

the diastolic pressure was not affected by the phenomenon observed above.

The observations on the rate and rhythm of the heart agreed with those of previous observers.

This work was done under the direction of Dr. Henry Ulrich.

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### Experimental Tularemia in Ring-Necked Pheasant.

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In his original description of the disease which he called tularemia, McCoy<sup>1</sup> considered the possible susceptibility of birds to this disease. Included in the list of species which he tested for susceptibility to the disease was the common pigeon. In all, he inoculated 4 pigeons with the spleen of guinea pigs dying from tularemia. He reported that the birds remained alive and apparently well.

In a previous paper<sup>2</sup> we reported that the ruffed grouse is very susceptible to tularemia. In a later report<sup>3</sup> it was stated that a varying susceptibility to this disease had been found in a number of other species of bird which had been tested. Further studies have been carried out on the degree of susceptibility of the ring-necked pheasant to experimental tularemia.

Pheasant No. 1 was inoculated in an open abrasion through the skin of the back, with heart's blood from a grouse dying of experimental tularemia. A control guinea pig inoculated with the same material died on the 3rd day with enlarged glands, and spleen and liver typical of tularemia. The pheasant remained apparently well, and was chloroformed on the 27th day. Its blood showed agglutination for *Bact. tularensis* in a dilution of 1:10 and above. No scar was discernible on the back at the site of inoculation. Necropsy showed internal organs normal. Three guinea pigs were inoculated from pheasant No. 1 as follows:

No. 1. Spleen. Killed on 17th day. Normal. No. 2. Liver.

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<sup>1</sup> McCoy, Geo. W., *Pub. Health Bull.* No. 43, April, 1911.

<sup>2</sup> Green, R. G., and Wade, E. M., *Proc. Soc. Exp. Biol. and Med.*, 1928, xxv, 515.

<sup>3</sup> Green, R. G., Wade, E. M., and Kelly, W., *Proc. Soc. Exp. Biol. and Med.*, 1928, xxv, 637.

Died on 8th day. No findings of typical tularemia. Its liver and spleen were inoculated into another guinea pig, which showed no evidence of tularemia.

Pheasant No. 2. Inoculated in an abrasion through skin of back with the spleen of a guinea pig dead of tularemia. Did not develop any apparent symptoms of disease. Was chloroformed on the 12th day. Agglutination test was negative at the time of inoculation and negative just before death in a dilution of 1:10 and above. Abrasion of the skin perfectly healed. Slight superficial redness at inoculation site on under side of skin. Internal organs appeared to be normal. Guinea pigs were inoculated with tissue as follows:

No. 1. Heart's blood. Chloroformed on 13th day. Normal. No. 2. Liver. Chloroformed on 14th day. Normal. No. 3. Muscle from inoculation site. Chloroformed on 13th day. Normal.

Pheasant No. 3. Inoculated in abrasion through skin on back with spleen of guinea pig dead from tularemia. Pheasant appeared to be perfectly well until it was chloroformed on the 13th day. Inoculation wound perfectly healed. No infiltration. Internal organs appeared to be normal. Agglutination test was negative at the time of inoculation and negative at time of death at dilutions of 1:10 and above. Three guinea pigs inoculated respectively with blood, liver and muscle from inoculation site remained well. Were chloroformed on the 14th day and found to be normal.

Pheasant No. 4. Inoculated subcutaneously and intramuscularly with emulsion of liver of a guinea pig dead from tularemia. A control guinea pig died on the 4th day with inguinal glands and spleen typical of tularemia. The pheasant remained apparently well and was chloroformed on the 26th day. Its blood did not agglutinate *Bact. tularensis* at a dilution of 1:10 and above. A superficial but extensive infiltration was present at the site of inoculation. The lesion was dry, hard, located just under the skin at the site of inoculation and extending into the muscle. Necropsy showed internal organs to be normal in appearance. Guinea pigs were inoculated with tissue as follows:

No. 1. Spleen. Chloroformed on 17th day. Normal. No. 2. Liver. Chloroformed on 17th day. Normal. No. 3. Muscle. Died on 4th day, showing a pneumonia. Some of the injected material still present under skin. Spleen of this pig inoculated into another pig did not produce tularemia.

Six pheasants were then utilized to study further the effect of intramuscular injection of infective material. Pheasants Nos. 5 to 10, inclusive, were inoculated into the breast muscle with  $\frac{1}{2}$  cc. of the same emulsion of spleen from a guinea pig dead of tularemia.

