

REPORT ON EXPERIMENTS UNDERTAKEN TO DISCOVER
WHETHER THE COMMON DOMESTICATED ANIMALS
OF TERCEIRA ISLAND ARE AFFECTED BY PLAGUE.

BY ANTONIO DE SOUZA, JUNIOR,
*Professor of Escola Medico-Cirurgica do Porto, and
Director of Laboratorio de Bacteriologia;*

JACINTHO ARRUDA,
*Director of Laboratorio Bacteriologico of Ponta
Delgada, S. Miguel, Azores;*

AND MANUEL PINTO,
Director of Laboratorio "Nobre" of Escola Medico-Cirurgica do Porto.

WE have recently had the opportunity of studying a plague epidemic that broke out on Terceira Island, Azores, in 1908. Terceira Island contains a population of 45,000 souls, the epidemic spread over 27 parishes. About 260 persons were attacked, with a mortality of about 48%.

In the course of our study we have seen the conclusions of the *Reports on Plague Investigations in India*, which have appeared in Vols. VI, VII, and VIII, of this *Journal*, 1906, 1907 and 1908, fully justified, nevertheless the "Conselho Superior de Hygiene de Reino" resolved to prohibit the entry into the Portuguese continent of birds and pigs from Terceira Island, and exacted that the black cattle should be disinfected in order to be accepted.

This action of the Council was presumably based upon the opinion arrived at by Simpson (1905) from his experiments in Hong-Kong and given in his *Treatise of Plague* (1905). As, however, Simpson's experiments and conclusions are criticised by Pearse, Acting Medical Officer of Health for Hong-Kong (1904), and the work of Walton (1900) and Bannerman and Kapadia (1908), made in India, of London

(1897), made in Russia, of Watkins-Pitchford (1904), made in Natal is in complete disagreement with the results of Simpson, we have also made experiments in this matter.

The mammals of the island that we could get for our experiments were 2 calves, 8 pigs, 2 cats and 1 kid; the birds were 8 pigeons, 1 turkey, 3 ducks and 85 hens.

Very briefly we are going to describe our experiments and their results.

Calves.

Calf No. 1. Female, about 75 kilograms in weight. It received subcutaneously an emulsion in physiological salt solution of 14 tubes of agar culture of the plague bacillus, pure and virulent and of very recent human origin. The virulence was confirmed in guinea-pigs. The calf did not show the slightest sign of sickness, eating well and remaining lively. There was no local reaction. The inoculation took place on 1 January, 1909 and the calf was abandoned on 24 April, 1909.

Calf No. 2. Female, 60 kilograms in weight. On 12 January, 1909, maize meal was mixed with pieces of the organs from a case of septicaemic plague, and also those of a cat which died of bubonic plague. The animal would only lick this mixture a few times, therefore on the next day we administered by the mouth agar cultures (pure) of the plague bacillus obtained from five Petri dishes (11 cm. in diameter). The cultures were mixed with dry maize leaves, the customary fodder of the cattle in this island. No morbid alteration was remarked in the animal, which was abandoned on 24 April, 1909.

Pigs.

Pig No. 1. Black, male, 10 kilograms in weight. It was inoculated on 31 December, 1908, in the following manner:

We made a mixture of meal and maize corn with cold water, to which we added a decapitated rat, *Mus norvegicus*, cut into small portions. The rat had died of septicaemic plague, as was shown by the anatomo-pathological aspect and by the enormous quantity of bacilli present in the blood, spleen, liver, etc. On the following day the pig ate, mixed with pieces of raw potato, the liver, spleen, lungs, heart, kidneys and glands of another rat (*M. norvegicus*) which died of septicaemic plague, with an enormous quantity of bacilli in all the organs. On the next day, at two o'clock in the afternoon, the pig ate,

with mashed potatoes, the organs of a guinea-pig (spleen, liver, lungs, heart, kidneys, supra-renal capsules, serous haemorrhagic peritoneal fluid) that died two days after the peritoneal inoculation of a pure culture of plague obtained from the spleen of a rat (*M. norvegicus*) spontaneously infected. On the same day at eight o'clock the pig swallowed the viscera of a cat attacked by primary pneumonic plague and spontaneously infected. The pig showed no signs of illness, always ate well, and perceptibly fattened until abandoned on 15 February, 1909.

