
Necrobacillosis in Equines: Clinical, Pathological, and Aetiological Studies on an Outbreak.

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INTRODUCTION AND CLINICAL OBSERVATIONS.

HISTORY.

THE outbreak occurred during the late summer and autumn of 1923 amongst a group of 130 horses which were being run on the farm Kaalplaats, District Pretoria. The animals were running entirely under veld conditions, and were not being stabled at night. The group of horses consisted of a number of immunized horses which were being tested for horse-sickness immunity and a number of controls. On account of the nature of the experiment the horses were not dipped, and as a consequence the farm became very heavily tick infested. Ticks found in great numbers included *Amblyomma hebraeum*, *R. evertsi*, *R. decoloratus*, *Hyalomma aegyptium*.

The origin of the outbreak can be traced to the injury done to the skin by the bites of ticks, more especially the bont tick (*Amblyomma hebraeum*). This tick has a predilection for attaching itself to the volar aspect of the pastern on the forelegs and the plantar aspect of the pastern on the hind legs. It also attaches itself to the region of the sheath, mammary gland, axilla and intermandibular space in horses.

Associated with the wounds caused by tick bites, the nature of the soil on the farm also played a part in the causation of the outbreak. The soil is of a heavy black clayey nature, which, after rains, "cakes" quickly around the lower portions of the limbs, more especially on those animals showing much "feather." This "caking" of the soil around the pasterns caused irritation of the small wounds, which resulted in the production of exuberant unhealthy granulations, with gaping of their lips. This process was repeated daily, the horses' legs becoming covered with moist black soil in and around the drinking pond. Later during grazing on drier ground the mud "caked" quickly from evaporation of the moisture and became firmly adherent to the hair of the fetlock, pastern and coronet.

We have observed in some of those cases which came under our observation mud cakes adhering to the hair of the fetlocks almost as hard as cement.

There were 130 horses running on the farm during the period of the outbreak, from March to May, 1923, and of these 53 became affected with bacillary necrosis. Thirteen of these developed metastatic gangrenous pneumonia and died. One horse died of enteritis during treatment and one was used as a dissection subject. The remaining 38 recovered.

Horses with a large amount of "feather" were as a rule affected; only a few of the lighter horses came under our notice. It is further interesting to note that there were 250 head of cattle and 42 donkeys running on the farm under the same conditions and at the same time, yet not a single case of bacillary necrosis occurred amongst them.

Theiler* described a similar outbreak of necrotic dermatitis accompanied by metastatic gangrenous pneumonia in donkeys in South Africa.

CLINICAL SYMPTOMS.

The onset of the disease was rapid. The first noticeable symptom was a slight painful swelling of the skin and subcutis, involving the posterior aspect of the pastern and hollow of the heel. In one of our cases the necrosis began in the intermandibular space, and in another in the umbilical region. At this stage there was fairly well-marked lameness with little flexion of the digit. Examination of the limb showed one or more small wounds on the posterior aspect of the pastern and numerous bont ticks (*Amblyomma hebraeum*) adhering to the skin. The wounds were unhealthy from the commencement. They varied in size and depth. The granulations were soft, yellowish-red, or yellowish-grey, occasionally blackish-red in colour. They were very easily removed, leaving a bleeding surface. The skin around the irregular borders of the wounds was dirty grey in colour, only slightly sensitive, necrosed and easily detached, leaving a blackish-red raw underground. In favourable cases these ulcers healed under granulation and cicatrization in three to six weeks. In other cases necrosis of the skin of the pastern and coronet quickly followed the initial stages of the lesion. The swelling extended rapidly upwards to the knee or hock and involved the circumference of the limb. It was hot, exquisitely painful and oedematous. After a duration of about forty-eight hours numerous soft fluctuating areas, about the size of a sixpenny to a shilling piece, could be felt over the swelling, where the hair could be pulled out without difficulty. These areas usually appeared around the coronet and in the region of the pastern, but they extended to the knee and hock in some cases. The skin over the soft areas underwent rapid necrosis and fell away, giving exit to a profuse greyish-yellow foetid thin liquid discharge, in which there were large pieces of necrosed tissue and sometimes admixture of synovia. In the most acute cases all the structures below the knee and hock were involved. Necrosis extended to the torus, coronary band and matrix resulting in an exungulation. The bursa podotrochlearis, synovial sheaths, and tendons were often complicated in the necrotic extension. The limb at this stage was intensely painful.

There was, as a rule, some general systematic disturbance from the commencement. The coat was rough and lustreless, with a large number of ticks adherent to the skin. The temperature varied from

* Personal communications.

102.5° F. to 104° F. The pulse-frequency varied from 40 to 60 per minute. The respirations varied from 14 to 22 per minute. The mucous membranes were somewhat injected. The faeces, outside the presence of parasitic eggs, were normal. The urine did not show any abnormal contents. The appetite was retained until necrosis was well advanced.

Gangrenous pneumonia, when it was observed as a complication, was ushered in with marked dejection, listlessness, and fever. The temperature varied between 103° F. and 106° F. The conjunctiva was dirty yellowish-red, sometimes ecchymosed and cyanotic. The nasal mucosa was bluish-red in colour. The respirations were of an abdominal type and increased in frequency, 24 to 40 per minute. The heart rate was increased up to 52 to 72 per minute. The pulse was soft and small. There was a brownish-red to brownish-black tenacious discharge from the nostrils, which became more profuse when the head was lowered. There was occasional painful coughing. The exhaled breath was very offensive. Auscultation of the chest revealed the presence of rales, sometimes metallic, and crepitation could be heard over the lower portion of both lungs. The bronchial murmur was intensified, and vesicular breathing diminished over these areas. Percussion was resented by the patient. It revealed areas of consolidation over the lower third of both lungs, while occasionally tympanitic areas were discoverable, revealing the presence of cavities. As a rule, fibrinous pleurisy could also be detected, friction sounds being heard over the lower portion of the chest during expiration and inspiration. Towards the later stages there was complete loss of appetite and rapid emaciation. Profuse sweating and sometimes diarrhoea were also evident. The horse went down with a collapse temperature, was unable to rise, and lay struggling with colicky symptoms for several hours before death supervened.

Course.—The course of the necrotic lesions was obstinate and acute in the extreme. The lesion spread rapidly and was checked only with difficulty. The ulcers in most cases took two to three weeks' treatment before healthy granulation and definite circumscription could be induced; afterwards, however, healing was fairly rapid. In several cases the necrotic process extended to important structures underlying the skin. The lateral cartilage, matrix, coronary band, tendon of the flexor profundus, the volar or plantar nerves, bursa podotrochlearis, digital and carpal sheaths were involved in many instances, with the result that cure could only be brought about by surgical interference. When the tendon sheaths were involved, the animal died quickly as a result of gangrenous pneumonia, which always supervened when the necrotic extension could not be quickly limited.

Treatment.—The acute nature of the disease was not suspected at the commencement. After thorough cleaning and clipping of the hair, warm antiseptic foot-baths, followed by antiseptic Priesznitz bandage, were tried. As antiseptics lysol, carbolic acid, lysoform, hycol, brilliant phosphin and corrosive sublimate were used. This treatment proved inefficient to limit the necrotic process so that many of the early cases developed gangrenous pneumonia and died.

Later, curetting of the wounds followed by cauterization with tincture of iodine of silver nitrate was tried; the dressing being completed by antiseptic moist cotton-wool bandages. This, although accompanied by better results, was not satisfactory.

Good results were obtained by curetting the wounds, and afterwards applying a cotton-wool "pack" saturated with corrosive sublimate in spirit (1-100). This treatment rapidly produced healthy granulation and limited the necrotic area. After about three days of this treatment, corrosive sublimate and spirit bandages (1-500) were used. Cicatrization was later helped by frequent dusting with tannoform or iodoform powder.

When necrosis involved important structures surgical interference was necessary. Several horses were treated by removal of necrotic tissue, while in two of the animals which later recovered the flexor profundus had to be resected and the navicular bone curetted.

Inhalations of eucalyptus oil and intratracheal injections of Lugol's iodine solution were tried where gangrenous pneumonia supervened, but without success.

The strength of the patient was maintained by means of cardiac tonics and general stimulants in addition to suitable nutritious easily digested food and good hygienic conditions.

PATHOLOGY.

A.—GROSS PATHOLOGY.

The observations discussed in this section were made at routine and student post-mortems carried out by various workers of this division. The individual reports are given in the Appendix.

In general the post-mortem examinations were carried out shortly after death, the interim varying from half an hour to several hours.

In the following description we shall mention—

- (1) the lesions found in the great majority of the cases and standing in definite relation to the disease;
- (2) the lesions found in some of the cases only, but probably related to the main pathological condition;
- (3) the lesions which must be regarded as accidental.

(1)—Principal Lesions.

The condition is invariably poor, the fat tissue having disappeared or being replaced by the transparent brownish gelatinous tissue which is normally met with as the result of atrophy of the fat tissue.

There are more or less extensive cutaneous abrasions in various parts of the body, particularly over the bony prominences.

Deep granulating wounds and large subcutaneous foci of necrosis and gangrene with collateral phlegmons represent the primary lesions. They are situated in the extremities in twelve cases, in the intermaxillary space in one, and in the abdominal wall in another case.

In all but one case the lungs are the seat of the most striking lesions found in the internal organs. They contain a varying number of foci scattered through the parenchyma, varying in size from a pinhead to an ostrich egg. The smaller foci have a stereotypic appearance. They sit either underneath the pleura which is raised over the focus, or in the depth of the organ. On section they appear more or less spherical, show a central core of pale yellowish almost white colour, opaque and dry appearance and firm consistence, which is surrounded by a zone of parenchyma up to 1-2 cm. wide, deep red, smooth, moist, and transparent, also firm but more elastic. Over superficially seated foci the pleura is thickened by infiltration with

a yellow gelatinous material, besides, in many cases, a fibrinous deposit or fibrous growth attaching them to the parietal pleura.

In all cases the liquid content of the pericardial sac is increased. Up to 500 c.c. may be present.

(2)—*Lesions Observed in Some of the Cases Only.*

In the majority of the cases the visible mucous membranes, as well as those of pharynx, larynx, trachea, oesophagus, stomach, and intestines, are pale. The blood generally stains well. Only in two cases is it rather watery. Flesh and subcutaneous tissue are generally found unaltered except for the reduction of the subcutaneous fat tissue. But in three cases both are unusually moist.

The myocard is pale and opaque in many cases, and in some of them the freshness of the carcass allows one to diagnose degenerative changes. In most cases it is fatty infiltration.

Epicardial and endocardial hæmorrhages are present in three-fourths of the cases. In one horse (H 15289) hæmorrhages are found in the tongue, and in another carcass (H 13474) in the adrenal glands and underneath one renal capsule; whether in this last case of traumatic origin or not has not been ascertained.

The peritoneal fluid is increased in about a third of the cases; even up to two litres. The serosa is transparent, with the exception of the diaphragmatical portion and the diaphragmatical surface of the liver, where the usual fibrous filaments are found.

In about two-thirds of the cases the liquid content of the pleural cavities is considerably increased; up to one and a half litre in one cavity. When little increased it is watery or slightly blood-stained; when abundant it is turbid reddish-brown and contains fibrinous floccules. Both visceral and parietal pleura are more or less thickened by yellow, gelatinous infiltration and a fibrinous coat. In one case there is a yellow dry caseous focus in the much-thickened pleura pericardiaca. In all these cases the necrotic foci in the parenchyma reach the surface of the lung.

Besides the typical pulmonary foci described above, other types are found, chiefly one which seems to develop when a bronchial lumen directly communicates with the lesion. There the foci are more or less greenish or brownish discoloured and contain irregular cavities filled with a semi-liquid greyish-green or yellow, cheesy, or custard-like material. The same material is found in the bronchi which communicate with these caverns, and their mucous membrane is markedly reddened.

In three cases the apical lobes are the seat of a chronic catarrhal broncho-pneumonia, and in one case large portions of both lungs in the state of red hepatization.

No necrotic foci are found in the liver, but this organ is enlarged in about three-fourths of the cases, the colour of the surface being somewhat paler and the cut surface opaque. The lobulation is distinct, the periphery of the lobule paler than normal or even distinctly yellowish. This fatty infiltration is very marked in one of the livers (H 14287) where the consistence is soft and brittle. In all the other cases the consistence is firm. In three cases, on the other hand, the organ is distinctly atrophic.

A slight to moderate swelling of the spleen is noticed in two-thirds of the cases. With one exception the trabeculae are still distinctly visible, the pulp is generally dark, and the malpighian bodies visible in most cases.

Stomach and intestines do not show marked alterations, with the exception of two cases where a marked apparently inflammatory hyperaemia is observed.

The kidneys are found pale on the surface and cut surface in many cases, and the cut surface is often opaque.

Enlarged lymph glands are found in various parts of the body. The bronchial and mediastinal lymph glands are almost regularly swollen and often reddened on surface and cut surface.

(3)—*Changes Independent of the Main Pathological Condition.*

The presence of numerous fibrous filaments on the peritoneal surface of the diaphragm in all the cases examined simply illustrates the occurrence of these lesions in all horses coming to local post-mortem. Although the lesions are most extensively developed in helmenthiasis nodularis of the liver, it still remains to be proved that it is in the majority of the cases due to helminthic traumata and not mechanical friction, as many observers believe.

In all cases strongyli are present in the large intestines. The cranial mesenteric artery contains the aneurism usually with strongylus larvae. In one case *Ascaris megaloccephala* is found in the small intestine.

Gastrophilus larvae are more or less numerous in stomach and initial portion of duodenum. This condition is regularly met with in our horses and only subject to seasonal variation. It appears, in the great majority of the cases, not to affect the health of the animal in general.

The bone marrow of the long bones (humerus and femur examined) shows a varying picture. In about half of the cases a more or less gelatinous appearance corresponds with the atrophy of the fat tissue in the whole body. More or less extensive red foci are present in about half of the cases. This condition is little understood at present, and so far no correlation has been satisfactorily established with any other condition in the organism. This is at least the experience of this laboratory where hundreds of horses are subject to post-mortem examination every year.

SUMMARY AND EPICRISIS.

The primary lesions are infected wounds in various parts of the body, most frequently in the extremities, from which, owing to the invasion with virulent necrosisbacilli, necrosis and gangrene and collateral phlegmons develop. Metastases are set in the lungs, and these pulmonary lesions go over to pulmonary and parietal pleura, occasionally to the pericardial pleura. Gangrene and cavern formation sets in in those foci which communicate with the lumen of the bronchial tree. The presence of an increased amount of fluid in thoracic cavity and pericardial sac, even when no inflammatory changes are noted, is probably as much part of the local "defensive" reaction in the thoracic cavity as of the general cachectic hydrops.

In a few cases a broncho-pneumonia is added to these lesions.

The degenerative changes in various internal organs (fatty infiltration of myocard, liver, and kidneys), oligæmia, and emaciation are probably the consequences of a toxaemia, which as far as we can judge would represent the immediate cause of death. In bringing about a cachectic condition the toxaemia was doubtless assisted by the reduced intake of food.

B.—THE MICROSCOPICAL STRUCTURE OF THE LUNG NODULES.

The following description applies only to the multiple necrotic foci characteristic of the disease, and containing only the typical filaments of the necrobacillus; not to foci of chronic or subacute polybacterial broncho-pneumonia sometimes met with alongside, and resembling the usual foreign body pneumonia. It may be stated here that we have not encountered metastatic necrobacillosis of the lungs in any form other than the nodules described in this section.

Material and Technique.

The material, fifteen specimens of lung from five cases, had been collected at routine post-mortems by the officers on duty and fixed in formalin (one-ninth). Freezing and paraffin sections were stained with haemalum (Behmer)—eosine, Van Gieson—haematoxylin, Weigert's fuchselin, Weigert's fibrin method, Giemsa in the modification suggested by Helly.

All the foci in which necrosis bacilli could be detected show the same characteristic picture. There is a more or less spherical piece of tissue in which necrosis is the dominant feature and a zone surrounding the foci which shows exudation and proliferation. We may conveniently refer to the first mentioned as the necrotic centre, to the second as "the surrounding zone."

Localization.

The nodules are scattered irregularly throughout the whole parenchyma and consist mainly of alveolar tissue. It is thought that they originate as small septic infarcts due to embolism of branches of the pulmonary arteries, but we were unable to detect very small, fresh foci. The smallest were of about sweet-pea size, and since the observed thrombosis of the vessels may be secondary, the correctness of this view of the most probable origin cannot be definitely proved.

Structure.

In the necrotic focus, areas rich in cells alternate with areas where hardly any nuclei are found. The areas rich in cells generally dominate so that in a section stained with haemalum and eosine the foci are well visible to the naked eye and stand out as blue spots quite different to the necrobacillary foci in the liver of cattle, and different to those suggested by pictures such as the one reproduced in Joest's *Special Pathol. Anatomy*, in Nieberle's article on the diseases of respiratory organs.*

There is no definite regularity in the relative proportion of these two areas. The one rich in cells may occupy the centre as in No. 2586 and be surrounded by a zone with few cells; or as in No. 2577 the periphery of the focus (in the demarcation zone) may abound in nuclei, whereas the centre is almost free of material taking basic dyes. (Fig. 1.)

It appears from the observations that three factors have to be considered to explain this variation in cell-content:—

1. The direct action of the bacilli or their products: Where the filaments are very numerous (in the pleura, for instance), the surrounding tissue has completely lost its structure, and only little debris are stained with basic dyes.

* R. Nieberle, *Atmungs Organe in E. Joest's Specieller Pathol. Anatomie der Hanstiere*. Berlin, 1924.

2. The development of a bronchiolitis and a catarrhal bronchopneumonia with an abundant cellular exudate in an area which is not yet overrun with bacteria.

3. The presence of more resistant elements as in the peribronchial tissue where the bronchial artery branches off with their adventitial lymphoid tissue constitute structures akin to lymph follicles.

Peribronchial arrangement of the areas rich in cells has repeatedly been observed, but on the other hand bronchioles were found in an area with very few cells, even in the periphery of the necrotic focus, i.e. in the youngest portion.

In the *areas rich in cells* the alveoles are still visible, although the septa have lost the finer details of structure; all the nuclei are pycnotic and the lumina are packed full of nuclei and nuclear débris. It is not easy to see what types they are derived from, but it seems that most of them were either neutrophile leucocytes or cells with a round somewhat pycnotic nucleus and a broad plasma border. The nature of these cells, which are not infrequently met with in catarrhal pneumonia, is much disputed. In the cases described here we could not decide whether they are derived from epithelial cells or from lymphocytes. The determination is made still more difficult by deformations apparently brought about by movements of the alveolar contents. The densely packed nuclei are all stretched out in one direction in the form of streams or whirls. A picture thus results which has a superficial resemblance to the one seen in spindle cell sarcomas. (Fig. 2.)

The cells are embedded in cellular detritus, serum, and fibrine. Fibrine is often present in considerable amount and the tufts may separate the mass of nuclei or press them to the wall of the alveole. Amidst the cells we find numerous long filamentous rods which stain like bacteria, and in their morphology and other properties resemble necrosis bacilli. The staining is generally homogeneous, but sometimes granules in the cytoplasm of the filaments take the stain much better, so that the picture of a string of beads results.* This picture could almost invariably be reproduced by Weigert's fibrine stain, with insufficient differentiation. One might, in this case, at first sight suspect long chains of streptococci, but Giemsa stain shows definitely that only filaments are present. The shorter elements resemble the longer ones in every respect except the length.

The remnants of blood-vessels and bronchioli can be made out with some difficulty in these areas, in the case of bronchioles only seldom is a small portion of the epithelium left as a solid group of cells, and in the case of blood-vessels only the general arrangements of the layers and the presence of elastic fibrils enables one to recognize them. The vessels are all thrombosed, plugged with cellular detritus.

The *areas of the necrotic focus where the cells are scarce* show some sparsely scattered basophile débris in a granular substance which takes acid stains. Fibrine is occasionally found, but less abundant than in the areas with many cells. The alveolar walls have completely disappeared in some places, but over larger portions they can still be recognized as septa without any structural details. In a similarly fragmentary way the bronchioles and vessels still show up, better if the tunica elastica is stained with fuchseline. Bacterial filaments and

* Like cultures of necrosis bacilli.

rods of varying length are scattered throughout, but generally less numerous and less well stained than in the areas rich in cells.

Broad strands of interstitium rarely form part of the focus: as if the interstitium were more resistant towards the invasion by the bacteria. But occasionally portions of it are involved in the necrotic process. It is instructive in examining such areas to start with the zone immediately surrounding the necrotic focus and to go towards the focus itself. On the way we meet simultaneously with the first long bacterial filaments and the increased cellular infiltration. In this region the small blood-vessels are widened and filled with blood. The lumina contain a considerable number of nucleated cells, mainly of the habitus of macrophages, and parallel with an increase in the number of intravascular nucleated cells the cellulation of the neighbouring interstitium increases.

