We are dealing in this instance with a secondary and not the primary tumor. This disturbance probably had its origin in some part of the lymph system and was transmitted to the kidney by way of the blood channels, but only after a violent activity on the part of the tumor cells had enabled them to break down the natural barriers of the vessels. It is indeed regrettable that the lymph nodes in this case could not be examined. They, no doubt, would have thrown additional light on the histogenesis of the type cell found in the kidney. The type cell and its position in a reticular substance together with its apparent arrival by the blood stream would indicate strongly that this was a metastatic lymphoblastoma. The abundant mitosis would suggest the manufacture of most of the cells in situ; convincing evidence of malignancy.

One cannot help but speculate on the possible influence of the actinomycotic process in inciting the lymphoid cells to their initial lawless proliferation. While actinomycosis is not ordinarily looked upon as a stimulant of lymphocytic activity, yet it is often a lymph gland disease; and, when generalized as in this case, the irritative effect upon the lymph tissue must be considerable. This is an interesting supposition but perhaps after all the appearance of the two conditions noted here was purely coincidental.

A secondary lymphosarcoma.

Lymphosarcoma



Fig. 1 (T.104) Metastatic Lymphosarcoma.
Kidney of a bull.
Photograph of a portion of the kidney showing tumorous foci in the substance of the organ.

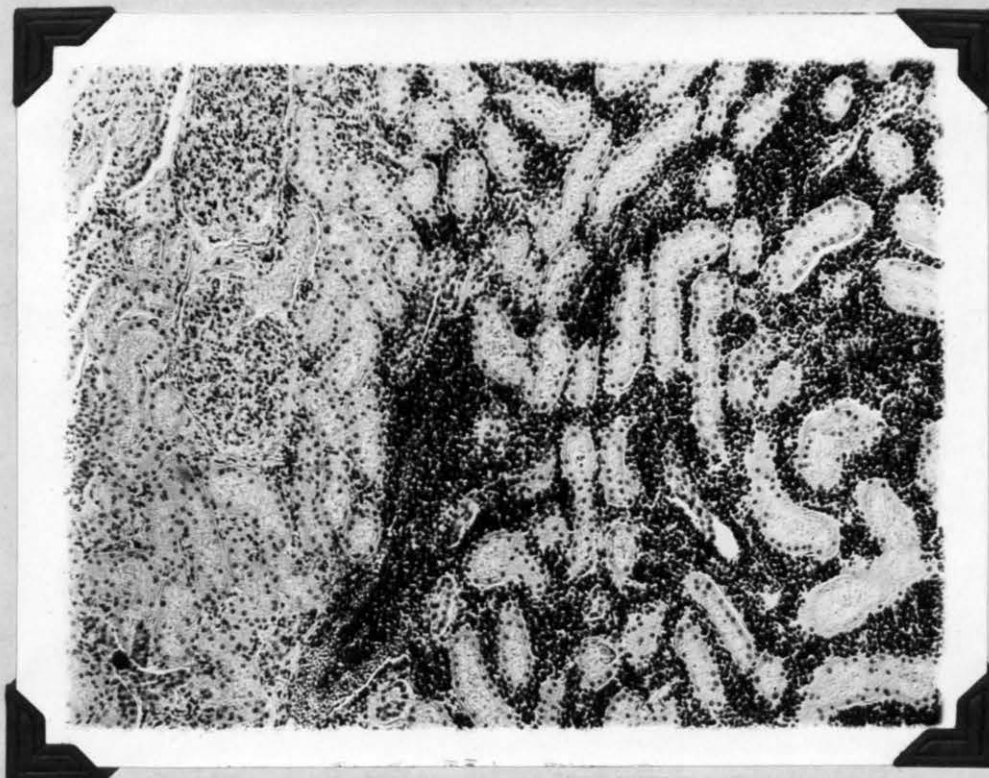


Fig. 2 (T.104) Metastatic Lymphosarcoma.--Kidney of a bull.
Low power photomicrograph showing tumorous involvement of a portion of the kidney substance. Neoplastic cells are in the interstitial areas.

Lymphosarcoma

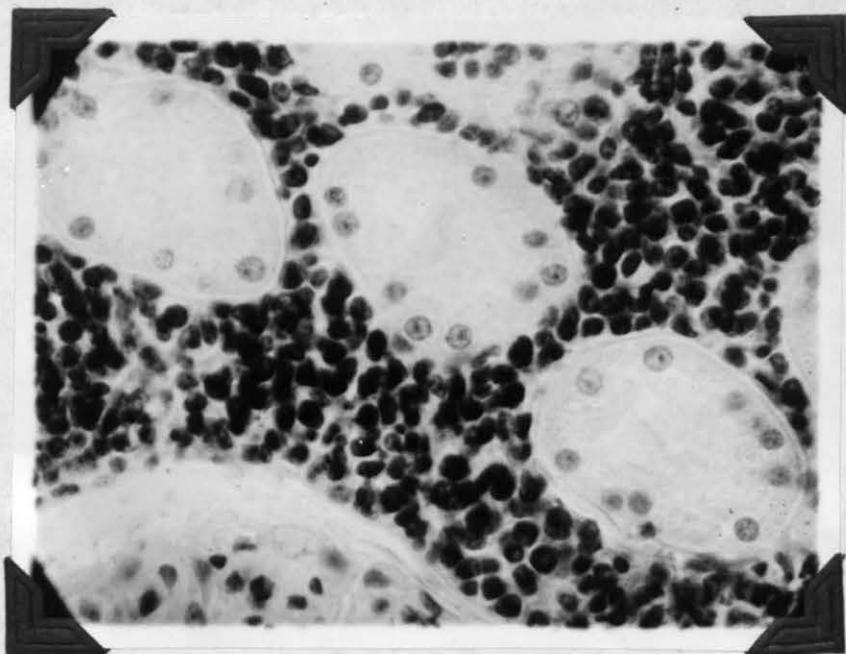


Fig. 3 (T.104) Metastatic Lymphosarcoma.--
Kidney of a Bull.

High power photomicrograph showing the extensive manner in which the tumor cells occupied the interstitial spaces.

STUDY NUMBER THIRTY-EIGHT

TUMOR NUMBER 105

Lymphosarcoma -- Vagina of a Bitch

Dr. E. E. Harnden of Stillwater, Oklahoma sent this material to our laboratory for a diagnosis.

Clinical Data: The subject was a three year old female pointer dog; color, white and tan. In July, previous to the tumor's removal in December, a small soft diffuse nodule was observed on the posterior portion of the vaginal wall. This became multiple and continued to enlarge until eventually the sexual act was impossible. At the time of its removal the tumor extended forward along the vaginal canal about four inches and a clinical diagnosis of venereal granuloma was made. It was removed surgically. Two months after the operation Dr. Harnden advised me that the bitch had made little or no progress. He also remarked that the male associated with the above bitch was suffering from a similar tumorous condition of the penis.

Gross Appearance: The mass was not weighed nor did I receive it entire, consequently nothing accurate could be determined as to its size. The data sheet contained the information that it was 10 cm. long, variable in width and had a roughened surface. No capsule was observed and the mass was rather friable in consistency. The surface was ulcerated and gave off a sero-hemorrhagic discharge. In the gross it did not appear overly vascular.

Microscopic Description: Sections were obtained through an area that showed clearly the tumor's position in relation to

Study Number Thirty-Eight--2

the underlying stroma of the vaginal wall and the remains of the vaginal epithelial layer (see Fig. 1). No sign of the submucosa could be seen, the tumorous cells apparently occupying that part of the structure. The tumorous portion was very cellular, the type cell being round in shape and lymphoid in appearance. It was of the large variety and occurred in compact formations with narrow strands of stroma at irregular intervals running in every direction. Intercellular fibrils appeared to be present in scant amount although this feature was difficult to determine with certainty..

Individually the cells were somewhat variable as to shape, most of them being nearly spherical; while a few, especially the largest, were somewhat oval. The large nucleus almost filled the interior of the cell and was located a little eccentrically. A fine granular chromatin substance was in abundance and mitotic figures were common (see Fig. 2). Blood channels were frequent throughout a goodly portion of the tumor. A few polymorphs were likewise seen but were more frequent near the surface.

The tumor parenchyma extended up to the squamous epithelial layer which in some instances was actually invaded and replaced by the tumor cells. A thin layer of cells, however, succeeded in maintaining their continuity. A portion of the surface did show an irregular zone of tumor cells superimposed upon the mucosa (see Fig. 1). Their origin could not be determined from the sections prepared.

Study Number Thirty-Eight--3

Diagnosis: This tumor is undoubtedly of lymphoid origin and falls into the class of lymphosarcomas. While its etiology and exact histogenesis must remain a matter of conjecture two possibilities exist. First, one must consider the chance of transplantation of the tumor cells from the male during coitus. This view is open to question, however, because of the fact that a histological diagnosis of the tumor on the male was not made. Second, there is a possibility of the proliferation starting from diffuse lymphoid tissue normally present in the stroma of the mucous membrane (1).

I fail to see here anything other than a true neoplastic formation and nothing to support the diagnosis made clinically of venereal granuloma. This growth possessed the necessary viciousness to eventually cause death by metastasis unless overtaken by retrogressive changes and that would not likely occur.

Ref.--(1) Bailey, Fred R. "A Text-Book of Histology". 375: 1913. William Wood and Company, New York.



Fig. 1 (T.105) Lymphosarcoma.--Vagina of a Bitch.
Low power photomicrograph showing the relation of the tumor cells to the remains of the mucosa. Note the layer of lymphoid cells overlying the epithelial layer.

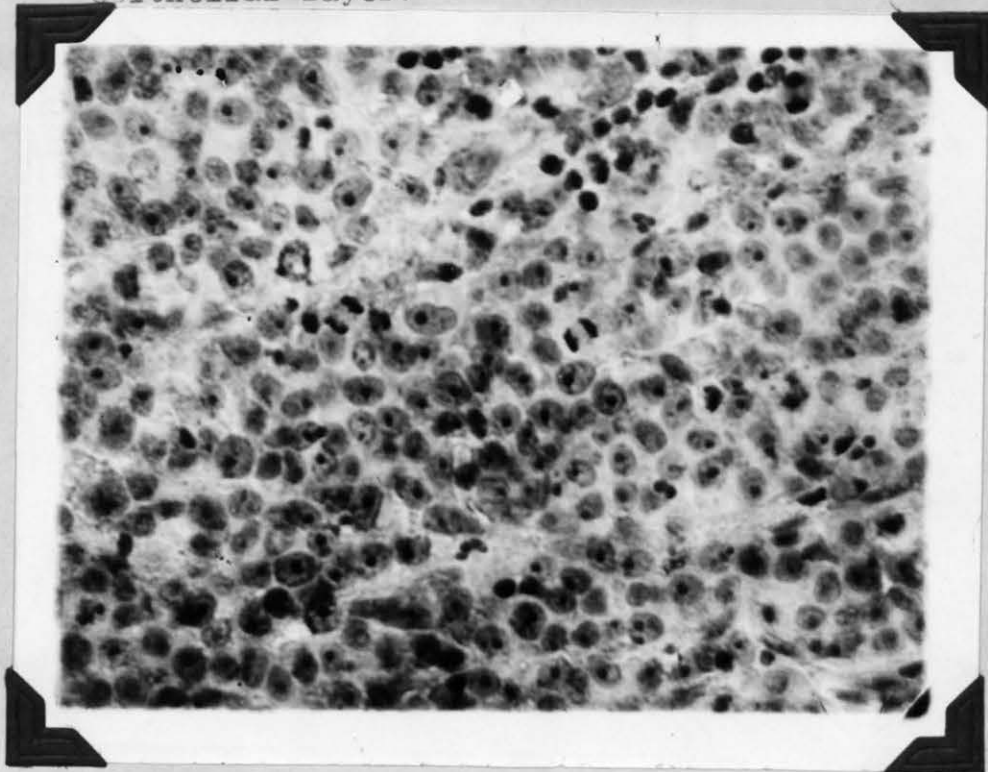


Fig. 2 (T.105) Lymphosarcoma.--Vagina of a Bitch.
High power photomicrograph showing the character of the tumor cells and two mitotic figures.

Lymphosarcoma

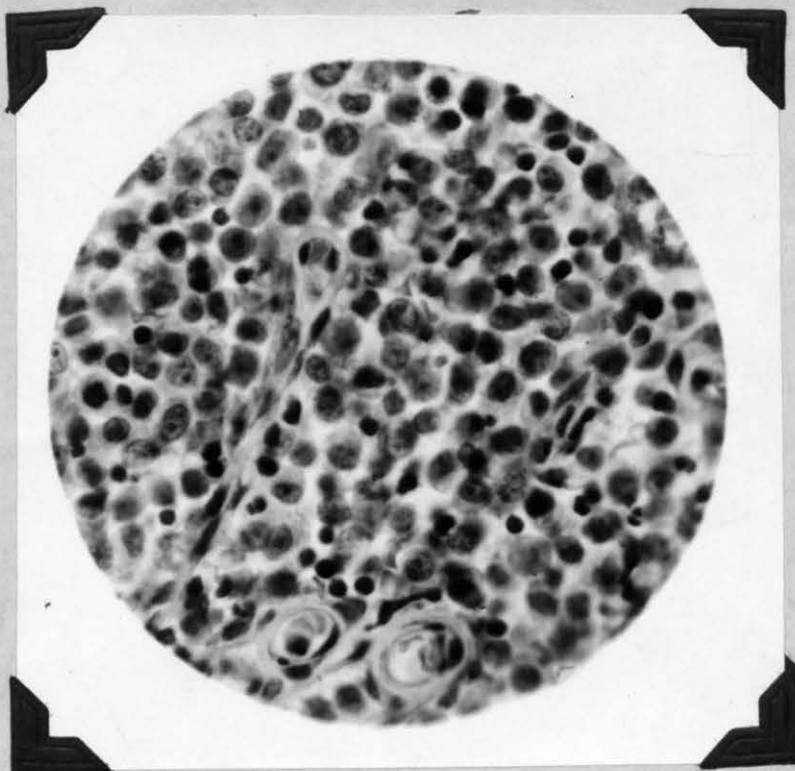


Fig. 3 (T.105) Lymphosarcoma.--Vagina
of a Bitch.
High power photomicrograph showing two
cappillaries at one edge of the picture.