Pig No. 2. Female, black with white marks, Yorkshire breed, crossed with pigs of the island, weighing 15 kilograms. On 1 January, 1909, it was inoculated subcutaneously with an emulsion in physiological salt solution of six tubes of pure agar culture of virulent plague bacilli of 27 hours' growth, recently obtained from autopsy of a human case. The pig showed no visible reaction, kept a good appetite and was abandoned on 1 March, 1909.

Pig No. 3. Male, brother of the former, of the same weight and colour. It was also inoculated on 1 January, 1909, intraperitoneally with a pure culture of virulent plague bacilli (the same as administered to the previous pig). The dose consisted of two tubes. There was no sensible reaction, the animal continuing to eat well. It was also abandoned on 1 March, 1909.

Pig No. 4. Black, male, weighing about 12 kilograms. On 8 February, 1909, it ate the bodies of four rats (*M. norvegicus*), without heads; cut into pieces and mixed with maize meal and cold water. The rats had been spontaneously attacked by septicaemic plague, and showed an enormous quantity of bacilli in their organs. On the following day the pig ate another rat (*M. norvegicus*) in the same condition as the former ones and the viscera of a cat, spontaneously attacked, and which had died of bubonic plague. On the following day it swallowed the organs of a man who had rapidly succumbed to the bubonic plague with septicaemia, that is, an inguinal bubo, 200 grams of liver, the gall-bladder and 100 grams of peri-bubonic cellular tissue with strong haemorrhagic oedema. All the organs contained a large quantity of plague bacilli. The animal always kept in good health, being abandoned on 24 April, 1909.

Pig No. 5. Black, male, 13 kilograms in weight. It swallowed on 12 February, 1909, a pure plague culture of 48 hours' standing (corresponding to 14 agar tubes) mixed with maize meal and cold water¹.

¹ Judging from test guinea-pig inoculations the dose of virus swallowed by this pig was sufficient to kill, by subcutaneous injection, 1,400 guinea-pigs of 300 grams in weight.

Furthermore, on the following day, it ate all the body of a rat (*M. norvegicus*) spontaneously attacked and killed by septicaemic plague, with an enormous quantity of bacilli in all its organs. The pig gave no sign of illness, having considerably fattened until abandoned on 24 April, 1909.

Pig No. 6. Black, female, 12 kilograms in weight. It received in the peritoneal cavity on 14 February, 1909, the contents of 79 or 80 Petri dish cultures 48 hours old. The dishes (11 cm. in diameter) were sown with plague bacilli recently obtained from a human body; they were so virulent that an eightieth part of the quantity injected into the peritoneal cavity of the pig killed a guinea-pig weighing 370 grams in $3\frac{1}{2}$ days. The same pig received subcutaneously, on the same occasion, under the same conditions already referred to, an agar culture (Petri dish) mixed with physiological salt solution. At the same time a square decimeter of the skin of the dorsum of the animal was scarified and rubbed strongly with the contents of another Petri dish. Finally the nasal mucous membrane was scarified and rubbed with pure plague culture of the same origin.

The pig did not fall sick. It left the Laboratory in a very fat condition on 24 April, 1909.

Pig No. 7. Black, male, 13 kilograms in weight. It ate on 15 February, 1909, mixed with maize meal, the following portions of the organs of a human case which had died on the same day of bubonic plague with septicaemia (after 36 hours' illness): bubo, 20 grams; spleen, 200 grams; liver, 200 grams; lung, 80 grams, sanguineous fluid, 50 grams. All these organs contained numerous plague bacilli¹.

