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COMPARISON OF SYMPTOMS (TEMPERATURE FLUCTUATIONS) IN DOGS INFECTED WITH TWO STRAINS OF *EHRLICHIA CANIS*

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Temperature responses in groups of dogs infected with two strains of *E. canis* viz. Lymphocytic and neutrophilic are compared in this study. The dogs infected with lymphocytic isolate showed typical exacerbations and remissions in temperature on alternate days while slight rise of temperature was seen in dogs infected with neutrophilic isolate of *E. canis*.

INTRODUCTION

Canine ehrlichiosis is a febrile debilitating disease of dogs characterized by anemia and other signs. Two strains of *Ehrlichia canis* i.e. lymphocytic (1962 Okl. isolate) in which the organism as a morula is found predominantly in the cytoplasm of lymphocytes and monocytes and in contrast morulae of neutrophilic isolate (1971 Okl. isolate) has been found exclusively in neutrophils, occasionally in eosinophils and never in other leukocytes (Ewing, *et al.*, 1963; Ewing, *et al.*, 1971; Hayat, 1972 and Hayat *et al.*, 1972).

The lymphocytic isolate was quite pathogenic to pups but not to adult dogs (Ewing 1964 and 1965). The disease caused by the Arkansas neutrophilic isolate seems to be somewhat milder. The Oklahoma neutrophilic isolate also caused a relatively milder disorder in the naturally infected and experimentally exposed dogs.

It is generally agreed that after an incubation period of one to three weeks (Malherbe, 1947 and 1948; Haig, 1955; Bool and Suttmoller, 1957; Raghavachari and Reddy, 1958 and Ewing and Buckner, 1965b) a rise in the body temperature occurs, often the first symptom of the disease. Temperature curves of dogs infected with *Ehrlichia canis* (lymphocytic isolate) are often very characteristic showing exacerbations and remissions on alternate days reaching a peak of 106°F to 107°F, then gradually coming down to lower peaks and to normal range (Neitz and Thomas, 1938; Lawrence, 1938; Malherbe, 1947 and 1948; Haig, 1955; Bool and Suttmoller 1957 and Ewing and Buckner 1965 a and 1965b).

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MATERIALS AND METHODS

Three experiments were performed. In the first experiment, 6 pups were exposed to the 1962 Oklahoma isolate of *Ehrlichia canis* by injecting each with 5 ml. of whole blood intravenously. Four pups served as uninoculated controls. Before exposure, the temperature of all those ten dogs were taken and postexposure temperature were also recorded. In second experiment four pups were exposed to neutrophilic isolate of *E. canis* (same dose) while two pups served as uninoculated controls. Since the pups selected for experiment 1 and 2 belonged to two different litters, a third experiment was conducted to study both isolates simultaneously. A litter of 7 pups was used; three pups were subjected to the lymphocytic isolate, and equal number to the neutrophilic isolate and one pup served as uninoculated control. All studies were the same as those conducted for the first two experiments.

RESULTS

Experiment 1.

The temperature pattern in all the six pups infected with lymphocytic isolate of *Ehrlichia canis* was essentially the same. For the purpose of brevity, therefore one graph showing body temperature response of a principal and a control animal which is representative of all experimental subjects is included. Presence of morulae in the peripheral blood is also shown in the graphs. Temperature response (Fig. 1) were very characteristic showing exacerbations and remissions roughly on alternate days beginning on an average of 11.83 days postexposure. Temperature reached a peak of 106°F to 107°F and then gradually dropped to lower peaks and to normal range. These findings were similar to the findings of Neitz and Thomas (1938); Lawrence (1938); Malherbe (1947 and 1948); Bool and Suttmoller (1957) and Ewing and Buckner (1965a and 1965b). In the present study a higher parasitemia (Fig. 1) was generally observed in infected dogs on days when they had a higher temperature. Morulae (Fig. 2) were few or absent from the peripheral blood lymphocytes during the remission periods. The pattern, however was not consistent enough throughout the study to conclude that it is a uniform feature of the disease.

Experiment 2.

Clinical signs attendant with infection produced by the 1970 Oklahoma isolate in the four principals were few and quite mild. A slight rise of body temperature (Fig. 3) occurred on an average of 21.5 days (range 18 to 24 days) postexposure. The duration of febrile period varied from 7-14 days and

