Can we, merely on the basis of the difference in acuteness of the disease, the variability of the position of the parasite in the red corpuscles, and the variable dimension of the parasitic elements themselves, stick to the four kinds of anaplasms, i.e., marginal, central, Argentinian, and Rossicium?

Paper No. 18.

CONTAGIOUS PLEURO-PNEUMONIA OF GOATS IN EAST AFRICA.

By R. W. M. Mettam, M.Sc., M.R.C.V.S., Veterinary Research Officer, Department of Agriculture, Kenya.

Contagious pleuro-pneumonia is without doubt the most serious and most prevalent of goat diseases in Eastern Africa. It ravages most of the native herds every year and causes immense loss. Unfortunately, it does not spare imported breeds, and many settlers who have experimented with imported goats as a dairy proposition have experienced heavy losses.

The disease has been diagnosed throughout the various parts of Kenya. It also exists in the Belgian Congo, where native breeds are said to be immune (van Saceghem); in Uganda, and in Tanganyika. It has also been investigated in India where it ravages the native herds in the Kangra district of the Himalayas. Reference to any text book will show that the disease has been observed in most of the countries forming the Mediterranean littoral. In the past much confusion has existed as regards the identity of contagious pleuro-pneumonia with the so-called "bourfida" of Algeria and with the infectious pneumonia observed in septicaemia haemorrhagica. From recent research it has been conclusively shown that there are only two infectious caprine pneumonias, viz.: (a) the pneumonia of acute caprine haemorrhagic septicaemia, and (b) contagious pleuro-pneumonia, and with the latter must be finally identified the pneumonia studied by Leclaiache, Mori, Pusch, Storch, Holzendorf, Polger, and Kroese in France, Spain, Thuringia, and Austria respectively.

The specificity of caprine contagious pleuro-pneumonia may be proved by the impossibility of infecting other animals than goats with pathological material while in the infectious pneumonia of caprine septicaemia haemorrhagica, sheep, rabbits, and mice may be successfully inoculated with pneumonic tissue.

From time to time sporadic outbreaks occur in this Colony and it is known that different strains of pleuro-pneumonia have been isolated. There is, however, some difficulty in distinguishing these strains from one another and in the clinical description of such outbreaks the term " septicaemia" is often used. From the fact that the disease is known to exist in the United States by Ofender and Washburn as "Safford." A simple broncho-pneumonia is found at post-mortem. But there is no difficulty in distinguishing them from the pulmonary lesions of contagious pleuro-pneumonia. Another type of pneumonia observed at the laboratory recently was found in goats used for the production of rinderpest virus. As is well known, in sheep and goats rinderpest is manifested by pathological changes in the lungs and chest. This fact has also been noticed by Edwards in India. Sheep and goats are not very susceptible to rinderpest, but it is not precisely...
known how extensive they are affected by this disease under natural conditions. In any case, the type of pneumonia observed in goats used for the production of virulent virus cannot be confused with the characteristic lesions of contagious caprine pleuro-pneumonia.

Susceptibility.

The disease is quite specific for goats. Every attempt to transmit the disease to cattle, sheep, and the usual laboratory animals always failed. Goats of all ages and of both sex are equally susceptible, while native animals do not appear to be any more resistant than imported animals.

Epizootiology.

Very little is known about the epizootiology of the disease. It is certain that in Kenya the virulence of the disease varies at different seasons and in some years causes far more loss than in other years. It is always at its worst during the wet months of the year when the animals are exposed to continual inclement weather by day and subsequently to the smoky, choking atmosphere of the kraals by night.

Two other well known and prevalent virus diseases of the Tropics, e.g. bluetongue and borrokkheen are also prevalent during and shortly after the rains, and there is no little similarity between the epizootiology of these two diseases and goat contagious pleuro-pneumonia.

It is generally very difficult to obtain native goats suffering from this disease during the dry seasons, but chronic cases have been observed in imported animals at this time, and in every instance there was evidence from the history that infection was incurred during the wet season.

The disease is said to be most prevalent in mountainous country, e.g. Pyrenees, Kaustra District of the Himalayas, etc., but there is evidence that in Kenya the disease occurs from sea level to 10,000 feet and higher. However, in such countries as Greece and Italy the disease also occurs at no very marked altitude.

The immunity possessed by native goats in the Belgian Congo is a very interesting fact when it is remembered that native animals in Uganda and Kenya are exceedingly susceptible to the disease. It is possible that, as the result of the opening up of Central Africa and the consequent more ready inter-communication between all parts of the heart of the continent, the disease has only recently been introduced east of the Great Lakes and the Mountains of the Moon.

Pathological Anatomy.