We did not note any morbid alteration in this pig, in spite of most careful observations. It was abandoned in a much fatter condition on 24 April, 1909.

Pig No. 8. Black, female, 10 kilograms in weight. On 9 March, 1909, it swallowed, mixed with maize meal, pieces of organs from a case which had died on the same day of primary pneumonic plague, viz. all the lung tissues affected by hepatisation and weighing 1,000 grams; part of the spleen of the same, 60 grams; piece of the stomach with sanguineous suffusion, 50 grams. Smears from the lung appeared to be made up exclusively of plague bacilli. On the following day the pig again swallowed in the same vessel human plague organs, this time the

¹ This quantity of virus would be sufficient to kill by subcutaneous inoculation 8,800 guinea-pigs of 250 grams in weight each, as we calculated by the inoculation of some of these animals.

following parts: the lung of another case which had died of primary pneumonic plague, 600 grams; spleen of the same, 200 grams. There was also in the lung a large number of plague bacilli¹.

On the day following the second ingestion the pig appeared low-spirited and without appetite, but this indisposition only lasted some hours, after which the animal ate the afternoon meal very well and continued to keep up its good health until finally abandoned on 24 April, 1909.

Dogs.

Dog No. 1. Male pup, 1.5—2 months old, about two kilograms in weight, of no particular breed. On 4 January, 1909, it ingested a dose of pieces of spleen from a case which had died on the same day of septicaemic plague. In this spleen there was a very large quantity of plague bacilli².

The pup gave no signs of illness and was abandoned on 10 February, 1909.

Dog No. 2. A pet dog (*C. vellosus*), male, 700 grams in weight. On 4 January, 1909, it took *per os* portions of bubo and human spleen of a person who died on the same day of septicaemic plague and showing a very large number of plague bacilli. On this same occasion a portion of the same spleen was converted into an emulsion with salt solution which was injected subcutaneously by the flank³.

The animal died in less than 48 hours. The autopsy made a few hours after death showed the following lesions: at the site of inoculation an extensive zone, reddish-violet and very oedematous and mortified, the oedema extending to the lower corresponding member and to the opposite side of the abdomen; generalised congestion; there were no inguinal buboes, but on the neck there were two glands, one on each side, with sanguineous suffusions. Tonsils very hypertrophied and the lungs strongly congested; spleen dark, very succulent, liver very red and with yellowish zones of superficial necrosis. In a short portion of the

¹ The 1,600 grams of lung swallowed by this pig would have sufficed to kill *per nasum* and *per os* about 220,000 guinea-pigs of 250 grams in weight according to our calculations, after having inoculated a few.

² The dose of virus ingested by this dog would be sufficient to kill, by subcutaneous inoculation, 200 guinea-pigs of 250 grams in weight, as was calculated by injection in some of these animals.

³ The quantity of virus administered to this animal was sufficient to kill, by subcutaneous inoculation, 900 guinea-pigs of 300 grams in weight each, as we calculated by injection of some of these animals.

small intestine near the large one the intestinal mucous membrane was highly congested. The bacteriological examination of the smears from the different organs gave the following results: mortified zone of the site of inoculation, many microbes, plague-like ones being rare. Cervical glands: Some microbes not of plague-like appearance. Pelvic ganglions nil. Mesenteric glands nil. Tonsils: rare plague-like bacilli. Lungs nil. The cultures revealed a long bacillus, staining faintly, without the morphological characteristics of the typical plague bacilli, showing notwithstanding some of their reactions (chains in broth and involution forms in salt agar). With this bacillus we did not succeed in bringing about the death of the injected guinea-pigs. Mixed with this bacillus a staphylococcus, stained by Gram's method, existed in the culture but we did not try to identify it.

Dog No. 3. Male, pet dog, mongrel, weighing about 8 kilograms. On 4 January, 1909, an agar culture of pure plague bacilli was injected intraperitoneally¹. The animal showed no signs of illness, kept a good appetite and was abandoned on 10 February, 1909.