STUDY NUMBER THIRTY-NINE

TUMOR NUMBER 110

Lymphosarcoma -- Subcutaneous Tissue of a Dog

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

Clinical Data: The subject was a Boston Terrier male dog. Three months before the second surgical removal of the tumor a nodule about the size of a twenty-five cent piece developed on the wall of the thorax approximately over the last rib, midway between the dorsal and ventral surfaces of the animal (see Fig. 1). It was located just under the skin. The growth was circumscribed and the owner thought it had developed as a result of the more or less trauma from coming in contact with the frame of a screen door in passing in and out of the house. The nodule was removed and while the superficial wound healed, it was soon evident that the growth was recurring. This was removed the second time but four months later the tumor had developed again and apparent metastatic nodule was present in the axillary region of the same side. As the case was considered hopeless the animal was destroyed and the nodules secured for study.

Gross Appearance: The tumor as it was removed the second time was an oval flat nodular growth about 7 cm. in diameter and 3.5 cm. in thickness and weighed 28 grams. It was firmly imbedded in the connective tissue of the area and was covered by the skin with the hair intact. The surface was smooth and there was no ulceration present. The mass had a greyish white color and was

Study Number Thirty-Nine--2

rather firm in consistence. The mass which was removed from the axillary region at post mortem had the same general physical features as the above and weighed 160 grams.

Microscopic Description: Sections thru a portion of the tumor showing the skin in situ revealed an extremely cellular type of structure with the tumor cells all but touching the lower layers of the skin epithelium. The subcutaneous connective tissue was reduced to a vestige of its normal amount and was everywhere permeated by the cells of the neoplasm. Most of the remaining fibrils were atrophic. The skin also showed the affect of pressure from beneath and had a drawn or stretched appearance. The tumor cells which were lymphoid in type were in compact mass formation with prominent reticular fibrils incompletely dividing them into small irregular groups that were ill defined (see Fig. 2). Coarser collagen fibrils were also plentiful and provided an ample stroma.

The type cells were round to oval in shape and quite variable as to size. Some were the size of a small lymphocyte but the majority were somewhat larger and resembled the large lymphocytes quite closely. The nuclei presented many different forms and most of them possessed an abundance of chromatin material. The nuclei were large and occupied a slightly eccentric position. Nucleoli were not seen. Mitosis was a constant and interesting feature (see Fig. 3). A good blood supply was assured by the vessels present which ranged in size from small arteries to minute capillaries. Sections from all the material removed from the initial lesion on

Study Number Thirty-Nine--3

the side as well as these from the mass in the axillary region had the same architectural plan (see Fig. 4). The axillary tumor did show considerable hemorrhage in the dense fibrous tissue at one edge of the growth but this did not have any apparent significance.

Diagnosis: This is a virulent type of lymphoid tumor that had its origin from lymph tissue in the subcutaneous region or from overly proliferative lymphocytes called to this point in response to the constant irritation resulting from striking the part against the screen door. In view of the history the latter explanation of the histogenesis seems the most acceptable. In either case, however, a lymphoblastoma has resulted which if permitted to run its course would undoubtedly have killed the victim as metastasis to a nearby region had already occurred.

While there may be some doubt as to the exact term by which to designate this growth it does not appear far amiss to call it a lymphosarcoma.

Lymphosarcoma



Fig. 1(T.110) Lymphosarcoma of the Subcutaneous Tissue of a dog. Photograph of the animal showing the tumor nodule on the right thoracic wall.

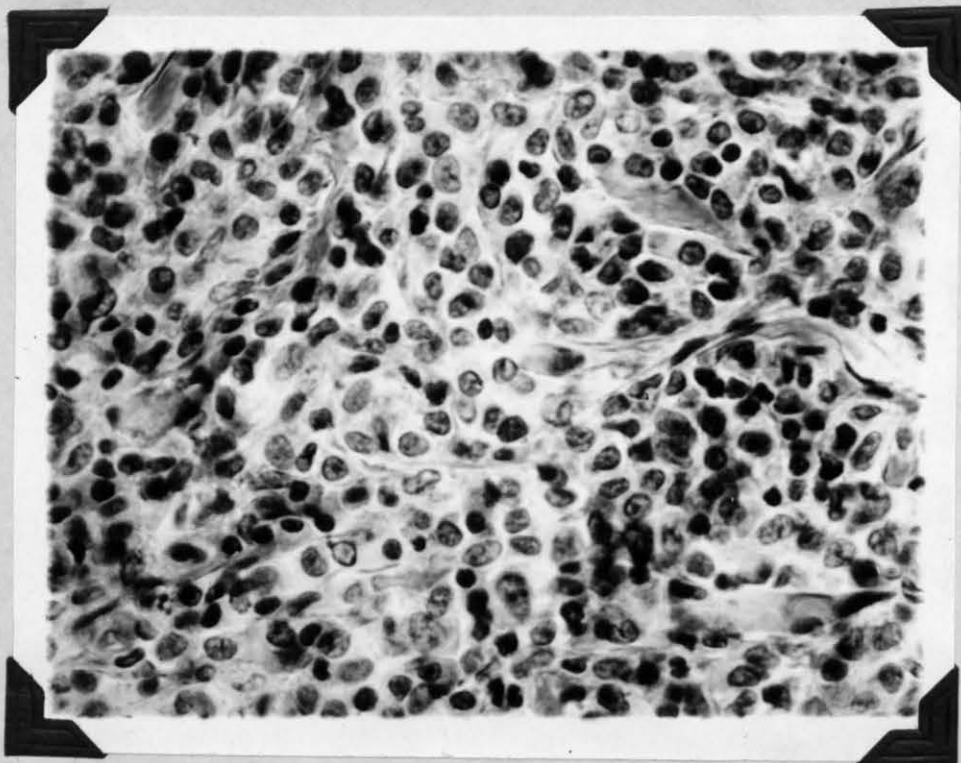


Fig. 2 (T.110) Lymphosarcoma of the Subcutaneous Tissue of a dog. High power photomicrograph showing the lymphoid tumor cells and the reticular fibrils.

Lymphosarcoma

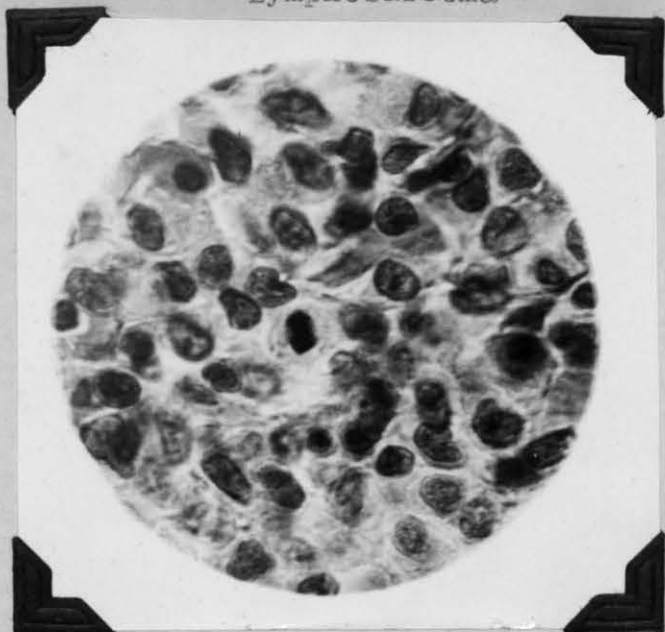


Fig. 3 (T.110) Lymphosarcoma of the Subcutaneous Tissue of a Dog. Oil immersion photomicrograph showing one mitotic figure.

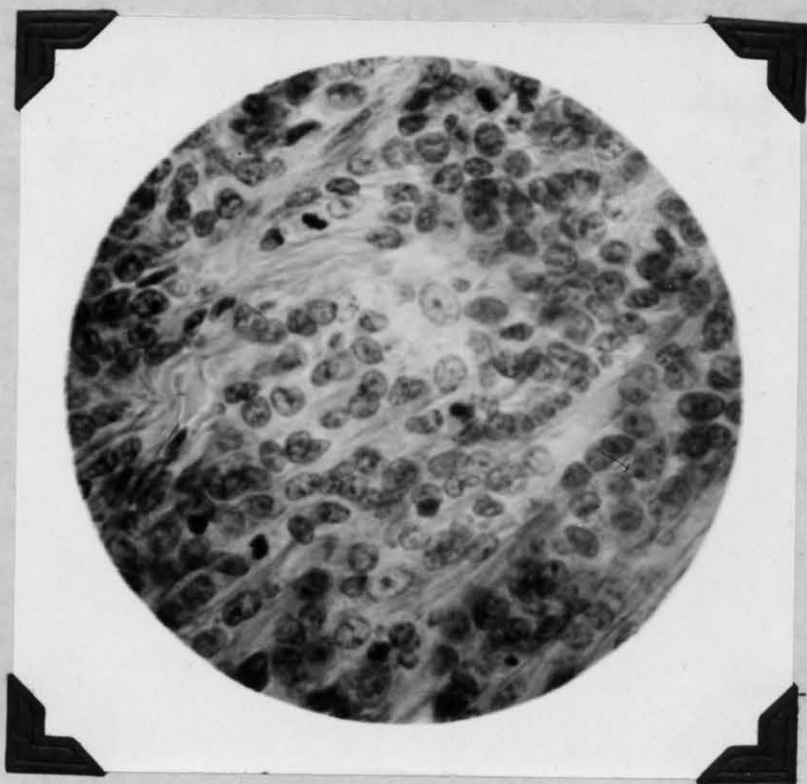


Fig. 4 (T.110) Lymphosarcoma of the Subcutaneous tissue of a Dog.
Recurrent lymphosarcoma of the subcutaneous tissue of a dog.
High power photomicrograph showing the lymphoid cells lying in reticular substance. Two mitotic figures present.

STUDY NUMBER FORTY

TUMOR NUMBER 113

Multiple Metastatic Lymphosarcoma -- Sheep

Dr. E. E. Harnden, Stillwater, Oklahoma sent this material to our laboratory for diagnosis.

Clinical Data: The subject was a two year old male South-down sheep that had been in apparent health up to within a few days of its death. A postmortem examination revealed a large tumor imbedded in the spleen and the lungs and liver had numerous smaller nodules throughout.

Gross Appearance: The large tumor in the spleen was somewhat spherical in shape and measured about 8.5 cm. in diameter. It was red in color, soft in consistency, and firmly embedded in an infiltrative manner in the substance of the organ. A serous capsule covered the exposed surface which was quite smooth. The lung involvement was very irregular with the tumorous foci measuring from 0.2 cm. to 3 cm. and 4 cm. in diameter. They were of a greyish white color and were plainly visible under the visceral pleura. Many of the tumorous areas consisted of discrete foci while in others the process was quite diffuse with many foci becoming confluent. The tumorous tissue was compactly organized and firm to the touch. While the liver lesions were not sent with the spleen and lung material, Dr. Harnden informed me that the tumor in this organ also varied much as to size and had the same general appearance as those in the lung.

Microscopic Description: Splenic nodule.--No sign of the splenic architecture remained in the sections studied. The tissue

Study Number Forty--2

consisted of round lymphoid cells enmeshed in a coarse network of fibrous stroma. From the coarser stroma finer fibrils were given off. Taken together the various fibrous strands provided a very rich stroma for the parenchyma of the tumor (see Fig. 1).

The tumor cells were spherical and polyhedral in shape. They possessed a large nucleus which stained deeply apparently due to the large chromatin content. Many of the nuclei occupied slightly eccentric positions and mitosis was a common feature. Blood spaces were provided in the heavier stroma.

Lung Lesion.--In this location the tumor cells were arranged in diffuse foci without any attempt to encapsulate the process. The masses were enlarging by peripheral infiltrations and presented a very jagged edge. In the occupied areas the tumor had displaced the lung tissue entirely although the outlines of collapsed vessels and of bronchioles containing the tumor cells were plainly seen. Most of the interalveolar capillaries appeared to be intact and in a state of congestion. Excessively heavy deposits of tumor cells were noticeable around many of the remaining bronchioles (see Fig. 2).

The type cell and its general arrangement was the same as described in the splenic noduli and mitosis was just as frequent in one as the other. The stroma was more pronounced in the lung tumor than in the splenic but this was perhaps due to an increase in the pre-existent interstitial tissue of the alveoli. The non-involved lung tissue was in a state of congestion with considerable

Study Number Forty--3

edema. Many of the alveoli had ruptured and become confluent.

Diagnosis: This is an example of a malignant lymphoid tumor which can best be termed a lymphosarcoma. I feel, however, that the lesions above mentioned (liver, spleen, and lung) were secondary to the primary growth which has escaped detection although the liver as the primary site of the disease should not be overlooked. Primary lymphosarcomas are especially rare in the spleen and lung and yet both organs are frequently involved metastatically. This could easily have taken place in case the liver was the site of the original tumor with the spleen, becoming affected via the blood stream from the lungs. It is surprising that the kidney had not been attacked since the tumor's cells had every opportunity to arrive there thru the vascular system. Since the kidneys were not sectioned this point cannot be definitely settled. Possibly the primary tumor was somewhere along the intestinal tract.

