

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 material 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 sero-fibrinous 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 "lungers" 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 veterinarians interested in avian diseases and about 34 papers were read by veterinarians from all over the world. The next poultry congress will be held in London (1930), and it is to be hoped that veterinarians from the British Empire will be well represented.

At present America is the foremost poultry-raising country in the world. Mohler (1928) states that more than one-third of the world's supply of poultry and eggs is produced in America. The annual value of these products amounts to over £250,000,000, which is greatly in excess of the whole annual mineral wealth production of South Africa.

In 1926 the poultry breeders in that country sold 800,000,000 newly hatched chicks and produced over 2,000,000,000 dozen eggs, the proceeds from which amounted to 16 per cent. of the total value of the live stock and its products for that year.

In England there is a tendency to produce more eggs for home consumption than in previous years, and consequently poultry diseases are receiving much attention. In South Africa the poultry industry has made great progress during the last decade and to-day we have a flourishing export trade in eggs. In comparing the products of the humble hen with that of our greatest agricultural asset, the Merino sheep, we find that during the 1927 season eggs produced in the Union were estimated at a value of £2,416,000 as compared with the £17,492,000 of our total wool value produced in the same season.

In proportion to its value, the productivity of the fowl is greater than that of any other species of farm animal, and no other contributes more directly towards the material support of so many people.

In the past the diseases of our quadrupeds have absorbed so much of our attention that the ailments of the feathered bipeds have received only casual recognition. With the virtual disappearance of some of our most devastating stock diseases and the rapid rise of poultry culture, the diseases of poultry have demanded thorough investigation and institution of more satisfactory sanitary measures for their control.

To-day veterinary students in all first-class agricultural institutions and veterinary colleges are receiving full instruction in the ailments of poultry. The life-cycles of the many parasites of poultry are of paramount importance to the field veterinary sanitarian when giving daily advice to poultry raisers as to how to combat and control poultry diseases.

The examination of diseased poultry in our main routine laboratories is a daily procedure, and, already, two biological products, namely, "Fowl Typhoid" and "Chicken Pox" vaccines, are given gratis to poultrykeepers.

In this paper some of the main poultry diseases and problems encountered in the Union will be discussed briefly.

### BACTERIAL DISEASES.

These are perhaps the most serious diseases of poultry in South Africa.

#### AVIAN TUBERCULOSIS.

Tuberculosis of poultry is occasionally met with in the Cape and Natal, especially along the coast. It is an exceptionally rare disease in the Orange Free State and in the Transvaal. The few cases studied

so far showed the liver, spleen, and intestines to be the main predilection seats of the disease. The organisms isolated corresponded in their biological features to avian strains isolated in other countries. In the few cases of tuberculosis in pigs studied at the abattoirs, avian strains have not been found, but on one occasion in a serious outbreak of tuberculosis in poultry, where the farmer was in the habit of giving the dead fowls to pigs, the latter were also found to be infected. In an outbreak of avian tuberculosis in Natal, D. T. Mitchell was able to trace the infection directly to a Barnevelder cock with chronic lesions. This bird was introduced from abroad three months previous to the outbreak.

The avian tuberculin employed so far in affected flocks has given good reactions. It was made from an avian strain isolated by the writer from the mesenteric gland of a hog in Baltimore, U.S.A., 1921. Since the isolation of local strains we have used these in the manufacturing of avian tuberculin, which can also be used where Johne's disease is suspected. The time is approaching when fowls introduced into South Africa will have to be tested in order to protect the local poultry and pig industries from this disease.

#### FOWL TYPHOID.

This is one of the most destructive fowl diseases in South Africa and the death-rate is sometimes very high. This malady was first described in South Africa by the writer (1926).

Adult fowls are mainly affected and the causal organism is *S. gallinarum*.

The main symptoms are diminished appetite, increased thirst, and general dullness; the feathers are ruffled and the neck held close to the body. The sick fowl often assumes a sleepy appearance. There is a diarrhoea and the faeces are of a greenish yellow colour. There is a high fever varying from 108° to 111.5° F.

The main post-mortem appearances are an enlarged friable liver, which may have a mottled or bronze-like appearance. The spleen is generally enlarged; the heart often shows chronic tubercle-like lesions; there may be a slight catarrhal enteritis.