Dog No. 4. Male, setter, weighing about 10 kilograms. On 11 February, 1909, we gave it, *per os*, the spleen and buboes of a cat spontaneously infected by plague, and a piece of spleen and a bubo from a case which succumbed on the same day from septicaemic plague of rapid evolution. These organs contained a large number of plague bacilli. There was no sign whatever of sickness, and the dog was abandoned on 15 February, 1909.

Dog No. 5. Male, lap-dog, mongrel, about 8 kilograms in weight. On 14 January, 1909, we shaved a portion of the skin of the back, about one square decimeter, which we scarified. On this surface we gave a hard friction with fragments of human organs full of plague bacilli and derived from a person who had rapidly succumbed to septicaemic plague. The dog showed no morbid sign, and the animal was abandoned on 15 February, 1909.

Dog No. 6. Male, mongrel, weighing about 15 kilograms. A cutaneous, parasitic disease produced many sore spots over all the skin of its back. This large ulcerated surface was taken advantage of to friction it with a human plague bubo which contained an enormous quantity of bacilli and which was derived from a person who had rapidly died from septicaemic plague. The dog kept up a good appetite, showing no signs whatever of illness, and was abandoned on 15 February, 1909.

¹ The dose injected would be sufficient to kill 400 guinea-pigs of 250 grams in weight each.

Rabbits.

Ten rabbits were inoculated. They were of different sizes, both wild and tame, and were subjected to cutaneous, subcutaneous, peritoneal and *per os* inoculations. For three of the inoculations we used organs of plague-infected human beings, rats and cats and also virulent cultures of plague bacilli. They all died within three to five days, a curious fact being that a tame animal of 2500 grms. in weight succumbed rapidly to a cutaneous friction over a small surface of two square decimeters with plague-infected organs.

Ferrets.

Ferret No. 1. Full-grown male. On 24 January, 1909, we injected subcutaneously a strong dose of virulent pure plague culture. The ferret died in less than four days, showing a necropsy appearance similar to the guinea-pigs and infected in the same way with numerous plague bacilli, as shown by inoculation in guinea-pigs.

Ferret No. 2. Full-grown male. Having shaved about four square centimetres of the dorsal skin, we frictioned it strongly on 18 January, 1909, with a human bubo full of plague bacilli and derived from an individual who had died rapidly from septicaemic plague. The ferret appeared to be healthy until 1 February, when it appeared run down, but still had an appetite. It died on 5 February. The autopsy showed the following lesions: a not very intense subcutaneous congestion, cervical right gland red and swollen, but without the surrounding tissues being inflamed; the left cervical gland, however, was the seat of a plague bubo. There were no noticeable crural or axillary glands; spleen very large; liver dark, smooth, and very congested. Congestion of the lungs, a retro-peritoneal suppurated gland, a mesenteric gland with the characters of the secondary plague bubo of the Austrian Commission; acute suphritis with fatty degeneration. The examination of smears showed the following results: blood: negative. Right cervical gland: numerous plague-like bacilli. Retro-peritoneal gland: negative. Mesenteric gland: few plague-like bacilli. In the cultures no bacillus was obtained that showed plague characteristics. The inoculations also did not reveal infection by plague.

Cats.

Cats Nos. 1 and 2. Both full-grown males. On 21 February, 1909, they ate small pieces of human bubo, spleen and liver highly infected with plague bacilli and derived from an individual who had died in three

days of bubonic septicaemic plague. The cats, three days after the infection, appeared ill and without appetite. It was afterwards noticed that the necks of both appeared swollen, above all in the sub-maxillary regions. On 5 March one of the cats died. At autopsy exactly similar appearances were observed to those of many other spontaneously infected cats we had occasion to examine on Terceira Island. Slightly generalised subcutaneous congestion, swollen glands in all parts, suppurating cervical buboes on both sides, including the sub-maxillary and carotidian glands, the left bubo being the larger, necrotic amygdalitis with large oedema of fauces, tracheitis, broncho-pneumonia with miliary nodules; spleen large and of a claret colour; liver very granular and congested; intense conjunctivitis and keratitis with hypopion. The organs of this animal showed: buboes: numerous plague-like bacilli. Ocular pus: some plague-like bacilli and phagocytes infected with degenerated bacilli. Liver and spleen: few plague-like bacilli. Kidneys: few plague-like bacilli. Lungs: numerous plague-like bacilli. The cultures of the spleen, liver, lungs, blood and bubo revealed plague bacilli. These were determined by inoculation tests.