Among the wandering cells of the interstitium two types are predominant: Polymorphonuclear cells and cells with a trachychromatic round or slightly irregular nucleus, and a cell body of varying dimensions. Many of these cells have the staining properties of lymphocytes and plasma cells. The simultaneous presence of two different cell types inside and outside the blood-vessels encourages to speculation on their causal relations, but it seems dangerous to draw conclusions from a momentary picture, and it is not the intention to increase the number of dubious theories which unfortunately abound in the literature of wandering cells and their possible precursors. Forms which might be interpreted as representing cells wandering in or out of the blood-vessels have not been found, nor any detachment of sessile endothelial or adventitial cells.

The wandering cells in the interstitium are embedded in a loose reticulum of collagen fibrils, the meshes of which are filled with serum and fibrine. Fibroblasts are present in moderate number. Their cytoplasm contains a large number of fat droplets. The nuclei in some of them are slightly shrunken. As a whole, however, the fibroblasts dive under in the necrotic focus with their structural features fairly undisturbed, and then, within the focus, suddenly fall to pieces, the nucleus as well as the cytoplasm.

Within a short distance (up to 100μ) the bacterial filaments get more numerous and at the same time pycnosis and karyorrhesis affects most of the nuclei. The structural details disappear and a dense mass of nuclear débris and cellular detritus, serum, and fibrine, with numerous bacterial filaments, indicates that the necrotic focus has been entered.

Occasionally interstitium invaded by the necrotic process shows few cells only, the general destruction of all the cells being the main feature apart from the presence of long bacterial filaments.

Quite an interesting picture is offered where the necrotic process involves the pleura. This is not often the case. The pleura, like the large interstitia, seems to offer a somewhat increased resistance to the necrotic process, and generally belongs to the surrounding zone. But where the pleura is involved the proliferation of the bacterial filaments is more luxurious than anywhere else. It seems desirable to describe such lesions in some detail.

The surface of the lung is covered by a moderately thick fibrinous layer in which, immediately on the propria serosae, large cells with round nuclei are embedded; sometimes in a formation which,

together with their general behaviour, suggests that they are probably serosa endothelial cells. The nuclei of these cells are somewhat pyknotic.

The propria is hardly thickened; perhaps slightly in some places. There is not one cell left intact. All the nuclei stain badly, diffusely, without showing any finer structural details. A small or moderate number of long bacterial filaments is present, embedded in a cellular detritus.

Sharply marked off from this layer, the elastica is found the seat of enormous bacterial proliferation. The bacilli lie in thick convolutions of long filaments, so that this zone represents one solid mass of bacteria of 150-250 μ depth in one case and 350 μ in another. In a section stained with Giemsa this layer of necrosis bacilli is well visible to the naked eye as a fine well-defined line running alongside the surface (Figs. 5, 6). The layer is separated from the propria by the somewhat thicker superficial layer of the tunica elastica, just as if this membrane had hindered the bacteria in their progress.

In deeper layers the elastic fibrils are less numerous and more widely separated than in normal portions. The subserosa is much thickened, all cells are destroyed, and the chromatine is very faintly stained. With some difficulty remnants of widened blood-vessels and a connective tissue network soaked with a serofibrinous exudate and infiltrated with a moderate number of cells can be made out.

The periphery of the focus (Figs. 3 and 4) is a comparatively thin zone which separates the necrotic centre from the surrounding parenchyma. It is characterized, as mentioned already, by a large number of bacterial filaments, which are larger and better stained than in any other part of the focus. Evidently it is the active zone of the focus where young bacterial filaments grow out into the surrounding parenchyma. In foci where the surrounding alveoles show few cells only, this zone is clearly differentiated from both the focus and the surrounding parenchyma by a larger number of neutrophile leucocytes, but in places where the focus itself is crowded with nuclei this demarcation zone does not stand out prominently, but merely forms the peripheral layer of the focus.

Interstitium and pleura in the periphery of the focus have been described above:

The lung tissue surrounding the focus shows certain typical changes in parenchyma, interstitium, and pleura, which recur in every nodule.

In parenchymatous portions the alveoles are filled with serum and fibrine. A moderate number of cells lies free in the lumen, mainly large polygonal cells with a round nucleus and a large vacuolated cell body. These cells evidently are desquamated epithelial cells. Less numerous are neutrophiles and cells of the habitus of macrophages and lymphocytes (the former with a large cell body, and a fairly large, irregular, leptochromatic nucleus, the latter with a spherical trachychromatic nucleus and a small basophile cell body). The alveoles show the capillary vessels distended and filled with blood. Occasionally cells are lying close to the capillary walls with a large more or less round nucleus containing 1-3 nucleoli and a large irregular basophile cell body (fibroblasts).

Fibroblastic activity is much more marked in the interstitium, where a loose network of collagen fibrils is soaked with a serum-like fluid. Embedded in this and evenly scattered over the section is

found a large number of large irregular polygonal cells with a basophile cytoplasm and a fairly large leptochromatic nucleus with 1-3 large nucleoli (fibroblasts). Many of these cells contain numerous fat-droplets. Mitoses are often observed and occasionally 2-4 nuclei occur in one cell. In some of the specimens few cells are present besides these active fibroblasts; in others there is a moderate infiltration with (a) neutrophiles; (b) small irregular polygonal cells with a small round trachychromatic nucleus and a basophile cytoplasm (plasma cells); and (c) cells similar with the exception of the cytoplasm, which stains light yellow with Giemsa.

In cases where the nodule sits underneath the pleura, the serosa shows marked changes; it is covered with a massive layer of fibrine. In the meshes of this feltwork neutrophiles are found entangled in considerable number. No bacteria of any kind can be detected. The deepest strata of this covering fibrine layer contain a few large cells of polygonal shape with large leptochromatic, oval, or somewhat irregular nuclei (serosa endothelial cells). The propria serosa is very much swollen, and may be up to 2.5 mm. deep. A loose network of collagen fibrils, infiltrated with serum and fibrine, forms the substratum for a moderate number of large fibroblasts, besides numerous neutrophile leucocytes and cells with round trachychromatic nuclei; some with the typical habitus of lymphocytes and plasma cells, and with a basophile cytoplasm, others with a cell-body staining pale yellow with Giemsa; further, a moderate number of macrophages, round cells with a leptochromatic bean-shaped nucleus and a non-basophilic cytoplasm. Numerous blood-vessels, with one or two layers of adventitial cells besides the endothelial layer, may be enormously distended with blood.

The tunica elastica and subserosa are characterized by the much larger number of fibroblasts and a reduced number of infiltrating wandering cells. Neutrophiles are comparatively rare. Many of the fibroblasts contain a large number of fat-droplets.

It was not possible from the available material to gain sufficient information on the histological changes in organs other than the lungs. But the few data collected may be added here. In one horse (14660) a chronic circumscribed interstitial myocarditis was found. In four cases where the liver was available for examination, it was found the seat of a slight chronic interstitial inflammation. Of the kidneys examined from four horses, one (H. 14287) showed multiple foci of acute leucocytary nephritis without necrosis bacilli, two showed interstitial lymphocytary nephritis, while the fourth showed no marked alterations. It should be mentioned in this connexion that at this institution the great majority, if not all, kidneys of adult, even apparently healthy, horses show a definite perivascular round cell infiltration. This condition seems to be absent in healthy foals and in healthy adult ruminants and must probably be regarded as the effect of some noxe, in spite of its universal occurrence among the horses that come to local post-mortem examination. In the two cases of nephritis interstitialis lymphocytaria mentioned above, the cellulation was distinctly above the normal intensity.

The spleen in two out of three cases showed changes which are not without interest in view of the fairly recent discussion in the literature on the nature and function of the so-called secondary follicles. In H. 14287 the secondary follicles were large and showed leucocytary infiltration as well as regressive changes, and in H. 14938 the reticulum cells of the follicles were proliferating actively.

SUMMARY.

Metastatic pulmonary foci of pure necrobacillosis, i.e. foci in which microscopically only the typical filaments are discovered, have a characteristic histological structure.

There is a central necrotic focus which differs from the foci found in the liver, etc., of cattle, in that considerable portions are crowded with nuclei and nuclear detritus. The nuclei, which belong to desquamated alveolar epithelial cells and wandering cells, are deformed and arranged in such a way that a picture results which has a superficial resemblance with a spindle cell sarcoma. A thin demarcation zone with mainly polymorphonuclear celluination separates the necrotic centre from the surrounding lung tissue, which represents a reaction zone with serofibrinous and slight cellular exudation, and with the appearance of large swollen fibroblasts in the interstitium.

Bacterial filaments are found in debris in the centre, well preserved and numerous in the periphery of the necrotic focus, and especially numerous, forming thick dense layers, underneath the compact outermost membrane-like layer of the tunica elastica pleurae.

BACTERIOLOGY.

In all the cases which occurred the lung lesions appeared to be very typical. The shape and size of the necrotic areas suggested that the foci might be due to infection with the necrosis bacillus (*B. necrophorus*). Attempts were therefore made to cultivate the bacteria present in the lesions in order to find out whether any particular species was predominant.

From the first two cases from which cultures were made on 17/3/23 a great variety of bacteria was obtained, and the media became rapidly overgrown. In the third case however, horse 13474, from which cultures were made on 4/4/23, shortly after death, colonies of an organism closely resembling *B. necrophorus* were obtained on blood agar slopes incubated anaerobically. The colonies were mixed with those of staphylococci in the primary cultures. The material for the cultures was taken from the cheesy portions at the edges of the necrotic foci. From these colonies of *B. necrophorus* type subcultures on blood agar slopes gave pure cultures of the organism. Cultures in Hibler's brain medium did not give any growth of the organism. From three further cases the organism found in case 13474 was isolated without much difficulty, though it was never obtained in pure culture direct from the lesions. These three cases were horses 15005 and 15096, both of which died on 9/5/23, and horse 14287 (11/4/23).

A horse (15023) which died on 9/4/23 from the typical necrotic pneumonia seen in the other cases, showed bacilli of the *B. necrophorus* type in the lesions, but there was too heavy a contamination with other bacteria for pure cultures to be obtained.

In most of the cases organisms of the *B. necrophorus* type were seen in the lesions and, as will be seen from the histological report, they were seen at the edge of the necrotic foci as long, wavy filaments in bundles.

From the material in the foci in the lungs of case 13474, two rabbits were inoculated subcutaneously on 4/4/23. One of these died on 9/4/23 and the other on 10/4/23. Post-mortem both showed similar lesions, and death was apparently due to toxæmia. In both cases the lungs, liver, and kidneys showed marked

hyperaemia, the heart contained dark uncoagulated blood, and the subcutaneous tissues at the site of inoculation showed marked infiltration with a reddish clear fluid. There was a yellowish fibrinous layer on the muscles at the site of inoculation, and in it and the fluid bacilli of the *B. necrophorus* type were frequent but there were numerous cocci as well. Cultures from the lesions gave a mixed growth of the organism with other bacteria and isolation in pure culture was impossible.

An organism of the *B. necrophorus* type having been isolated from these cases, the question arose as to whether it really was the *B. necrophorus* described in the textbooks or not. The existence of this organism in South Africa has never been doubted as conditions such as the disseminated necrosis of the liver in cattle, foot-rot in sheep, etc., occur. From a case of disseminated necrosis of the liver in a cow which died of heartwater at this laboratory it was possible to isolate a typical strain of *B. necrophorus*, and during the time the writer was stationed in Natal in 1922 an outbreak of purulent infection of the joints in calves occurred there which was undoubtedly due to an infection with *B. necrophorus*. In this latter condition bacteria of the necrophorus type were very frequent in the pus from the joints, and when inoculated into rabbits subcutaneously it produced death from toxæmia in seven to ten days, the only lesions being necrosis of the tissues at the site of inoculation with infiltration of the subcutaneous tissues with a yellowish clear fluid. The organism was not actually isolated from these cases, however, owing to the anaerobic apparatus in use at the time being defective.

The organism isolated from the cases of gangrenous pneumonia corresponded morphologically very closely to the description given of *B. necrophorus*. It was gram negative and stained with the usual basic aniline dyes, though not deeply. In stained preparations the bacilli were seen as thin straight or slightly curved bacilli, varying greatly in length from short, almost coccoid forms to bacilli 5μ to 8μ in length. The most typical form however was that of long wavy filaments which stained irregularly, some portions being unstained others deeply stained, giving a beaded appearance. In the lesions the bacillary forms were the predominating ones and in cultures the filamentous ones. When stained by Neisser's method for *Bac. diphtheriae* the filaments did not show the beading so characteristic for that organism.

Cultural Characters.—Great difficulty was experienced in getting the organism to grow on artificial media. The first cultures were obtained on blood agar slopes incubated anaerobically. No growth was obtained aerobically on any medium. The colonies on blood agar appeared after two days' incubation at 37° C. as minute circular opaque ones which on further incubation became larger, up to the size of a pin's head, flat and star-shaped, with a greenish tinge on the surface. There was no great development after several days' incubation, and the growth was always meagre. After about ten days to a fortnight the bacteria in the colonies appeared to break up into fragments, and could not be morphologically distinguished any longer. On *blood serum* a meagre growth was obtained, but none on ordinary agar or glucose agar.

In *Hibler's* brain medium no growth occurred, but in Tarozzi cultures, ordinary broth to which fragments of fresh guinea-pig liver had been added, growth occurred and was fairly good, gas being

produced and the lump of tissue later becoming blackish in colour. These Tarozzi cultures exhaled a putrid odour. In all media there was a strong tendency for the cultures to die out, and frequent transplantation was necessary. The strain of the organism was finally lost owing to a delay in transplantation and owing to a lack of fresh material, has not been recovered again.

Animal Inoculations.—These were made into horses and small animals. On 21/5/23 two horses were inoculated with culture material. This was obtained by washing the surface growth from a five-day-old culture on blood agar with 10 c.c. of ordinary broth. Horse 15716 received 3 c.c. intravenously and 15679 had a patch of skin on the side of the neck shaved, deeply scarified, and some of the emulsion rubbed into the scarified part. Both these horses were observed daily for three weeks but showed no symptoms of illness, and the scarified part on horse 15679 healed rapidly.

On 25/7/23 two more horses were inoculated with culture material, this time from a Tarozzi culture. Horse 15752 received 5 c.c. intravenously and 15689 5 c.c. subcutaneously.

Horse 15752 at the time of injection was suffering from pernicious anaemia, and died nine days after inoculation. It became very weak, the respirations were rapid, and the skin of the head became damaged by the horse hitting its head against the walls of the stall. There was no evidence of pneumonia during life. At post-mortem death was found to be due to pernicious anaemia. There were a few foci present, somewhat resembling those seen in the gangrenous pneumonia cases, but the organism could not be isolated from them. Bacilli of the *necrophorus* type were present in the material from the foci, but cultures from it were badly contaminated, and rabbits inoculated with it died from septicaemia without evidence of necrosis infection.

Horse 15689 developed a large fluctuating swelling at the site of inoculation on the neck. This was opened on the tenth day when about to burst, and a greenish-yellow thin pus escaped. From this pus the organism was isolated without difficulty, but pus inoculated into rabbits did not produce any effect. It is possible the virulence had fallen off, as the culture used for inoculating the horses was one which had been subcultured for several generations.

With regard to the small animals inoculated, rabbits, guinea-pigs, white rats, and white mice were used.

To see what lesions would be produced by the inoculation of a pure culture into small animals, the following experiment was carried out. The surface growth from a blood agar slope five days old was washed off with 10 c.c. of ordinary broth and inoculated into small animals on 16/6/23.

- (a) 1 rabbit received 2 c.c. intraperitoneally.
- (b) 1 rabbit received 1 c.c. subcutaneously.
- (c) 1 guinea-pig received 1 c.c. intraperitoneally.
- (d) 1 guinea-pig received 1 c.c. subcutaneously.
- (e) 1 white rat received .5 c.c. subcutaneously.
- (f) 1 white rat received .5 c.c. subcutaneously.
- (g) 1 white mouse received .2 c.c. subcutaneously.
- (h) 1 white mouse received .2 c.c. subcutaneously.

(a) Did not die.

(b) Died on 22/6/23, six days after inoculation. The heart's blood was dark and uncoagulated. The lungs, liver, and kidneys

showed hyperaemia. The site of inoculation showed the subcutaneous tissues to be infiltrated with a yellowish gelatinous material. There was a yellowish layer of necrotic material on the muscles in this region. Death was apparently due to toxæmia. Cultures made from the necrotic material at the site of inoculation gave a mixed culture of the organism, which was later isolated in pure culture.

(c) Killed *in extremis* on 26/6/23, ten days after inoculation. At post-mortem it showed slight hyperaemia of the lungs and a few dark spots on the pleura. The liver was enlarged and yellowish-brown in colour. The kidneys appeared normal. The spleen was enlarged, and showed a few small white foci about the size of a pin's head. The abdominal wall at the point of inoculation showed a thick yellowish fibrinous deposit in the surrounding subcutaneous tissues. This infiltration extended all the way along the abdominal wall to the neck and in some places was a centimetre thick. A turbid serous fluid was present in the infiltrated areas. This fluid showed numerous bacilli of the *B. necrophorus* type. Cultures made from it gave mixed cultures of the organism from which pure cultures were obtained later.

(d) Died on 20/6/23, four days after inoculation. At post-mortem the heart's blood was found to be dark and uncoagulated, the liver hyperaemic, and the spleen soft, dark and swollen. The peritoneal cavity contained a small quantity of turbid reddish-yellow fluid. At the site of inoculation the subcutaneous tissues were yellow and infiltrated with a fibrinous greenish-yellow material. Smears from this showed a mixed infection of different types of bacteria. Cultures were unsuccessful. The guinea-pig was somewhat decomposed.

(e) and (f) Did not die.

(g) Died on 21/6/23, five days after inoculation. At post-mortem the subcutaneous tissues at the site of inoculation showed the presence of a yellowish necrotic material. No other lesions were seen. In the necrotic material bacilli of the *necrophorus* type were present, but there were too many other bacteria present, so that cultures failed owing to contamination.

(h) Did not die.

On the 21/7/23 two rabbits were inoculated subcutaneously with two different strains of the organism of the *necrophorus* type, but they did not die. Apparently the strains had lost their virulence.

CONCLUSIONS.

An organism closely resembling the *B. necrophorus* was isolated from foci in the lungs of horses dying from necrotic pneumonia. This organism morphologically was identical with *B. necrophorus*, but appeared to be more difficult to cultivate.

It was not proved that this organism was the cause of the disease with which it was associated, and transmission experiments in horses were not successful, the case of horse 15752 not having been definitely found to have been a true case of necrotic pneumonia.

In small animals the results obtained from inoculation of infected material agree with those obtained with *B. necrophorus*, with the distinction that guinea-pigs were susceptible as well and showed well-marked lesions.

It is probable therefore that the organism belonged to the *necrophorus* group, but that it was a variation from that species which causes the well-known conditions such as disseminated necrosis of the liver in cattle and foot-rot in sheep.

APPENDIX I.

CLINICAL NOTES.

CASE 4.—Horse 15289. Presented in the Clinique 15.3.23. Brown gelding, six years old, 14.3 h.h., star.

Status Presens: Condition fair. Coat rough and lustreless, numerous ticks adherent to the skin. Marked depression and listlessness. M.M. reddish and slightly icteric. Pulse, 48 per minute, soft. Temperature, 103.8° F. Respirations 18 per minute. Coughing. Marked pleuritic groove. Vesicular murmur harsh and grating. Crepitation and rales evident on auscultation of lower portion of the diaphragmatic lobes of both lungs. Dullness on percussion of lower border of both lungs. Brownish-red discharge from nose. There is a high-grade supporting-leg lameness in the off hind limb. The limb is swollen to the middle of the metatarsal region. The swelling is hot, painful and oedematous. There is a wound on the plantar aspect of the pastern $1\frac{1}{2}$ inch by 1 inch. It shows blackish-red to blackish-grey unhealthy granulations. It exudes a yellowish-red discharge. The borders of the wound are irregular, greyish-yellow and non-sensitive.

Diagnosis: Necrotic dermatitis with phlegmosis off hind limb. Pneumonia.

Treatment: Wounds cleaned, curetted and swabbed with tincture of iodine. Antiseptic foot-baths and antiseptic Priesnitz bandages daily. Camphorated oil 200 c.c. subcutaneously twice daily and inhalation of eucalyptus oil.