Pathologically there are two clearly defined forms of the disease, viz.: (a) the acute and (b) the chronic form. (a) In the acute form the pneumonia changes are very characteristic. All the phases of a fibrous pneumonia are present from the initial congestion to red and grey suppuration. The lungs are much enlarged, solid, sink in water, and vary in colour from reddish purple to a pinkish grey. Sections are moist, present a regular mosaic, and break with a granular fracture. From them exudes a bloody, watery fluid, while in the bronchi one observes a hyaline-looking material which readily coagulates forming casts or plugs. There are soft thrombi in the larger and visible blood-vessels. There may be no pleurisy, but this is exceptional.

Generally, the pneumatic areas are fibrous deposit which is saturated with a deposit may be as much as 3cms. thick lacunae, which contain the characteristic cases it is easily removed from the lung more firmly attached. This deposit, in lung and extend out to the pericardium, then the deposit and exudate are almost constantly so. The pleural exudate may be unilateral or present in both sides, running a course of 10 days or longer, the pariaul visceral pleurae. In nature and are easily broken down. In more and more dense and fibrous. They are quite normal or may be very injected and covered with adhesions whose uncleavage is course of the disease.

The bronchial glands are usually what swollen and moist. The only other connection with the spleen and heart condition known as acute "tumor splenic may appear flabby and soft with the cause, however, cardiac lesions are associated pneumonitis.

The right lung only was affected in the case of the leit lung only in 23 per cent of cases. per cent. The pneumonia was bilateral. In pneumonia the lesions were most frequent in main and cardiac lobes.

(b) In the chronic form, the majority of cases the lungs are firm but dense, tough, fibrous adhesions, when one of the pleural covering a pneumonia may be observed that the adhesions may be covering a normal lung. In chronic pnumonia noticed. In a small percentage of cases the existence independently of any comonit... however, pleurisy and pneumonia are present at the same time.

The fate of an acute pneumonia in the lungs, is a chronic fibrous pneumonitis, gangrene have never been noticed. But it is clear that almost complete resolution occurs The lungs are very great, and it may be imp at all in the lungs of an animal that shows typical clinical acute case of the disease.

When resolution is not complete, i.e. consolidation, and the anatomical picture super bovine pleuro-pneumonia, there is no differentiation between the bovine and pneumonia are not observed in goats.

As is well known, these lesions are typical bovine pleuro-pneumonia.
affected by this disease under natural
conditions of pneumonia observed in goats used
for transmisson. Every attempt to transmit
the disease, however, always with the
result that it is not possible to obtain native goats suffering from
the disease, chronic cases have been
found, and in every instance human
infection was incurred during the
summer months of the year when the
weather is hot and dry and the
atmosphere of the kraals is fly-infested.

The clinical picture of the disease is
characteristic. All the phases of the
disease are present, from the initial
infection to the development of the
purulent lesions in the lungs. Sectional
sections show a large number of
fibrous adhesions and the spleen is
enlarged and congested. The kidneys
are also involved, and in fatal cases
gangrene of the terminal ileum is
common.

In the chronic form of the disease, the
fibrous adhesions become more
prominent and the spleen is much
enlarged. The lungs become nodular
and the pleura is thickened.

The prognosis is unfavourable, and
death usually occurs within a few
months from the onset of the
symptoms.

GENERAL COMMENTS

In conclusion, it may be stated that
the disease under discussion is a
serious and prevalent one in the
mountainous regions of Central Africa
and is transmitted to human beings
by contact with diseased animals.

The disease is characterized by
purulent lesions in the lungs,
which are accompanied by enlargement of
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mountainous regions of Central Africa.
ETIOLOGY.

The disease is due to an ultra-microscopic and filtrable virus, which is present in the pneumonic areas of the affected lung and in the pleural exudate. Every attempt to cultivate the etiological agent has always failed. In acute cases cultures from the lungs and pleural fluid are negative. It is only in chronic cases that cultures may be positive, and then the nature of the organisms present indicate extraneous contamination. Mori, an Italian worker, believes the cause to be an aspergillus, but local experiments have entirely failed to substantiate this claim. Similarly, numerous workers, e.g. Lanfranchi and Pacchioni in Italy, Langhorn and Van Saejahem in the Belgian Congo, etc., have isolated various organisms which they believe to be the cause, but local investigation confirms the general consensus of opinion that this disease must be classified as being due to an ultra-visible virus.

Mori has observed in various phagocytic cells of the lung and pleural exudate peculiar bodies which he describes as comidia. These structures have also been observed by Schellhas in Tanganyika and by the writer in Kenya. A closer examination of them leaves no doubt but that they are “cell inclusion bodies,” structures which are so characteristic and specific of many virus diseases.