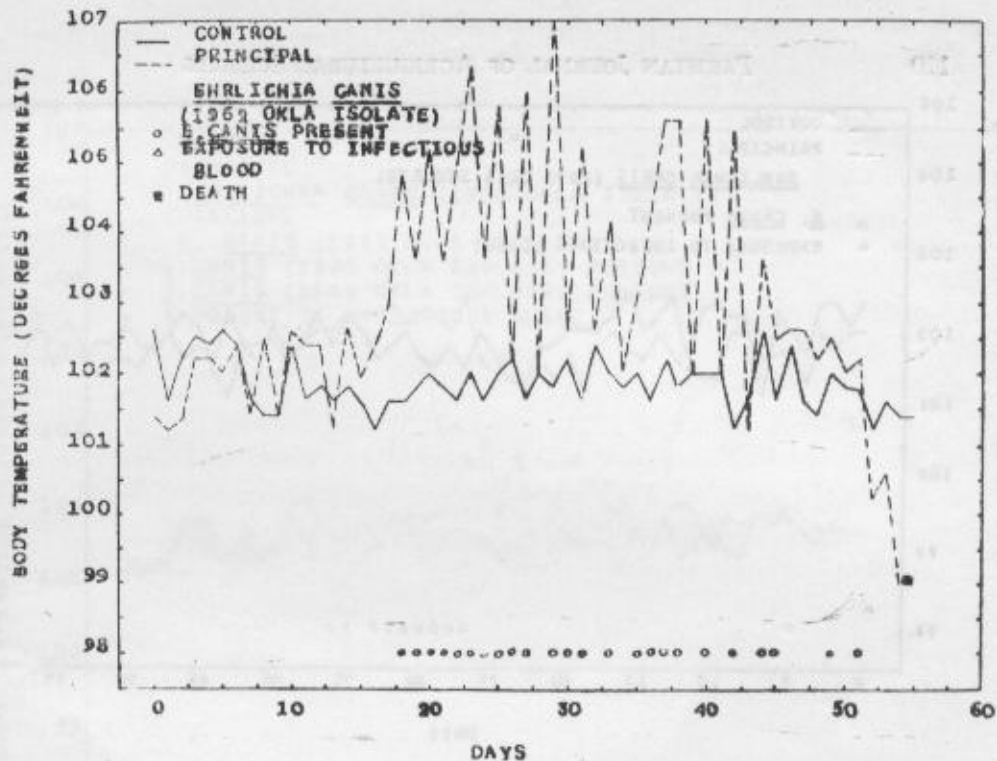


Figure:1 Parasitemia and body temperature fluctuations in a representative principal and a littermate control; principal exposed to *E. canis* 1962 Oklahoma Isolate

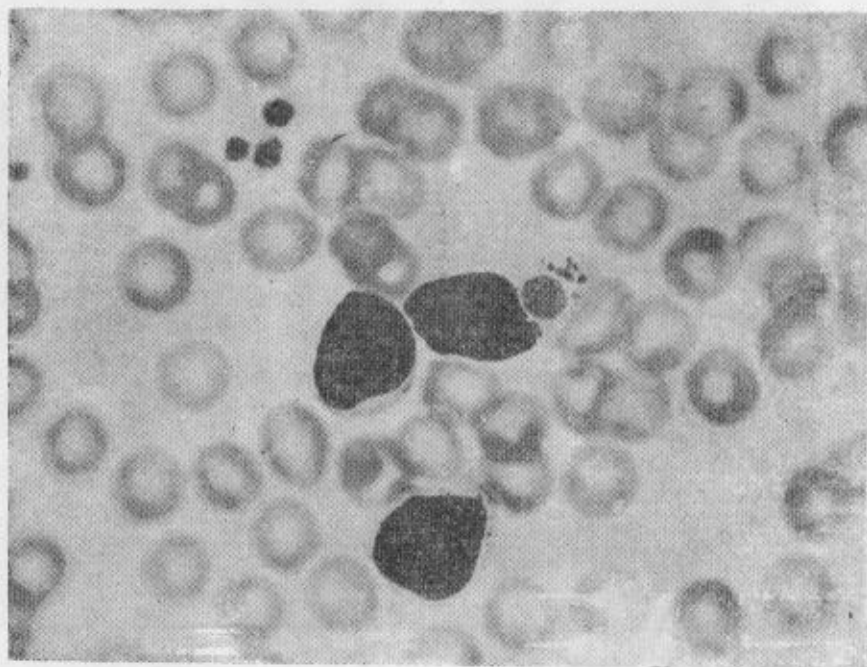


Figure : 2 Lymphocyte containing morula of *Ehrlichia canis*, 1962 Oklahoma isolate.