The second cat was seriously ill for three weeks, but recovered and to-day belongs to one of us.

Goat.

Young female of 8 kilograms in weight. On 12 February, 1909, it received a pure and virulent plague culture of seven agar tubes emulsified in physiological salt solution; two-thirds were introduced intraperitoneally and the remainder subcutaneously. The cultures were taken from human corpses and from that of a cat. The kid gave no signs of acute illness, but it was noticed that it grew thin, and on 1 March, 1909, it would not feed. On the following day it became blind and knocked its head against the walls, dying on 4 March, 1909. The autopsy showed the axillary, inguinal, cervical and popliteal glands to be succulent, but white; the mesenteric and retro-peritoneal glands had the same characteristics. Spleen small and dry. Liver smooth and congested. Lungs discoloured and oedematous. Smears taken from all the glands referred to, and also from the spleen, liver, lungs, kidneys and blood, showed no bacilli at all. All the cultures made from the same organs proved sterile, excepting one from the pelvic gland that showed a bacillus unlike that of plague.

Pigeons.

On 5 January, 1909, eight pigeons were inoculated with cultures of pure and virulent plague bacilli and with the organs of spontaneously plague-infected rats containing a large number of bacilli. We made use of the subcutaneous, intraperitoneal and *per os* inoculations, large doses being administered to each bird¹. None of them showed any sign of illness, and the experiments were abandoned on 1 March, 1909.

Turkey.

Full-grown male. On 12 February, 1909, we forced it to swallow the viscera (spleen, liver, kidneys, supra-renal capsules and lung) and the buboes of three spontaneously plague-infected rats that had succumbed to this disease and in which there was a very large number of bacilli. The turkey at no time showed the slightest sign of illness, keeping up a good appetite until it was abandoned on 24 April, 1909.

Ducks.

On 12 January, 1909, three ducks were inoculated (two of them being males and one female), one subcutaneously, another intraperitoneally and the third *per os*, with the organs of a guinea-pig inoculated with plague, to which it had rapidly succumbed, and of a spontaneously infected rat. The organs contained a large number of plague bacilli². The ducks did not suffer at all, and continued to eat well until they were abandoned on 24 April, 1909.

Chickens.

1st Series. On 20 December, 1908, we inoculated three chickens, two hens and one cock of 900, 910 and 950 grams respectively, with the livers and spleens of spontaneously plague-infected rats with numerous bacilli in these organs. To one fowl we administered *per os* one-third

¹ The dose of culture administered to each animal would be sufficient to kill 50 guinea-pigs of 300 grams each, and the dose of plague-infected organs that fell to the lot of each one would be sufficient to kill 60 guinea-pigs of the same weight, as we calculated by inoculation experiments on some of these animals.

² The dose of mixture of organs administered to each duck would be sufficient to kill, by subcutaneous inoculation, 300 guinea-pigs of 330 grams each in weight, according to experiments made on some of these animals.

of the material employed, with which we also frictioned the nostrils and the nasal fossus. One-third of the material was introduced, emulsified in physiological salt solution, under the skin of the second fowl, and the remaining third was introduced in the same way into the peritoneal cavity of the third bird¹.

Only the bird inoculated intraperitoneally fell sick, showing in the rectum a temperature of 42.5° C. which was maintained for two days, during which it ate little, and had a down-cast appearance with the feathers standing up. It rapidly got better and was abandoned with the others on 24 April, 1909.