NATURAL INFECTION.

It is not exactly known how the disease is spread under natural conditions. Some workers, like Van Saejahem, believe that infection takes place *per os*, but the majority are of the opinion that it is essentially aero-genic in origin. It is most probable that the etiological agent of all the specific pneumoconias primarily reach the lungs through the bronchial tubes. The experimental transmission of the disease carried out at Kabete support the view that infection is bronchogenic.

TRANSMISSION EXPERIMENTS CONDUCTED AT KABESE.

The disease has been artificially transmitted to healthy goats as follows, viz.:

(a) In five cases by actual contact; (b) in one case tried by intrabronchial insufflation of 0.01 pleural exudate, and (c) by intramuscular inoculation of filtrate passed through a Sutz filter in one of two cases tried. In each of these experiments extraneous infection can be ruled out as experimental animals were always kept rigidly isolated.

Subcutaneous inoculation of the juice expressed from pneumonic tissue caused a febrile reaction but no pneumonia, while intravenously similar material caused no reactions.

The general conclusions from the experiments conducted locally are, viz.:

(1) That the disease may be transmitted in a certain percentage of cases to healthy goats by actual contact, by intrabronchial insufflation of infective material, and by direct intrapulmonary inoculation of pneumonic material. The percentage of all successful experimental transmission is on the low side, about 25 per cent.

(2) That intravenous and subcutaneous inoculation of pneumonic material causes a temporary febrile reaction without producing clinical pleuro-pneumonia.

(3) That goats which are treated" coding paragraph leave no is develop the typical disease in natural cases.

(4) That cattle, sheep, and all the immune.

(5) That the period of incubation and that the course of the disease.

(6) That recovery from one at immunity, so the animal is second and fatal attack and a within a couple of months of.

(7) That artificial transmission of some difficulty. This has also other workers on this disease, e.g. in Tanganyika, Leclainche in Melandi and Stavropoulos appear as if the virus is out thorax of the very commence would explain why in a high come for autopsy, pleural fluid inocuous for experimental inoculated intratracheal.

SYMPTOMS OF THE DISEASE.

The symptoms of the acute disease are classical of acute pneumonia. In chronic cases may be manifested, but the acute or associated condition generally severe.

Such an animal coughs occasionally, and this symptom may lead to a sus. Some chronic cases suddenly relapse and die. The cause of these breakdowns they have been observed to follow contas possibly some chronic cases relapse w environmental or atmospheric conditions. Agents are generally pneumonic. It is very acute human pneumococcal pneumonia is winter season. In bovine and ovine cases chronic “lunger” plays a very important the disease. Whether the same holds go unknown, but the impossibility of test material from chronic cases is significant the virus has disappeared from the pulmon.

SUMMARY AND CONCLUSIONS.

1. Contagious pleuro-pneumonia of disease which ravages native and import responsible for a morality of 60 to 100% be a periodic variation in the potency of

2. The disease may be acute or chroni ally in the chronic form, accompanied by
(3) That goats which are treated on the lines noted in the preceding paragraph have no immunity conferred, as they develop the typical disease when placed in contact with natural cases.

(4) That cattle, sheep, and all the usual laboratory animals are immune.

(5) That the period of incubation varies from 4 to 16 days, and that the course of the disease may be as short as three days.

(6) That recovery from one attack does not confer any immunity, as the animal may subsequently contract a second and fatal attack and succumb to the second attack within a couple of months of the first.

(7) That artificial transmission of the disease is a matter of some difficulty. This has also been the experience of most other workers on this disease, e.g. Mori in Italy, Schellhase in Tanganyika, Loesche in France, Walker in India, Melanid and Styrianopoulou in Greece, etc. It would appear as if the virus is only present in the lungs and thorax at the very commencement of the disease, and this would explain why in a high percentage of cases which come for autopsy, pleural fluids and tissue extracts are innocuous for experimental healthy goats even when inoculated intratracheally.

**Symptoms of the Disease.**

The symptoms of the acute disease are easily recognized. They are classical of acute pneumonia. In chronic cases, however, no lung symptoms may be manifested, but the animal exists in an unthrifty or emaciated condition and generally suffers from an intermittent enteritis.

Such an animal coughs occasionally, especially on unusual exertion, and this symptom may lead to a suspicion of lung trouble.