Preventive vaccine for this disease has proved highly satisfactory.

The carrier problem, and relation of this disease to the so-called leucaemias, are still under investigation. We have already obtained interesting data on their relationships.

In Kenya, Kearney (1923) discussed a disease of poultry under the name of "Kikuyu Fowl Disease" at the Fifth Pan-African Veterinary Conference. This appears to be a fowl typhoid-like disease. It would be interesting to compare the East African strains with some of ours, and those isolated by Donatien and co-workers (1924) in Algiers.

#### BACILLARY WHITE DIARRHOEA OF CHICKENS.

This is a highly infectious paratyphoid disease of chickens occurring during the first three days of life. The disease is characterized by severe white diarrhoea, prostration, and high mortality.

Historically this malady is eminently associated with Rettger and co-workers. There is no other poultry disease that has received so much attention of late years.

It is caused by *S. pullorum* and was first described in America by Rettger (1900). In South Africa the disease was bacteriologically diagnosed only a few years ago, by the writer (1927).

Thus far, all the strains of the organisms isolated in the Transvaal are anaerogenic. Among chickens, the first outbreak in the Union was due to an anaerogenic strain. In its morphological and staining reactions the local strains of *S. pullorum* correspond with *S. gallinarum*, but during primary isolation grow less luxuriantly on artificial media.

Biochemically *S. pullorum* differs from *S. gallinarum* in its inability to ferment dulcitol and maltose. Also, the acid alkaline transitional period on litmus milk is much longer in *S. pullorum* than in *S. gallinarum*.

*Distribution in South Africa.*—The extent of distribution is still under investigation. Besides the outbreak under discussion, on two occasions *S. pullorum* was isolated from diseased ovaries of hens sent to the laboratory, and once in a case from the Orange Free State, on examination of chickens dead in the shells of artificially incubated eggs.

Both Mitchell and Alexander have found the disease to be on the increase in Natal, and it is certain that spread of this bacillary white diarrhoea will have far-reaching effects in retarding the progress of poultry culture in South Africa. It is therefore of primary importance that more data be obtained of the distribution in the Union by bacteriological examination, as well as serological testing.

#### BOTULISM.

Under the name of "limber-neck" this disease of poultry has attracted a good deal of attention in the United States of America. The symptoms are essentially those of a paralysis which is usually rapidly fatal. Heavy losses have occurred from feeding poultry with spoiled tinned foods containing botulism toxin, but, generally speaking, under natural conditions the fowl is not very susceptible to botulism.

In South Africa it is common in ducks under the name of "lamsiekte" and used to be seen in ostriches when they were numerous. In ducks it is usually a result of eating decomposing fish or snails when dams dry up or eating meat that has undergone decomposition. Recently an outbreak of botulism in turkeys has been investigated. In the fowl we have not so far seen cases of the disease, the resistance of this bird being probably the reason. An article by Robinson (1929) on botulism in domesticated animals in South Africa contains references to the disease in poultry.

#### SPIROCHAETOSIS.

This infection often causes heavy losses among young and adult poultry. The common fowl-tick, *Argas persicus*, is the only known transmitter in the Union.

Spirochaetosis of poultry in South Africa was first described by Bevan (1908) in Rhodesia and recorded by Jowett (1911) in Capetown.

Since 1924 the writer has investigated several outbreaks in the Orange Free State and Transvaal. The larvae were always present on the birds during the septicaemic state. Where lameness is absent and the presence of larvae not noticed, one may easily confuse the disease with fowl typhoid.

Great care is taken by Government veterinary officials in the Union that the runs for egg-laying competitions are kept free from fowl-tick infestation. Fowls are also thoroughly inspected and quarantined before they are admitted to the competitions. Veterinarians can do much to combat this disease by giving advice to poultry-keepers on the life-cycle of *Argus persicus* and advocating tampan-proof poultry-house construction.

#### FOWL CHOLERA.

This disease has never been bacteriologically diagnosed in South Africa. On a few occasions a diagnosis has been made from the examination of blood-smears. To make a diagnosis on morphological grounds alone is dangerous, as the peripheral staining of *S. gallinarum* sometimes suggests a bipolar appearance. Jowett (1908) has described an epizootic pneumo-pericarditis of a turkey in the Cape. The organism isolated shows a strong bipolar staining.