A multiple metastatic lymphosarcoma.

Lymphosarcoma

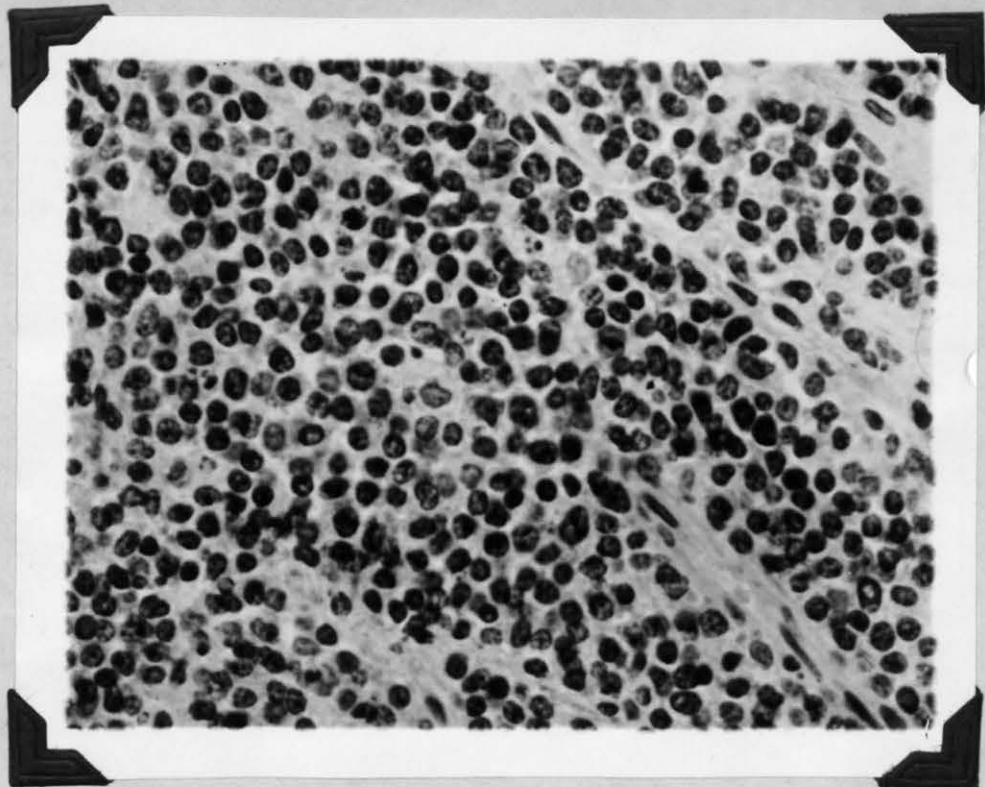


Fig. 1 (T.113) Metastatic Lymphosarcoma.--Splenic lesion of a Sheep. High power photomicrograph showing the lymphoid cells and the coarse fibrils of the stroma.

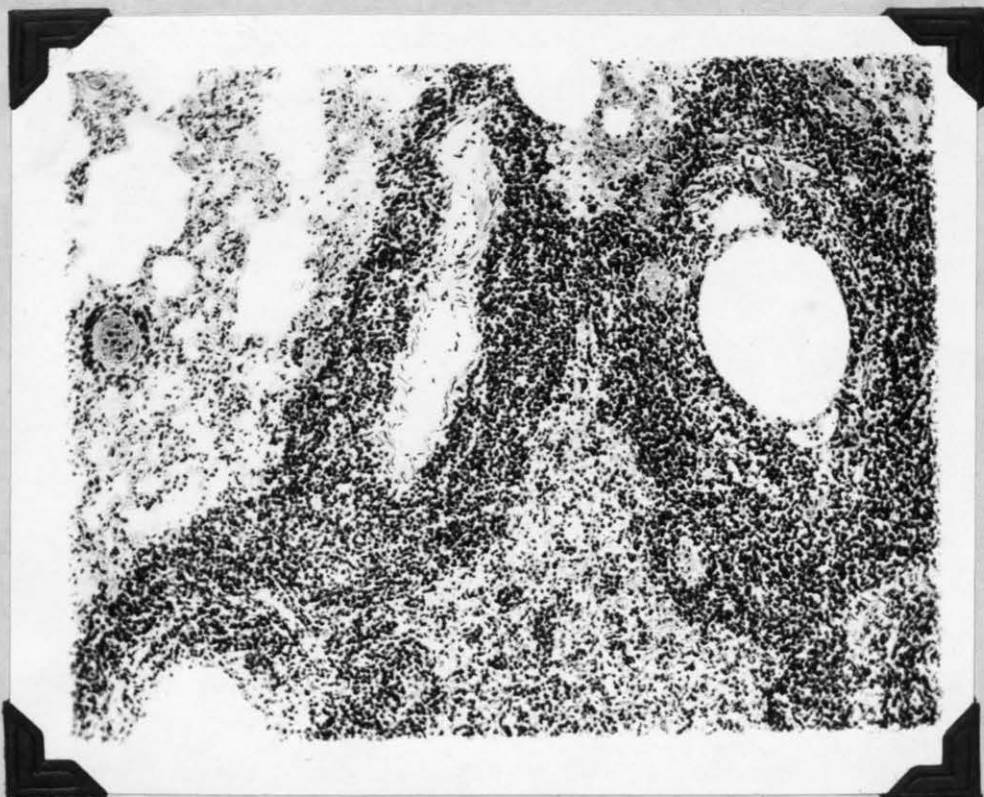


Fig. 2 (T.113) Metastatic Lymphosarcoma.--Lung of a Sheep. Lower power view showing the peribronchial arrangement of the neoplastic cells.

STUDY NUMBER FORTY-ONE

TUMOR NUMBER 115

Recurrent Lymphosarcoma -- Dorsum of Neck of a Dog.

This material was received from Dr. Frank P. Mathews, Lafayette, Indiana.

Clinical Data: The animal was a four year old English bull dog on which had developed a hard circumscribed swelling about two months previous to its surgical removal. When first seen the tumor was about the size of a walnut. As the growth appeared on the dorsal portion of the neck it was thought that it started as a consequence of the constant irritation from the collar. The animal did not appear to show any ill effects from the disease and remained in good physical condition as long as he was under observation.

Twenty-one days after the tumor was removed it had recurred and was practically as large, if not larger, than the initial growth. At the time of the second operation two other tumors were found, one involving the fascia at the point of the right shoulder while the other was on the left side of the neck slightly below the original growth and apparently involving the musculature. Neither of these later tumors were removed and only a portion of the growth removed from the initial lesion at the second operation was received for study.

Gross Appearance: The mass which measured 6.5 cm. by 5 cm. had a dirty white color and an oval flattened shape. It was quite compactly knit and hard in consistence. A capsular covering was ill defined as the mass seemed to be imbedded in the connective

Study Number Forty-One--2

tissue of the part. It was located just under the skin and the surface of the nodule was somewhat roughened and devoid of hair except at the periphery.

Microscopic Description: Sections were obtained at right angles to the skin and showed the neoplastic process to be actively invading the subcutaneous area in a rather striking manner (see Fig. 1). The tumor cells were slipping in between the strands of fibrous tissue and as a consequence the collagen fibrils had become atrophic and were disappearing. Not even the adipose tissue was exempt from their invasive tendencies although here the cells were packed around and not in the fat cells. In the deeper portions of the nodule the cells were likewise pushing between and thru the muscle fibers, which were also becoming atrophic (see Fig. 2).

The type cell of the tumor was clearly lymphoid in character although it presented a multiplicity of forms that were almost bewildering. The majority were spherical or polyhedral in shape and were of a fairly large type (see Fig. 3). The cells outlines were difficult to see due to the rather clear faintly staining cytoplasm. The nuclei were large and many were hyperchromatic. A few nucleoli were seen. Mitotic division was frequent and many different phases were studied (see Fig. 4). A rather definite reticulum was constantly present but it lacked the capacity to separate the cells into orderly groups. In various parts of the sections were small foci of small round cells which resembled lymphocytes. These were in compact formation and took a deep basic stain

Study Number Forty-One--3

which differentiated them sharply from the larger lighter stained cells of the tumor proper. The parenchyma depended for its blood supply upon minute channels in the midst of the tumor cells. Some of these vessels appeared as rudimentary capillaries while many others revealed no vessel structure whatever.

Diagnosis: There can be no doubt that this tumor is a lymphosarcoma. The type cell, its arrangement, and infiltrative behavior makes this diagnosis the only one tenable. While it is regrettable that the other nodules described in the history were not available for study, yet I feel that there can be no reasonable doubt about the character of their make up and origin. They probably arose metastatically from the initial growth and no doubt came into being as a result of the manipulation incidental to the surgical interference with the primary nodule. The rapidity with which the growth reoccurred is typical of many tumors of this group and emphasizes the danger accompanying their haphazard removal.

I am somewhat at a loss to account for the origin of this tumor since lymphosarcomas usually arise from lymph tissue and particularly a lymph node. The area of the dorsum of the neck of the dog is normally devoid of lymph tissue, which fact makes it difficult to put forth an acceptable histogenesis of these cells. It is possible that what was considered as the primary tumor was in reality the result of metastasis from the original tumor located elsewhere but not discovered. Perhaps the other nodules had a similar origin.

Study Number Forty-One--4

The inflammatory origin of the tumor should be considered and if correct, would explain the wide difference in the cells of the tumor and those that were much smaller and which stained deeply basic.

A recurrent lymphosarcoma.



Fig. 1 (T.115) Recurrent Lymphosarcoma.--Neck of a Dog.
Low power photomicrograph showing the neoplastic cells invading the subcutaneous tissues.

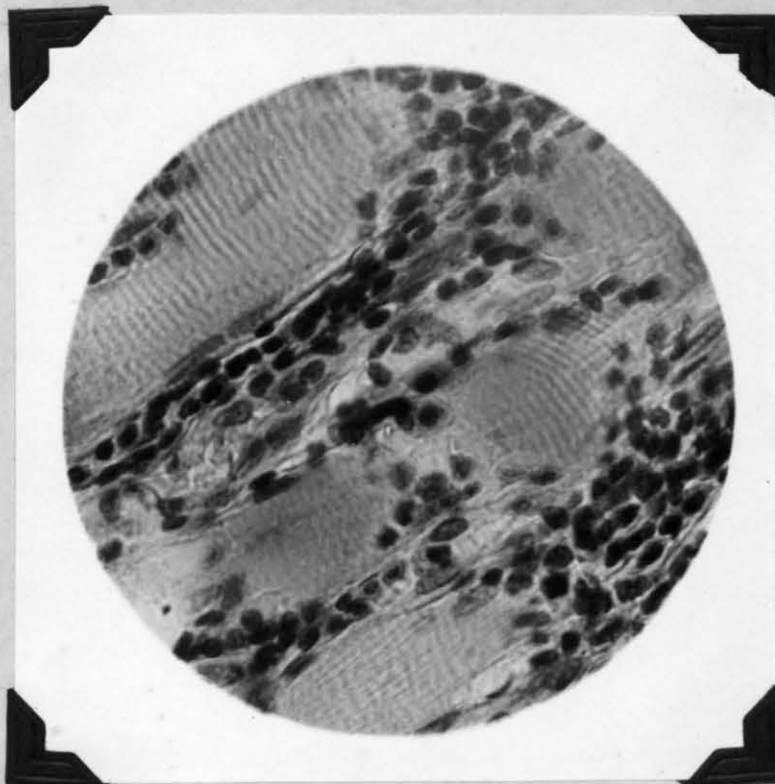


Fig. 2 (T.115) Recurrent Lymphosarcoma.--
Neck of a Dog.
High power photomicrograph of tumor cells invading the muscle fibers.

Lymphosarcoma

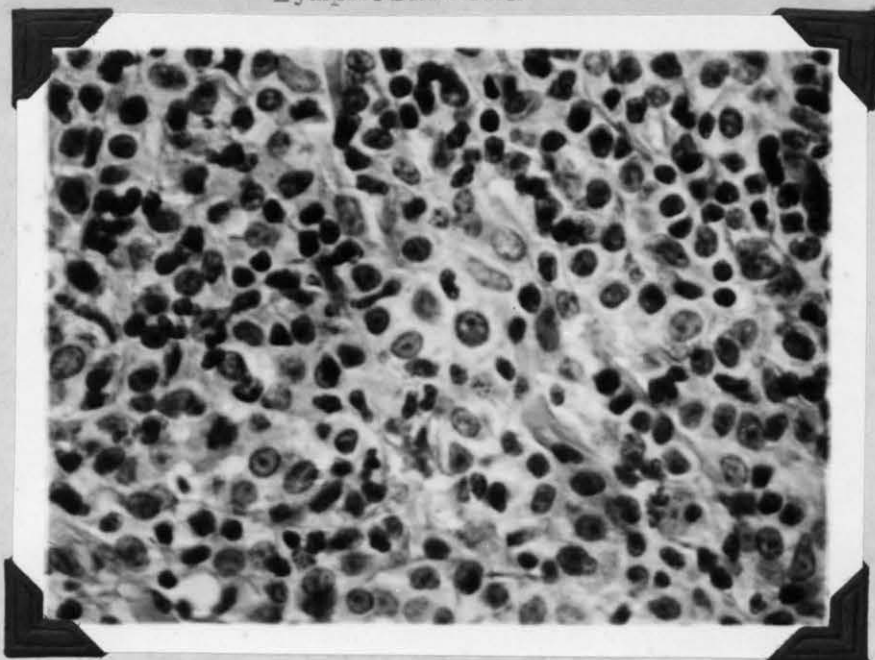


Fig. 3 (T.115) Recurrent Lymphosarcoma.--
Neck of a Dog.
High power photomicrograph of the tumor cells
showing their irregular size and shape. Deli-
cate reticular fibrils can be seen.