16.3.23: General condition unimproved. Not feeding. Dull and listless. M.M. slightly cyanotic and icteric. Pulse 56 per minute, very weak. Respirations 28 per minute. Coughing. Nostrils dilated. Marked pleuritic groove. Discharge from the nose, brownish-red. Vesicular murmur harsh. Crepitation and rales more marked. Dullness on percussion over lower border of both lungs. Necrosis of the skin is much further advanced. There are several soft fluctuating areas around the pastern which, on opening, give exit to a greyish-yellow liquid, mixed with tissue flocculi. Phlegmosis now extends to the hock. Horse in *in extremis*. Died during the night.

CASE 5.—Horse No. 14660. Presented in the Clinique 15.3.23. Bay gelding, seven years old, 15.2 h.h., star.

Status Presens: Condition poor. Coat rough. Numerous ticks adhering to the skin. Temperature 102.6° F. Pulse 42 per minute. Respirations 18 per minute. Lung sounds normal. There is a high-grade supporting-leg lameness in the off hind leg. The leg is diffusely swollen to the middle of the metatarsal region. The swelling is hot, painful and oedematous. The skin around the coronet is swollen, exquisitely painful and shows several small circumscribed prominences varying in size up to a shilling. These areas are fluctuating. The skin over them is moist and the hair easily removed.

Diagnosis: Necrotic dermatitis with phlegmosis.

Treatment: The lesion was thoroughly cleaned. The abscesses were opened, curetted and cauterized with silver nitrate. The after-treatment consisted in daily disinfection of the wounds by antiseptic irrigation, followed by injection with tincture of iodine and antiseptic Priesnitz bandages.

Pneumonia was treated by hypodermic injections of camphorated oil, 150 c.c. twice daily, and inhalations of eucalyptus oil.

Progress—

16.2.23: Condition is unchanged. Temperature, 102.6° F. Pulse, 42 per minute.

17.3.23: M.M. injected, slightly yellowish in colour. Temperature, 104° F. Pulse 52 per minute, soft. Respirations 24 per minute. Coughing. Brownish discharge from nostrils. Crepitation and rales on auscultation over both lungs. Some dull foci over the lower border of both lungs on percussion. Pleuritic groove evident. The wounds around the coronet are extending rapidly. The borders are necrotic. There is a profuse foetid greyish-yellow liquid discharge. Swelling is more extensive and reaches the hock.

18.3.23: General condition worse. M.M. dirty yellowish-red. Temperature 104° F. Pulse 58 per minute, weak. Respirations 24 per minute. Marked crepitus and rales. More marked pleuritic groove. Dull areas on percussion increased in extent. Not feeding. Sphincter ani relaxed. Faeces soft. The wounds are very unhealthy and their necrotic borders are rapidly extending. There is separating of the wall of the hoof from the coronary band all around the coronet.

19.3.23: General condition somewhat worse. Temperature 104° F. Pulse 62 per minute. Respirations 32 per minute.

20.3.23: General condition disimproved. Does not rise. M.M. cyanotic. Eyes retracted in the orbital cavity. Temperature 102.8° F. Respirations 38 per minute. Coughing. Profuse foetid blackish-red discharge from nostrils. Pulse 62 per minute, almost imperceptible. Large areas of skin over coronet and pastern sloughed away, exposing the digital vessels and nerves. The wall of the hoof almost entirely separated from the sensitive laminae.

21.3.23: Horse *in extremis*. Died during the forenoon.

CASE 8.—Horse 13474. Presented in the Clinique 31.3.23. Bay mare, eleven years old, 14 h.h., star, snip.

Status Presens: Condition poor. Coat rough with numerous ticks adhering to the skin. Expression anxious. M.M. red and slightly icteric. Pulse 56 per minute, weak. Respirations 19 per minute. Coughing. Marked pleuritic groove. Temperature 104.2° F. Staggers on progression. The eyes are sunken in the orbital cavity. There is corneal opacity and injection of the conjunctiva, with lachrymation in the near eye. There is a marked swelling of the abdomen extending from the sternum to the mammary gland. Laterally it reached the level of the elbow and stifle, where it is sharply marked off. There are numerous bont ticks attached to the skin of the abdomen. Scattered over the swelling are many small wounds from which a reddish watery discharge drops. The wounds are unhealthy and not granulating.

Diagnosis: Necrotic dermatitis with phlegmosis.

Treatment: After removing the ticks, the hair was clipped and the wounds cleaned and disinfected with corrosive sublimate solution, 1 to 500. They were injected with strong tincture of iodine (U.S.P.) and dusted with iodoform daily. The swelling was treated with camphor liniment.

1.4.23: General condition unchanged. Lesion on the abdomen also unchanged. Temperature 105° F. Pulse 56 per minute. Respirations 18 per minute.

2.4.23 General condition disimproved. Animal very dull. Temperature 104° F. Respirations shallow, 22 per minute. Coughing. Pulse weak, 53 per minute. M.M. yellowish-red. Brownish discharge from the nostrils. Breath foetid. Crepitation and rales over both lungs on auscultation. The lower border of both lungs is dull on percussion. The near lung also shows the presence of a cavity 3½ inches in diameter, over which the percussion sound is tympanitic and hollow. The swelling on the abdomen is not increased, but the borders of the wounds have extended and are necrotic. The discharge from the wounds is foetid, greyish-yellow and blood-stained.

3.4.23: General condition disimproved. Not feeding. Rises with difficulty. Dull and listless. M.M. cyanotic. Pulse weak, 60 per minute. Temperature 99.2° F. Respirations 24 per minute. Coughing. Breath very foetid. Animal groans with pain. Faeces soft. Sphincter ani relaxed. The swelling has not increased in size, but it shows numerous necrotic areas along the line of the linea alba, which exude an extremely foetid greying-red liquid discharge with tissue flocculi.

4.4.23: Temperature 101.8° F. Pulse 68 per minute. Respirations 28 per minute. Coughing. Animal *in extremis*. Died during the afternoon.

CASE 9.—Horse 15852. Presented in the Clinique 15.3.23. Dun mare, nine years old, 15.2 h.h., star.

Status Presens: Condition fair. Coat rough, long and lustreless. Numerous ticks adhering to the skin. M.M. pink. Pulse 52 per minute. Temperature 102.8° F. Respirations 18 per minute. Slight cough. Vesicular murmur is somewhat harsh and grating. There is a high-grade supporting-leg lameness in the off foreleg. The leg is swollen to the middle of the metacarpal region. The swelling is hot, painful and oedematous. The coronet is markedly swollen and presents several soft fluctuating areas over which the hair is removed. There is a wound on the volar aspect of the pastern 2 inches by 1½ inch. The wound is unhealthy-looking and exudes a liquid greyish foetid discharge.

Diagnosis: Necrotic dermatitis and phlegmosis with abscess formation.

Treatment: Wound cleaned, curetted and cauterized with silver nitrate. Abscesses opened, cleaned and injected with strong tincture of iodine. Antiseptic foot-baths and antiseptic Priesnitz bandages daily. Subcutaneous injections of camphorated oil, 150 c.c., twice daily, and eucalyptus inhalations were given when pneumonia developed.

16.3.23: Necrotic lesions somewhat more extensive, otherwise no change. M.M. pink. Pulse 52 per minute. Temperature 103° F. Respirations 20 per minute. Slight coughing.

17.3.23: Pneumonic symptoms have developed. M.M. injected and slightly icteric. Pulse 58 per minute, soft. Respirations 28 per minute. Slight brownish discharge from nostrils. Crepitation and slight rales can be heard on auscultation over both lungs. The leg lesion shows extension of the necrotic process. The wall of the hoof is separated from the coronary band. The animal is in extreme pain. Morphia, 7½ grs., given subcutaneously.

18.3.23: General condition much worse. Not feeding. Temperature 103.8° F. M.M. injected and icteric. Pulse 60 per minute. Respirations 28 per minute. Coughing. Marked pleuritic groove. Brownish foetid discharge from the nose. Crepitation and rales marked. Lower portion of both lungs shows dullness on percussion. The leg is more swollen. Skin necrosis is extending rapidly. There is a very profuse foetid dirty yellowish-grey discharge from the wounds.

19.3.23: General condition disimproved. Not feeding. Pneumonic symptoms more exaggerated. M.M. cyanotic. Temperature 102.8 F. Pulse 62 per minute, weak. Respirations 28 per minute. Coughing. Fairly profuse foetid nasal discharge. Nostrils dilated. Marked pleuritic groove. Crepitation and rales marked. Dullness over lower border of both lungs on percussion. The limb shows very rapidly extending swelling, which now extends above the knee. The necrosis involves the coronary region and the whole posterior aspect of the pastern. The separation between the wall of the hoof and sensitive laminae is almost complete.

20.3.24: Animal is *in extremis*. Respirations 32 per minute. Temperature 103.6° F. Pulse 62 per minute. Died during the evening.

CASE 11.—Horse 15096. Presented in the Clinique 23.3.23. Brown gelding, eleven years old, 15.3½ h.h., star, race.

Status Presens: Animal rises with difficulty. Condition very emaciated. Decubital abrasions over the bony prominences. Numerous ticks adhering to the skin. M.M. pale yellowish. Temperature 101.6° F. Pulse 38 per minute, soft. Respirations 16 per minute. Sphincter ani relaxed. There is a slight lameness in the near fore and near hind limbs. Both are swollen to the fetlock. There is a wound on the coronet of the near fore limb on the lateral aspect, 1 inch by ½ inch. It is unhealthy and exudes a thin greyish-yellow discharge. There is a another wound on the plantar aspect of the pastern of the near hind limb, 1½ inch by 1 inch. This wound is also unhealthy with yellowish-red soft granulations and greyish-yellow blood-stained discharge.

Diagnosis: Necrotic dermatitis with phlegmosis.

Treatment: Wounds cleaned, curetted, and cauterized with copper sulphate and carbo-ligni (1 to 10). Antiseptic foot-baths and dry dressing (iodoform 1, bismuth sub-nitrate 3) with dry protective cotton-wool and gauze bandages daily. Decubital abrasions were dressed with bismuth, iodoform, and paraffin paste. Arsenic, 4 grains per *os*.

24-31.3.23: Doing well, general condition improving slowly.

1-30.4.23: Wounds have made slow progress, but general condition not much improved.

6.5.23: General condition shows disimprovement. Not feeding well. Dull and listless, stands with head depressed and ears drooping. M.M. pale, slightly yellowish. Pulse 48 per minute. Temperature 103.6° F. Respirations 18 per minute. Lung sounds normal. Wounds in the limbs show fairly healthy granulations and begin to cicatrize nicely. Several decubital abrasions still require daily dressing.

7.5.23: No change in general condition.

8.5.23: Animal has developed symptoms of liver atrophy ("staggers") in an acute form. M.M. injected and icteric. Pulse 48 per minute. Temperature 103.6° F. Respirations 18 per minute. Very dull and listless after epileptiform fit. Large wounds inflicted over both supraorbital processes exposing the bone. Died during the night.

CASE 12.—Horse 15023. Presented in the Clinique 28.3.23. Chestnut gelding, eleven years old, 15.1 h.h., race snip, white sock off fore.

Status Presens: Condition fair. Coat rough and lustreless. M.M. pink. Temperature 105° F. Pulse 40 per minute. Respirations 14 per minute. Lung sounds normal. There is a medium-grade supporting-leg lameness in the off fore. The limb is swollen to the fetlock. Swelling hot, painful and oedematous. There is a wound, 3 inches by 1½ inch, on the volar aspect of the

pastern, which is pale red in colour, with irregular borders. There is another small wound, 1 inch by $\frac{1}{2}$ inch, on the medial aspect of the coronary band. These wounds exude a thin yellow non-foetid discharge. The balls of the heel are swollen, painful, and there is a slight separation of the horn in this region. There is an opening in the lateral sulcus of the frog which exudes a blackish-grey discharge. The frog is entirely underrun and separated from the sensitive frog.

Diagnosis: Necrotic dermatitis with phlegmosis. Pododermatitis acuta superficialis circumscripta.

Treatment: Wounds cleaned, curetted and cauterized with corrosive sublimate in spirit, 1 to 25. Horny frog removed. Antiseptic Priesnitz bandages applied daily after cleaning and curetting the wounds.

29.3.23: General condition unchanged. M.M. pink. Pulse 44 per minute. Temperature 104.4° F. Respirations 14 per minute. Lung sounds normal. The limb lesions do not show much change.

30.3.23: General condition not changed. Feeding. M.M. pink. Pulse 40 per minute. Temperature 102.2° F. Respirations 14 per minute.

31.3.23: No change. Feeding. Temperature, M. 101.8° F., E. 104.8° F. 1.4.23: No change. Feeding. Temperature, M. 101.2° F., E. 104° F.

2.4.23: No change. Feeding. Temperature, M. 102° F., E. 105° F.

3.4.23: General condition satisfactory. Feeds well. M.M. pink. Pulse 44 per minute. Temperature M. 102.4° F. Respirations 16 per minute.

4.4.23: General condition disimproved. M.M. reddish and slightly cyanotic. Pulse 48 per minute, soft. Temperature M. 102.4° F., E. 104° F. Respirations 18 per minute. The leg lesion is somewhat improved. Wounds appear to be cleaning. Granulations reddish and more healthy looking.

5.4.23: Pneumonic symptoms have developed. M.M. reddish and ecchymosed. Pulse 48 per minute, soft. Temperature 104.4° F. Respirations 18 per minute. Coughing. Marked pleuritic groove. Nostrils slightly dilated. Brownish discharge from both nostrils. Vesicular murmur is harsh and there is crepitation evident over both lungs on auscultation. The lesion on the limb is unchanged.

6.4.23: General condition much worse. Feeds a little. Pneumonic symptoms more exaggerated. M.M. reddish, ecchymosed and icteric. Temperature 104° F. Pulse 48 per minute. Respirations 19 per minute. Coughing. Lower third of both lungs dull on percussion. Lesion on the limb appears to be improving.

7.4.23: General condition worse. Not feeding. M.M. congested and icteric. Pulse 52 per minute. Temperature 104.4° F. Head hanging. Profuse muco-purulent discharge from nostrils. Respirations 24 per minute. Coughing. Nostrils dilated. Crepitation and rales evident on auscultation and dullness on percussion. Anus is open. Faeces are soft, almost liquid. Horse is *in extremis*. Limb lesions are unchanged.

8.4.23: Animal very weak. Cannot rise. Pneumonic symptoms more exaggerated. Pulse 68 per minute. Temperature 101.6° F. Respirations 24 per minute. Died during the forenoon.

CASE 13.—Horse 14835. Presented in the Clinique 28.3.23. Brown gelding, eight years old, 16.1 h.h.

Status Praesens: Condition poor. Coat rough, long, and lustreless. Numerous ticks adhering to the skin. Animal very depressed. M.M. reddish-yellow. Pulse 54 per minute, soft. Temperature 101.8° F. Respirations 24 per minute. Lung sounds are normal. There is a high-grade swinging, and supporting leg lameness in the off hind limb. The limb is swollen from the coronet to the hock. Swellings hot, painful and oedematous. The lymphatic vessels are corded. The inguinal lymphatic glands are slightly swollen and painful. There is a wound on the plantar aspect of the pastern, $2\frac{1}{2}$ inches by 2 inches, and a small wound on the medial aspect of the fetlock, $1\frac{1}{2}$ inch by 1 inch. The wounds are unhealthy, showing yellowish-red soft granulations which bleed easily. There is a thin liquid greyish-yellow discharge. The region around the coronet shows several small soft patches from which the hair can be removed without difficulty. The wall is separated from the coronary band in the region of the heels and bulbs of the frog. The torus is swollen and very painful on pressure.

Diagnosis: Necrotic dermatitis and pododermatitis with coronary phlegmosis and abscess formation.

Treatment: The wounds were cleaned and curetted. The detached portions of the wall and horny frog were removed. The lesions were afterwards treated with tincture of iodine and an antiseptic Priesnitz bandage applied. This

was carried out daily. Subcutaneous injections of camphorated oil, 150 c.c., twice daily, and inhalations of eucalyptus oil were also given after the onset of pneumonia.

29.3.23: General condition much disimproved. Not feeding. Temperature 103° F. Pulse 58 per minute. M.M. "muddy" and slightly icteric. Respirations 28 per minute. Slight coughing. Nostrils dilated. Slight nasal discharge, brownish red in colour. Breath foetid. Auscultation reveals crepitation and slight rales. The lower third of both lungs is dull on percussion. The swelling in the limb is more extensive. The wounds appear more unhealthy with very rapidly extending borders. Discharge is profuse greyish-yellow, containing tissue flocculi. There are several small openings around the coronet which exude a similar discharge, but slightly blood-stained. The tendons and ligaments on the plantar aspect of the pastern are exposed. Exungulation is quickly taking place from rapidly extending necrosis of the laminae.

30.3.23: General condition worse. Horse lies in extreme pain. M.M. cyanotic. Temperature 103° F. Pulse imperceptible. Auscultation shows heart beats to be 68 per minute. Respirations 36 per minute. Coughing. Nostrils dilated. Profuse nasal discharge which is extremely foetid. The leg lesion shows necrosis of the skin of the coronet and pastern, with exposure of the ligaments and tendons. Discharge is profuse and stinking. The hoof is almost completely detached.

Strychnine sulphate 1 gr. and morphia sulphate 7½ gr. hypodermically.

31.3.23: Condition very bad. Temperature 104° F. Pulse 68 per minute. Respirations 36 per minute.

1.4.23: Horse *in extremis*. Died during the forenoon.

CASE 14.—Horse 14777. Presented in the Clinique 28.3.23. Brown gelding, eight years old, 16.1 h.h., star.

Status Presens: Condition good. Coat long, rough, lustreless. Numerous ticks adhering to the skin. M.M. slightly injected and slight yellowish tinge. Pulse 54 per minute, soft. Temperature 104° F. Respirations 32 per minute. Coughing. Slight rales can be heard over both lungs on auscultation. There is a high-grade supporting-leg lameless in the near foreleg. The leg is swollen to the lower third of the metacarpal region. Swelling is hot, painful and oedematous. There is a wound on the volar aspect of the pastern, 2½ inches by 2 inches. The wound is unhealthy and shows yellowish-red granulations. It exudes a foetid yellowish liquid discharge. The lymphatic vessels of the forearm are corded and painful.

Diagnosis: Necrotic dermatitis with phlegmosis. Pneumonia.

Treatment: The wound was cleaned, curetted, and cauterized with silver nitrate. An antiseptic foot-bath was given daily, followed by the application of a corrosive sublimate and spirit bandage (1 to 500).

The animal was given camphorated oil, 150 c.c., subcutaneously, twice daily, and inhalations of eucalyptus oil.

29.3.23: General condition disimproved. M.M. injected and shows slight icterus. Pulse 58 per minute, weak. Temperature 104.4° F. Respirations 28 per minute. Coughing. Nostrils dilated. Slight reddish-brown discharge from the nostrils. Vesicular murmur harsh and grating. Rales and crepitation distinct in auscultation. Percussion reveals dullness over lower third of both lungs. Animal lies all day in extreme pain. 1 grain of strychnine sulphate and 7½ grains of morphia sulphate administered subcutaneously. This gave relief for some hours.

The lesion is spreading rapidly. Swelling extends slightly above the knee. There are small necrotic foci on the skin around the coronet and pastern. The discharge from these openings is greyish and blood-stained. The original wound shows greyish-red granulations and discharges profusely. The horn of the wall is separated from the coronary band over the lateral and medial aspect of the heel and balls of the frog.

30.3.23: General condition much worse. Horse *in extremis*. Cannot rise. M.M. cyanotic. Temperature 103.8° F. Pulse 64 per minute, almost imperceptible. Respirations 30 per minute. Coughing. Breath offensive. Sweating over triceps and quadriceps regions. The swelling in the limb has increased. The skin necrosis is much more extensive and the discharge more profuse. The tendons and tendon sheaths are involved in the necrotic process. The animal is *in extremis*. Died during the night.

CASE 17.—Horse 15018. Presented in the Clinique 31.3.23. Bay gelding, ten years old, 15.1 h.h., star, both hinds white sock, flecked with white over back and croup.

Status Presens: Condition poor. Coat rough and lustreless. Numerous ticks adhering to the skin. M.M. slightly pale. Pulse 45 per minute. Temperature 101.2° F. Respirations 16 per minute. There is a supporting-leg lameness in both hind legs. Both limbs are swollen to the fetlock. Swelling is hot, painful and oedematous. The near hind limb shows a wound on the plantar aspect of the pastern, 2½ inches by 2 inches. The wound shows unhealthy granulations. There is a fairly profuse thick yellowish viscid discharge. The off hind shows a similar wound, 2 inches by 1½ inch.

Diagnosis: Necrotic dermatitis with phlegmosis.

Treatment: Wounds cleaned and curetted. Cauterized with silver nitrate. Dry dressing of iodoform and bismuth subnitrate applied daily with a protective bandage.

1.4.23: No change in general condition. Temperature 103.4° F.

2.4.23: No change in general condition. Temperature 104.2° F.

