

SUMMARY

1. Plasmodium (Garnhamella) coturnixae, is a malaria parasite obtained from a locally available game bird Coturnix coromendelica. Cross infection experiments showed that this parasite could infect the birds of genus Coturnix only, but the birds of the same family like other quails and chick, and also the birds of other family, like duck and canary were not infected by this parasite.
2. To overcome host-specificity of this parasite :
 - a) normal chickens were repeatedly inoculated. Daily ^{inoculation} with heavily infected blood for as long as 20 days could not produce infection in chicks.
 - b) An immunosuppressant drug like corticosteroid, when injected before the inoculation of infected blood could not bring about parasitemia in a resistant host like the chick.
3. If parasitized erythrocytes of the coturnix were incubated with normal chicken serum and then injected intravenously into another coturnix, it could induce parasitemia as readily as when the injected blood was incubated with saline. So, chicken serum did not contain an immune factor which could immobilize either the parasite or the parasitized erythrocyte.

4. Attempts were made to isolate the parasites in a viable condition from the infected Coturnix blood. For the hemolysis of the erythrocytes, anticoturnix erythrocyte hemolysin was produced in rabbits. Such hemolysin treatment did not affect the shape of the merozoites but the latter were found to lie in clusters. The trophozoites and schizonts were round in shape. Such parasites, isolated according to the method of Trager (1954) were viable because when they were injected into fresh Coturnix birds, they produced parasitemia.

5. The nature and kind of hemoglobins in susceptible and resistant birds were investigated :

- a) Both in the susceptible and as well as in the non-susceptible birds the hemoglobin concentration was around 9 gm %. During infection the hemoglobin level of Coturnix decreased considerably.
- b) Paper electrophoresis showed that the pattern of hemoglobin was similar in the Coturnix and the chick. Two hemoglobin bands were observed. The faster moving band was present in smaller amounts than the slow moving band. The faster moving band in the Coturnix was, however, slightly faster than that of the chick.
- c) Polyacrylamide gel electrophoresis also showed that both these two kinds of birds had two kinds of hemoglobins each.

- d) Quantitative analysis by elution showed that the faster moving hemoglobin was 25% of the total hemoglobin and the slower one 75%. Graphical representation of the fractions showed that the two peaks in Coturnix were completely separable, indicating the existence of a 2 mm clear space between the two bands. But in chick the peaks were not so sharply distinct showing the distance between the two bands to be less than 2 mm.
- e) When treated with urea the hemoglobin from coturnix and chick showed three bands. But the relative positions of the bands in coturnix and in chick were different. The middle band in the coturnix was more anodal than in the chick.

6. The sera of both susceptible and non-susceptible birds were investigated.

- a) The total serum protein was lower in the susceptible birds than that in the non-susceptible birds. During infection the serum protein of Coturnix was lower than the normal one.
- b) The serum sodium and potassium levels were more or less same in the susceptible and non-susceptible birds and almost similar to the human.
- c) Paper electrophoresis as well as polyacrylamide gel electrophoresis showed that the gamma globulin of chick, the non-susceptible birds was normally higher than that

of a normal coturnix. During infection the gamma globulin level of coturnix was increased.

- d) Quantitative estimation showed that the gamma globulin of non-susceptible birds was higher than that of susceptible bird. A higher concentration of gamma globulins in the sera of infected Coturnix was observed.

7. The following experiments were carried out in relation to the possibility of the presence of some immunological phenomenon at the back of host-parasite specificity :

- a) Ouchterlony plate tests were performed to find out the presence of naturally occurring antibody in the non-susceptible host against any parasite antigen extractable in 0.154 M saline and 1 M saline. No positive result was obtained in the form of precipitin bands.
- b) When tanned sheep erythrocytes were coated with 1 M saline extract of the parasites and then incubated in the presence of the serum of a non-susceptible bird, like the chick, hemagglutination was observed to occur. These results indicated the possible presence of a naturally occurring antibody in the serum of a resistant bird. Such experiments with the sera of a susceptible bird did not show hemagglutination; but when the sera was derived from an infected bird, strong hemagglutination was observed.

- c) Free merozoites were prepared from heavily infected coturnix erythrocytes by the technique of Trager. When such biologically active merozoites were incubated with chicken and coturnix erythrocytes, a larger number of attachment of the coturnix erythrocytes with the parasite was found to occur than with erythrocytes of the resistant species.
- d) Tanned sheep erythrocytes were coated with 1 M extract of the free parasites. When such treated sheep erythrocytes were incubated with erythrocytes of the chick or the coturnix, a larger number of the susceptible erythrocytes had attached the treated sheep erythrocytes than the non-susceptible erythrocytes.
- e) Chicks normally attain immunological competence at around the 13th day of embryonic life. When chick embryos were inoculated with infected coturnix blood on the 11th and 13th day of embryonic life, and then allowed to hatch at the usual time, it was found that even then, the chicks did not become infected.