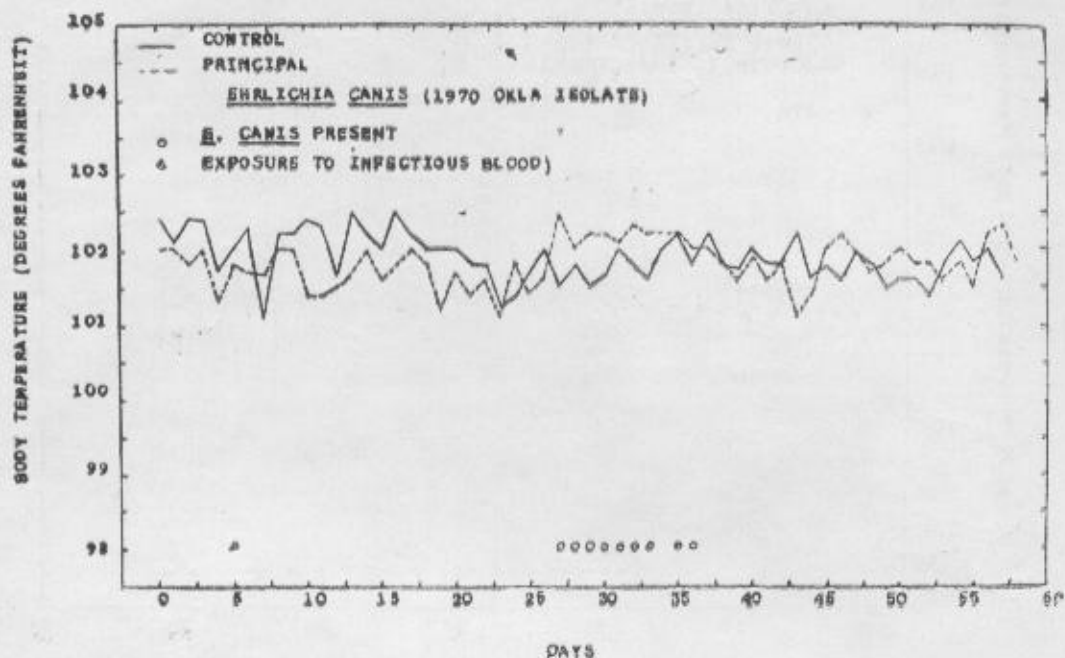


Figure 3 Parasitemia and body temperature fluctuations in representative principal and a littermate control principal exposed to *E. canis*, 1970 Oklahoma isolate

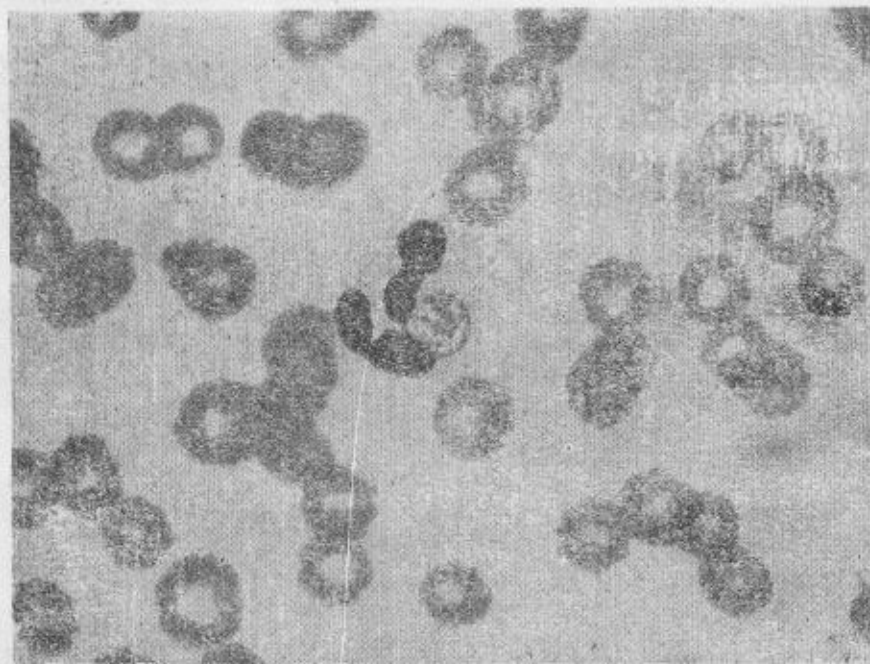


Figure 4. Neutrophil containing morula of *Ehrlichia canis* 1970 Oklahoma isolate.