2nd Series. On 25 December, 1908, we inoculated 12 chickens, 11 full-grown and a cock-chick. We mixed with cold maize meal virulent plague cultures of human origin which we made the birds swallow, also frictioning their nostrils with the same material. The 11 chickens did not suffer at all, whilst the cock-chick died some days after through the bad treatment inflicted on it by the other chickens (cranial wounds). The autopsy of this chick revealed no signs whatever of infection. The examination of the smears from its organs was negative, the cultures sterile and the inoculations unsuccessful. The 11 chickens were abandoned on 24 April, 1909.

3rd Series. On 15 February, 1909, 25 grown-up chickens were inoculated intraperitoneally and *per os* with pure and virulent plague cultures obtained from the autopsy of an individual who died from a rapid form of illness².

Of these 25 birds, 24 without doubt did not suffer at all, and were abandoned on 24 April, 1909. We ought to note that we placed some Terceira Island guinea-pigs and rabbits (which we have seen are very susceptible to plague) along with the fowls. In spite of close contact with the faeces of the chickens, none of these animals showed any sign of illness. Some days after the inoculation of these 25 chickens (according to our habit, the birds remained under observation in the Laboratory for at least 10 days) another chicken that was under observation in another place escaped, and through the carelessness of a servant it got in among the 25 chickens. Eight days later one of the 26 chickens died, unexpectedly, as it had eaten well at the morning

¹ The quantity of virus administered to each bird would be sufficient to kill 400 guinea-pigs of 250 grams, according to experiments made on some of these animals.

² The dose inoculated into the peritoneal cavity of each bird would be sufficient to kill 40 guinea-pigs of 250 grams each, and that administered *per os* enough to kill 800 guinea-pigs of the same weight, as we calculated by inoculating some of these animals.

meal. We were in doubt whether the chicken which died was the intruder or not. The chicken did not however die of the plague, as was proved at autopsy when the following lesions were observed: severe pulmonary congestion, enteritis with blood suffusions in the intestinal mucous membrane, the contents of which had some modified blood; peritonitis, with haemorrhagic fluid and agglutination of the intestines by false membranes. Smears of the lungs and contents of intestines showed plague-like bacilli, but the cultures did not give chains in broth nor Hankin's involution forms in salt agar. Inoculations into guinea-pigs caused the death of these animals in less than 24 hours, but plague bacilli could not be detected. The disease was not chicken-cholera, but seemed to us to be what French veterinary surgeons call infectious enteritis of chickens.

4th Series. On 12 March, 1909, we inoculated 25 full-grown chickens, intraperitoneally and *per os*, but with a dose more or less double to that administered to the other series. These birds showed no sign of illness, and were abandoned on 24 April, 1909.

5th Series. On 15 March, 1909, we forced 20 full-grown chickens to swallow pieces of a human lung—primary pneumonic plague with lobar hepatisation and with an enormous quantity of plague bacilli¹.

None of these birds showed any sign of illness, and were abandoned on 24 April, 1909.

CONCLUSIONS.

(1) Although our experiments on calves may not be extensive, we think we may affirm that the bovine race, in spite of the large doses inoculated, did not contract the plague.

On Terceira Island we had no knowledge whatever of any case of illness in bovines which could be put down to plague.

(2) As for the pigs, we consider the series of animals on which we experimented fairly large. The doses of virus inoculated were really enormous, far larger than what they would naturally receive.

The experiments led us to conclude that pigs do not contract plague².

¹ The dose ingested by each bird would be sufficient to kill by subcutaneous inoculation 1,000 guinea-pigs of 250 grams each, according to the calculation made by inoculation of some of these animals.

² We succeeded in examining the corpses of four pigs that died rapidly of infectious diseases on Terceira Island. In two of them we noticed illnesses which cause reddish spots on the skin, with haemorrhagic enteritis and generalised adenitis. We ought to state

(3) The experiments made on dogs seem to show that only with very large doses of plague bacilli can infection of these animals be obtained, and it seems beyond doubt that in its normal condition the dog is an animal practically refractory to the plague.