#### PROTOZOAN DISEASES.

In South Africa the most serious protozoan disease affecting poultry is coccidiosis, especially in the early spring and summer months, after heavy rains.

The disease has been recorded by Jowett (Cape, 1911), by Curson (Cape, 1924), and Mitchell (Natal, 1926).

This disease is very fatal to chickens and young fowls. At present the effect of carbontetrachloride on *Eimeria avium* is under investigation, but the control of carriers of this malady is our ultimate aim.

#### BLACKHEAD IN TURKEYS.

This disease has been recorded in the Cape by Jowett (1911). A few cases showing similar lesions as described in blackhead were noted in turkeys by Mitchell and the writer in Natal, but these on examination turned out to be chronic cases of coccidiosis.

The disease has not been diagnosed yet in the Transvaal and the Free State, notwithstanding the fact that *Heteraties gallenae* is very common in these Provinces.

#### VIRUS DISEASES.

##### FOWL DIPHTHERIA OR FOWL POX.

In South Africa the common form of avian variola is the skin form, which manifests itself on the comb, wattles, and, in rare cases, the skin of other parts of the body may also be involved. When both the skin and mucous membranes of the head are attacked, the mortality is very high. Investigations carried out in Natal by Mitchell have shown that an efficient vaccine similar to the anti-diphtherin of De Blicck and Van Heelsbergen can be prepared.

The demand for this biological preparation is great, and each year thousands of doses are issued free of charge to poultry owners in the Union.

##### EUROPEAN FOWL PLAGUE.

Fortunately, this devastating disease has not yet made its appearance in South Africa. The recent serious outbreak in the United States has shown how easily new diseases may be introduced and how seriously they may affect the industry while they rage. It was only by the prompt action of the State and Veterinary Authorities that the disease was duly eradicated.

## FUNGOID DISEASES.

These diseases are of rare occurrence in the Union. Favus has only once been encountered by the writer. The affection was confined to the comb and the adjacent feathered portion of the head. The causal agent appeared similar to *Achorion gallinae*.

*Aspergillosis*.—This condition has been recorded in the Cape by Walker (1915) and Curson (1921) in ostriches and fowls respectively. The disease is very uncommon in the inland provinces and has only twice been noted by the writer, in one instance as the cause of mycotic pneumonia of a hen and in another case in a parrot. In both cases *Aspergillus fumigatus* was isolated.

## POISONING IN POULTRY.

The most common is arsenical poisoning, often done deliberately, with criminal intent. Little is known of the rôle played by plant poisoning of poultry in the Union. Henning (1926) has demonstrated the toxic effects of *Cotyledon wallichii* for fowls. Kehoe (1912) fed *Cotyledon orbiculata* to twelve fowls. Five developed symptoms of poisoning and two of them died.

## DISEASES OF OBSCURE ETIOLOGY.

ROUP OR *Coryza infectiosa*.

As it has been designated by De Blicck (1927), is very common in this country. It causes great annual losses as a result of falling off in condition and egg-production during the disease. We are of the same opinion as the Dutch investigators that it is not similar to the mucous membrane form of chickenpox. In South Africa there are generally debilitating factors, especially heavy tapeworm infestations, which predispose to an outbreak of roup. Many organisms have already been described as the cause of roup. By using a method similar to that described by Weaver and Mitchell (1927), the writer was able to isolate an organism which was very pathogenic for guinea-pigs and rabbits, but with these organisms it was not possible to reproduce the disease in healthy fowls. Strains from different epizootics were not constant in their carbohydrate reactions. This disease still requires much investigation to be done on it.

## "LEG-WEAKNESS" IN POULTRY.

This disease has assumed considerable economic importance in various parts of the Union, causing serious losses in some cases. The malady seems to affect pure-bred stock only and, as a rule, a small number of birds at a time.

The disease is characterized by hyperplasia in the nerve tissues, giving rise, according to situation, to various forms of paralysis or paresis. The most common seats of nerve affection are the sciatic and brachial nerves, resulting in paralysis of the limbs. Sometimes the spinal cord or the optic nerves are involved, the latter causing a condition known as "glassy eye." All attempts to find the cause have failed. It would appear that certain fowls have a hereditary predisposition to this disease.