The blood of each pheasant at the time of inoculation failed to agglutinate *Bact. tularensis* in a dilution of 1:10 and above. A control guinea pig inoculated with the same material died on the 3rd day.

Pheasant No. 5. Appeared to be perfectly well the following day and was chloroformed 24 hours after inoculation. There was slight, soft infiltration at inoculation site. Internal organs appeared normal. Three guinea pigs were inoculated with tissue as follows:

No. 1. Blood. Remained well. Chloroformed on the 15th day. Found normal. No. 2. Liver. Died on the 3rd day, showing exudate over abdomen. No gland involvement. Liver and spleen normal. Exudate inoculated into another guinea pig which died on the following day showing exudate over abdomen. Exudate inoculated into 3rd guinea pig in series, which remained well and did not show lesions of tularemia when it was chloroformed on 9th day.

No. 3. Breast muscle. Died on 5th day showing enlargement of both inguinal glands. Spleen and liver typical of tularemia.

Pheasant No. 6. Appeared to be perfectly well when chloroformed on 4th day. Moderate, soft infiltration of muscle at inoculation site. Internal organs appeared normal. Guinea pigs inoculated with tissue as follows:

No. 1. Blood. Remained well. Chloroformed on 14th day. Normal. No. 2. Liver. Became sick and died on the 9th day. Both inguinal glands enlarged. Spleen and liver typical of tularemia. No. 3. Breast muscle. Became sick and died on 6th day. Both inguinal glands enlarged. Spleen and liver typical of tularemia.

Pheasant No. 7. Showed no symptoms of disease. Was chloroformed on the 7th day. Questionable infiltration at inoculation site. Internal organs appeared normal. Agglutination test on 7th day positive in a dilution of 160 complete. Guinea pigs were inoculated with tissue as follows:

No. 1. Breast muscle. Died on 7th day. Right inguinal gland enlarged. Spleen and liver typical of tularemia. No. 2 remained well. Chloroformed on 15th day. Normal. No. 3. Liver. Remained well. Chloroformed on 15th day. Normal.

Pheasant No. 8 remained apparently well. Chloroformed on the 11th day. Slight redness at site of inoculation. Internal organs appeared to be normal. Agglutination test showed complete agglutination in a dilution of 1:320. Three guinea pigs inoculated respectively with blood, liver and breast muscle remained well, and when chloroformed on the 14th day appeared to be normal.

Pheasant No. 9. Did not show any symptoms of disease when chloroformed on the 14th day. No infiltration visible at the site

of inoculation. Internal organs appeared to be normal. Agglutination test positive in a dilution of 1:80. Three guinea pigs inoculated respectively with blood, liver and breast muscle remained well and when chloroformed on the 14th day appeared to be normal.

Pheasant No. 10 appeared to remain perfectly well until it was chloroformed on the 18th day. No infiltration at inoculation site. Internal organs apparently normal. Agglutination test positive in a dilution of 1:160. Three guinea pigs inoculated respectively with blood, liver and breast muscle remained well, and when chloroformed on the 16th day appeared to be normal.

The results obtained by skin inoculations of ring-necked pheasants indicate that tularemia infection is not easily established by such a procedure, if at all. Following the injection of *Bact. tularensis* into the breast muscle, the organism may remain alive in that organ as long as 7 days, as shown by the result obtained on pheasant No. 7. An early invasion by *Bact. tularensis* into the internal organs may occur, as indicated by its presence in the liver of pheasant No. 6, killed on the 4th day after intramuscular injection.

The pheasant appears to rid itself completely of the organism during a period following the 7th day, as it was not found on the 11th, 14th, 18th or 26th days. Specific agglutinins may occur in the blood stream by the 7th day following intramuscular injection, while it appears that no specific agglutinins are produced following cutaneous inoculation. In no case did a pheasant show any symptoms of disease following inoculation of *Bact. tularensis*. It appears, however, that by intramuscular inoculation the organism will remain alive in the breast muscle, may invade internal organs and stimulate the production of specific agglutinins. We may say then that an experimental symptomless infection of tularemia may be produced in the ring-necked pheasant. The difficulties in establishing this infection, however, make it appear that the ring-necked pheasant would be immune to tularemia under conditions of natural infection.

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### Iodine in Maryland Waters in Relation to Goiter.

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A large amount of seafood insures an abundance of iodine in the diet and there is very low goiter incidence in the tidewater region.