This conclusion proved very interesting to Terceira Island, where dogs have rendered and continue to render great service in rat hunting¹.

(4) The experiments made on rabbits led us to conclude that this animal is, on Terceira Island, very susceptible to plague.

(5) Our experiments on ferrets were made because these animals are extensively employed in rat-hunting, above all in the country.

According to these experiments the ferret is an animal susceptible to plague, but only able to contract an acute form of this disease by inoculation of large doses. However, as the ferret sucks the blood of the rats its use in hunting these animals is not recommended².

(6) Our experiments corroborate those of the Austrian Commission that cats can be infected by plague *per os*, after which they show autopsy

that the adenitis did not appear at all like primary plague buboes of the Austrian Commission, and that the intense reaction so characteristic of the neighbouring glandular tissues was missing. These two pigs died of a pasteurellose that, in our opinion, can never be taken for the plague by anyone accustomed to see this disease. This conclusion is founded on the bacteriological examination of smears from organs, cultures and inoculations in guinea-pigs. Two other pigs succumbed to infection, the lesions in the fauces, epiglottis, larynx, trachea, bronchial tubes and lungs being especially pronounced, there being even false membranes and ulcerations in the larynx, besides sub-mucous congestion and sub-mucous oedema.

In these pigs there were also glandular enfarcts that were far from resembling, however, plague buboes (whether primary of the first or second order, or secondary). There was no haemorrhagic septicaemia in these two pigs; it was probably, however, the illness which French veterinary surgeons call swine pneumo-enteritis, a conclusion drawn from the character of the isolated bacillus and the effect of their inoculation into experimental animals.

We may mention that one of these two latter pigs was under observation in the Laboratory where it was destined to serve for inoculation experiments with plague.

These observations strengthen the conclusions about the insusceptibility of pigs to plague.

¹ We examined the bodies of two dogs, which had rapidly died of infectious diseases. We did not certify the existence of plague, either by anatomo-pathological signs or by bacteriological examination. We can equally mention that we had no knowledge of any case whatever of illness in these animals that could bear any relation to the epidemic.

² We examined the bodies of three ferrets spontaneously infected on Terceira Island. Two of them had suppurating cervical glands in which we did not succeed in identifying the plague bacillus; but the third, having entered a rat-hole, killed one of these animals and died from plague, as was verified by us.

appearances very similar to those of cats spontaneously infected by plague with buboes in the neck¹.

(7) The general conclusion which we draw from our experiments on four kinds of birds, namely, pigeons, ducks, turkey and chickens, especially in regard to the latter, is that these animals are insusceptible to plague².

¹ We made a fairly long analysis of cat-epizootic plague on Terceira Island, finding 23% (23 out of 100 cats examined) attacked by plague. The majority of these cats had cervical buboes, some at least had probably been infected *per os*; others had axillary, inguinal and popliteal (only one) buboes; and in these cases the infection probably occurred through the agency of fleas. Finally, two succumbed to primary pneumonic plague. We will enter more into detail on this subject in a future paper.

² On Terceira Island we examined a considerable number of birds which had spontaneously died during the plague epidemic, namely, 1 parrot, 3 turkeys, 1 sea-gull, 1 blackbird, 4 pigeons and 17 chickens. None of these birds showed any signs of plague on the bacteriological and post-mortem examinations. One of the pigeons was a victim to an acute infectious disease which appeared to be due to an unidentified coccus. Some chickens died of chicken-cholera, and it should be noted that the lesions observed at autopsy could not be confounded with those of plague-infected animals, the bubo being absent, whether the primary of the first or second order, or the secondary of the Austrian Commission.

We are convinced that a sufficiently long practice of the pathological anatomy of plague does not allow us to confound the lesions of this disease with those of chicken-cholera.

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