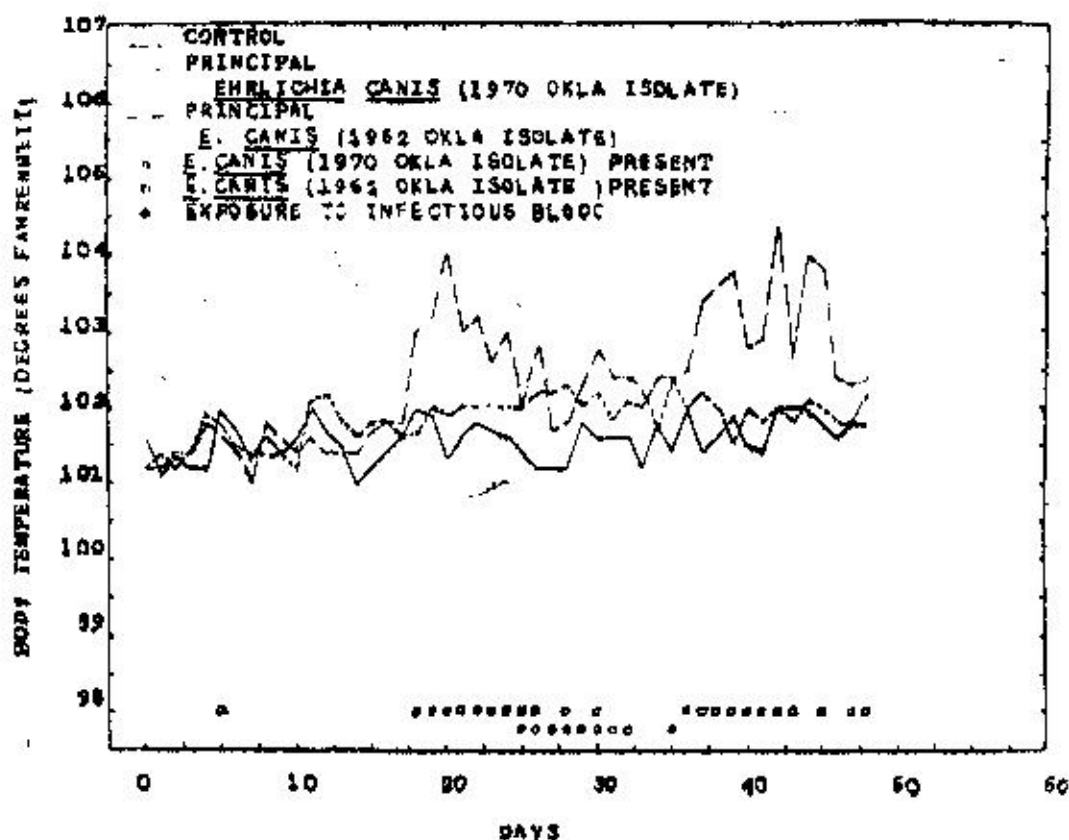


Figure 5 Parasitemia and body temperature fluctuations in two representative principals and a littermate control; one principal exposed to *E. canis*, 1962 Oklahoma isolate and the other to *E. canis*, 1970 Oklahoma isolate

roughly corresponded with the presence of morulae in the peripheral blood (Fig. 4). The characteristic pattern of temperature fluctuations on alternate days produced by the 1962 Oklahoma isolate did not occur in pups infected with this strain.

Experiment 3.

The first sign of infection with both strains of *E. canis* was rise in body temperature. The febrile period in both cases corresponded roughly with the presence of morulae in the peripheral blood (Fig. 5) the body temperature of pups exposed to the 1962 Oklahoma isolate in this experiment never rose above 105°F and remained below 104°F in most cases. Exacerbations and remissions occurred but were not as marked as those in experiment 1 (Fig. 5). Among those exposed to the 1970 Oklahoma isolate the highest temperature observed was 102.8°F and this was seen in one pup, 25 days after exposure. These results are quite similar to those obtained in experiment 2 (Fig. 3). The disease produced by the 1962 Oklahoma isolate was however, less severe in pups in third experiment than those in experiment 1 (Fig. 1)

DISCUSSION

In the first group of dogs infected with lymphocytic isolate of *Ehrlichia canis*, temperature responses were very characteristic showing exacerbations and remissions. These findings are similar to the findings of Neitz and Thomas (1938); Lawrence (1938); Malherbe (1947 and 1948); Bool and Suttmoller (1957) and Ewing and Buckner (1965a and 1965b). A slight rise of body temperature occurred on an average of 21.5 days post-exposure. The duration of the febrile period varied from 7-14 days and roughly corresponded with the presence of morulae in the peripheral blood. The characteristic pattern of temperature fluctuations on alternate days produced by the 1962 Oklahoma isolate did not occur in pups infected with this strain. From temperature responses and other signs, it seems that 1970 Oklahoma isolate produces a milder form of ehrlichiosis than does that 1962 Oklahoma isolate but it has similarities to the 1970 Arkansas isolate reported by Ewing, *et al.*, (1971). Although dogs in third experiment exposed to the 1962 Oklahoma isolate were not affected as severely as those in experiment 1 but the general pattern of the disease was similar. It is not possible to state why the dogs reacted differently but difference in breed susceptibility to canine ehrlichiosis are well documented in the literature (Huxsoll, *et al.*, 1970 and Seamer and Snap, 1970).

The neutrophilic isolate remains in the peripheral blood for a shorter period than does the lymphocytic isolate, which in this study persisted for

50 days after their first appearance. It is perhaps presumptuous to state that the mild strain of the organism is ablated from the peripheral blood at an early stage.

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