3.4.23: Not much change. Swellings slightly decreased. Temperature 103.8° F.

4.4.23: Not much change. Temperature 103.8° F.

5.4.23: General condition unchanged. Wounds appear healthier. Swellings decreased.

8-12.4.23: No change in general condition. Swellings decreased.

13.4.23: General condition disimproved. Dull. Not feeding well. M.M. pale. Temperature 102.2° F. Pulse 60 per minute. Respirations 32 per minute. Lung sounds normal. The wounds on both hind limbs are somewhat unhealthy looking, and the swelling has increased slightly.

14.4.23: General condition unchanged. Temperature 100.6° F.

15.4.23: General condition disimproved. Not feeding well. M.M. slightly congested and icteric. Temperature 101.6° F. Pulse 52 per minute. Respiration 28 per minute. Lung sounds normal. The swelling on the off hind limb is considerably increased and extends to the middle of the metatarsal region. The wound is bathed with a viscid bright yellow exudate. It is evident the digital sheath is open. 5 c.c. 3 % protargol injected into sheath.

16-18.4.23: Condition unchanged.

19.4.23: General condition worse. M.M. injected. Temperature 105.4° F. Pulse 48 per minute. Respirations 24 per minute. Coughing. Slight crepitus can be detected over both lungs on auscultation. Slight brownish discharge from nose.

22.4.23: Condition not much changed. Temperature remains high, 105° F.

25.4.23: General condition bad. Not feeding. M.M. injected. Temperature 104.2° F. Pulse 52 per minute. Pneumonic symptoms apparent. Crepitus and rales present. Dullness on percussion. Respirations 28 per minute. Coughing. Discharge from nose. The digital sheath of the off hind limb is suppurating.

26-29.4.23: The condition gradually disimproved. The temperature remained subnormal, 99° F.-100° F, until the animal died on the night of the 29th.

CASE 18.—Horse 15062. Presented in the Clinique 31.3.23. Chestnut gelding, seven years old, 15.2 h.h., blaze, four white socks.

Status presens: Condition fair. Coat rough and lustreless. Numerous ticks adhering to the skin. M.M. slightly injected. Temperature 102.6° F. Pulse 48 per minute, soft. Respirations 18 per minute. There is stiffness in both fore limbs during progression. Both fore limbs are swollen to the fetlock. Swelling is painful, hot and oedematous. The volar aspect of the pastern of both fore limbs shows a wound, 2 inches by 1½ inch. The borders of the wound are irregular in outline. Both wounds show unhealthy granulation. The granulations are soft, easily bleeding, and reddish-grey. There is a yellowish-grey blood-stained discharge.

Diagnosis: Necrotic dermatitis with phlegmosis.

Treatment: Wounds cleaned, curetted and cauterized with silver nitrate. Tincture of iodine and antiseptic Priesnitz bandages applied daily.

1.4.23: No change. Temperature 103° F.

2.4.23: No change. Temperature 104.2° F.

3.4.23: General condition unchanged. M.M. slightly injected. Pulse 48 per minute. Temperature 103.2° F. Respirations 18 per minute. Coughing. Necrosis of the borders of the wounds rapidly extending. The granulations are undergoing necrosis. Swelling has extended up the limbs to the knee.

4.4.23: General condition bad. Symptoms of pneumonia have supervened. M.M. injected and yellowish. Pulse 52 per minute. Temperature 105.6° F. Respirations 24 per minute. Coughing. Marked pleuritic groove. Vesicular murmur harsh. Slight crepitation and rales on auscultation. Discharge from the nose brownish-grey and foetid. There is rapidly-extending necrosis of the skin of the pastern, with many soft fluctuating areas.

5.4.23: General condition worse. Not feeding. Pneumonic symptoms much more exaggerated. Dullness over lower third of both lungs. M.M. injected, slightly icteric. Temperature 105° F. Pulse 58 per minute. Respirations 24 per minute. Coughing. Necrosis of the skin of both fore coronets and pasterns is almost complete. There is a profuse foetid greyish-yellow discharge from several small openings in the region of the pasterns. The original wounds extend to the digital fascia.

6.4.23: General condition disimproved. Not feeding. Does not rise. M.M. cyanotic and slightly icteric. Pulse 68 per minute, weak. Temperature 104° F. Respirations 28 per minute. Coughing. Marked crepitus and rales. Dulness over lower portion of both lungs. Necrosis of the skin and underlying tissues of both fore limbs below the fetlock advancing rapidly.

7.4.23: Horse *in extremis*. Temperature 104° F. Died during the forenoon.

CASE 25.—Horse 14287. Presented in the Clinique 5.4.23. Chestnut mare, nine years old, 14.3 h.h., blaze.

Status Presens: Condition good. Coat rough with numerous ticks adhering to the skin. M.M. normal. Pulse 48 per minute. Temperature 102.6° F. Respirations 15 per minute. There is a high-grade supporting-leg lameness on the off fore limb. The digital and metacarpal regions are diffusely swollen. The swelling is hot, painful and pits on pressure. There is a wound on the volar aspect of the pastern in the hollow of the heel, $\frac{1}{2}$ inch by $\frac{1}{2}$ inch. It is circular in outline with rough greyish-yellow borders. It exudes a thick yellow purulent secretion, containing necrotic tissue flocculi. On probing, it is found that the wound is deep, extending through the torus to the central sulcus of the frog. There is separation of the wall of the hoof from the coronary band on the medial aspect of the heel and median frog-bulb.

Diagnosis: Necrotic dermatitis, extending to the torus; pododermatitis necrotica.

Treatment: Operative removal of the horn over the posterior part of the median area of the frog and frog-bulb. The fistula was cleaned with a curette. This was followed by an antiseptic foot-bath and Priesnitz bandages.

6.4.23: General condition not changed. M.M. pink. Pulse 48 per minute. Temperature 102.8° F. Respirations 16 per minute. There is marked evidence of pain. The coronary band is swollen and shows numerous small areas which are soft and moist and from which the hair can be easily removed. There is profuse yellowish-grey foetid discharge from the fistula.

7.4.23: The animal shows an anxious expression; does not feed. M.M. injected and slightly icteric. Respirations 30 per minute. Nostrils dilated. Brownish-red discharge from nostrils. Distinct rales on auscultation of both lungs. Pulse 56, soft. Temperature 104.6° F. Limb very much swollen to the knee. Numerous small openings around the coronet. These, in addition to the fistula, exude a greyish-yellow discharge. There is slight separation of the wall from the coronary band all around the coronet.

8.4.23: General condition disimproved. M.M. dirty reddish and icteric. Brownish discharge from nose. Pulse 52 per minute. Respirations 36 per minute. Temperature 105° F. There is crepitation and rales over both lungs on auscultation. The lesion of the off foreleg shows the skin all around the coronet necrosed and sloughing. The detachment between the coronary band and the wall of the hoof is complete.

9.4.23: Condition much worse. Temperature 105.4° F. Pulse 68 per minute, weak. Respirations 45 per minute, blowing. M.M. congested and icteric. Discharge from nose slightly blood-stained and extremely foetid. The animal does not rise, but lies stretched out in the box, sweating profusely. Large areas of skin over the digital and metacarpal regions have sloughed away, exposing the tendons and tendon sheaths.

10.4.23: Animal *in extremis*. Does not attempt to rise. Sweats profusely. Temperature 105.4° F. Pulse 64 per minute, almost imperceptible. Respirations 46 per minute. Breath very offensive. The limb, below the knee, presents a sloughing area with profuse foetid discharge, greyish-yellow with tissue flocculi.

11.4.23: Animal died.

CASE 33.—Horse 15005. Presented in the Clinique 30.4.23. Dark brown gelding, seven years, 14.3. h.h.

Status Presens: Condition poor. Coat rough, lustreless. Numerous blue ticks adhering to the skin of the neck and body. Bont ticks adhering to the legs, inter-maxillary space, and inguinal region. Few red ticks adhering to the skin around the anus. Numerous red tick larvae attached in the ears. Pulse 48 per minute. Temperature 101.8° F. M.M. pink. Mixed lameness off fore. The off foreleg is swollen from the coronet to the knee. The swelling is hot, painful and oedematous. It shows a wound on the volar aspect of the knee, 3 inches by 2 inches. There is another wound on the volar aspect of the metacarpal region, 1½ inch by 1 inch. A third wound is present on the volar aspect of the fetlock, 1 inch by 1 inch. The wounds are unhealthy, showing soft yellowish-red granulations. There is a thick greyish-yellow foetid discharge, containing tissue flocculi exuding from the wounds. The borders of the wounds are irregular dark red to greyish-yellow in colour and non-sensitive for a distance of about half an inch from the edge. The skin over the volar aspect of the limb is hard and shows numerous small wounds, varying in size from a pin's head to a small pea. The near fore shows a swelling on the volar aspect of the pastern. The skin is sensitive and shows many small wounds due to tick-bites.

Diagnosis: Necrotic dermatitis.

Treatment: Ticks removed. Wounds cleaned and curetted. The lesions were then painted over with strong tincture of iodine (U.S.P.) and warm antiseptic baths and Priesznitz bandages applied daily.

1.5.23: Wounds unhealthy and rapidly extending.

3.5.23: There is marked swelling of the off fore limbs from the hoof to the knee. M.M. injected, slightly muddy. Temperature 103° F. Pulse 52 per minute. Respirations 30 per minute. Crepitus and rales over both lungs on auscultation. Dullness on percussion over lower border of diaphragmatic lobes of both lungs. Marked pleuritic groove. Slight brownish discharge from the nose.

5.5.23: Temperature 103.8° F. Pulse 48 per minute, weak. M.M. slightly cyanotic. Wounds extending. Swelling involves whole limb up to the knee.

6.5.23: Temperature 103.8° F. Pulse 62 per minute, weak. M.M. cyanotic. Respirations 34 per minute, blowing. Brownish discharge from the nose. Auscultation reveals distinct rales and crepitus over both lungs. Marked local dullness on percussion. Expression anxious, but horse still feeds. Swelling extends somewhat above the knee. A large piece of necrotic tissue has fallen away over the post-carpal region, exposing the tendons and tendon-sheath. Profuse secretion exudes from wounds all over the swollen area, greyish-yellow, flocculent and foetid.

7.5.23: Temperature 103.8° F. Pulse 62 per minute, weak. Respirations 28 per minute. M.M. cyanotic. Foetid discharge from the nose. Swelling still extending. Limb is carried.

8.5.23: Animal in *extremis*. Temperature 104° F. Pulse 56 per minute, weak. M.M. cyanotic. Marked brownish foetid discharge from nose. Swelling has extended to the middle of the forearm. There are several small openings through the skin of the metacarpal and digital region due to sloughing of the skin. In addition to the large wounds present, these openings also exude a greyish-yellow foetid flocculent discharge. There is a patchy sweating over the triceps and quadriceps region. The horse died during the night.

CASE 41.—Horse 14938. Presented in the Clinique 2.5.23. Dun gelding, three years old, both hinds white socks.

Status Presens: Condition poor. Coat rough and long. Numerous ticks adhering to the skin. Temperature 103.6° F. M.M. yellowish-red. Pulse weak, 48 per minute. Respirations 28 per minute. Slight brownish foetid discharge from the nose. Crepitation and rales on auscultation of both lungs. The inter-maxillary space is swollen, hot, and painful. The swelling is pitted with small wounds due to tick-bites. The wounds show unhealthy granulations. There is a profuse reddish-yellow discharge.

Diagnosis: Necrotic dermatitis. Pneumonia.

Treatment: Skin over the lesion thoroughly cleaned and wounds painted with strong tincture of iodine.

Intratracheal injections of Lugol's iodine solution and subcutaneous injections of camphorated oil.

3.5.23: General condition unchanged. M.M. injected and icteric. Pulse 52 per minute, soft. Temperature 103.8° F. Respirations 28 per minute. Crepitus and rales distinct. Slight foetid discharge from the nostrils. The

swelling is increased, and a large area of skin is undergoing necrosis. The small wounds are becoming confluent. Profuse greyish-red flocculent foetid discharge.

4.5.23: Condition unchanged. Crepitus and rales more marked. Discharge from nostrils more profuse.

5.5.23: Animal cannot rise. M.M. dirty red, slightly icteric. Pulse weak, 56 per minute. Temperature 103.8° F. Respirations 21 per minute, shallow. Profuse discharge from the nose. The skin in the inter-maxillary space has undergone necrosis, and large pieces have sloughed away. Animal is *in extremis*. Died during the night.

The following table shows the animals which recovered with the duration of treatment in each case. The majority of the horses shown in this table were treated with corrosive sublimate and spirit swabs (1-100) after cleaning and curetting the wounds. This was followed by corrosive sublimate and spirit bandages (1-500). Later, when circumscription and healthy granulation was induced, tannoform was used as a dusting powder.

Case Number.	Animal Number.	Diagnosis.	Admitted.	Discharged.
1	13822	Necrotic dermatitis, with phlegmosis both fore pasterns and near hind pastern....	11.3.23	9.4.23*
2	15134	Necrotic dermatitis, with phlegmosis both fore pasterns.....	15.3.23	27.7.23†
3	15022	Necrotic dermatitis near fore pastern, with phlegmosis.....	15.3.23	23.4.23
6	14351	Necrotic dermatitis, with phlegmosis and abscess formation off fore pastern.....	15.3.23	11.4.23
7	14294	Necrotic dermatitis, with phlegmosis off fore pastern.....	15.3.23	9.7.23
8	15068	Necrotic dermatitis, with phlegmosis near hind pastern.....	15.3.23	12.5.23
10	6435	Necrotic dermatitis, with phlegmosis off hind hind pastern.....	18.3.23	23.4.23
15	14906	Necrotic dermatitis, with phlegmosis off fore pastern.....	31.3.23	12.5.23
16	14709	Necrotic dermatitis, with phlegmosis near fore pastern.....	31.3.23	23.4.23‡
20	14281	Necrotic dermatitis, with phlegmosis off fore pastern.....	2.4.23	14.8.23§
21	14839	Necrotic dermatitis, with phlegmosis off fore pastern.....	2.4.23	23.4.23
22	15401	Necrotic dermatitis, with phlegmosis near hind pastern.....	2.4.23	12.5.23
23	13055	Necrotic dermatitis, with phlegmosis off fore pastern.....	5.4.23	5.5.23
24	15016	Necrotic dermatitis, with phlegmosis near fore and near hind pasterns.....	5.4.23	28.5.23
26	15277	Necrotic dermatitis, with phlegmosis off fore pastern.....	7.4.23	28.5.23
27	15302	Necrotic dermatitis, with phlegmosis near hind pastern and hock.....	7.4.23	27.7.23
28	15106	Necrotic dermatitis, with phlegmosis near fore pastern.....	7.4.23	25.5.23
29	15053	Necrotic dermatitis, with phlegmosis off fore pastern.....	7.4.23	28.5.23
30	15290	Necrotic dermatitis, with phlegmosis near fore pastern.....	7.4.23	14.5.23

* Destroyed on this date for anatomy. Not yet quite cured.

† Developed podotrochilitis acuta suppurativa and was treated by resecting the tendon of the flexor profundus.

‡ Died of acute enteritis.

§ This horse developed necrosis of the os pedis with sequestration during treatment as a result of a picked-up nail. The condition was cured by operation.

Case Number.	Animal Number.	Diagnosis.	Admitted.	Discharged Cured.
31	15038	Necrotic dermatitis, with phlegmosis off hind pastern.....	7.4.23	11.6.23
32	14350	Necrotic dermatitis, with phlegmosis and abscess formation near hind coronet. . .	19.4.23	2.6.23
34	15112	Necrotic dermatitis, with phlegmosis near fore pastern.....	24.4.23	14.5.23
35	15020	Necrotic dermatitis, with phlegmosis near hind pastern.....	24.4.23	28.5.23
36	15405	Necrotic dermatitis, with phlegmosis near hind pastern.....	24.4.23	26.6.23
37	15104	Necrotic dermatitis, with phlegmosis off hind pastern.....	24.4.23	4.6.23
38	15413	Necrotic dermatitis, with phlegmosis near fore pastern.....	24.4.23	25.5.23
39	15065	Necrotic dermatitis, with phlegmosis off fore pastern.....	17.4.23	14.5.23
40	15124	Necrotic dermatitis, with phlegmosis near fore pastern.....	28.4.23	14.8.23*
42	15007	Necrotic dermatitis, with phlegmosis near hind pastern.....	8.5.23	11.6.23
43	15205	Necrotic dermatitis, with phlegmosis knee and elbow off fore.....	8.5.23	29.7.23
44	15426	Necrotic dermatitis, with phlegmosis intermaxillary space.....	11.5.23	9.7.23
45	14706	Necrotic dermatitis, with phlegmosis off fore pastern.....	31.3.23	11.7.23
46	15035	Necrotic dermatitis, with phlegmosis post carpal region off fore.....	16.5.23	26.6.23
47	15284	Necrotic dermatitis, with phlegmosis flexor aspect, both knees.....	15.5.23	11.6.23
48	14684	Necrotic dermatitis with phlegmosis post carpal region off fore.....	15.5.23	11.6.23
49	12980	Necrotic dermatitis, with phlegmosis off fore pastern.....	25.5.23	4.6.23
50	15169	Necrotic dermatitis, with phlegmosis near hind pastern and hock.....	25.5.23	27.7.23
51	14858	Necrotic dermatitis, with phlegmosis near hind pastern.....	26.5.23	11.6.23
52	14902	Necrotic dermatitis, with phlegmosis, medial aspect forearm off fore.....	29.5.23	11.6.23
53	14908	Necrotic dermatitis, with phlegmosis near fore pastern.....	7.4.23	15.5.23

* This horse developed podotrochilitis suppurativa and quitter. These conditions were treated by surgical operations.

APPENDIX 2.

POST-MORTEM REPORTS.

I am indebted for most of these notes to the colleagues who have conducted the post-mortems as "officers on duty."

The original records have been slightly abbreviated, and in the pathological anatomical diagnosis only the important lesions are summarized. The abbreviation "n.u." signifies "nothing unusual."

Horse 15289. P.M. No. 2545. Spec. 2477. Gelding, aged.

Interim, hour. Condition poor. Abdomen, n.u.

Integument: Off hind leg swollen from hock downwards.

The swelling pits on pressure; a large wound about 4 by 2 cm. on plantar aspect of pastern covered with a brownish granulation and exuding a blood-stained, turbid fluid of offensive odour. The connective tissue bordering the wound is greyish-yellowish, soft. Visible mucous membranes pale. Little fat in subcutis. Periton. cavity, n.u. Diaphragm, n.u. Pleural cavity contains a small amount of yellowish-green flocculent material. Salivary glands, n.u. Thyroid, n.u. Tongue shows intramuscular petechiae. Pharynx and oesophagus, n.u. Mucous membrane of larynx and trachea injected. Bronchi, n.u. Right lung: pleura thickened over greater portion of surface, owing to a yellow gelatinous infiltration which reaches up to 5 mm. in depth; the parenchyma itself contains a number of foci from hazel-nut to hen's egg size, which consist of a firm greyish to reddish-grey, more or less globular central portion, and a surrounding zone of deep red, almost black colour. Pericardial sac contains 100 c.c. of a brownish turbid fluid. Epicard shows petechiae along the coronary grooves. Right ventricle in diastole, left systole. Blood well coagulated. Myocard of right heart 3 cm., of left 4 cm. thick, greyish-brown transparent, of normal consistence. Aorta, n.u. Liver enlarged, fibrous filaments on diaphragmatical surface. Fair amount of blood from cut surface. Central veins distended, otherwise n.u. Pancreas, n.u. Spleen measures 41 by 19 by 2 cm., capsule n.u.; on section trabeculae distinct; malpighian bodies fairly distinct, colour dark brown; consistence, n.u. Adrenals, n.u. Kidneys, n.u. Stomach: mucous membrane of fundus portion slightly reddened, few gastrophilus larvae. Duodenum contains few gastrophilus larvae. Marked diffuse reddening of mucous membrane of the whole small intestine; large intestine contains strongyli, otherwise n.u. Cranial mesenteric artery shows a verminous aneurysm. Bladder, sexual organs, and nervous system, n.u. Bone-marrow of humerus shows two red patches, otherwise yellow; bone-marrow of femur half red, half yellow.

Pathological Anatomical Diagnosis: Emaciation, anæmia, gangrenous hyperpericard phlegmon in off hind leg, serofibrinous pleuritis multiple, metastatic necrosis in lungs, petechiae in epicard and tongue. Stasis in liver, etc., tumor splenis, acute enteritis.

Etiological Diagnosis: Metastatic necrosis of lungs.

Horse 15096. P.M. No. 2679. Spec. 2583. Gelding, aged.