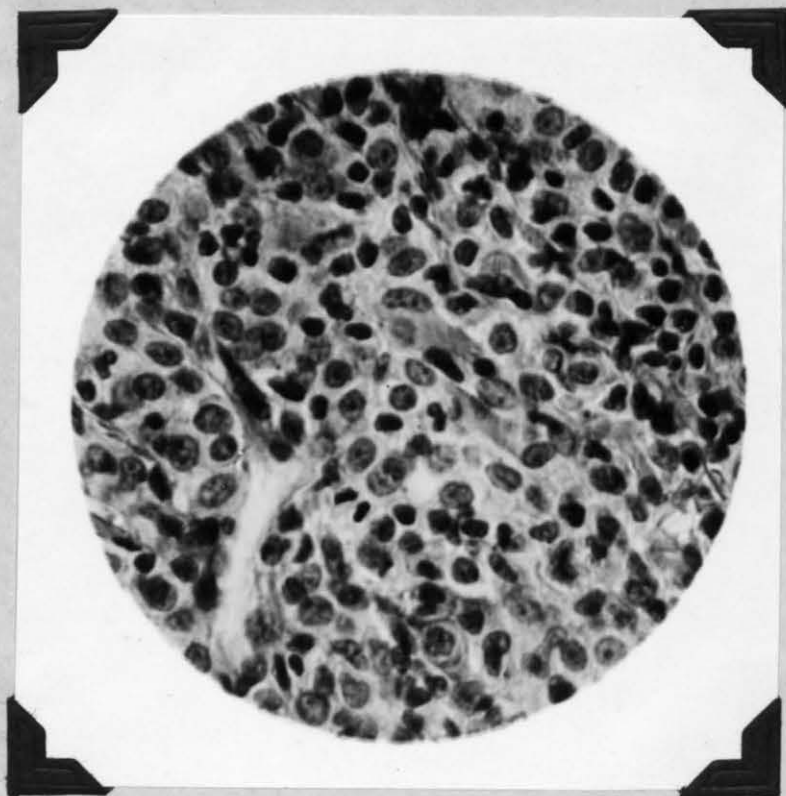


Fig. 4 (T.15) Recurrent Lymphosarcoma.--
Neck of a dog.
High power photomicrograph showing one
cell undergoing mitosis.

STUDY NUMBER FORTY-TWO

TUMOR NUMBER 131

Lymphosarcoma -- Mesentery of a Chicken

The material for this study was received from Dr. Frank P. Mathews, La Fayette, Indiana.

Clinical Data: The information on this phase of the study is rather brief due to the fact that the clinic sheet was incompletely filled out. The material was from a Barred Rock hen that had been dressed for food. The intestines and mesentery were involved in a tumorous growth which was distributed diffusely throughout the abdominal cavity.

Gross Appearance: The growth was of a greyish white color and presented a cauliflower like appearance due to its multitude of raised nodules varying in size from a pin head to a pea. In most places only a portion of the intestinal serosa was disturbed, the growth being located largely in the mesentery. The organs appeared to be free of the disease.

Microscopic Description: Sections were prepared thru the wall of the small intestine and a portion of the attached mesentery. These revealed a highly cellular form of growth invading every part of the mesentery structure, the fat cells alone resisting (see Fig.1). The type cell was rather large with a hyperchromatic nucleus which was placed rather eccentrically. The cells varied in shape from nearly spherical to polyhedral. In some areas strands of delicate reticular fibrils were present. The cells were divided into irregular groups of varying sizes by distinct compact strands of fibrous

Study Number Forty-Two--2

connective tissue. These structures carried the larger blood channels while small capillaries were fairly frequent in the midst of the tumor parenchyma.

The tumor was limited in its extension to the mesentery and a small part of the intestinal serosa. The intestinal wall proper was not invaded. In the mesentery there were many solid cords of tumor cells which suggested a lymphatic occupancy. Mitotic figures were a frequent and interesting feature of this material. Sections of the kidney and liver failed to show any involvement of these organs.

Diagnosis: This is clearly a lymphoid tumor with the usual characteristics of a lymphosarcoma. Since the submucosa and the musculature of the intestinal walls were free of the disease I am inclined to believe that this tumor had its origin from one of the lymph nodes of the mesentery. The apparent lack of metastasis is interesting and suggests the inability of the tumor to break through the vessel walls at this stage of the process. No doubt in time, had the bird been permitted to live, the aggressive infiltration of the cells would have resulted in such a destructiveness as to make metastasis inevitable.

A mesenteric lymphosarcoma.

Lymphosarcoma

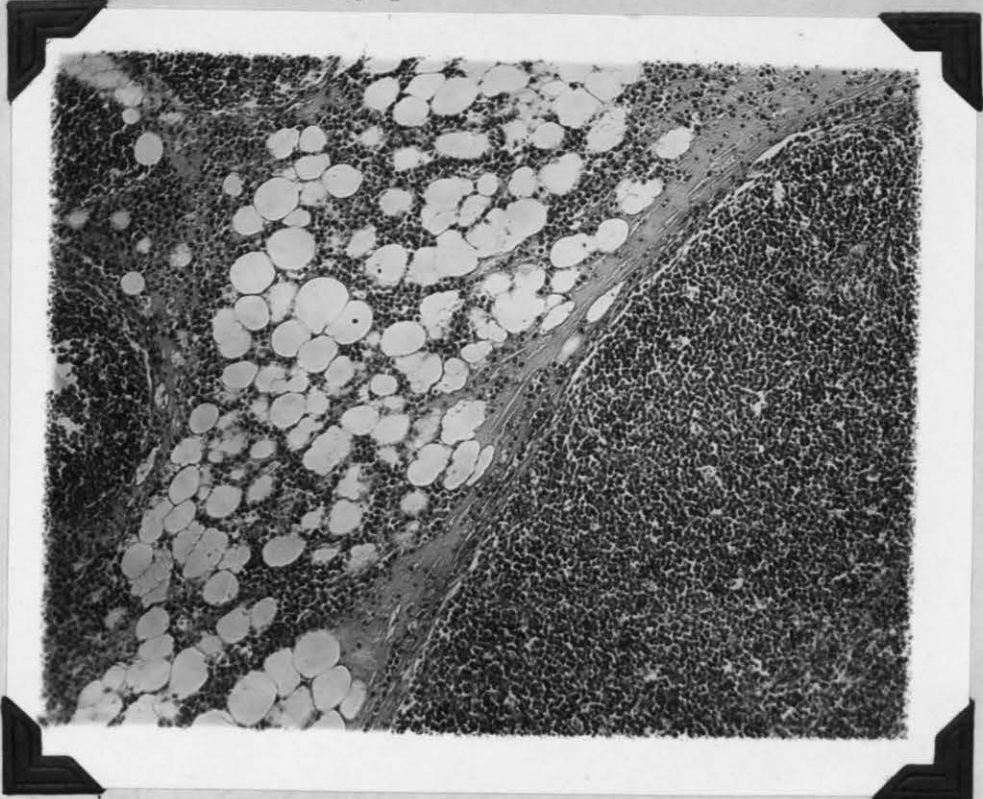


Fig.1 (T.131) Lymphosarcoma of the Mesentery of a Chicken.

Low power photomicrograph showing the cellular nature of the growth and its infiltrative capacity around the fat cells of the mesentery.

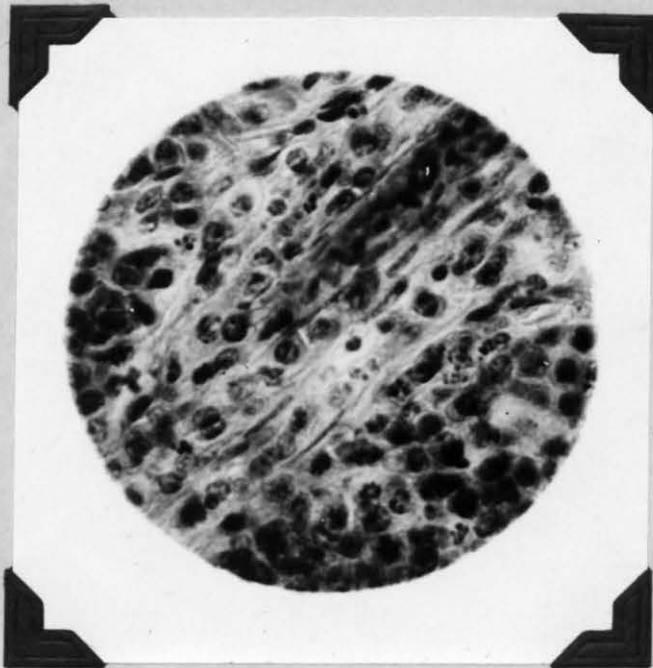


Fig. 2 (T.131) Lymphosarcoma of the Mesentery of a Chicken.

High power view showing the delicate reticulum between the rows of lymphoid cells.

STUDY NUMBER FORTY-THREE

TUMOR NUMBER 157

Metastatic Lymphosarcoma -- Heart of an Ox

This material was received from Dr. E. E. Harnden, Stillwater, Oklahoma.

Clinical Data: The subject was a ten year old Holstein cow which had been in poor physical condition for four weeks previous to death. Six weeks previous to her death she lost a large quantity of blood by accidental amputation of the tail. Five weeks later, one week before death, she gave birth to a three weeks premature calf which, while weak, appeared normal and lived. The animal finally died from obscure causes and a postmortem examination was conducted. The small intestine and the mesentery were extensively involved in a tumorous process. The uterus was slightly affected as was the abomasum. The ventricles of the heart contained masses of foreign tissue also. Unfortunately none of the material was preserved for study except the heart tissue and this disappeared after one block of the tissue was imbedded. The only material I had the opportunity of studying was a stained section of the heart which Dr. Harnden sent me.

Gross Appearance: Not having any of the gross material for first hand study I had to depend upon the clinical data sheet for this phase of the study. The tissue had an amorphous form, was fairly soft in consistence and greyish white in color. A capsule was not detected and the material was moderately vascular. The tumors were multiple in their presentation and were embedded diffusely in the surrounding elements.

Study Number Forty-Three--2

Microscopic Description: The heart tissue was extensively invaded by lymphoid cells which seemed to have a special affinity for the connective tissue of the organ. The perimysial and endomy-sial zones were quite distinct due to the tumorous occupancy of these structures. (Fig. 1). The muscle fibers were invaded in a few instances and atrophy was common throughout. Most of the fi-bers had lost their cross striations but they could be distinguish-ed faintly in a few instances. The tumor cells had invaded the subepicardial fat to a considerable degree and only the fat spaces remained intact against the invading cells.

The type cell was of the small lymphoid variety although a few large examples were seen. They were irregularly spherical in outline and possessed a nucleus that nearly filled the cells in-terior leaving but a scant zone of cytoplasm. The nuclei were lo-cated slightly eccentrically and the majority were oval in shape. All the nuclei were hyperchromatic. Mitotic figures were plenti-ful but no new blood vessels were seen.

Diagnosis: This is a metastatic lymphosarcoma. The prim-ary tumor probably had its origin along the intestinal tract with the tumors in the other locations secondary. The involvement of the heart undoubtedly resulted as a consequence of the tumor cells breaking through a vessel wall in large numbers.

This study is of particular interest because of the ap-arent rarity of cardial involvements in neoplastic diseases (1). Adami (2) remarks that the infrequency of primary neoplasms of the

Study Number Forty-Three--3

heart can probably be attributed to the fact that the heart is constantly in a high state of efficiency and in such a condition is not susceptible to tissue irregularities that might develop into tumorous growths. The presence of a tumor within the cavities of the heart is always associated with more or less change from fragments loosening and causing sudden death from pulmonary embolism. Rupture of the heart may also occur when the tumor involves the myocardium to a marked degree.

The involvement in this case was sufficient to seriously interfere with the efficiency of the organ and no doubt was the direct cause of the death of the animal.

Metastatic lymphosarcoma.

Ref.--(1) Hutyra and Marek. Pathology and Therapeutics of the Diseases of Domestic animals. Vol. 1: 1077. Alex Eger, Chicago. 1912.

(2) Adami and Nichols. Principles of Pathology. Vol. II: 158. Lea and Febiger, Philadelphia and New York. 1911.

Lymphosarcoma

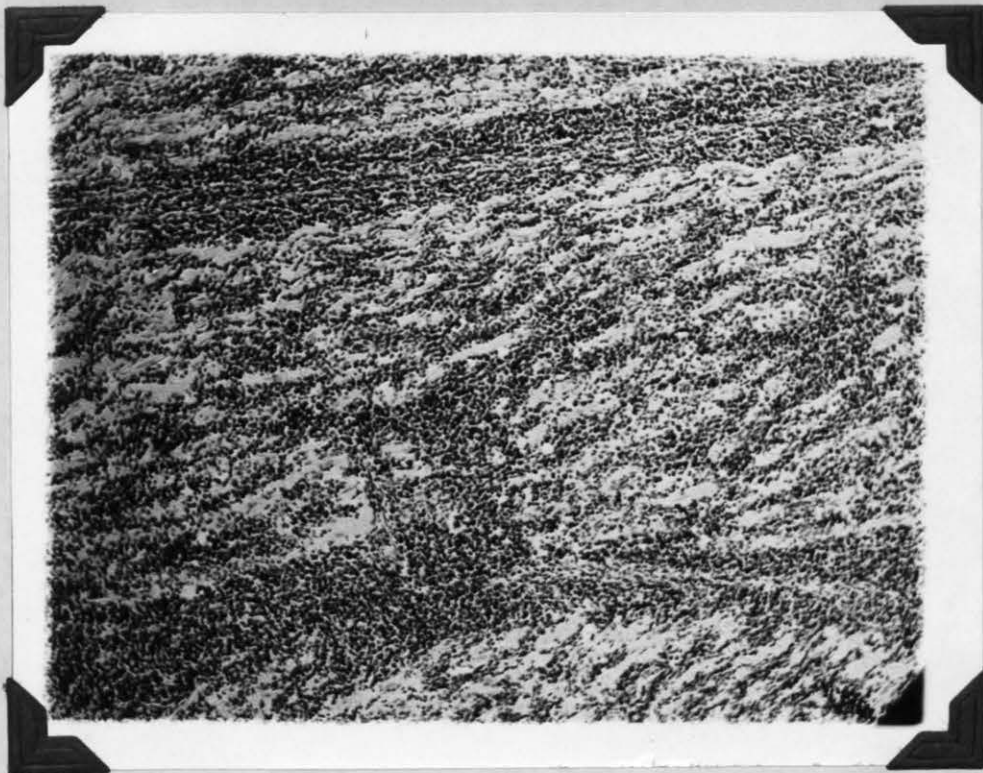


Fig. 1 (T.157) Metastatic Lymphosarcoma of the Heart of an Ox.
Low power photomicrograph showing the extensive way in which the neoplastic cells invaded the cardiac tissue.