Some chronic cases suddenly relapse, develop acute symptoms, and die. The cause of these breakdowns is not always evident, but they have been observed to follow contact with natural acute cases. Possibly some chronic cases relapse when exposed to unsuitable environmental or atmospheric conditions. Cold, dampness, and such agents are generally pneumonie. It is a well-known statistical fact that acute human pneumonoeal pneumonia is most prevalent in cold, wet, winter seasons. In bovine and ovine contagious pleuro-pneumonia the chronic "lunger" plays a very important role in the propagation of the disease. Whether the same holds good in this goats' disease is unknown, but the impossibility of transmitting the disease with material from chronic cases is significant and seems to indicate that the virus has disappeared from the pulmonary tissues of chronic cases.

**SUMMARY AND CONCLUSIONS.**

1. Contagious pleuro-pneumonia of goats is a specific caprine disease which ravages native and imported breeds annually and is responsible for a mortality of 60 to 100 per cent. There appears to be a periodic variation in the potency of the virus of this disease.

2. The disease may be acute or chronic, and is frequently, especially in the chronic form, accompanied by a troublesome enteritis.
3. The disease is due to a filter-passing virus whose nature is unknown, but which is present in the lung lesions and pleural effusions of acute cases. Experimentally, as animal from chronic cases has invariably failed to reproduce the disease, it is concluded that the causal virus is not present in the lungs of such cases. The conidia-like bodies described by Mori as being a phase in the life-history of an aspergillus, is not accepted. These structures are "cell-inclusion bodies," and are probably similar in nature and character to similar bodies found in other virus diseases.

4. Pathologically, acute cases are accompanied by an extensive pneumonia affecting one or both lungs, while there is also a serofibrinous pleurisy with effusion into the mediastinal cavities. Acute cases either terminate fatally or develop into a chronic pneumonia. Chronic cases either recover by a slow process of resolution or else relapse on further exposure to fresh infection when they invariably succumb.

5. Experimental transmission is very difficult and has only been accomplished in a few instances with material from peracute or early acute cases. It always failed with material from chronic cases. The disease has been successfully reproduced by intrabronchial insufflation, intrapulmonary inoculation, and by actual contact with natural acute cases.

6. Epizootologically the disease causes highest mortality during the wet season. Both native and imported breeds are very susceptible and the mortality may be as high as 60 to 100 per cent. There is no information as to how the virus of the disease is maintained under natural conditions. It is not considered likely on the basis of experimental work that chronic "lungen" exist.

7. Recovery does not confer any immunity, while relapses are very common. Up to the present no immunological research has been undertaken at Kabete. Isolation of sick animals and the complete segregation of imported animals from native or squatter stock is strongly advocated.

Paper No. 19.

POULTRY DISEASES IN SOUTH AFRICA.

By G. Martinaglia, D.Sc., B.V.Sc., Veterinary Research Officer, Department of Agriculture, Union of South Africa.

INTRODUCTION.

In presenting this paper, it is not intended to give a symposium on poultry diseases in South Africa, but rather to impress on my veterinary colleagues the importance of the poultry industry and to discuss a phase of our professional work which has hitherto been sadly neglected. Poultry culture has made phenomenal strides during the last twenty years. This industry is well organized, and the world's poultry congresses have done much to popularize the industry and to stimulate international scientific interest in all branches relative to poultry culture.

The first world's poultry congress was held at the Hague (1921), the second in Barcelona (1924), and the third in Ottawa (1927). The last congress was well attended by diseases and about 34 papers were over the world. The next poultry (1930), and it is to be hoped the world. Mohler (1928) states that the Empire will be well represented.

At present America is the foremost world. Mohler (1928) states that the supply of poultry and eggs is produced of these products amounts to over a excess of the whole annual mine Africa.

In 1926 the poultry breeders of newly hatched chicks and produce the proceeds from which amounts of the live stock and its products.

In England there is a tendency consumption than in previous years, and are receiving much attention. It has made great progress during the flourishing export trade in eggs, the humble hen with that of our Merino sheep, we find that during the Union were estimated at a value of £17,492,000 of our total wool value.

In proportion to its value, it is greater than that of any other species and contributes more directly towards the people.

In the past the diseases of much of our attention that the all received only casual recognition. Of some of our most devastating poultry diseases, the diseases of poultry culture, the diseases of poultry investigation and institution of measures for their control.

Today veterinary students in stations and veterinary colleges are reagents of poultry. The life-cycles are of paramount importance to the giving daily advice to poultry raisers to poultry diseases.

The examination of diseased poultry is a daily procedure, and, namely, Fowl Typhoid and 40 gratis to poultrykeepers.

In this paper some of the articles and encountered in the Union will be dis BACTERIAL.

These are perhaps the most serious Africa.

AVIAN TUBERCOLOUSIS.

Tuberculosis of poultry is common in Natal, especially along the coast, in the Orange Free State and in the