Condition poor. Abdomen slightly distended. Integument shows very numerous engorged blue ticks. Decubitus on both elbows. Abrasions on left knee and both flanks. Near fore limb shows a wound 2 by 1 cm. on the lateral aspect of the coronet. It exudes a turbid reddish fluid. The ground is greyish. Visible mucous membranes pale. Blood dark red, coagulated, well-staining. Subcutaneous tissue, n.u. Peritoneal cavity, n.u. Pleural cavity: fibrous adhesions between the diaphragmatical lobe of the left lung and the costal and diaphragmatical pleura. Salivary glands, n.u. Submaxillary and pharyngeal lymph glands moist and pale on cut surface. Periportal lymph glands, n.u. Splenic glands, n.u. Mesenteric glands moist on cut surface. Tongue, pharynx, oesophagus, n.u. Left lung: mucous membrane of bronchi injected. The pleura shows fibrous adhesions to parietal pleura; colour of surface dark bluish-red; on section dark red colour, a fair amount of a red fluid can be scraped off; the base of the diaphragmatic lobe contains a cavity of fist size filled with a yellow, cheesy material; weight, 4 kg. Right lung: no caseous foci, otherwise similar to left; weight, 4.1 kg. Pericardial sac contains 500 c.c. of a turbid, amber-coloured fluid. On epicard, few red spots along the sulci. Right ventricle dilated; endocard, n.u.; left endocard shows a few bluish-red spots. Thickness of myocard 2 cm. in right, 4 cm. in left heart; on section opaque, greyish; consistency decreased; weight, 3.5 kg. Liver small, edges sharp, capsule n.u., colour of surface bluish-red; on section lobulation distinct, centres deep red; periphery greyish; consistence leathery; weight, 5.4 kg. Pancreas, n.u. Spleen: 37 by 20 by 2.5 cm., capsule n.u.; on section dark red. Trabeculae and malpighian bodies not distinct; consistence normal; weight, 1.1 kg. Adrenals, n.u. Kidneys: cortex somewhat opaque, otherwise n.u. Stomach dilated, filled with gas. Fundus shows diffuse bluish-red patches, in the cardiac portion a few gastrophilus larvae. Duodenum contains a few gastrophilus larvae, otherwise n.u. Large intestine, n.u. Cranial mesenteric artery contains a large aneurysm with strongylus larvae. Bladder distended with yellow-brown, turbid urine. Sexual organs and nervous system, n.u. Bone-marrow of humerus fatty; of femur half fatty, half red.

Pathological Anatomical Diagnosis: Emaciation, gangrenous dermatitis in near fore limb, hydropericard, atrophy and venous congestion of liver. Slight tumor splenis and endocardial-epicardial hæmorrhages. Degeneration of myocard, pulmonary necrosis.

Etiological Diagnosis: Cachexia, pulmonary necrosis.

Horse 14938. P.M. No. 2673. Spec. 2577. Gelding, 3½ years.

Interim, some hours. Rigor mortis present in mouth. Condition poor. Abdomen slightly distended. Integument: intermaxillary space filled through swelling extending to larynx; in the centre an open wound, partially covered with brownish crusts, in other parts showing exposed the reddish-grey moist ground. Subcutaneous and intermuscular tissue around larynx and trachea moderately infiltrated with a yellow gelatinous material. Conjunctiva yellowish-white with deep red patches. Mucous membranes of nostrils light pink, of mouth brownish-white. Blood half coagulated, fairly well staining. Flesh rather pale, purplish-red. Subcutaneous tissue, n.u. Peritoneal cavity: organs in position, serosa smooth, glistening, and transparent; no foreign content. Pleural cavity contains a small amount of a watery liquid. Salivary glands and thyroid, n.u. Larynx: mucous membrane pale, trachea contains a small amount of whitish froth. Left lung inflated, pleura shows few fibrous adhesions; colour of surface in apical lobe deep purple, in the rest of the lung it varies from light pink to light purplish-grey. Through the pleura one sees a few nodules of irregular shape and measuring up to 3 mm. across; they have a firm consistence.

The main bronchus contains a fair amount of white froth, main vessels n.u. From the cut surface of the apical lobe a fair amount of yellowish, frothy mucus is flowing off. The interstitium is much increased, of whitish colour; the lobuli show up as greyish spots of 1 mm. diameter surrounded by a deep red parenchyma. Several cavities up to 1 cm. in diameter are surrounded by a fibrous capsule and filled with a yellow caseous material. In the diaphragmatic lobe, on section the edges appear slightly inverted; a fair amount of a blood-stained froth can be scraped off, the colour varies from light pinkish to bright brick-red. A small number of nodules is present, varying in diameter from 3 to 5 mm. These nodules show a more or less firm centre of a colour varying from yellowish-white to light purple, some have a deep red halo. Right lung: apical lobe as in left; the cut surface of the main lobe has a patchy appearance due to the presence of parenchyma strands of a reddish-brown colour, slightly increased consistence, and reduced volume and air content; from the rest of the parenchyma a fairly large amount of blood-stained froth can be scraped off, otherwise as the left lung. Weights: left 2.5 kg., right 3.1 kg. Pericardial sac contains 500 c.c. of a slightly turbid, yellow liquid. Heart: right ventricle in half diastole, ostium admits hand freely; left in incomplete systole, ostium admits three fingers; both contain coagulated blood. Epicardial fat tissue small in amount, transparent, gelatinous. Right endocard shows few deep red spots and stripes measuring up to 1 mm. across; left endocard and valves, n.u. Myocard light brown, slightly opaque, consistence very soft, 1 cm. in the right, 3 cm. in the left heart. Coronary vessels, n.u.; weight 2.15 kg. Ductus choledochus open. Liver rather small; numerous fibrous filaments on diaphragmatical surface; surface purplish to bluish-grey; on section edges straight, fair amount of blood flowing off. Lobules fairly distinct; in most places the centres of the lobules are deep red, the peripheries light brown, in some the centres brown, the periphery brownish-grey; the consistence is rather firm and tough; weight, 3.9 kg. Spleen small, 17 by 30 by 2.5 cm., capsule n.u.; on section edges straight, colour purple, trabeculae distinct; malpighian bodies not visible; pulp fairly easily scraped off; consistence tough; weight, 0.52 kg. Adrenals, n.u. Right kidney: adipose capsule practically absent, fibrous capsule easily detached, colour of surface light yellowish-grey; on cut surface the cortex appears opaque, light yellowish-grey; the zones are indistinct, the medulla pink; consistence normal, left as right. Weights: right 0.55 kg., left 0.45 kg. Stomach small, contracted, contains a small amount of soft ingesta, few gastrophilus larvae on mucous membrane of cardiac portion. Small intestine contains semi-liquid ingesta, mucous membrane yellowish-grey. Caecum contains soft ingesta, few strongyli, mucous membrane pale. In the rectum the mucous membrane is swollen, on cut surface it appears infiltrated with a colourless fluid. Mesentery devoid of fat. Bladder empty; mucous membrane, n.u. Nervous system, n.u. Nasal passages, n.u. Bone-marrow in humerus and femur red.

Pathological Anatomical Diagnosis: Emaciation, gangrenous phlegmon in intermaxillary space. Chronic catarrhal broncho-pneumonia in both apical lobes. Multiple metastatic necrosis of lungs, atelectasis in right lung, hydropericard, hydrothorax. Atrophy of liver with interstitial fibrosis. Atrophy of spleen.

Etiological Diagnosis: Metastatic necrosis of lungs, cachexia.

Horse 15852. P.M. No. 2554. Spec. 12487. Mare, 7 years.

Rigor mortis present in hind legs. Condition poor. Abdomen distended. Integument: numerous ticks in oral region, bont ticks on abdomen. Hair removed over left tuber coxae. Off foreleg swollen from carpus. Wounds of a few cm. diameter on coronet and volar aspect of pastern with a dirty greyish-red ground and partly covered with brown crusts. Mucous membranes pale. Blood stains badly, subcutaneous tissue poor in fat. Peritoneal cavity: situs viscerum, n.u.; small amount of yellowish fluid. Intestines distended with gas. Diaphragm: convexity forwards, numerous fibrous filaments on both surfaces. Pleural cavity contains a small amount of an amber-coloured fluid; numerous fibrous filaments on costal pleura. Thyroid, n.u. Submaxillary and retropharyngeal glands, n.u.; both lymph glands enlarged, pale. Mediastinal lymph glands enlarged, bluish and moist on cut surface. Splenic lymph glands pale, moist on cut surface. Tongue, pharynx, oesophagus, n.u. Trachea: mucous membrane slightly reddish discoloured. Right lung inflated, numerous fibrous filaments on diaphragmatic surface; the surface has a mottled appearance; from the cut surface a fair amount of blood escapes; Colour reddish-blue. The right apical lobe contains numerous grey foci of soft consistence; on section into the cardiac lobe, dilated bronchi are discovered which are filled with a yellow fluid. Diaphragmatic lobe on section bluish-red, numerous small cavities contain a soft whitish material with bad odour, which can easily be washed out; the adjoining lung tissue appears smooth and moist on section. The pleura is thickened over superficial foci. In the right lung the bronchi show reddish discolouring of the mucous membrane; the left lung is similar to the right, only slightly more pale. The pericardial sac is covered with a small amount of a dark gelatinous fat tissue; it contains 250 c.c. of an amber-coloured fluid. The heart appears rather large, on the epicard there are numerous red spots; the epicardial fat tissue is gelatinous; right ventricle in diastole; numerous red spots under endocard; valves, n.u.; left ventricle in incomplete systole; endocard shows numerous red spots; myocard in right ventricle measures 1.75 cm., in left ventricle 3.5 cm., it is somewhat pale on section and friable. Coronary vessels, n.u. Liver: edges sharp, capsule shows few fibrous filaments; colour of surface slate-blue, from the section a fair amount of blood flows off; the edges are inverted; cut surface reddish-brown; central veins prominent, lobulation distinct; consistence firm, leathery. Spleen: 49 by 21 by 2.2 cm., capsule, n.u.; on section the edges appear straight, the pulp is dark in colour. The malpighian bodies not easily seen. Trabeculae distinct. Adrenals, n.u. Kidneys: right, adipose capsule poor in fat, capsule strips easily; on section the zones are distinct, striation is not marked; parenchyma turbid; consistence firm; left as right. Stomach contains a large amount of ingesta. Mucous membrane n.u., except for a few gastrophilus larvae. Small intestine mucous membrane, n.u. Bladder, sexual organs, n.u. The choroid plexus of the side ventricles is infiltrated with gelatinous material. Bone-marrow, n.u.

Pathological Anatomical Diagnosis: Emaciation, gangrenous phlegmon in off foreleg. Slight ascites and hydrothorax. Lobular broncho-pneumonia and bronchi-ectasis in the apical lobe of both lungs. Multiple metastatic necrosis of lungs, hydropicard, Hæmorrhages in epicardium and both endocardia.

Etiological Diagnosis: Metastatic necrosis of lungs.

Horse 14660. P.M. No. 2555. Spec. 2488. Gelding, 9 years.

Interim, some hours. Rigor mortis not well marked. Condition poor. Abdomen not distended. Integument: bruises over bony prominences; large wound on off hind fetlock and pastern; the off hind limb shows a very large area of necrosis extending on the plantar aspect of the digit from the coronet to the fetlock, involving all the tissues between the flexor tendons and the skin; above this the leg is swollen and, on incision, shows a marked increase of the subcutaneous fibrous tissue. Blood dark red, partly coagulated. The subcutis contains a small amount of fat tissue. Peritoneal cavity, n.u. Diaphragm covered with numerous fibrous filaments. Thyroid, n.u. Axillary lymph glands slightly swollen; on section reddened and moist, surrounded by a yellow gelatinous material. Retropharyngeal lymph glands slightly swollen, red, and moist on section. Mediastinal lymph glands swollen, moist, and reddened on cut surface. Periportal lymphatic glands swollen, reddened on section. Splenic lymph glands slightly swollen, moist, and red on cut surface. Tongue shows a notch and scar 6 cm. aborally from apex. Pharynx and oesophagus, n.u. Larynx contains a small amount of a greyish mucus. Mucous membrane in parts bluish

discoloured. The mucous membrane of the trachea is covered with dirty greyish-brown flakes and in the end portion reddened. Left lung partly deflated. The pleura shows fibrous adhesions, in places it is much thickened (up to 5 mm.) by infiltration with a yellow gelatinous material; colour of surface dirty yellow; on section the edges are everted, the cut surface shows a fair number of nodules of 2.8 cm. diameter with a dull dirty yellow, solid central focus of 2 to 8 cm. diameter and a dark red moist and glistening surrounding zone; in some of these foci there are cavities of 3 to 6 mm. diameter. The mucous membrane of the main bronchus is of a dirty red colour and covered with reddish froth. The pulmonary vein contains a large dark yellow clot, the branches of the pulmonary artery show thrombi. Right lung as left. The pericardial sac contains 250 c.c. of a dirty red fluid with a few floccules. Heart: epicardial fat tissue gelatinous, dirty yellow; both endocardia show n.u.; myocard 1.7 cm. in right, 5 cm. in left ventricle; on section dirty greyish-yellow, opaque. Liver enlarged, borders rounded, capsule shows fibrous filaments, colour of surface yellowish-brown; from the cut surface a fair amount of blood exudes; edges everted; lobulation distinct; central veins surrounded by dark areas; periphery light; pancreas, n.u. Spleen of normal size, 43 by 21 by 2.6 cm.; pulp dark red; trabeculae very distinct; malpighian bodies visible. Adrenals, n.u. Kidneys: left adipose capsule contains a small amount of a gelatinous fat tissue; capsule very easily detached; on section the zones are distinct, cortex light yellow; consistence slightly friable; right kidney very similar to the left, with the exception of the cortex, which shows a more marked radial striation. Stomach: few gastrophilus larvae; mucous membrane reddened and slightly swollen. Small intestines, n.u.; large intestine contains a fair number of strongyli, otherwise n.u. Mesentery contains a small amount of gelatinous fat. Nervous system, n.u. Bone-marrow of humerus and femur yellow gelatinous.

Pathological Anatomical Diagnosis: Emaciation, gangrenous phlegmon in off hind leg. Multiple necrosis of lungs, pleuritis, hydropericard. Fatty degeneration of myocard, liver, and kidneys. (Histological: Hepatitis, nephritis, and myocarditis interstitialis.)

Etiological Diagnosis: Metastatic, multiple necrosis of lungs.

Horse 14777. P.M. No. 2584. Gelding, 6 years.

Interim, 15 hours. Rigor mortis passed off. Condition poor. Abdomen, n.u. Integument: abrasions about left eye, in sternal region, on left shoulder, and left hock. Near fore leg swollen from metacarpus downwards, a large wound (6 by 5 cm.) on the volar aspect of the pastern, the ground of this wound is granular yellowish-red and secretes a turbid, yellowish fluid. Mucous discharge from nostrils, conjunctiva, as well as buccal and anal mucous membrane pale; blood from axillary vein dark, badly clotted. Flesh dark, subcutaneous tissue moist. Peritoneal cavity, n.u. Diaphragm shows fibrous adhesions on both surfaces. Pleural cavity contains $1\frac{1}{2}$ litre or more of a dirty reddish odourless fluid with numerous flocculi; parietal pleura dark red; in several places adhesions which contain necrotic foci. Tongue shows a wound on the left side of the middle portion, $1\frac{1}{2}$ cm. long. Mucous membrane of pharynx purplish. Larynx contains a large amount of blood-stained froth; mucous membrane purplish. Mucous membrane of trachea reddish discoloured. Left lung inflated, surface uneven on account of the presence of multiple elevations 3 to 6 cm. in diameter; on section into these, foci are found underneath the pleura, which show a yellowish-white central core, easily enucleated and firm, surrounded by a dark red zone of parenchyma; the middle portion shows a dark red colour on section, the anterior and posterior portion a light red colour. Right lung as left. Heart: large, red spots in epicard, little epicardial fat tissue; right endocard n.u., left shows large red spots; myocard, right 3 cm., left 5 cm., opaque and friable. Liver enlarged, fibrous filaments on diaphragmatical surface, colour of surface purplish; from section blood exudes; centre of lobuli dark red, periphery brown; consistence firm. Pancreas, n.u. Spleen: 48 by 24 by 5 cm., swollen; pulp dark; malpighian bodies indistinct. Kidneys: fibrous capsule strips easily; on section edges slightly bulging, cortex pale yellowish, zones distinct. Stomach shows gastrophilus larvae in fundus and pylorus portion; mucous membrane covered with mucus of a slate-grey colour. Large intestine filled with ingesta, patchy injection of mucous membrane. Aneurysm in cranial mesenteric artery. Bladder contains 3,500 c.c. of a turbid, deep yellow urine. Nervous system, n.u. Bone-marrow of humerus proximally yellow gelatinous, distally red.

Pathological Anatomical Diagnosis: Emaciation, decubitus lesions, gangrenous phlegmon in near foreleg, serofibrinous pleuritis, hydropericard epi and endocardial hæmorrhages. Multiple metastatic necrosis of lungs. Tumor splenis, stasis in liver.

Etiological Diagnosis: Metastatic necrosis of lungs.

Horse 14835. P.M. No. 2589. Gelding, 5 years.

Interim, $\frac{1}{2}$ hour. Condition poor. Abdomen, n.u. Integument: ticks on ears and tail. Off hind leg swollen from coronet to hock, the swelling pits on pressure. A wound, 7 by 5 cm., on the plantar aspect of the pastern and another one, 4 by 2 cm., on the medial aspect of the fetlock; the wounds have a brownish-red, granular ground, here and there infiltrated with a reddish-black material. The surrounding connective tissue is infiltrated with yellow fluid. Dirty mucous discharge from nostrils. Conjunctiva pale. Mucous membrane of mouth purplish; abrasion on dental surface of bottom lip. Blood not coagulated, flesh dark. Adhesion between left lung and parietal pleura over an area of hand-size between the twelfth and fourteenth rib; the corresponding area of the costal pleura is yellow in colour and surrounded by a red zone. Tongue, pharynx, and oesophagus, n.u. Mucous membrane of larynx reddened. Left lung in partial inspiration, about ten elevations on the surface; besides the area of adhesion to the parietal pleura, which has already been described, there are yellow fibrous tufts in various places. The apical lobe has a dark brown colour on cut surface and firm consistence; similar areas of hepatization are observed all along the margo acutus; the main lobe on section shows a number of foci which correspond with the superficial elevations mentioned; they have an almost spherical shape, and vary from 1 to 5 cm. in diameter; the smaller foci are dark red, the larger ones dirty yellow, both firm and both surrounded by red parenchyma; weight, 5.5 kg. Right lung similar to left; weight, 8.3 kg. Pericardial sac contains 60 c.c. of a blood-stained fluid. Heart: the epicard shows a few red pin-point spots, the fat tissue is reduced in amount; right ostium admits four, left three, fingers; red spots in left endocard; myocard reddish-brown; weight, 2.5 kg. Liver: the capsule of the left lobe shows fibrous filaments and two patches, about 7 cm. across, where it is thickened owing to the presence of fibrous tissue; on the anterior surface of the right lobe we find three small sub-capsular nodules, slightly raised above the surface, firm, on section gritty to the knife, and easily removed; on section the lobulation is distinct, the centres deep red, the peripheries pale. Spleen appears reduced in size, measures 38 by 18 by 3.5 cm., the capsule shows numerous fibrous filaments; colour of cut surface normal; malpighian bodies distinct; consistence firm; weight, 0.85 kg. Kidneys: no perirenal fat tissue, capsule strips easily, on section the cortex shows radial striation, zones distinct, the pelvis contains a custard-like material. Stomach contains a few *Gastrophilus* larvae in the cardiac portion, otherwise n.u. *Gastrophilus* larvae in initial portion of the small intestine. The mucous membrane of the large intestine shows patches of reddening near the pelvic flexure of the large colon. Bladder contains 100 c.c. of a viscid and clear fluid. Nervous system, n.u. Mucous membranes of the nasal passages congested.

Pathological Anatomical Diagnosis: Emaciation, gangrenous phlegmon in off hind leg. Red hepatization of apical lobes and parts of diaphragmatical lobes of both lungs. Multiple metastatic necrosis of both lungs. Epicardial and sub-endocardial hæmorrhages in left ventricle, hydropericard.

Etiological Diagnosis: Fibrinous pneumonia, multiple metastatic necrosis of lungs.

Horse 13474. P.M. No. 2593. Mare, aged.