It was first noticed by Marek (1907) in Europe, by Doyle (1925) in America. Pappenheimer, Dun, and Cone (1926) suggested the name of *Neurolymphomatosis gallinarum* for this disease. Thomas

(1928), of this Division, has given a full description of the disease as occurring in South Africa. Owing to the obscure etiology of the condition and its possible relationship to other diseases in poultry such as leucemias and neoplasms, it warrants thorough investigation.

#### FOWL LEUCEMIA.

Various forms of so-called leucaemic diseases have been observed, but owing to the present chaotic state of our knowledge, it is, perhaps, advisable to delay discussion of this subject until more work has been done.

De Kock (1928) draws attention to the great difficulty experienced in differentiating certain forms of neoplasms, leucemias, and lymphoid hyperplasias.

#### NUTRITIONAL DISEASES.

Under the unnatural conditions which poultry, especially under the intensive system, have to exist, many obscure diseases have been observed which can probably be attributed to such factors as faulty feeding.

Recently a disease of considerable importance has been noted where poultry have been kept under the intensive system. It is particularly noticed where poultry keepers are feeding their birds in order to get the maximum egg production, and is generally seen in young hens in lay, but older hens may also be affected.

*Symptoms.*—Fowls go off their feed, show a slimy diarrhoea. The colour of the comb varies from a bright scarlet to a purplish blue. The crop often appears empacted. The temperature generally varies from subnormal to 1 degree above normal. The blood is of a dark-red colour and bacteriological examination of the blood or organs is generally negative.

*Autopsy.*—On post-mortem examination the skin on the breast is often red and the subcutaneous vessels injected. On opening the abdominal cavity free yolk is often seen between the intestines, and the ova are soft and of a yellow colour. In other cases there is a whitish chalk-like deposit round the pericardial sac or on the epicardium. The air sacs adjacent to this organ are often also involved. The serosa of the intestine sometimes displays a greyish granular deposit. The kidneys often show punctiform foci which appear like urates. In a few cases greyish specks were seen in the liver. Large accumulation of yolk in the abdominal cavity is almost a constant feature, and the vessels on the membranes of the ova may be infected. The oviduct on rare occasions bears the appearance of having been soaked in glycerine; even the flesh may suggest that appearance.

In all these cases there is usually a general catarrh all along the alimentary tract; this might account for the impaction of the crop so often noticed in this condition.

All attempts to isolate an organism playing an etiological rôle have failed. The disease seems to be closely associated with a ration rich in protein. In all these instances there was a high content of meat and lucerne used. The biochemical factor involved in this disease is under investigation at present. It appears to resemble the so-called visceral gout. In all outbreaks of this nature studied the joints were not implicated.

Rickets is sometimes encountered in chickens kept in close confinement where they have no access to sunlight, but on the whole this disease is uncommon, probably due to the abundance of sunshine which the African climate offers. The vitamin-deficiency diseases of poultry have not yet been investigated in this country. Often feather-eating has been noticed, but whether this is simply an acquired vice or a form of avitaminosis is not quite clear.

#### EXTERNAL AND INTERNAL PARASITES.

Where the law of poultry hygiene is not strictly observed, poultry in South Africa suffer much from parasitic infection. The main ectoparasites are the ticks, mites, lice, and fleas. Bedford (1924) has discussed these fully. They are controlled by the usual methods adopted in other countries.

In case of the subcutaneous mite *Laminosioptes cysticola* and the air-sac mite *Cystodites nudes*, control measures are difficult to apply, as nothing is known of their life-histories. The latter was first recorded by Walker (1915) in this country.

Nematode infestation is of frequent occurrence in the Union. *Ascaridia lineata* is the commonest cause of serious losses in young poultry. *Heterakis gallinae*, the caecal worm, is found in almost all poultry in the Transvaal, but does not appear to cause noticeable harm. The fact, however, that the eggs of this parasite may contain the protozoan of entero-hepatitis (*Histomonas meleagridis*) might have serious consequences if this disease were introduced into the Transvaal. An interesting nematode, *Hertertia gallinarum*, having a termite, *Hodothermus pretoriensis*, as an intermediate host, has been described by Theiler (1919).