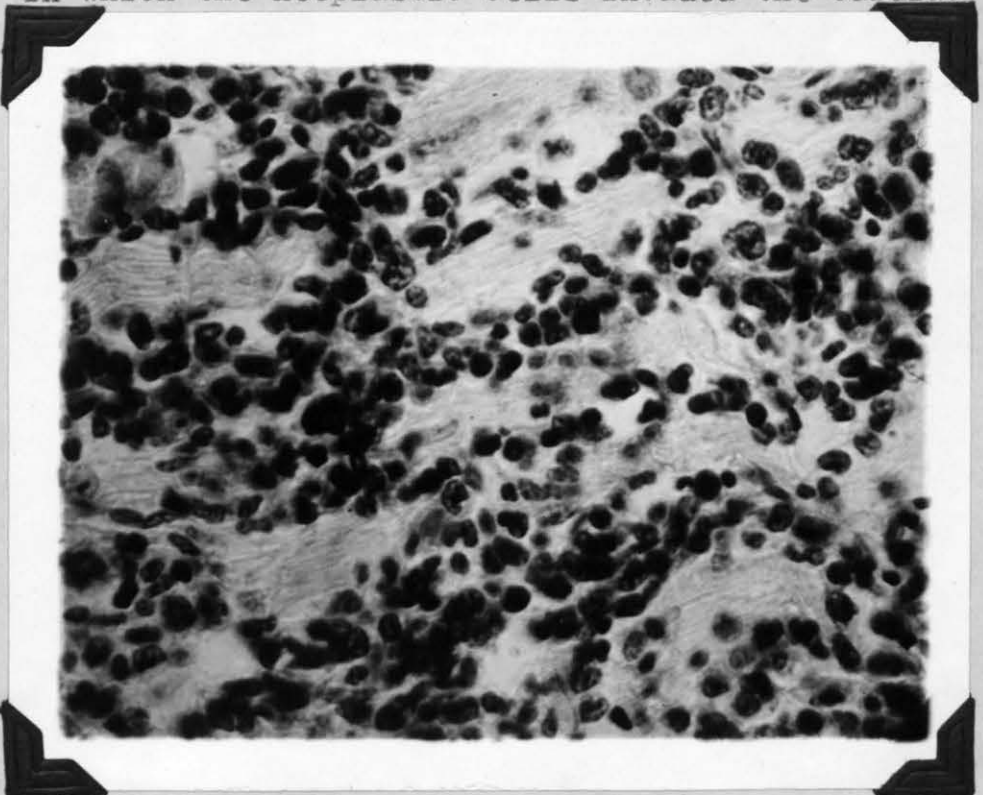


Fig. 2 (T.157) Metastatic Lymphosarcoma of the Heart of an Ox.
High power photomicrograph showing the intimate relationship of the lymphoid cells to the cardiac muscle fibers.

STUDY NUMBER FORTY-FOUR

TUMOR NUMBER 12

Melanoma -- From the flank of a cow

This material was supplied by Dr. G. G. Feldman of Spokane, Washington.

Clinical Data: The tumor was from an old Hereford cow. An oval circumscribed growth on the left flank was noticed at the time of slaughter. It was preserved in formalin for further study.

Gross Appearance: The tumor was a single nodule, oval in shape and about 8 cm. in diameter. It was intensely black in color, was encapsulated and possessed hair on the external portion.

Microscopic Description: The most striking feature of this structure was the presence of a large amount of brownish black pigment diffusely scattered throughout (Fig. 1). The tissue as a whole was quite compact with but very few blood channels showing. At one edge of the sections epidermis was present and it was noted that there was a considerable zone of connective tissue separating the pigmented area from the skin.

With the high magnification the tumor cells could be studied more intimately. The individual cells were oval or slightly elongated in shape with the nucleus occupying more than half the cell bulk. Very minute chromatin granules were discernible. There was some intercellular material but its exact nature was somewhat obscure. While a considerable

Study Number Forty-four - 2

majority of the cells contained pigment, yet there were a great many entirely pigment free. The pigment which was dark brown in color was in the nature of fine granules. In many instances this was so closely packed as to make it impossible to see its granular character except at the very periphery.

The pigment seemed to have a special affinity for the nuclear substance although where it was in abundance the cytoplasm as well was occupied. Some few pigment granules could be seen in the intercellular spaces. A few of the cells showed a distinct polar arrangement of the pigment accumulations. There was no evidence of malignancy such as mitotic figures, etc.

Diagnosis: This is a tumorous nodule made up largely of a specific type of cell called the melanoblast. Since there is no evidence of any aggressiveness or other malign behavior on the part of these cells the diagnosis would be a melanoma.

Melanoma

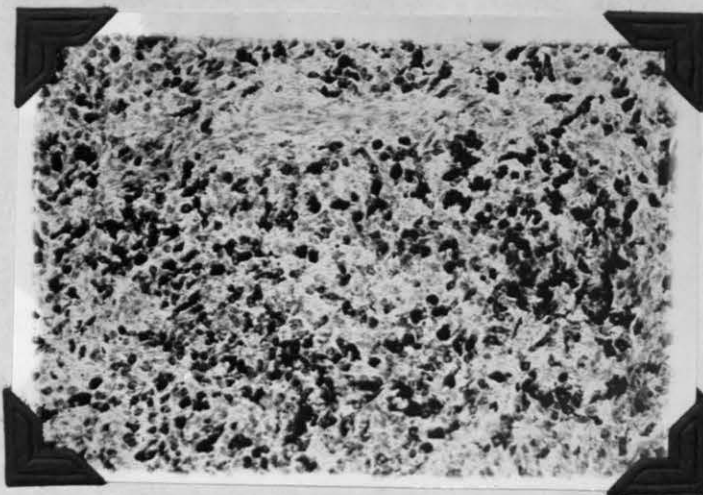


Fig. 1 (T.12) Melanoma.--Flank of a Cow.

Lower power view showing compact structure of the tumor and the diffusely scattered pigment.

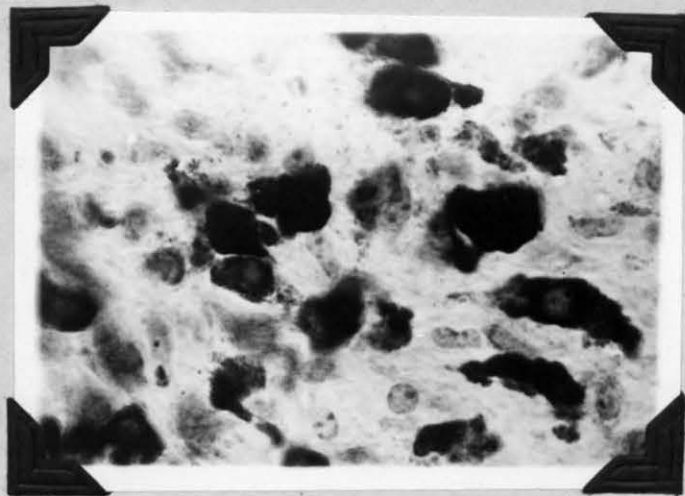


Fig. 2 (T.12) Melanoma.--Flank of a Cow.

High power photomicrograph showing the large pigment content of many of the nuclei.

STUDY NUMBER FORTY-FIVE

TUMOR NUMBER 31

Melanoma -- From the Upper Eye Lid of a Horse

Clinical Data: A circumscribed pigmented tumor was removed from the medial aspect of the inner lower margin of the upper right eye lid of a nine year old gray horse. The tumor was directed toward the eyeball, and from its position and size it appeared to interfere with the vision of the affected eye.

Gross Appearance: The tumor was oval in shape and the size of a hazel nut. It was firm in consistency and had a capsular covering. The surface was quite smooth and devoid of hair. In color the neoplasm was a dark brownish black.

Microscopic Description: The most striking feature of the microscopic view was the great abundance of dark brown pigment in the form of small granules which occupied the cytoplasmic and nuclear elements of the cells to such a degree as to entirely hide most of these structures. Not only were the cellular structures saturated with the pigment but it was also extensively deposited in the intercellular areas. In fact the pigment was deposited in such an amount as to make a study of the pigment producing elements or cells difficult, if not impossible. As far as could be discerned these were somewhat oval elongated cells of such a number as to make a very cellular mass. The intercellular material appeared as strands of collagen fibrils taking a bright eosin

Study Number Forty-five - 2

stain. Near the outer margin of the growth the longitudinal axis of the cells and the strands of intercellular fibres ran around the growth in the same general direction, like the layers of an onion. In the depths of the tumor this orderly arrangement was entirely lost and the cells and their products appeared in a jumbled manner. Blood channels were numerous and were rather well formed structures but many were devoid of blood. No mitotic division of any of the cells was observed.

Diagnosis: Melanoma.

STUDY NUMBER FORTY-SIX

TUMOR NUMBER 28

Melanoma -- From the Poll of a Hog

This tumor was sent to the laboratory by Dr. J. R. Grigsby, Wray, Colorado.

Clinical Data: A hard circumscribed growth appeared on the poll of a Duroc-Jersey hog. It was first seen when the animal was a suckling and was removed when the animal was six months old.

Gross Appearance: The tumor was an oval shaped formation measuring 7.5 cm. x 10.5 cm. It was brownish black in color and was well imbedded in the connective tissue of the part. The mass weighed 270 gms. and was but slightly vascular. The tumor was so full of pigment that it discolored the hand upon touching.

Microscopic Description: Sections from this growth presented a dense form of structure with a considerable number of well defined vessels lined with vascular endothelium. It was interesting to note, however, that very few contained any blood.

The type cell of this tumor very much resembled the fibroblast except for the pale staining nucleus. The tumorous tissue was quite cellular especially in those areas where the pigment showed the greatest accumulation. The cells were somewhat spindle or oval in shape and they were in apposition. They contained a minimum amount of cytoplasm.

Study Number Forty-six - 2

The nuclei were irregularly oval and appeared to be finely "potted." This appearance was probably due to the finely granular chromatin material.

The pigment was in the form of minute granules and while present practically everywhere, it was quite unevenly distributed. In some areas it piled up to such an extent as to entirely obliterate the cellular elements of the part. In cells where the pigment was scant it clustered about the margin of the nucleus. Very little, if any, pigment invaded the tissues of the blood vessels. No mitotic figures were seen.

Diagnosis: This is one of a class of tumors known as melanoblastomas. The absence of secondary nodules and the lack of any evidence of malign aggressiveness would indicate that this was a simple melanoma.

Melanoma

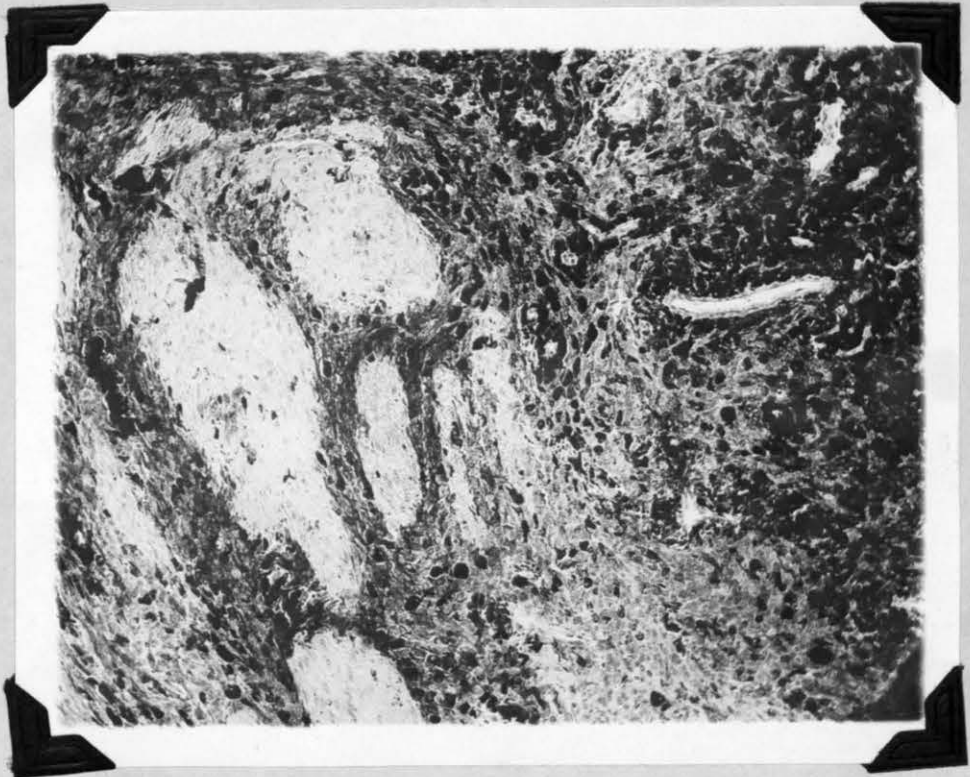


Fig. 1 (T.28) Melanoma.--Skin of a Hog.
Low power view showing the diseased fibrous stroma
and the large accumulation of pigment.