Interim, 1 hour. Condition poor. Abdomen not distended; many abrasions over the lower portions of the abdominal wall; from these surfaces a reddish, clear fluid exudes; the skin in these areas appears to be necrotic; on section the subcutis and muscles in these areas have a spongy appearance and reddish-yellow mottled coloration, they enclose numerous foci which contain a yellow-white caseous material. The whole abdominal wall is 5 cm. thick. The visible mucous membranes are pale. Portion of afterbirth protrudes from vagina. The blood is partly coagulated, well-staining, the flesh reddish-brown. The subcutaneous tissue of the axillary region shows a yellow gelatinous infiltration. Peritoneal cavity, n.u. Diaphragm on pleural surface covered with a thick, greenish-yellow fibrinous deposit. The pleural cavity contains a fair quantity of a turbid, reddish fluid; the costal pleura is thickened in numerous areas which have a yellow colour. Salivary glands and thyroid, n.u. Submaxillary lymph glands, n.u. Portal lymph glands moist and reddened

on cut surface. Tongue, pharynx, oesophagus, larynx, and trachea, n.u. Lungs: pleura in more than half the surface of the posterior lobe and in the lower portion of the anterior lobe covered with a greenish-yellow fibrinous deposit; under the pleura there are numerous foci of about walnut size, of a pale yellow colour, sharply marked off from the surrounding tissue by a red zone of about 5 mm. depth; on section the lungs show similar foci; all have a firm consistence; weight of left lung 4.7, of right 4.8 kg. Pericardial sac contains about 100 c.c. of an amber-coloured, turbid fluid. Epicard shows numerous red spots. Sub-endocardial tissue is infiltrated with a yellow, gelatinous material. Coronary vessels, n.u. Left myocard measures 4 cm, right 1.5 cm.; on section it appears pale greenish-brown, opaque; consistence normal; weight, 2 kg. Liver enlarged; fibrous filaments on diaphragmatical surface; from the section a large quantity of a dark blood exudes; colour of cut surface bluish-red, lobulation distinct; consistence decreased; weight, 9.1 kg. Pancreas, n.u. Spleen measures 44 by 21 by 3 cm.; capsule, n.u.; on section pulp dark greyish-red, slightly bulging; malpighian bodies and trabecles distinct; consistence soft; weight, 1.4 kg. Adrenals are both enlarged and show, on section, numerous red areas of the size of a pin-head. Right kidney: capsule easily detached, underneath the capsule clotted blood covering an area of 2 by 3 cm.; on section the cortex appears pale reddish-brown, with red radial striation, medulla bluish-red. Stomach: content shows n.u.; the mucous membrane of the fundus portion has a mottled bluish-red and green appearance and shows a habronema nodule of hazel-nut size. Small intestine: mucous membrane bile-stained, greenish-yellow. Caecum and colon: mucous membrane of a pale slate colour, strongyli present in enormous number. The cranial mesenteric artery contains a large aneurysm with a thrombus and strongylus larvae. Nervous system, n.u. Bone-marrow in humerus fatty, in femur proximal one-third red distally fatty.

Pathological Anatomical Diagnosis: Emaciation, gangrenous phlegmon in abdominal region, serofibrinous pleuritis, multiple metastatic necrosis of lungs, hydropericard, degeneration of myocard. Fatty liver. Hæmorrhages in epicard, adrenals, underneath the right renal capsule. Tumor splenis.

Etiological Diagnosis: Multiple metastatic necrosis of lungs.

Horse 15062. P.M. No. 2603. Gelding, 6 years.

Interim, a few hours. Rigor mortis present. Condition poor. Abdomen slightly distended. Integument shows a few ticks. The off fore hoof is bandaged, a large wound in right heel extending to left, covered with iodoform; the ground shows a cheesy-yellow material of offending smell, the wound is surrounded by a firm, yellow fibrous tissue. Slight discharge from nostrils; visible mucous membranes, n.u. Blood coagulated; flesh and subcutis, n.u. Peritoneal cavity contains about 1½ litre of red, turbid fluid; the diaphragm is partly adhering to the lung by fibrous tissue. Pleural cavity contains fluid, in various places fibrous adhesions between lung and parietal pleura. Salivary glands, n.u. Suprathyroid lymph glands very moist and red on cut surface, periportal lymph glands moist. Tongue, n.u. Pharynx contains foam. Oesophagus, n.u. Larynx contains a small amount of foam mixed with mucus. Trachea contains foam; the mucous membrane shows a fair number of red pin-point spots. The lungs are partially deflated. The serosa shows numerous fibrous filaments. The surface is of a bluish colour, uneven owing to numerous elevations; from the cut surface, which is of a pink colour, a large amount of blood-stained foam can be scraped off; scattered all over the lung there are foci consisting of a yellow cheesy ill-smelling material, in places in cavities up to 4 cm. in diameter and surrounded by a red, firm tissue which appears very moist. The bronchi contain a large amount of foam mixed with yellow, cheesy material. The mucosa shows red pin-point spots; the bronchi in the altered portions are filled with a brownish, turbid, semi-fluid material. The pericardial sac contains about 200 c.c. of a reddish turbid fluid. Heart: contracted; left ostium admits three, right four, fingers; epicard shows numerous red points and patches; right endocard shows red points, left endocard red points and patches; myocard pale, opaque; weight, 4.4 kg. Liver: capsule shows fibrous adhesions; surface bluish-grey, blood oozes from the cut surface, which is pale brownish-red and opaque; lobulation distinct; central veins wide; weight, 8.6 kg. Spleen measures 44 by 22 by 4 cm.; capsule, n.u.; on section trabeculae distinct, n.u. Kidneys: fat capsule practically absent, fibrous capsule strips easily; cut surface moist, rather pale, somewhat opaque. Stomach contains gastrophilus larvae, otherwise n.u. Small intestine: gastrophilus larvae in initial portion of duodenum; mucous membrane shows a few reddish patches. Large intestine

contains numerous strongyli, otherwise n.u. Bladder contains about 250 c.c. of a clear, yellow fluid. Brain, n.u. Bone-marrow in humerus and femur firm, reddish yellow; the mucous membrane is covered with a small amount of mucus.

Pathological Anatomical Diagnosis: Emaciation, gangrenous focus in heel of off forefoot, ascites, hydrothorax, hydropericard, multiple metastatic necrosis of lungs with cavern formation. Hæmorrhages in epicard and both endocards, fatty degeneration of liver and myocard.

Etiological Diagnosis: Multiple metastatic necrosis and gangrene of lungs.

Horse 15023. P.M. No. 2606. Spec. 2517. Gelding, 8 years.

Rigor mortis broken in front limbs, present in hind limbs. Condition poor. Abdomen slightly distended. Integument: red and bont ticks around the anus, hairless patches on point of shoulder and over the ribs. Wounds: one, 6 by 2½ cm., on medial aspect of off fore coronary band and one, 2 by 1 cm. on volar surface of fetlock. A small opening in the lateral sulcus of the off fore frog leads into a cavity filled with a blackish, semi-fluid material, separating the horny from the sensitive frog. Visible mucous membranes: conjunctiva pale, yellowish; mucous membrane of the mouth ditto; dirty white discharge from the nostrils. Blood coagulated; flesh dry, opaque; little fat in the subcutaneous tissue. Peritoneal cavity: situs viscerum, n.u.; serosa, n.u.; small amount of an amber-coloured liquid in the cavity. Diaphragm convexity forwards; blood-spots under abdominal serosa. Pleural cavity contains 1,500 c.c. of a brownish-red, opaque fluid; the costal pleura on the left side is thickened over an area extending backwards from the sixth rib, owing to yellow gelatinous infiltration and fibrinous deposit. Thyroid, n.u. Bronchial lymph glands swollen; on section moist and dark; mediastinal lymph glands similar; supratharyngeal lymph glands swollen, moist, and pale; portal lymph glands brownish and moist on section; splenic glands swollen, dark on cut surface. Mucous membrane of the tongue pale, the dorsum shows small erosions. Pharynx, mucous membrane pale; oesophagus, mucous membrane yellowish. Left lung inflated, attached to the parietal pleura over a large portion of the costal surface; the pleura is thickened on both surfaces on account of a yellow gelatinous infiltration, newly formed fibrous tissue, and a fibrinous deposit; on section numerous foci are visible, varying in diameter from 2 to 5 cm.; they show a yellow cheesy material in the centre, a dark periphery, and are surrounded by a zone of flesh-like, firm parenchyma. Right lung similar to left. Main bronchi contain froth and a custard-like material (fibrine); main vessels, n.u. Pericardial sac contains 140 c.c. of an amber-coloured fluid. Heart rather small, small amount of dark transparent epicardial fat tissue. Both ventricles in incomplete diastole. Both endocards and valves n.u., except for a yellow gelatinous infiltration of both atrio-ventricular valves. Aorta, n.u. Liver of normal size and shape, the capsule shows a few fibrous filaments; colour of surface rather dark; on section edges slightly everted, small amount of blood flows off; cut surface dark brown; lobulation distinct; consistence firm. Pancreas, n.u. Spleen measures 28 by 55 by 4½ cm., it is swollen; the capsule is covered with fibrous adhesions and shows deep red pin-point spots; on section the edges are everted, the pulp is dark brown, the trabeculae not prominent, the consistence firm. Adrenal glands, n.u. Right kidney: no fat in capsule; the fibrous capsule strips easily; the surface is smooth and glistening, it shows small grey foci, which on the cut surface are seen to enter the cortex; on section the zones are distinct, the cortex appears opaque and shows radial striation. Left kidney as the right one. The stomach contains a small amount of ingesta, few gastrophilus larvae present. Small intestine: mucous membrane slate-grey, n.u.; large intestine, n.u. The cranial mesenteric artery contains an aneurysm with strongylus larvae. Bladder empty; mucous membrane, n.u. Sexual organs and nervous system, n.u. Bone-marrow of humerus and femur gelatinous.

Pathological Anatomical Diagnosis: Emaciation, anæmia, subcutaneous gangrenous foci in off forefoot. Ascites, serofibrinous and productive pleuritis, multiple metastatic necrosis of lungs. Hydropericard, tumor splenis. Multiple foci of chronic interstitial nephritis.

Etiological Diagnosis: Multiple metastatic necrosis of lungs.

Horse 14287. P.M. No. 2614. Spec. 2522. Mare, 8 years.

Interim, ½ hour. Rigor mortis complete. Abdomen slightly distended. The off foreleg shows a doughy swelling from knee to foot. On the volar aspect of the pastern there is a wound measuring about 1 by 1 cm.; it has irregular

borders and leads into a cavity filled with a pus-like material, which extends into the digital torus; on the medial aspect of the heel the cavity separates the horny wall from the matrix. Conjunctiva pale, small amount of a frothy discharge from the nostrils. The mucous membrane of the vagina varies in colour from yellow to wine-red. Rectum protruding. Flesh yellowish-red. Peritoneal cavity: organs in position, no foreign content; serosa, n.u. The diaphragm shows fibrous filaments on both surfaces. Salivary glands and thyroid, n.u. Mandibular lymph glands, n.u.; mediastinal lymph glands enlarged; on section mottled grey-red, moist; periportal lymph glands, n.u. Tongue, pharynx, oesophagus, larynx, trachea n.u. Right lung: the colour of the surface varies from pale yellow to purplish; yellow nodules from pea to hazel-nut size stand out prominently; the pleura in their neighbourhood is thickened and adheres to the costal pleura; on section the parenchyma appears deep red, moist; the nodules are well defined, yellow in colour, and surrounded by a deep red zone; consistence otherwise only slightly increased; the main bronchus contains a frothy liquid, its mucous membrane has a pale yellow colour; main vessels, n.u. Left lung as the right one. The pericardial sac contains 20 c.c. of a turbid, blood-stained fluid. Epicard, n.u.; both endocard, n.u.; both atrio-ventricular valves show slight infiltration; the myocard is of a light yellowish-brown colour, opaque and friable. Liver much enlarged, edges rounded, fibrous filaments on diaphragmatical surface; colour of surface yellowish-brown; on section the vessels are filled with dark red fluid; lobulation distinct; the periphery of the lobules yellowish; consistence soft and brittle. Pancreas, n.u. Spleen measures 46 by 21 by 3.5 cm.; capsule greyish, few fibrous filaments; pulp dark red; malpighian bodies prominent; trabeculae quite distinct. Right adrenal somewhat dark in colour, probably owing to hypostasis. Right kidney has little pericapsular fat tissue, the fibrous capsule strips with difficulty; surface reddish, mottled; cortex greyish-yellow, the glomeruli are distinct, the medulla yellowish-grey, enlarged. Left kidney: the capsule strips with difficulty, exposing a dark red surface; cortex greyish-red, glomeruli not visible, medulla yellowish-pink. Stomach shows gastrophilus larvae in cardiac portion. Small intestine, mucous membrane in ileum slightly swollen. Large intestine, n.u. The cranial mesenteric artery shows the usual aneurysm. Bladder contracted; mucous membrane pinkish-white. Sexual organs and nervous system, n.u. Bone-marrow of humerus from brownish-red to yellow.

Pathological Anatomical Diagnosis: Gangrenous phlegmon in off foreleg, multiple metastatic necrosis of lungs, slight hydropericard, fatty degeneration of myocard and liver, acute nephritis. (Histological: chronic interstitial hepatitis and stasis.)

Etiological Diagnosis: Multiple metastatic necrosis of lungs, toxæmia.

Horse 14789. P.M. No. 2640. Mare, aged.

Rigor mortis present. Condition very poor. Abdomen distended. The whole integument covered with ticks, supraorbital fossa slightly filled. The near foreleg shows a granulating wound, measuring 7 by 4 cm., on the lateral aspect of the coronet. Conjunctiva dark red, watery discharge from the nostrils. Blood partly liquid, flesh dark red. Peritoneal cavity contains a quantity of blood-stained fluid and a large amount of gas. Viscera in normal position. Diaphragm shows fibrous filaments on peritoneal surface; the left ventral portion is ruptured. Pleural cavity contains a litre of a blood-stained fluid. Salivary glands and thyroid, n.u. Bronchial lymph glands, n.u.; periportal lymph glands swollen; splenic lymph glands enlarged, on cut surface red, mottled; mesenteric lymph glands swollen, soft. Tongue, pharynx, oesophagus, larynx, trachea, n.u. Left lung deflated; pleura, n.u.; colour of surface dark pink; cut surface reddish-grey; consistence normal; bronchi contain foam, otherwise n.u. Right lung: colour of surface pale yellowish-pink; few red spots under the pleura; on section yellowish-grey; consistence, n.u. Pericardial sac contains 20 c.c. of a clear, amber-coloured fluid. Heart of normal size and shape. Epicard shows a few red spots. Right heart contains a yellow blood-clot; endocard and valves, n.u.; left heart contains a red blood-clot, the endocard shows numerous red points; myocard pale greyish-red, soft; valves n.u.; aorta n.u. Pancreas n.u. Liver: capsule shows numerous fibrous filaments; colour of surface varies from dark blue to reddish brown; on section it is dark greyish-brown; the lobulation is distinct; the consistence firm. Spleen swollen, measures 16 by 25 by 5 cm.; surface dark bluish-grey, few fibrous filaments; on section pulp dark red, soft; trabeculae not distinct; consistence soft. Adrenals, n.u. Right kidney:

capsule strips readily, colour of surface yellowish-brown; on section cortex pale; consistence firm; left as right. Stomach contains few gastrophilus larvae in pyloric portion, otherwise n.u. Small intestine: in places mucous membrane deeply reddened, more so towards the ileum. Caecum and colon: mucous membrane grey. The mesentery is devoid of fat; an aneurysm with strongylus larvae is found in the cranial mesenteric artery. Bladder empty; mucous membrane reddish, mottled. Slight prolapse of vagina; uterus not pregnant. Nervous system, n.u. Bone-marrow in femur jelly-like, in humerus fatty in the proximal, jelly-like in the distal portion.

Pathological Anatomical Diagnosis: Emaciation, granulating wound on near forefoot. Ascites, hydrothorax, slight hydropericard, epicardial and sub-endocardial hæmorrhages in left heart, degeneration of myocard, tumor splenis, fatty degeneration of kidneys, acute enteritis.

Etiological Diagnosis: Acute enteritis.

Horse 15018. P.M. No. 2651. Spec. 2559. Gelding, aged.

Rigor mortis present. Condition poor. Abdomen distended. Decubitus lesions over zygomatic processes, facial crest wing of atlas, shoulder, elbow, carpus, patella, tibia, tuber calci. Near fore and near hind leg swollen. Off hind limb swollen; the swelling in this leg extends from the coronet till below the hock. There are abrasions on plantar and lateral aspect of fetlock, from which a serous liquid escapes on pressure. The plantar aspect of the pastern shows a lesion measuring 4 by 3 cm., which is covered with granulation tissue; in the centre an opening leads into the depth for 2 cm. and ends in a cavity filled with a pus-like liquid mixed with a cheesy material. The near hind limb presents a similar lesion. All mucous membranes are pale. The blood is coagulated, well staining; the subcutaneous tissue poor in fat, in places there is a gelatinous infiltration. Flesh n.u. Peritoneal cavity: situs viscerum n.u.; serosa n.u., no foreign content. Diaphragm: convexity forwards. Pleural cavity: the costal pleura shows numerous fibrous tufts, it is moist and glistening, the cavity contains 10 c.c. of a transparent amber-coloured fluid. Thyroid, n.u. Aboral bronchial lymph glands moist on cut surface, dark; the aboral ones much enlarged, greyish-red. Mandibular lymph glands moist; splenic glands rather small, dark and moist. Tongue and pharynx n.u. Oesophagus, n.u. Trachea contains a small amount of blood-stained froth. Left lung: size and shape n.u.; pleura shows fibrous filaments and patches of thickening on both surfaces; colour of surface dark blue, except for a few patches of greyish colour in the apical lobe and along the margo acutus; the apical lobe is brown on section and of a liver-like consistence; the bronchial lumina in this part are filled with a thick greyish mucus; the cardiac lobe shows numerous greyish firm foci and, near the ventral border, a cavity filled with custard-like material and lined with a dark capsule of 3 mm. diameter; diaphragmatic lobe dark red on section, a dirty red liquid can be scraped off; bronchi contain a pus-like material. Right lung similar to left. Pericard poor in fat, gelatinous, contains 200 c.c. of an amber-coloured fluid. Heart flabby; the right ventricle contains a large coagulum, ostium admits whole hand; left ventricle contains a plasmacoagulum, ostium admits four fingers; size and shape normal; epicardial fat gelatinous, one deep red spot underneath the serosa. Right ventricle: endocard and valves reddish discoloured. Left ventricle: endocard and valves n.u. Coronary vessels n.u. Myocard measures $2\frac{1}{2}$ cm. in the left, $1\frac{1}{2}$ cm. in the right heart; on section it is brown, opaque. Liver rather small, borders sharp, fibrous filaments on both surfaces; blood oozes from the cut surface, edges are everted; lobulation distinct; consistence leathery. Pancreas moist, yellowish; spleen: capsule shrivelled, shape n.u., measures 50 by 20 by 2 cm.; on section the trabeculae are distinct, the follicles not visible. Adrenals, n.u. Right kidney has no pericapsular fat tissue, the fibrous capsule is easily removed; on section the three zones are distinct, the glomeruli prominent; consistence firm; left as right. Stomach small; mucous membrane, n.u. Intestines, n.u. Mesentery devoid of fat. Bladder empty, mucous membrane shows a few deep red spots. Nervous system, n.u.

Pathological Anatomical Diagnosis: Emaciation, decubital lesions, gangrenous phlegmons in both hind limbs, purulent broncho-pneumonia in both lungs, multiple metastatic necrosis with cavern formation. Hydropericard, atrophy of heart, liver, and spleen.

Etiological Diagnosis: Metastatic broncho-pneumonia and multiple metastatic pulmonary necrosis.

Horse 15005. P.M. No. 2680. Spec. 2586. Gelding, 5 years.