Nine species of fowl tapeworms have been found in South Africa so far according to Mönnig (1928) and Le Roux (1926). *Amoebotaenia sphenoides* (Rail, 1892) is occasionally found in South Africa, but is not recognized as being very pathogenic. The complete life-history has been traced through the earthworm intermediate host by Mönnig (1926).

The life-histories of all these tapeworms are not known, and it is an urgent necessity to investigate these questions. This work is to be started in the near future at Onderstepoort.

The following articles of general interest have appeared in a special poultry edition of *Farming in South Africa* (May, 1928):—“The Anatomy of the Fowl” (Curson), “Hygiene in Combating Poultry Diseases” (Martinaglia), “Some Causes of Mortality in Chickens” (Mitchell), “Parasites of Fowls” (Mönnig). Mitchell has also contributed a number of general articles on the diseases of poultry to the *Natal Farmer*.

As we have delegates hailing from all over the African Continent, it is to be hoped that there will be a free discussion on this subject.

It is the wish of the writer that this brief survey on poultry diseases will serve as a basis for discussion on most of the poultry epizootics and problems confronting those interested in avian pathology.



## REFERENCES.

- BEDFORD (1924). "The External Parasite of Poultry, with Measures for their Control," *Jl. Dept. Agr., U. S. Afr.*, Vol. 9, pp. 123-140.
- BEVAN (1908). "Spirochaetosis of Fowls in Southern Rhodesia," *Jl. Comp. Path. and Therap.*, Vol. 21, pp. 43-49.
- CURSON (1921). "Aspergillosis of the Fowl," *Jl. Dept. of Agri., U. S. Afr.*, Vol. 3, pp. 225-230.
- CURSON (1920). "Coccidiosis of the Fowl," *Jl. Dept. Agr., U. S. Afr.*, Vol. 1, pp. 815-818.
- DE BLIECK (1927). "Diphtheria and Pox in Chickens and the Combating of this Disease," *Proceedings of World's Poultry Congress*, pp. 290-294.
- DE KOCK (1928). "Lymphoid Hyperplasias and Allied Tumours in the Fowl," *Jl. S. Af. Vet. Med. Assn.*, Vol. 2, pp. 73-75.
- DONATIEN, PLANTUREUX, ET LESTOQUARD (1924). "La Typhose Aviaire Algerie," *Rev. Gen. Med. Vet.*, Vol. 33, pp. 65-83.
- DOYLE (1925). "Neuritis in Chickens," *Jl. Am. Vet. Med. Assn.*, Vol. 68, New Ed. 21, pp. 622-630.
- HENNING (1926). "Krimpsiekte," *11th and 12th Repts., D. V. Ed. and Res.*, pp. 331-364.
- JOWETT (1908). "Epizootic Pneumo-pericarditis in the Turkey," *Jl. Comp. Path. Therap.*, Vol. 21, pp. 324-330.
- JOWETT (1911). "Coccidiosis of the Fowl and Calf," *Jl. Comp. Path. Therap.*, Vol. 24, pp. 207-225.
- JOWETT (1911). "Blackhead. Infectious Entero-Hepatitis or Typhlo-Hepatitis: A Disease of Young Turkeys," *Jl. Comp. Path. Therap.*, Vol. 24, pp. 289-302.
- JOWETT (1911). "Fowl Spirochaetosis," *Abstracted in Vet. Jl.*, Vol. 67, pp. 240-248.
- KEARNEY (1923). "Avian Diseases," *Rept. of Proceedings, Fifth Pan-African Veterinary Conference*, pp. 76-78.
- KEHOE (1912). "Preliminary Note on the Poisonous Properties of *Cotyledon orbiculata*," *Second Report, D.V.R.*, U. S. Afr., pp. 387-397.
- LE ROUX (1926). "Helminths collected from the Domestic Fowl and the Domestic Region in Natal," *11th and 12th Repts., D.V. Ed. and Res.*, pp. 209-220.
- MAREK (1907). "Multiple Nervenentzündungen (Polyneuritis) bei Huhnern," *Deut. Tierarz. Woch.*, Vol. 15, pp. 417-431.
- MARTINAGLIA (1926). "Fowl Typhoid," *Jl. Dept. Agr., U. S. Afr.*, Vol. 12, pp. 298-304.
- MARTINAGLIA (1928). "Fowl Typhoid and Bacillary White Diarrhoea," *Jl. S. Afr. Vet. Med. Assn.*, Vol. 2, pp. 77-81.
- MARTINAGLIA (1929). "Diseases of Domestic Animals in South Africa due to Organisms of the Salmonella Group," *15th Rept., D.V.S., U. S. Afr.*, Vol. 1, pp. 233-295.
- MOHLER (1928). "The Control of Poultry Diseases in the United States," *Jl. Am. Vet. Med. Assn.*, Vol. 25, pp. 558-567.
- MONNIG (1926). "The Anatomy and Life-History of the Fowl Tapeworm *Amoebotaenia sphenoides*," *11th and 12th Rpts., D.V. Ed. and Res.*, pp. 199-208.
- MONNIG (1928). "Check List of the Worm Parasites of the Domestic Animals in South Africa," *13th and 14th Repts., D.V. Ed. and Res.*, pp. 801-840.
- MITCHELL (1925). "Coccidiosis in Poultry," *Jl. Dept. Agr., U. S. Afr.*, Vol. 10, pp. 408-416.
- PAPPENHEIMER, DUN, AND CONE (1926). "A Study of Fowl Paralysis," *Bulletin 143, Storrs. Agr. Expt. Stn., U.S.A.*
- RETTGER (1900). "Fatal Septicaemia amongst Young Chicks," *New York Med. Jr.*, Vol. 71, pp. 803-805.