STUDY NUMBER FORTY-SEVEN

TUMOR NUMBER 37

Melanoma -- Distal Region of Right Metatarsus -- Bovine

This material was received from Dr. G. G. Feldman, Veterinary Inspector in the United States Bureau of Animal Industry, stationed at Spokane, Washington.

Clinical Data: A red and white six year old grade cow was slaughtered for food and during the subsequent post-mortem examination a single circumscribed pigmented tumor was removed from the distal third of the right metatarsus. Pigmented areas were also noted throughout the liver and in the hepatic lymph glands.

Gross Appearance: The tumor measured 7.5 cm. by 13 cm. at its greatest dimensions and was oval in shape. It was covered by skin over its entire surface and was rather broadly attached to the adjacent underlying tissue. Its color was almost coal black except for a narrow zone about 1 cm. wide just under the skin at the periphery. Here, well defined spaces or channels were evident. The mass was rather soft to the touch.

Microscopic Description: Sections from this tumor revealed a variable type of structure from a compact type in the depth of the mass to a loose areolar arrangement nearer the surface. Bundles and strands of collagenous fibrils constituted the bulk of the tumorous material. In close association with the connective tissue were many oval cells

Study Number Forty-seven - 2

with pale staining nuclei. These cells had a tendency to accumulate in a circular fashion at the periphery of the blood vessels which were numerous. A great quantity of brown pigment was present for the most part in mass formation. It was rather unevenly distributed and was in the form of small granules. Most of the cells of the tissue were entirely blotted out by the large amount of pigment that had accumulated within and around them, although many were free of pigment. Around many of the vessels the pigment had gathered in a perithelial manner. No features indicating a malignant aggressiveness was observed.

Diagnosis: From the microscopic study one would have to call this a melanoma. While it may be difficult to explain the melanotic deposits in the liver without establishing a metastatic relationship with the tumor on the metatarsus, yet this does not appear likely in view of the adult nature of the tumor tissue. There were no cells undergoing mitosis and the connective tissue elements were of a nature foreign to malanosarcoma. It is more likely that the liver pigmentation was coincidental with the external tumor or perhaps was the result of pigment carried there by the venous system from this tumor. Free pigment is often released into the blood stream due to some degenerative influence within tumors of this kind. While I did not have the opportunity to examine

Study Number Forty-seven - 3

the pigmented liver, I would hardly expect to find there anything other than the pigment alone. It is not likely that the oval, faintly staining cells of the tumor would have been present. Again we must remember Dr. Mallory (1) considers melanoblastoma as always malignant with frequent metastasis by the blood and lymph stream and that Adami (2) remarks, "No other form of tumor affords so many obvious metastases." It is quite likely that the lower animal produces melanotic tumors that differ materially from those in man.

A melanoma.

References:

1. Mallory, F. B., Principles of Pathologic Histology. P. 343. W. B. Saunders & Co., Philadelphia. (1914)
2. Adami, J. George, The Principles of Pathology, Vol. 1, p. 827. Lea and Febiger, Philadelphia. (1910)

Melanoma

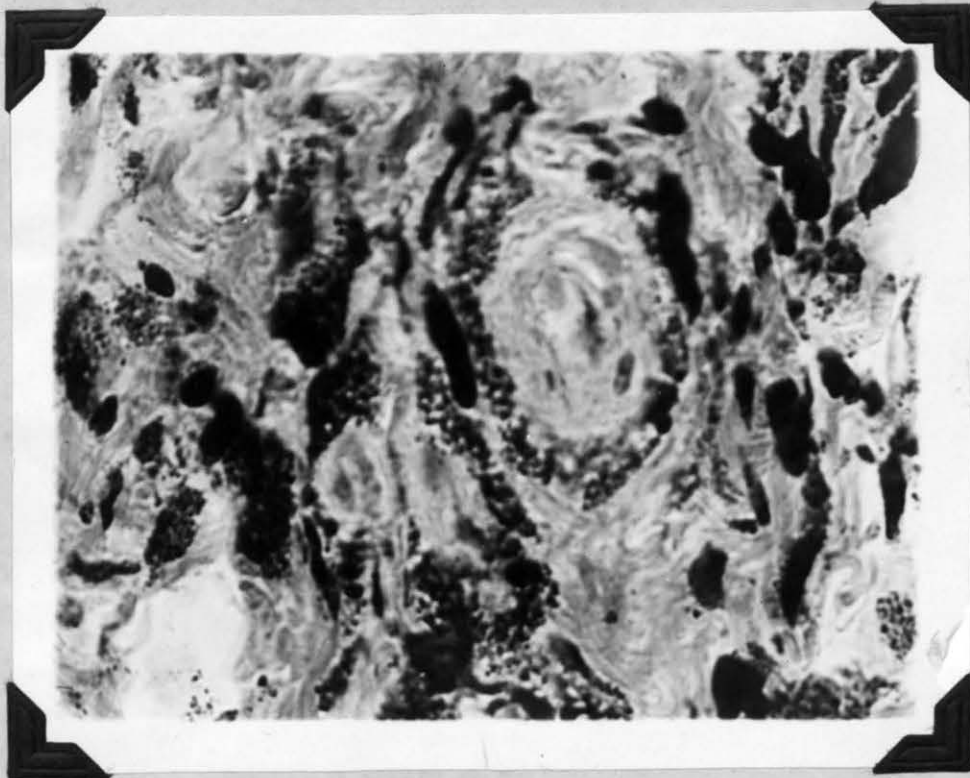


Fig. 1 (T.37) Melanoma from the Lower Leg of a Bovine.
High power view showing the granular nature of the pigment.

STUDY NUMBER FORTY-EIGHT

TUMOR NUMBER 47

Melanoma -- Abdominal Wall -- Hog

Tumor received from Dr. Wm. F. Fisher, Walsenburg, Colorado.

Clinical Data: The animal was a one year old Duroc hog. Five separate nodular tumors were removed surgically from the abdominal wall near the umbilical scar. According to the owner's statement, the tumors were first observed two weeks previous to their removal.

Gross Appearance: The tumor received at our laboratory was somewhat spherical in shape and measured about 2.5 cm. in diameter. The surface was smooth and devoid of hair. The mass was highly vascular and the upper two-thirds was intensely black in color while the lower third was the color of dirty cream.

Microscopic Description: The outer or upper portions of these sections were so saturated with the brownish granular pigment as to make a close scrutiny of the cellular elements difficult, if not impossible. The lower or deeper portions, however, showed the type cell to be the melanoblast. The bulk of the tumor in these areas consisted of fibrous connective tissue between the strands of which were seen the tumor cells. These cells seemed to possess an invasive character for while no mitotic figures were observed the cells were pushing into or between the strands of collagen material in every direction (Fig. 1). The melanoblasts stained a light blue and were

Study Number Forty-eight - 2

polymorphous with the oval types predominating.

Chromatin granules were numerous and very minute and where the cells were closely packed the nuclei occupied most of the cellular volume. Aside from the delicate strands of connective tissue a supporting stroma was absent. A great many of the melanoblasts in the deeper portions of the tumor were pigment free, while others contained such a large amount of this substance as to completely hide the cell containing it.

Blood vessels were abundantly distributed throughout the mass. While those in the denser connective tissue possessed well defined walls the walls of those in the midst of the melanoblastic cells were quite thin. It was interesting to note how the pigment producing cells accumulated around the periphery of many of the blood vessels. Around many of the vessels in the more compact connective tissue were great accumulations of eosinophiles. Among the melanoblasts in some areas these same cells were also numerous and an occasional one was seen in practically every field. Some greatly dilated sweat glands were observed in the lower zone of the sections but the distended structures were apparently empty.

Diagnosis: This is a type of multiple melanoblastoma. There were no malignant tendencies revealed with the possible exception of the infiltrative behavior on the part of the deeper cells. While the diagnosis based on the histology

Study Number Forty-eight - 3

presented must be simple melanoma, yet I feel that if these tumors had not been removed when they were that perhaps a melanosarcoma would have developed within a comparatively short time.

A simple melanoma.

Melanoma

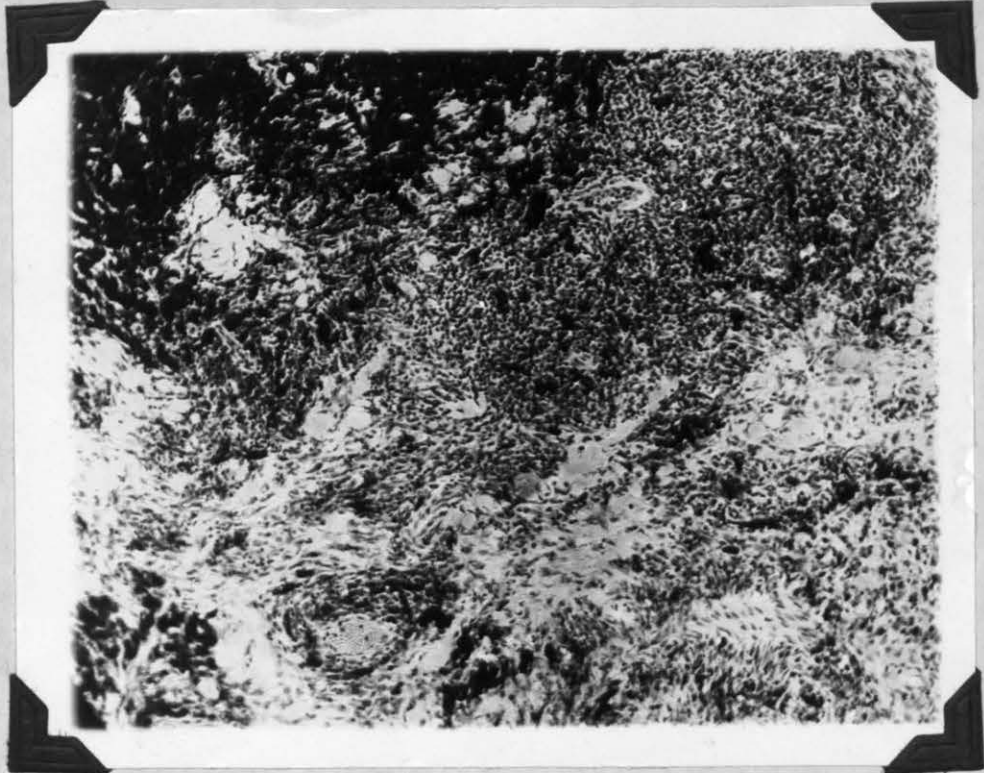


Fig. 1 (T.47) Melanoma.--Abdominal Wall of a Hog.
Low power view showing the infiltrative tendency
on the part of the tumor cells to invade the dense
fibrous stroma.

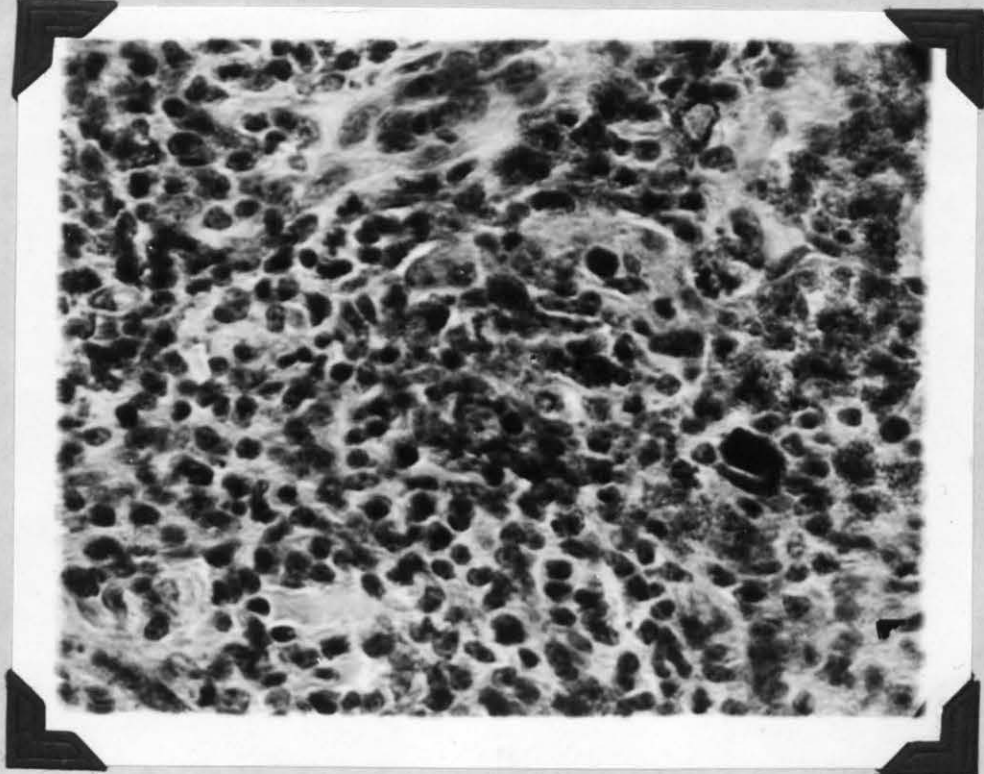


Fig. 2 (T.47) Melanoma.--Abdominal Wall of a Hog.
High power view of the melanoblasts.