Rigor mortis present. Condition poor. Abdomen slightly distended. Decubitus lesions over zygomatic ridge and wing of atlas, on the lateral aspect of the off fore limb over an area extending 10 cm. above and below the carpal joint; the limb is swollen in the region of the lesion and right down to the hoof there are excoriations on the volar side; on the medial surface of the same joint there is a wound measuring 11 by 7 cm., covered with granulation tissue underneath a layer of dirty, yellowish material; on section a cavity is found underneath the skin which contains a yellowish caseous material over an area extending right down the metacarpus, where it ends 6 cm. above the fetlock. There is a small wound on the volar aspect of the fetlock. Mucous membranes of mouth, nostrils, and eyes are pale; the cornea opaque; the anus shows n.u. Blood from the axillary vein dark red. Little fat in the subcutis. Flesh opaque. Peritoneal cavity; situs viscerum, n.u.; the cavity contains a small amount of a reddish liquid; serosa n.u. Diaphragm convexity forwards, fibrinous filaments on both surfaces. Costal pleura shows marked injection of blood-vessels and is covered with a fibrinous coat uniting the lung surface with the costal pleura, the latter is thickened in many places and shows extravasations on cut surface. The lumen contains 330 c.c. of turbid, blood-stained flakes. Salivary glands and thyroid n.u. Praescapular lymph glands large, on cut surface greyish, moist; bronchial lymph glands enlarged; mandibular and supratharyngeal lymph glands slightly pigmented, portal lymph glands on section grey, very moist; splenic lymph glands not enlarged, moist and pale on cut surface. Tongue, pharynx, oesophagus, n.u. Left lung inflated, numerous adhesions between parietal and visceral pleura, visceral and pericardial pleura; the visceral pleura is thickened, infiltrated with gelatinous material. The lungs contain a number of dry caseous foci. The pericard is attached to the apical lobe of the left lung. The pleura pericardiaca is much thickened and contains a caseous focus; in the pericardial sac there are 75 c.c. of a red, transparent fluid; the internal surface is smooth and glistening. Right heart flabby, left firm; the epicard contains a small amount of a gelatinous tissue; both endocarids show n.u.; myocard on section mottled, opaque but firm. Ductus choledochus open. Liver large; borders rounded, fibrous filaments on diaphragmatic surface; on section edges everted, large amount of blood flows off; central veins distended; parenchyma greyish; inter-lobular septa very distinct. Pancreas, n.u. Spleen of normal size and shape, measuring 14 by 24 by 3½ cm. The parietal surface shows near the oral border an embryonic fissure measuring 7 by 1½ c.m., and caudally to this a scar of 4 cm. length. The visceral surface shows a scar 10 cm. long, to which part of the omentum is attached. Trabeculae and malpighian bodies are prominent; pulp brown, dry, not easily scraped off. Adrenals: cortex rather dark, shows red radial striation. Kidneys: adipose capsule poor in fat. Fibrous capsule adherent in places; surface mottled; on cut surface the cortex pale; consistence rather friable; right as left. The stomach contains a small amount of ingesta and a fair number of gastrophilus larvae. Small intestine: mucous membrane grey, ascaris megaloccephala present. Large intestine: mucous membrane pale. Cranial mesenteric artery contains an aneurysm with strongylus larvae. Bladder, urine clear; mucous membrane, n.u. Nervous system, n.u.

Pathological Anatomical Diagnosis: Emaciation, decubitus lesions, gangrenous phlegmon in off fore limb, serofibrinous pleuritis, multiple metastatic necrosis of lungs, hydropericard, fatty degeneration of liver. (Histological: chronic interstitial hepatitis.)

Etiological Diagnosis: Multiple metastatic pulmonary necrosis.

APPENDIX 3.

HISTOLOGICAL NOTES.

2477. *Foci in Lungs.*

Focus A.—A focus of necrobacillosis situated under the pleura, freezing sections HE, HvG.* The focus is surrounded on all sides by subpleural and interstitial connective tissue strands.

The *subpleural connective tissue layer*, although separated from the focus by oedematous lung tissue a few alveoles deep, is considerably thickened, and consists of a loose reticulum of collagen fibrils and numerous large fibroblasts.

* HE stands for Haemalum-Eosine, HvG for Haemalum v. Gieson.

The meshes are filled with a homogeneous material, which stains light pink with HE and light yellow with vG, and a fair number of cells, chiefly large, with fairly large irregular leptochromatic nuclei (macrophages) and a few neutrophile leucocytes.

The observations may be summarized: inflam. oedema with proliferation of fibroblasts.

The *interstitial septa as a whole* show the same changes as the subserosa, but in some places, where the necrotic focus encroaches upon the interstitium there is a dense infiltration with wandering cells, chiefly neutrophiles, besides a few round cells. In both types regressive changes (karyorrhexis and pycnosis) are frequently observed. This cellular infiltration gets denser as we go towards the centre of the necrotic focus, and the fibroblasts forming an underlying reticulum also show regressive changes, and finally disappear in the dense mass of infiltrating cells, which cannot be clearly separated from the alveolar portion of the focus.

The parenchyma which on the pleural side separates the focus from the subserosa shows the alveoles filled with a homogeneous material stained light pink with HE, orange yellow with van Gieson, and desquamation of epithelial cells which in places are still in connexion with the wall, in others free in the lumen. Their cytoplasm often shows a large number of large vacuoles. A small number of polymorphnuclear leucocytes is also present, besides a few cells with much cytoplasm, and a fairly large leptochromatic, slightly irregular and often bean-shaped nucleus (macrophages).

The necrotic focus itself has an alveolar structure which, however, is not very prominent. It shows areas where the alveoles are crammed full of nuclei, others where hardly any material stains with the ordinary basic dyes. There is no definite arrangement of these two areas. Both contain bronchioles and arteries and veins or their remnants, although a peribronchial arrangement of the areas rich in cells is striking in some sections. There the area with little nuclear material borders on to the surrounding oedematous zone, there a narrow demarcation zone with an increased number of neutrophiles separates the two.

The *necrotic areas with few cells* show the alveoles filled with a homogeneous material, which stains light pink (HE) or light yellow (vG). Few pycnotic nuclei and nuclear fragments are present. The alveolar walls are just faintly indicated as homogeneous strands with some nuclear debris. Bacterial filaments are present in a moderate number, not long, and rather faintly stained in the centre, but more numerous, long, and more deeply stained in the peripheral portions and the demarcation zone.

In the *necrotic areas rich in cells* the alveolar structure is still visible, although the alveolar septa are mere strands of structureless material and nuclear debris. The alveolar lumina are crammed full of nuclei, round or segmented. In places all the nuclei are uniformly stretched out, straight or in a vortex, as if a rotary movement had taken place in the semi-fluid mass of cells, or as if they were squeezed through alveolar septa from one alveole into the next one. Bacterial filaments are numerous in between the cells.

The cells are embedded in a material of the structure and staining properties of serum and in places fibrine.

A thrombosed vein and a few thrombosed small vessels are present in the area as well as the remnants of what appears to have been a bronchiolus.

2477. Focus B.

Freezing sections HE, HvG.

From periphery to centre.

(a) Alveoles empty, walls n.u.

(b) Large interstitium with proliferation of fibroblasts.

(c) Alveoles filled with serum, desquamated endothelial cells, and neutrophiles.

(d) Alveoles with neutrophiles (1/3 to 1/2); cells with round nucleus (1/2 to 2/3), fairly rich in coarse basophile granules, and a cell body of varying, sometimes considerable width.

In the alveoles of the centre of the focus these cells are deformed, stretched, and like streaming along the walls from one alveole into the other.

Bacterial filaments.

2477. Focus C.

Paraffin sections HE, HvG Giemsa (Helly), Loeffler's methylenblue, Weigert's fibrine stain, Weigert's fuchseline for elastic fibrils. The block contains a portion of a necrotic focus on one side and two areas of parenchyma

separated by a septum on the other. In the necrotic nodule there are 6 foci of $\frac{1}{2}$ to 2 mm. diameter, where the alveoles are filled with a mass of densely crowded nuclei similarly as in the previous specimen. The relation to blood-vessels and bronchioles is more pronounced than in the last two specimens. Focus I contains two large hollow elements. One with a fairly thick wall and numerous elastic fibrils. The lumen is filled with serum, fibrine, and cells chiefly with round nuclei, but also neutrophiles. This, evidently, was a bronchiolus. The other smaller lumen contains chiefly serum granular cell detritus and fibrine. The wall contains smooth muscle fibres and a few elastic fibrils. Although *elastica interna* and *externa* are not too distinct, the large amount of smooth muscle suggests pulmonary artery. Focus II does not go through all the sections; it is only a portion of I.

Focus III contains a central tube which in places still shows an epithelial lining.

In focus IV a central tube can be recognized with some difficulty. A muscularis and few circular elastic fibrils are visible. The lumen is filled with fibrine, serum, and cells. Some look like desquamated epithelial cells. This also seems to be a bronchiolus.

V and VI are small foci without vessels or bronchioles. It seems most of these cell accumulations are peribronchial.

Details: (1) *Portions of the necrotic focus where nuclei are numerous:* The alveolar content consists of numerous long rods and filaments about $\frac{2}{3}\mu$ in diameter, neutrophile leucocytes, cells with a small round trachychromatic nucleus and a broad plasma border. (Whether this type of cell is of a lymphocytic or epithelial nature could not be decided.) These elements are embedded in a material which behaves like serum and fibrine (HE, HVG Giemsa, Weigert's fibrine stain, etc.). In places all the cells, i.e. their nuclei, appear much deformed, stretched out, all in the same direction, which may be linear or vertical, just as if the whole semi-fluid alveolar-content had been in a rotatory movement or squeezed from one alveole into the other.

(2) *Areas of the nodule with slight cellular infiltration* show marked destruction of the alveolar walls. The arrangement of the septa and their structure is still recognizable, but the nuclei are few, and show pycnosis, karyorrhexis, and karyolysis. In places the interalveolar septa can only be made out with difficulty. The lumina contain serum, fibrine, and few cells; lymphocytes, large cells with small trachychromatic nuclei and neutrophiles. These nuclei are either pycnotic or faintly stained (karyolysis). Numerous bacterial filaments of the usual type are present, but also shorter rods. Most of the latter, to judge from diameter and staining properties, are very probably fragments of the larger forms. In the periphery of the focus the bacterial filaments are more numerous, longer, and better stained.

The tissue surrounding the focus offers two different structures; parenchyma and interstitium. In the parenchymatous portion the alveolar lumina are filled with serum, little fibrine, and a varying number of red cells, besides a few neutrophiles and large vacuolated cells with a leptochromatic, round, or slightly irregular nucleus (desquamated epithelial cells). The interalveolar capillary vessels are widened and filled with blood. Here and there the septa show large, slightly elongated cells, with a cytoplasm staining blue with Giemsa and a large nucleus with large nucleolus (fibroblasts).

In a broad strand of *interstitium* as well as in adventitial tissue of smaller blood-vessels two salient features are noticed.

(1) A diffuse marked infiltration with a material of serum properties.

(2) A marked proliferation of fibroblasts.

There is a loose network of fine collagen fibrils and scattered broader strands of collagen. In the meshes a faintly staining (yellowish with van Gieson, red with eosine, bluish-grey with Giemsa) finely fibrillar material is present, which, however, still leaves a large number of (artificial) empty spaces.

Evenly scattered in this fine network we find numerous large cells with a large nucleus, generally showing one or two or a few large nucleoli and a large irregular plasma body drawn out in spindle or star-like shape. Most of these fibroblasts have a finely vacuolated protoplasm; some of them show a few large vacuoles.

There are comparatively few other cellular elements besides these numerous fibroblasts, namely neutrophiles and cells of the habitus of lymphocytes and macrophages. Numerous capillary vessels and arterioles are widened and filled with blood.

Diagnosis: Necrotic focus with marked peribronchial cellular exudation, collateral hyperaemia and oedema in the parenchyma, oedema, hyperaemia and fibroblastic activity in the interstitium.

Focus D.—Freezing sections HE, HvG, Sudan III, and methylenblue.

A focus of about sweet-pea size sitting underneath the pleura.

Pleura and subpleural tissue belong to the reaction zone. The pleura is slightly thickened. Embedded in the dense network of collagen and elastic fibrils there are large fibroblasts, occasional neutrophiles, and a few small round cells.

The subpleural connective tissue is very much enlarged. The collagen fibrils are more or less widely separated by a material staining light pink with eosine, yellow with van Gieson's method and possessing a homogeneous or fine fibrillar appearance. Embedded in this there are numerous large fibroblasts, spindle or star-shaped, occasionally binucleated. In most of these fibroblasts the cytoplasm is filled with small and medium size lipid droplets (Sudan III). A moderate number of other cell types are found—neutrophiles generally with a fair number of lipid droplets in their cytoplasm, then round cells varying in habitus from the lymphocyte to a large cell with a similar nucleus resembling plasma cells, but also forms with slightly irregular nuclei, which were regarded as small histiocytes. Typical macrophages with the large leptochromatic, irregular, often bean-shaped nucleus are less frequent.

The blood-vessels in the subserosa are much widened and filled with blood. No bacteria are present in this portion.

In the zone of parenchyma surrounding the necrotic focus the alveoles are filled with serum and fibrine, desquamated epithelial cells in varying number, some loaded with lipid droplets, further neutrophiles, and a few small round cells and macrophages. Only few of these nuclei are pycnotic. No bacteria are present.

As soon as we get into the periphery of the necrotic focus, within a few 100μ numerous long bacterial filaments appear, together with an accumulation of neutrophiles and pycnosis in the majority of the nuclei.

The necrotic focus has the same structure as those described before. Portions with few cells alternate with such where the alveoles are crammed full of nuclei. The vessels are thrombosed, the bronchial lumina plugged with masses of nuclei: all pycnotic. Both bronchioles and vessels are found in areas with many and in such with few cells.

Numerous bacteria are present of the habitus of necrosis bacilli, again very abundant, occasionally in thick bundles, in the demarcation zone.

In places the necrotic focus invades portions of the interstitium. If we follow the interstitial connective tissue from the surrounding zone to the necrotic focus, the picture hardly changes until we get into the periphery of the necrotic area where already long bacterial filaments are present. There, within about 100μ , a fairly dense cellular infiltration becomes apparent. The infiltrating cells are neutrophiles and round cells. The neutrophiles have peculiarly swollen up and rather lightly stained nuclear segments. The uninuclear cells show an excentric, round, or slightly irregular, trachychromatic nucleus and a cell body of varying size and shape. Less numerous are cells of the macrophage type. Only a few $1/100$ mm. further the nuclei show pycnosis, lysis, and the field is occupied with cellular detritus.

Specimen 2487.

Lung: Paraffin HE, HvG, fibrine stain, Giemsa, methylenblue.

This is an ordinary lobular broncho-pneumonia with necrosis. No typical necrosis bacilli. Various types of bacteria, including short rods and streptococci.

Specimen 2488.

Lung: Focus of about walnut size situated underneath the pleura. Paraffin sections, HE, HvG, methylenblue, fibrine stain, elastic fibrils stain, Giemsa.

The subserosa belongs to the reaction zone. In places it is immediately bordering on to the necrotic focus. It shows increase of connective tissue, infiltrations with a serum-like fluid, and a considerable number of large fibroblasts, besides some neutrophiles and round cells as in previous cases.

Where the parenchyma surrounds the focus, the alveoles are filled with serum, few desquamated epithelial cells, and neutrophiles, occasionally a moderate amount of fibrine. In the focus itself, as usually, areas rich in cells alternate with areas almost devoid of nuclear material. The areas with many cells show the usual structure, and they generally contain a fairly large amount of fibrine (Weigert's stain).

The typical bacterial filaments are present as in other cases, but they stain very feebly in the deeper portions of the focus. In the periphery they are fairly numerous and well stained, but thick tufts of long filaments are present where the periphery of the focus touches the subserosa.

Various organs: Freezing sections: HE, HVG, Sudan III, prussian blue reaction.

Myocard: In an area a few 100 μ in diameter the muscle fibres are widely separated and some of them much reduced in volume. The gaps are filled with a coarse network of collagen fibrils and numerous fibroblasts and a few round cells.

In scattered patches the fibres show marked fatty infiltration.

Myocarditis chronica circumscripta, fatty degeneration.

Liver: Structure in general the usual; central veins fairly wide. Some of them have a thickened wall due to a subendothelial layer of collagen. Liver cells show no striking alterations. In the intralobular capillary vessels an increased number of round cells is met with, chiefly of lymphocyte-plasma-cell habitus. In places small intracapillary accumulations of typical plasma-cells (not macrophages!). In the periportal interstitium a moderate increase of connective tissue and a fairly marked round cell infiltration. Most of the cells are polygonal in shape, and have round, trachychromatic, excentrically situated nuclei (plasma cells).

Kidneys: Parenchymatous elements show nothing unusual, but the connective tissue is generally increased around the capsules of Bowman and in the adventitia of small arteries. The capillary vessels of the cortical interstitium are widened and filled with blood over large ill-defined areas. There is a moderate perivascular infiltration in the cortex, chiefly around arterial interlobulares. The cells are typical lymphocytes and plasma cells.

Thyroid: Nothing unusual.

Mandibular salivary gland: Nothing unusual.

Spleen: Haemosiderosis.

2522. A. Lung focus about hazel-nut size.

Paraffin: HE, HVG Giemsa, methylenblue, fibrine stain, elastic fibrile stain.

The section contains a sector of the necrotic focus and surrounding tissue, including parenchyma and interstitium.

The necrotic focus resembles the foci of other cases. The alveolar walls are broken up, and where their remnants are left the nuclei are pycnotic; many have even completely disappeared. Vessels are all thrombosed, bronchioles plugged with a mass of cells. The structural elements can hardly be recognized. The alveolar lumina in places are crammed full of nuclei; many of them deformed and in some of the alveolar all the nuclei stretched out and as if streaming in a straight line or a whirl. The cells are neutrophiles, lymphocytes, but chiefly the large cells with small round trachychromatic nucleus of uncertain origin (lymphocytes or epithelial cells).

In the tissue surrounding the nodule the alveoles are filled with serum, red cells, fibrine, and a few nucleated cells, neutrophiles, some karyorrhetic and desquamated epithelial cells, with vacuolated protoplasm, and often pycnotic and irregular nuclei; few fibroblasts.

A portion of the interstitium shows a picture somewhat different from that observed in 2477. The network of collagen fibrils is slightly more dense, the fibrils shorter, the fibroblasts are smaller, their nuclei as well as the cytoplasm, which is spindle-shaped in most cases.

Wandering cells are more numerous. Neutrophiles and a peculiar type of cells. They have small trachychromatic nuclei, round or slightly irregular, and a fairly large, more or less round, but somewhat irregular cell body and numerous vacuoles in the cytoplasm. Superficially these cells resemble plasma cells, but probably they are not of lymphoid origin.

Numerous long filaments of the usual type within the focus and more numerous in its periphery. No definite relation can be established between the portions of the focus rich in cells and the bronchioles and larger blood-vessels.

2522. B. Portions from the periphery of a focus of hepatization.

Paraffin: HE, HVG, fibrine, methylenblue.

The picture is much the same throughout the section. The alveoles are filled with serum and a varying, sometimes large, sometimes small, amount of fibrine (Weigert), desquamated epithelial cells with pycnosis of nucleus and vacuolization of the cytoplasm. A similar material is blocking the bronchial lumina, and in some of the bronchioles numerous neutrophiles collect between epithelium and propria. The epithelium in these bronchioles is partially shed off into the lumen. Micro-organisms cannot be made out definitely. The vessels are not thrombosed.

There is a fairly marked increase of the interstitial connective tissue. A coarse network of fairly broad strands of collagen fibrils shows a fair number of fibroblasts, and few smaller cells with small pyknotic nuclei and an irregular cell body.

Liver: Haemalum—van Gieson, Sudan III, prussian blue reaction. Freezing sections, Haemalum—Eosine.

General structure not much altered. Central veins rather wide. In the intralobular capillary vessels a fair number of neutrophils (slight leucostasis). Liver cells show fatty infiltration in irregularly distributed patches. The droplets are of medium size. In the interstitium increase of connective tissue. Numerous spindle-shaped fibroblasts and a fair number of plasma cells.

D: Chronic interstitial hepatitis.

Spleen: The pulp is crowded with erythrocytes. Fair number of pulp cells loaded with granules of yellow pigment (hæmosiderine). The follicles are rather small. In some of them secondary follicles consisting of cells of epithelioid habitus. Neutrophils, some with karyorrhexis, can be found in such follicles.

Kidney: Multiple foci in cortex with marked regressive changes in parenchymatous elements: pycnosis, karyorrhexis, karyolysis, albuminoid material in the luminae of Bowman's capsules and tubules. Neutrophils in lumina and destroyed walls of tubuli.

In the interstitium red cells, serum, fibrine, in places numerous neutrophils.

Paraffin sections: Giemsa, HE, HVGieson, Weigert's fibrine stain. No necrosis bacilli.

Diagnosis: Circumscribed acute purulent nephritis.

Myocard: Nothing unusual.

2577. Lung typical focus of about pea size.

Paraffin: HE, HVG fibrine, methylenblue, Giemsa, elastic fibrils.

The section contains a subpleural necrotic focus, a surrounding zone of collateral hyperaemia and oedema, and neighbouring apparently normal tissue.

The necrotic focus shows a large (2 by 3 mm.) area where few cells only are present, and the structure has more or less completely vanished. The alveolar walls can still be made out, but in the whole area there is not one intact nucleus left. In most places there are only nuclear débris; in others nuclei undergoing karyorrhexis.

The alveolar lumina are filled with a homogeneous or granular material, staining yellow in van Gieson, red with eosine, together with occasional tufts of a filamentous material which gives a Weigert's stain for fibrine. There are numerous filaments and long rods, not too well stained in the centre of the focus, but prominently stained in its periphery. They resemble the filaments observed in other cases. With Weigert's stain for fibrine and incomplete differentiation they appear as strings of beads.