- ROBINSON (1929). "Botulism in the Domesticated Animals in South Africa. A Review of the Present State of Our Knowledge." Paper presented to the Pan-African Veterinary Conference. Pretoria, 1929.
- THEILER (1918). "A New Nematode in Fowls, having a Termite as an Intermediate Host, *Filaria gallinarum*, n. sp.," *5th and 6th Repts., D.V. Ed. and Res.*, pp. 695-708.
- THOMAS (1928). "Leg-weakness in Poultry. A Preliminary Note on the Occurrence of a Specific Fowl Paralysis in South Africa," *Jr. S. Afr. Vet. Med. Assn.*, Vol. 1, pp. 67-72.
- WALKER (1915). "A Short Note on the Occurrence of *Cystodites nudus* (Vizioli) in the Domestic Fowl in South Africa, *3rd and 4th Repts. D.V.R., U. S. Afr.*, pp. 577-581.
- WALKER (1915). "Aspergillosis in the Ostrich Chick," *3rd and 4th Repts., D.V.R., Union of S.A.*, pp. 535-574.
- WEAVER AND MITCHELL (1927). "A Study of Roup in the Domesticated Fowl from the Standpoint of Etiology," *Poultry Science*, Vol. 3, pp. 9-21, 23.

Paper No. 20.

## HEMOPROTOZOAL INFECTIONS (SPIROCHAETOSIS AND PIROPLASMOSIS) OF POULTRY IN EGYPT.

By DR. M. CARPANO, Chief Specialist of Pathology and Bacteriology of the Veterinary Department, Egypt.

1. Spirochaetosis of fowls and geese in Egypt and the mediums causing the morbidity.

In view of the morphological, biological, and epidemiological identity of the *Spirochaeta gallinarum* and *Spirochaeta anserina*, can we still consider these two agents as different species?

2. Susceptibility of indigenous fowls and those from free areas to *Spirochaeta gallinarum*.

The difficulties experienced in countries where the *Spirochaeta gallinarum* is prevalent, as in Egypt, for instance, in connection with the introduction of pure-bred fowls for the improvement of the local breeds.

3. What are the most efficacious systems of therapeutics and immunization of poultry which are at the same time economical and practical, so that they are within reach of every one and may be used on a large scale for combating spirochaetosis?

4. In addition to spirochaetosis of poultry, a piroplasm of poultry has recently been observed in Egypt, caused by a hemoprotozoa, which has been called *Aegyptianella pullorum*.

5. Morphology of the said hemoparasite and its evolutionary cycle. Principal clinical symptoms and anatomical-pathological lesions caused by it. Susceptibility of the indigenous fowls and of those imported from areas which are free from this hemoprotozoa.

6. Relations between the *Aegyptianella pullorum* and the *Spirochaeta gallinarum*. The morphological and biological reasons which have led us to separate clearly these two hemoparasites, the first one endoglobular and the second peculiar to the sanguinary plasm.