STUDY NUMBER FORTY-NINE

TUMOR NUMBER 87

Melanoma -- Head of a Steer

This tumor was sent to our laboratory by Dr. G. G. Feldman, Spokane, Washington.

Clinical Data: The specimen was removed from a four year old Shorthorn steer that had been slaughtered for food. It was located at the base and distal to the right ear. The right retropharyngeal lymphnode and the liver contained some black deposits suggestive of melanin. Only the tumor mass was received for study.

Gross Appearance: The mass measured 20 cm. x 10 cm. and had a round flattened appearance. It was coal black in color and quite firm to the touch. It was covered with connective tissue over the entire surface and was located beneath the skin. No special encapsulation was observed. The material cast off a diffusible pigment which colored the fixative fluid a dark brown.

Microscopic Description: This proved to be a very cellular type of growth. The type cell occurred in densely packed masses which were separated by rather strong connective tissue septa. These connective tissue structures gave off many finer outshoots which became lost in the parenchyma of the growth. The stroma presented a rather adult appearance being quite compact with slender almost atrophic nuclei. The type cell was difficult to describe minutely due to its

Study Number Forty-nine - 2

being saturated with a brownish finely granular pigment. It was a fairly large cell oval to spherical in contour with a nucleus that occupied about one half of the cellular bulk. The cell failed to stain deeply, the nuclei remaining a light blue. No reticular substance could be made out between the cells. The pigment was everywhere and its abundance made it impossible to determine the question of mitosis except to say that none was seen. The granular pigment was even noticed out in the stroma although here it was quite scattered and exhibited no tendency to clump. An abundant blood supply was assured the tumor via large well formed vessels in the stroma.

Diagnosis: This is a type of pigmented tumor belonging to the melanoblastomas. In a case of this kind the only difficulty that arises is to determine if the growth be aggressive enough to be classed as a melanosarcoma. From the evidence I am inclined to class this as a non-malignant growth. The facts favoring this view are: first, the enormous amount of pigment (melanin) present. In my observation malignant melanomas show many young melanoblasts which are pigment free. Very few if any pigment free cells were seen in this tumor. Second, the size of the cells are characteristic of a melanoma rather than of a melanosarcoma, being somewhat smaller than those in the latter type of tumor.

Study Number Forty-nine - 3

Third, mitotic figures which are usually very common in the malignant form are absent. Fourth, the large amount of stroma and the adult nature of the connective tissue comprising it are typical of the benign form. Lastly, there is absence of secondary metastatic nodular formations in the internal organs, particularly the liver, kidney and spleen. The finding of pigment in the retropharyngeal lymphnode and liver does not prove metastasis. I would explain its presence in these locations by the entrance of pigment only into the lymph and blood streams. This must occur frequently in a mass of this kind that is so heavily charged with pigment. It is only when the melanoblasts are transported and reach fruitful soil that metastatic foci become manifest.

A simple melanoma.

(Photomicrographs were not attempted due to the unsatisfactory manner in which melanin photographs.)

STUDY NUMBER FIFTY

TUMOR NUMBER 46

Melanosarcoma -- Skin of a Hog

This material was presented by Dr. Geo. Rueter, Berthoud, Colorado.

Clinical Data: The animal was a three months old Duroc hog. About one month before the tumor's removal a walnut sized nodule was observed on the left side back of the scapula. The tumor was removed surgically.

Gross Appearance: The tumor was a black mass, firm in consistency and oval in shape. It measured 5 cm. x 13 cm. and was imbedded rather firmly in the connective tissue of the part. The surface, which was rough and ulcerated, possessed some hair. A bloody watery discharge was given off from the surface.

Microscopic Description: Sections of this tumor were obtained from areas showing the dense connective tissue of the underlying structure. Encroaching upon this in a promiscuous manner were the elements of the tumor proper, consisting of a pale staining cells and a considerable amount of brownish black pigment (Fig. 1). In the zone immediately adjacent to the bulk of the connective tissue the tumor cells appeared in rows between the strands of connective tissue, and the cells were elongated as though from the pressure of the invaded elements. In the areas away from the connective tissue of the tumor most of the tumor cells were oval in

Study Number Fifty - 2

shape although many were polymorphous. Intercellular substances were not apparent. Individually the neoplastic cells varied considerably in size but they were for the most part fairly large structures with light blue cytoplasm and possessing nuclei which occupied a little more than half of the cellular bulk. The nuclei did not possess any particular capacity for taking the basic stain intensely and appeared faintly stained compared to the nuclei of many other tumors. Many of the tumor cells showed mitotic division and many different phases of this phenomenon were observed (Fig. 2).

The pigment which was in the form of minute granules was for the most part within the cytoplasm of the tumor cells and in some instances these accumulations completely hid the make-up of the cell. Apparently the non-nuclear portions were the first to become filled with pigment and the nuclei took up the excess with some overflow as indicated by the pigment granules that were scattered practically everywhere. Some areas of considerable size contained cells entirely pigment free except for an occasional granule or two. The cells showing mitotic division contained no pigment.

An interesting feature of the sections was the large amount of blood found free between many of the tumor cells. In spite of the fact that well formed blood vessels were few, in some fields the red corpuscles constituted the

Study Number Fifty - 3

bulk of the structure. In some portions of the material the tumor cells showed a tendency to form in small groups of from two or three to a dozen or more. An occasional eosinophile and a few lymphocytes were seen scattered among the tumor cells.

Diagnosis: The type cell of this tumor is unmistakably the melanoblast or pigment producing cell. Melanoblastomas are common in the skin of hogs but most of them that I have examined were simple melanomas without any indications of malignancy. In this case, however, we have a type of growth that has all the characters of a malign proliferation. In addition to an infiltrative manner of growth, the mass showed abundant mitosis, an excess of blood and a certain rapidity of development that makes for viciousness of neoplastic formations. The early age of the animal (three months) would suggest that there was very little, if any, inhibitory influence exerted upon the tumor by the natural protective agencies of the body. The age of the animal would also indicate that perhaps the etiology of this growth was linked to some congenital disturbance. A melanosarcoma.

Melanoblastoma of the skin should not be confused with diffuse deposits of melanin (melanosis) which are so often seen in the skin of hogs. While it must be admitted

Study Number Fifty - 4

that such deposits are potential seats of true tumor formations they should not be considered such until a definite nodule develops.

Melanosarcoma

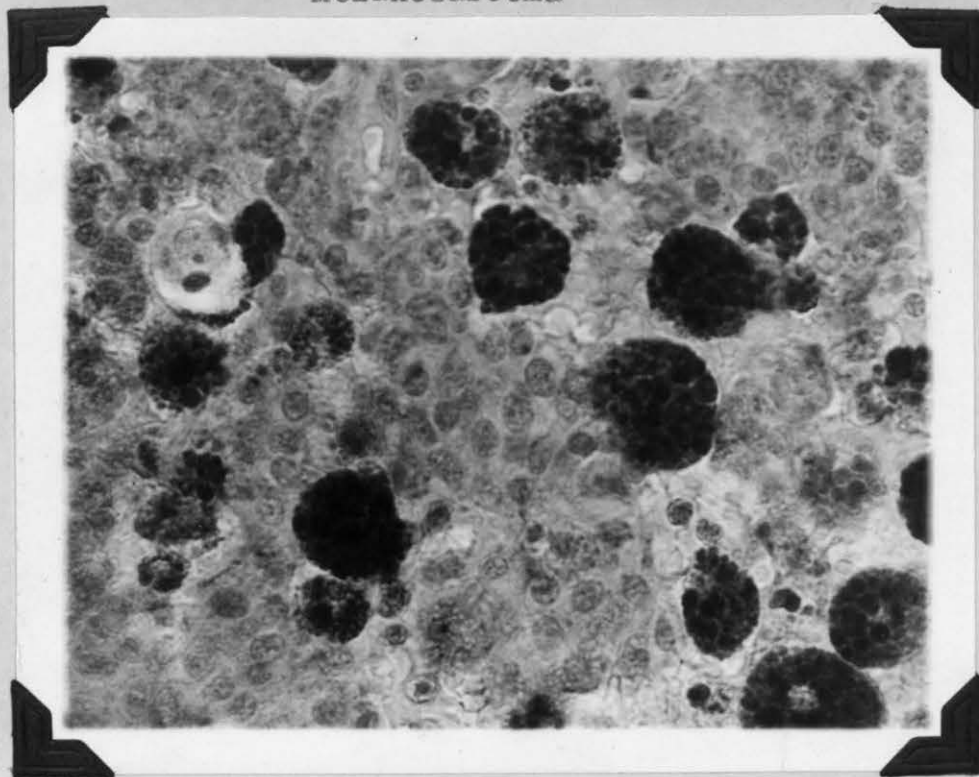


Fig. 1 (T.46) Melanosarcoma.--Skin of a Hog.
Low power view showing many melanoblasts which are pigment free. The pigment containing cells occur in groups.

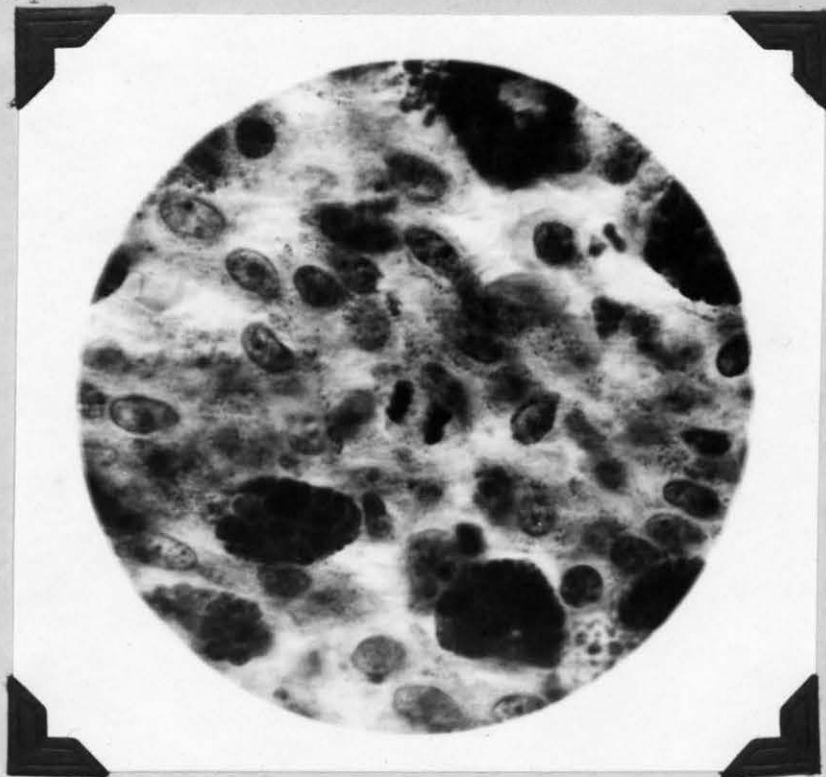


Fig. 2 (T.46) Melanosarcoma.--Skin of a Hog.
High magnification showing one mitotic figure.

STUDY NUMBER FIFTY-ONE

TUMOR NUMBER 93

Melanosarcoma -- Neck of a Horse

This material was received from the Veterinary Hospital thru the courtesy of Dr. H. E. Kingman.

Clinical Data: The animal was an old grade grey horse that had been secured for surgical exercises. A large tumor was present on the side of the neck and there were many smaller ones in the region of the anus. Upon autopsy a great many small black tumors were seen generally distributed throughout.

Gross Appearance: The large mass from the neck was coal black in color and shaped somewhat like a pear. It measured 13 cm. x 6 cm. and weighed 300 grams. It was of firm consistence and was firmly attached to the surrounding parts by a connective tissue covering.

Microscopic Description: Sections from this material showed many heavy connective tissue septa between which were dense fields of large pigment producing cells. Fine reticular strands of tissue were distributed irregularly between many of the cells of the parenchyma (Fig. 1). These apparently had their origin in the denser septa. Upon close examination the type cell was found to be loaded to capacity with a finely granular brownish pigment material (Fig. 2). In fact, the pigment was so great in amount as to make it impossible

Study Number Fifty-one - 2

to study the finer details of the cells in which it occurred. The pigment was scattered promiscuously throughout the stroma of the entire tumor. Blood vessels were commonly observed and were rather adult in type. Very few cells of the parenchyma were pigment free. Mitosis was not observed although the large amount of pigment present would have made it impossible to have observed mitosis even though it had been a common feature.

The growing parenchyma of the tumor was not sharply separated from the elements of the stroma but exhibited a certain infiltration.

Sections from various nodules from the body cavities showed the same general type of structure described above with the exception that the masses were more fibrous and fewer of the cells contained pigment.

Diagnosis: This is a type of melanotic tumor which has some features suggestive of malignancy. The infiltrative behavior of the tumor cells and the abundance of the secondary nodules in the body cavities points to a metastatic neoplasm. Again, the large amount of pigment in practically all the cells of the large tumor and the abundance of the reticular stroma is contrary to the usual picture of melanosarcoma. However, it is difficult to account for the multiple manifestations observed in this case in any other way.

Study Number Fifty-one - 3

No doubt if this tumor had not been molested and the animal had been permitted to live, the tumor would have caused serious involvements of the vital parts. From the widespread nature of the disturbance rather than upon the histological pathology of the material, I am inclined to view this as a melanosaarcoma.