Two smaller foci of similar appearance are separated from this by areas of dense cellular infiltration.

These areas—with rich cellular infiltration—show the usual structure. The alveoles are recognized with difficulty. The lumina are filled with deformed nuclei, in places as typical stream or whirl-like arrangement of stretched-out elements. Many of the débris resemble nuclei of neutrophils.

The focus reaches the surface of the lung, and the pleura is involved in an area of about 1 cm. diameter. It is covered with a thin layer of fibrine in which large cells with a round nucleus are embedded immediately on the surface of the propria serosae. The nuclei of these cells which seem to be serosa endothelial cells, are pyknotic.

The propria is slightly thickened in a few places. It does not show one intact or even easily recognizable cell or cell remnant. All nuclei stain diffusely and lightly. Finer structural details are completely missing. It contains a moderate number of long bacterial filaments.

Sharply marked off from this layer and separated by the thick peripheral layer of elastic fibrils, the elastica is found to be the seat of enormous bacterial proliferation. The bacilli are lying in convolutes of long filaments, so that this zone represents one solid mass of bacteria of 150-250 μ depth. In a section stained with Giemsa this zone shows up clearly, even macroscopically, as a fine deep blue line. The elastic fibrils of the deeper layers of the elastica are more widely separated, and appear less abundant than in the pleura covering the surrounding parenchyma.

In a zone surrounding this focus the alveoles are filled with a homogeneous or slightly granular material, which stains deeply with eosine and picric acid (vG), and a moderate number of neutrophils and vacuolated epithelial cells.

An inflammatory oedema is observed in the interstitium, where the collagen fibres form a loose network in which a large number of fibroblasts are present, occasionally in pycnosis. All of them show vacuoles (probably fat droplets) in the protoplasm. Less numerous are neutrophiles and round cells with a small round pycnotic nucleus and a vacuolated cell body.

2577. *Lung B*: This is not a typical focus, but an ordinary chronic broncho-pneumonia of the apical lobe with induration.

2577. *Lung C*: Acute catarrho-purulent broncho-pneumonia. The capillary vessels widened. The alveolar lumina filled with a serum-like material, occasionally fibrine or a basophile granular material (mucine), numerous epithelial cells, and neutrophiles. The same content in bronchial lumina.

Liver: Structure in general the usual. Some of the central veins show thickening of the walls by a subendothelial layer of collagen. The intralobular capillary vessels contain a fair number of wandering cells: neutrophiles, macrophages, lymphocytes. The macrophages often contain a golden-brown granular pigment, the lymphocytes not seldom hyperchromatosis of the nuclear periphery or karyorrhexis. Most of the liver cells contain a brown, granular pigment; many show pycnosis of the nuclei. In a few intralobular foci with a diameter of about one-half lobule radius the liver cells have disappeared, and are replaced by a network of cells with fairly large, round, or elongated leptochromatic nuclei, in the meshes of which neutrophiles, small round cells, and macrophages are lying, besides a varying number of red cells.

The interstitium is enlarged by broad strands of collagen and a fairly dense infiltration with round cells resembling plasma cells.

D: Hepatitis chronica.

Kidneys: n.u.

Adrenals: n.u.

Spleen: The follicles are fairly large. The reticulum cells of the follicles increased in number; occasionally the chromatine has the arrangement as in a nucleus before mitosis. A fairly large number of neutrophile leucocytes is scattered in between the lymphocytes. In few lymphocytes there is hyperchromatosis of the nuclear periphery.

The pulp is rich in red cells and cells of the macrophage type loaded with a brown granular pigment.

2586. *Lung A*.

Macroscopically: the interstitium is much enlarged and forms a whole network; the parenchyma is deep brownish-red, moist, glistening and translucent, similar to red gelatinous bone marrow. Freezing sections: HE, HVG, Sudan III, methylenblue.

The alveoli are filled with a homogeneous material of serum properties, in which few desquamated epithelial cells and a varying number of red cells are lying. The interstitium is a loose fibroblastic tissue with a fair number of young fibroblasts, round cells and a few neutrophiles, infiltrated and apparently distended by the same homogeneous material as that found in the alveolar lumina.

Diagnosis: Oedema and hæmorrhages.

2586. *Lung B*.

A subpleural focus of about hazel-nut size, white, dry, firm, surrounded by a parenchyma zone of marble-like appearance due to the presence of a red network on a deep orange ground. Freezing sections: HE, HVG, Sudan III, methylenblue.

The necrotic focus sits immediately underneath the surface. The pleura itself is involved in the necrotic process. The structure of the focus closely resembles the foci previously described. Alveolar structure can well be recognized. Bronchioli and blood-vessels are plugged with fibrine and cellular detritus. The alveolar walls show pycnotic nuclei, and the finer details of the structure have vanished. The lumina are filled with a dense mass of nuclei, which seem to belong to neutrophiles, and desquamated epithelial cells here and there. Numerous bacterial filaments are present, which bear the characteristics of necrosis bacilli. These are more numerous towards the periphery. In the pleura, which shows destruction of all cellular elements, they are so densely crowded as to form a thick layer about 300μ below the surface and about 150μ thick, quite similar to the one observed in 2577.

Areas with few cells do not occupy a large portion of the necrotic focus except where fibrine is abundant and occupies the field. But a fairly broad zone underneath the subserosa, as well as subserosa and serosa, contain very little basophile material, a more or less homogeneous serum or fibrine-like substance and cellular detritus with only a few debris taking nuclear stains.

The surrounding tissue shows in the case of the interstitium serous infiltration, proliferation of fibroblasts and a moderate infiltration with various types of small round cells, many resembling plasma cells, whereas in parenchymatous areas the alveolar lumina are filled with serum, fibrine, few desquamated epithelial cells and few neutrophiles, and the vessels injected.

2586. *Lung C.*

A focus of about pea size, white, dry and firm, surrounded by a deep red, moist, somewhat granular, parenchyma.

Paraffin: HE, HVG, methylenblau, fibrine Weigert for elastic fibrils, Giemsa.

The focus has the usual structure, but the arrangement of areas with few and many cells is so that an incomplete ring of rich cellular infiltration in the middle of the focus surrounds a central portion, in which the cells are few and is surrounded by a broad peripheral zone of the same appearance. This peripheral zone is separated from the parenchyma surrounding the focus by a zone rich in neutrophiles, a true demarcation zone.

The central portions of the necrotic focus with few cells show rather faintly the alveolar structure. The alveolar walls have no intact nuclei left, but carry some nuclear débris. The lumina contain a pink-stained homogeneous material with a fair number of more or less karyorrhetic neutrophile leucocytes and round cells. In a few alveoles fibrine is detected with Weigert's stain. The bacteria are not well stained, but in the Giemsa sections long rods and filaments can be made out, which resemble the necrosis bacilli.

The peripheral portions with few cells have a similar appearance. The alveolar walls can still be made out indistinctly, but all the nuclei are either karyorrhetic if they have not almost completely disappeared. The lumina are filled with serum, fibrine (still well stained with Weigert's fuchseline), and cellular débris. Comparatively little chromatine is left. Here and there the shape of a polymorph leucocyte nucleus can still be made out. Numerous long rods and filaments like necrosis bacilli are present. They are very numerous in the periphery, longer and better stained than in the depth of the focus.

The areas with numerous cells offer the same picture as other cases. The alveolar structure can still be made out, but the alveolar septa have lost the finer details of the structure, and the lumina are completely filled with a densely crowded mass of nuclei. The nuclei cannot be determined definitely, but most of them probably belong to epithelial cells and neutrophiles. In some places they are all stretched out in the same direction, and appear to stream from one alveole into the next one.

Attempts to bring this well-defined area rich in cells into relation with any particular structure have not been successful. Elastic fibril stain (fuchseline) reveals the presence of a small—thrombosed—artery in the area, but similar and larger vessels have also been found in the peripheral zone with few cells.

A small portion of interstitium with an artery and a bronchiole belongs to the necrotic area. The artery contains a large fibrinous clot, the endothelial cells are desquamated. The same cellular elements are present in the wall and adventitia as in the surrounding zone, but the nuclei of these infiltrating cells are either pycnotic or more or less broken up. In another area situated close to it, and probably representing the remnants of a bronchiolus, nuclear débris are densely packed.

The demarcation zone described above separates the necrotic area from the surrounding tissue, where the nuclei have preserved their structure and the alveoles are filled with serum, fibrine, few desquamated epithelial cells, occasional erythrocytes and neutrophiles, in places even a large number of red cells. Some of the bronchioles in this region show a fair number of filaments and numerous leucocytes and desquamated epithelial cells in the lumen. The capillary vessels are distended with blood.

Serosa and subserosa are very much thickened where they cover the focus. A massive layer of fibrine is lying on the propria, as a dense feltwork which entangles a fair number of neutrophiles. No bacteria are visible. The deepest strata of this covering fibrine layer contain a few large cells of polygonal shape, with large leptochromatic, oval, or somewhat irregular nuclei.

The propria serosae is very much swollen, 2.5 mm. deep in the average. It shows a loose network of collagen fibrils infiltrated with serum and fibrine, in which a moderate number of large fibroblasts are suspended, besides numerous neutrophile leucocytes and cells with round trachychromatic nuclei. Some of these latter cells have the typical habitus and staining properties of lymphocytes and plasma cells; in others the cytoplasm stains pale orange with Giemsa. A moderate number of macrophages are found in addition.

round cells with a leptochromatic, bean-shaped, or irregular nucleus and a non-basophile cytoplasm. Numerous blood-vessels with one or two layers of adventitial cells besides the endothelial layer are enormously distended with blood.

Tunica elastica and subserosa both carry a much larger number of fibroblasts and much smaller number of infiltrating wandering cells. Neutrophiles are comparatively rare. Many of the fibroblasts show large vacuoles, evidently corresponding with the fat droplets observed in freezing sections. Where portions of the *interstitium* lie in the reaction zone the changes are about the same as in the subserosa, but the cellular infiltration is more marked.

2856. *Lung D.* An area light yellow and smooth on cut surface, of firm, elastic consistence.

Liver: Freezing sections, HE, HVG, Sudan III, prussian blue reaction.

The picture is about the same over the whole section, the alveolar lumina are more or less completely occupied by a homogeneous material (staining yellow with van Gieson's method, light pink in HE, not at all with Weigert's fuchseline) in which a large number of cells are embedded. Most of them appear to be desquamated epithelial cells. They have a large vacuolated plasma body of round or polygonal shape and a leptochromatic vesicular or slightly shrunken and irregular nucleus. Besides these there are numerous neutrophiles. The alveolar walls are much thickened. They show a loose meshwork of collagen fibrils soaked with a serum-like fluid and numerous large irregular spindle or star shaped cells with large leptochromatic nuclei (fibroblasts).

These fibroblasts are also numerous in the interstitial fibrous tissue, which shows a loose meshwork of connective tissue fibres infiltrated with serum and a few wandering cells of the habitus of neutrophiles and plasma cells.

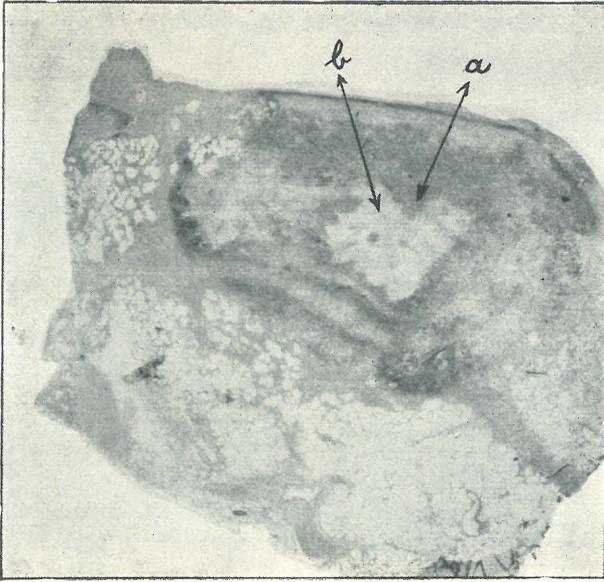
2586. *Lung E:* Similar in many respects to *B*, but the demarcation zone broader, almost as well developed as in *C*; distribution of bacteria again so that the centre contains very few, the periphery many.

Liver: Freezing sections, HE, HVG, Sudan III, prussian blue reaction.

General structure as usual, the central veins fairly wide. In some of them a subendothelial layer of collagen. In the intralobular capillary vessels an increased number of nucleated cells, neutrophiles, macrophages, and round cells resembling lymphocytes or, more often, plasma cells, i.e. cells with a round trachychromatic nucleus with light wheel-spoke pattern, excentrically situated in a fairly large round or oval cell body. In free macrophages and kupfercells a golden pigment is often met with in clusters of coarse granules, which gives a negative prussian blue reaction.

The liver cells offer a great variety of nuclear forms, small pycnotic, unusually large with few large nucleoli, often two or more nuclei in one cell (as often found normally). The cytoplasm contains a moderate number of golden yellow granules. In few places some of the liver cells contain fat droplets. In the interstitium a slight increase of connective tissue is noticeable besides a moderate cellular infiltration. Amongst these cells we find typical lymphocytes and neutrophiles, but far more numerous are plasma cell-like types with a large polygonal or round cell body and a round trachychromatic, excentrically situated nucleus.

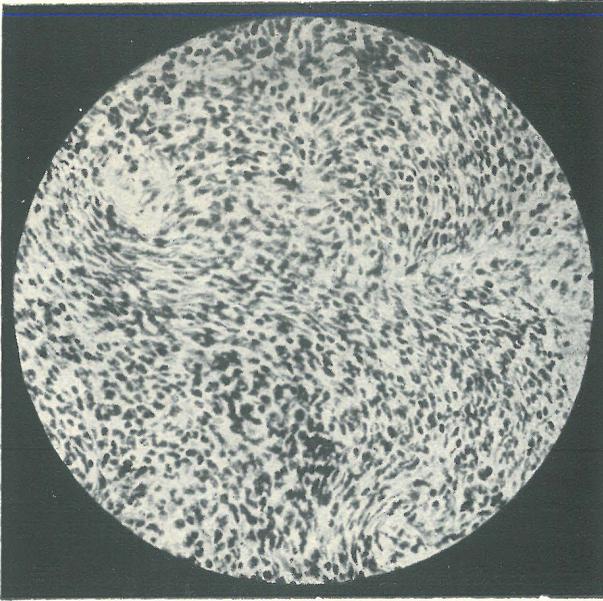
Kidney: Occasionally pycnotic nuclei in tubuli contorti. A moderate infiltration with cells resembling lymphocytes and plasma cells around small arteries and glomeruli. The infiltration is not more pronounced than in any adult healthy horse.



Subpeural nodule. Magn. $6\frac{1}{2}$. Paraffin Section. Haemalum-Eosine. (Spec. 2577.)

- (a) Central portion with numerous nuclear débris.
 (b) Central portion with little basophile material.

FIG. 1.

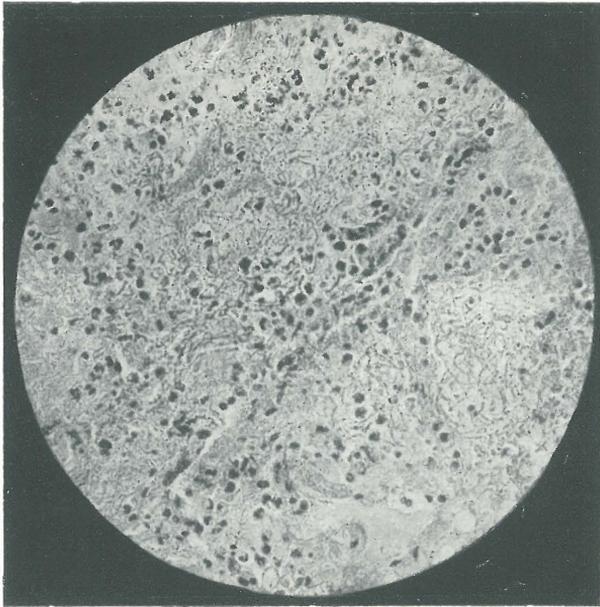


Central portion (rich in cells) of a nodule. Magn. 250.
 Haemalum-Eosine. (Spec. 2586.)

FIG. 2.

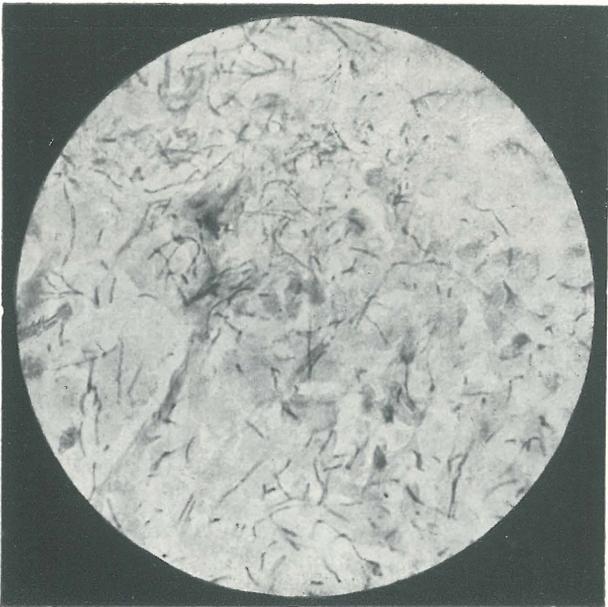
Necrobacillosis.]

[*Quinlan, Steck, and Robinson,*



Demarcation zone with numerous filaments. Magn. 250.
Giemsa-Helly. (Spec. 2586.)

FIG. 3.

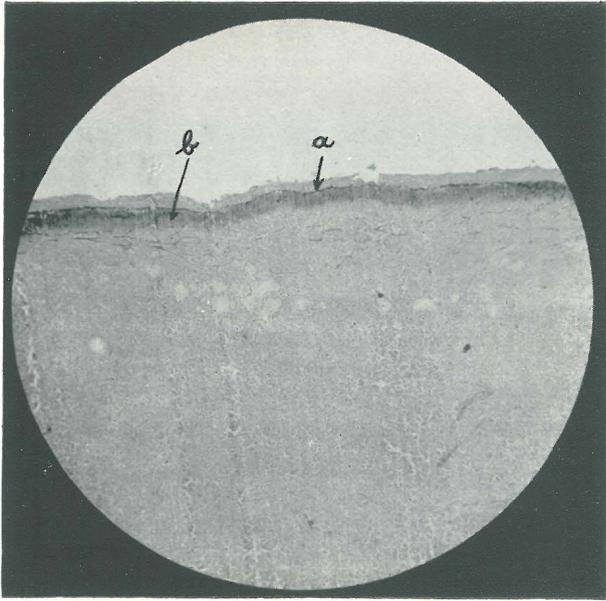


Periphery of necrotic focus with numerous filaments. Magn. 670.
Giemsa-Helly. (Spec. 2477.)

FIG. 4.

Neerobacillosis.]

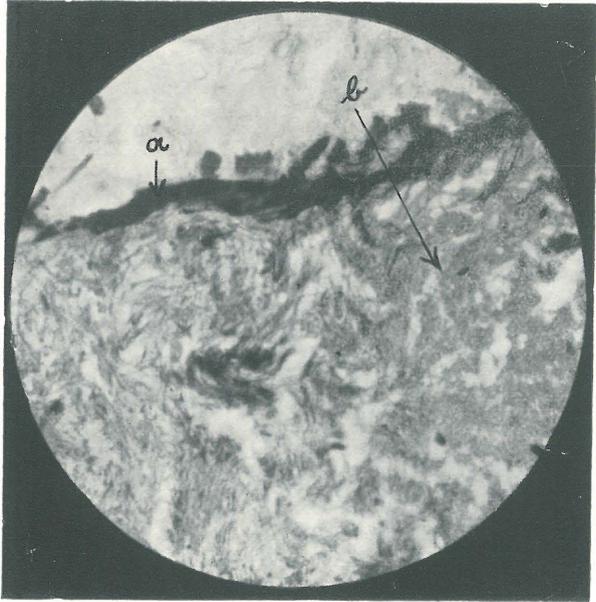
[*Quinlan, Steek, and Robinson,*



Subpleural focus showing a dense mass of bacteria as a dark zone underneath the *T. elastica*. Fuchselin-Giemsa. Magn. 33. (Spec. 2577.)

- (a) *Tunica elastica*.
 (b) Zone stained dark owing to numerous bacterial filaments.

FIG. 5.



The same enlarged 1,000 \times to show the filaments underneath the elastica. Fuchselin-Giemsa. (Spec. 2577.)

- (a) *Tunica elastica*. (b) *Neerosis bacilli*.

FIG. 6.

Neorobacillosis.]

[Quinlan, Steck, and Robinson.