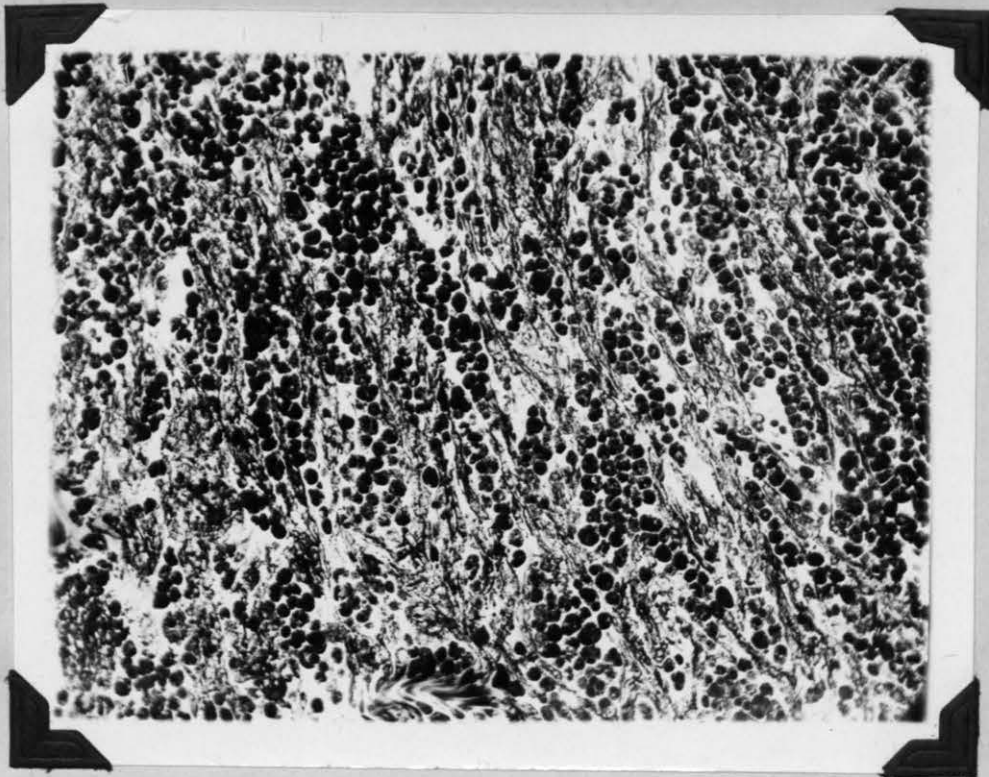


Fig. 1 (T.93) Melanosarcoma.--Neck of a Horse.
Low power photomicrograph showing the reticular nature of the stroma and the large number of pigment containing cells.

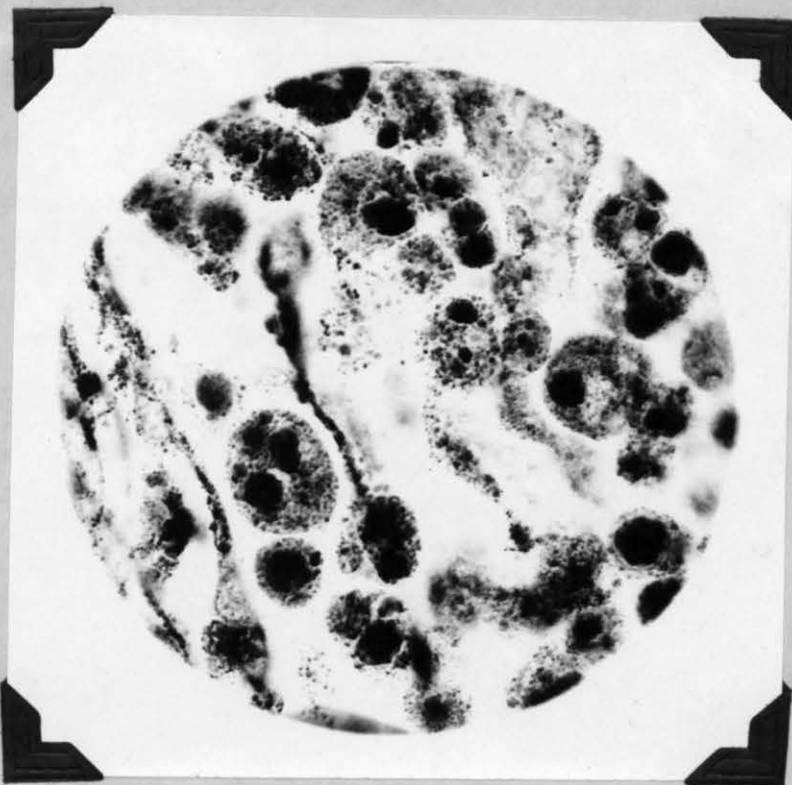


Fig. 2 (T.93) Melanosarcoma.--Neck of a Horse.
High power photomicrograph showing the granular nature of melanin, much of which is contained within the cells.

STUDY NUMBER FIFTY-TWO

TUMOR NUMBER 165

Metastatic Melanosarcoma -- Dura Mater of the Spinal
Cord of a Dog

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

Clinical Data: A dog with a primary mammary melanosarcoma was autopsied and a number of secondary growths were found, including an involvement of the meninges of the cord.

Gross Appearance: The growth had an elongated shape and was located ventrally in the epidural space upon the dura mater. The entire specimen was not received but that which was examined seemed to have occupied a position somewhere posterior to the last thoracic vertebra. The growth on cross section had a crescent contour, measuring about 3 cm. in width by 1.3 cm. in depth. It was greyish white in color with some small lighter spots scattered throughout. The tissue was rather firm to the touch and was not encapsulated. It was firmly bound to the dura mater.

Microscopic Description: The tumor consisted of an abundance of dense fibrous tissue between the stroma of which were young melanoblasts in all stages of mitotic division. Most of the cells were arranged in thin columns with an occasional clumping or nestlike formation (Fig. 1). The processes of cells ran in every direction and presented a tangled, twisted appearance. The cells of the parenchyma

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varied greatly in size, those in clump formation being rather large while those in the narrow columns were much smaller. Most of them were cuboidal to polyhedral in shape with rather clear cytoplasm and a large hyperchromatic nucleus with nucleoli frequently showing. The nuclei also varied much as to shape with the polyhedral type predominating. A good many of the epithelial cells contained an accumulation of a finely granular brown pigment that resembled melanin in appearance. A good share of the tissue showed a considerable round cell infiltration. Some fairly large areas of fibrous tissue showed a few atrophic tumor cells and a large number of clear spaces that were perhaps lymph vessels.

Diagnosis: The involvement of the dura mater is a little unusual and would certainly point to a generalization probably by way of the blood stream. The abundance of stroma in the atrophic appearance of many of the cells would perhaps indicate a tendency toward regression.

This is a metastatic extension of a primary mammary melanosarcoma.

Metastatic Melanosarcoma

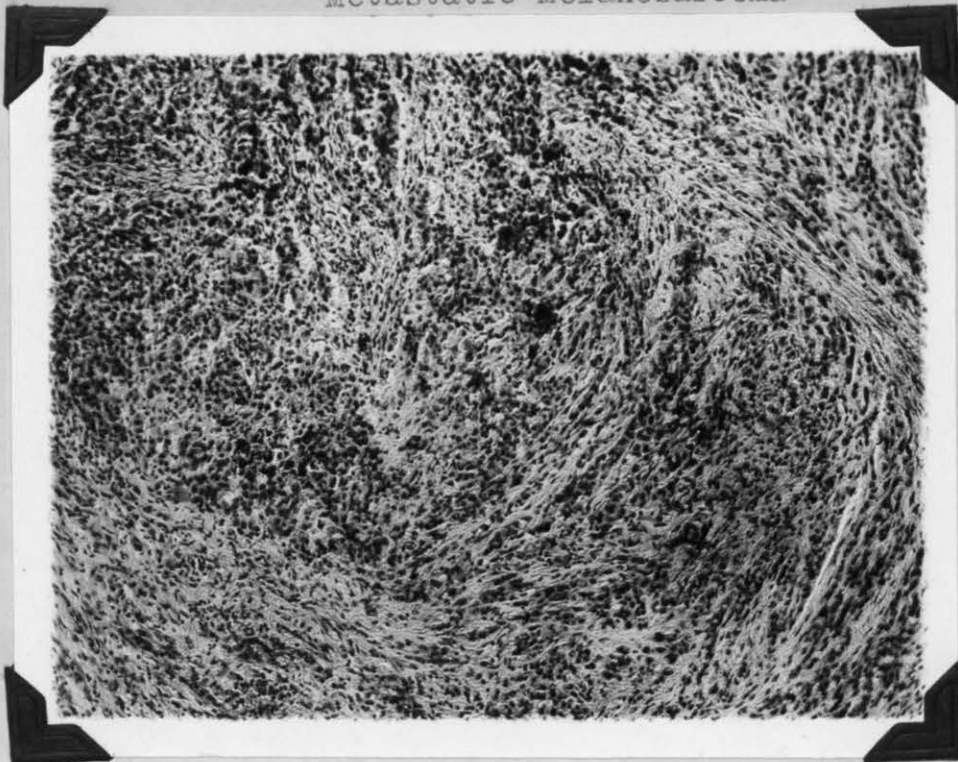


Fig. 1(T.165) Metastatic Melanosarcoma of the Dura Mater, Spinal Cord of a Dog.
Low power view showing the large amount of fibrous stroma.

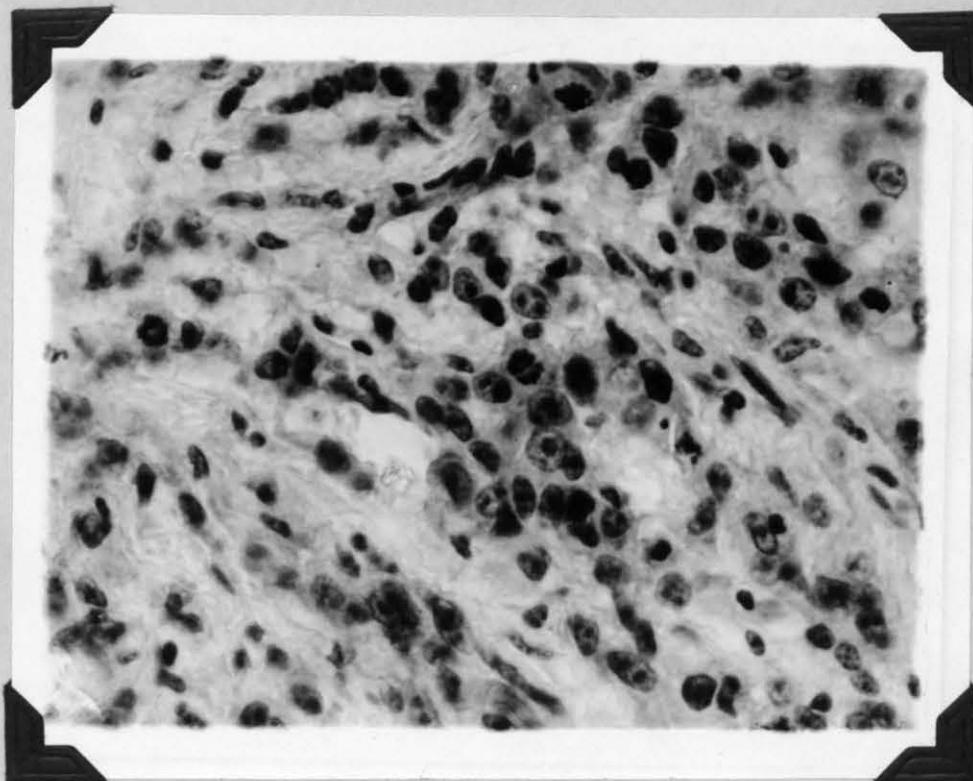


Fig. 2 (T.156). Metastatic Melanosarcoma of the Dura Mater, Spinal Cord of a Dog.
High power photomicrograph showing the embryonic melanoblasts many of which contain nucleoli. Note the absence of pigment.

Melanosarcoma

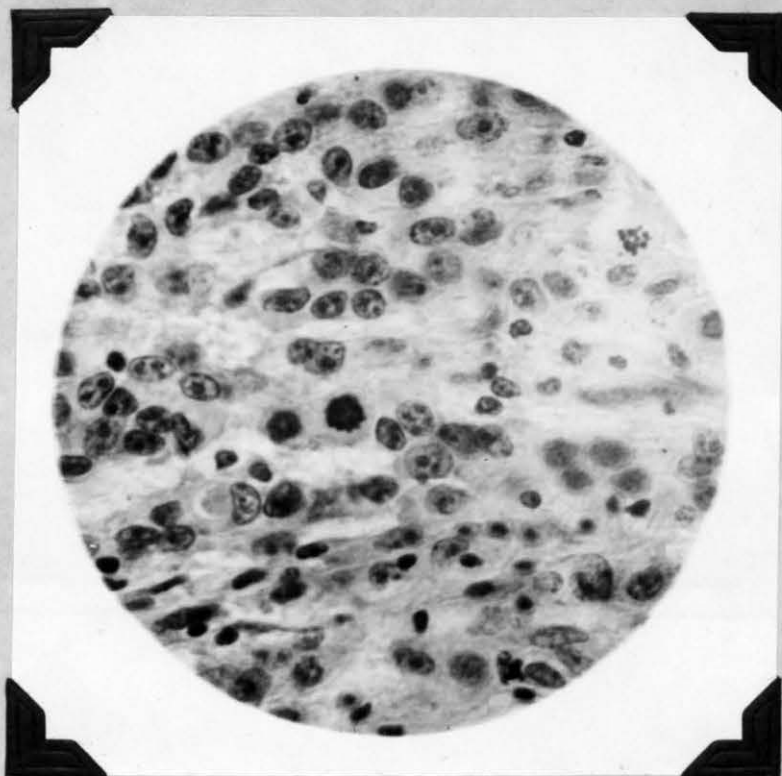


Fig. 3 (T.165). Metastatic Melanosarcoma of the Dura Mater, Spinal Cord of a Dog. High power photomicrograph showing one melanoblast undergoing mitotic division.