

COMPARATIVE STUDIES ON *SALMONELLA* STRAINS ISOLATED IN PALESTINE FROM CAMELS AND A HUMAN BEING

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Edwards reported in 1938 that he had isolated from ducks a *Salmonella* strain which showed the antigenic formula VIII, XX, i, z6. This strain was called *S. kentucky*. Olitzki & Ellenbogen (1940) reported an enteric infection of camels in Palestine caused by a *Salmonella* strain which was isolated from the blood and the abdominal organs of three camels showing enteric symptoms and cachexia. This strain showed the antigenic formula of *S. kentucky*, but could be differentiated from it by its biochemical properties. Of nineteen camel sera, nine contained H- and O-agglutinins for this strain; the other ten sera O-agglutinins only. In 1941 Hirsch isolated in Haifa from the faeces of a man a *Salmonella* strain which showed the same antigenic formula. A brief report follows:

Date of examination 27 July 1941. Name: A. K., 25 years old. Residence: Labour Settlement, Yajur. Suffered during 2 days from a mild rise in temperature and headache. On the first day of the illness diarrhoea without blood. Denied having eaten camel flesh or sausage prepared from camel flesh. In this settlement there appeared during some months sporadic cases of gastro-enteritis. The causative strain was apparently *S. typhi murium*, since its presence was demonstrated in all these cases. In the case reported, however, the O-antigen of *S. typhi murium* could not be demonstrated, and this fact led to further investigation with the result that a strain with the formula of *S. kentucky* was isolated from the stools. It is possible that abortive infections of the same type occurred in the settlement, but remained undiagnosed.

Comparative studies were carried out in order to ascertain whether the three different strains, the original *S. kentucky*, the camel strain and the human strain from Haifa, were identical. Absorption tests were carried out with six different rabbit sera. Three of the sera were prepared by immunization with bacteria heated at 60° C. for 30 min. and three others by immunization with bacteria heated at 100° C. for 2 hr. By absorption of these sera with the homologous or heterologous strains the H- and the O-agglutinins were completely removed. All three strains were therefore antigenically identical.

The pathogenicity of the strains for mice was very low. If the bacteria were fed once or twice to mice, deaths did not occur. But when the bacteria were given on 8 consecutive days, each day 100×10^6 bacteria suspended in water, the following results were observed. Within 17 days after the last feeding thirty-one of fifty mice fed repeatedly with *S. kentucky*, twenty-eight fed with the camel strain and twenty-four fed with the human strain died. In 75–86% of the mice remaining alive the organisms were not found.

The fermenting activities of the three strains were similar. All three strains produced acid and gas from glucose, mannitol, maltose, arabinose and xylose, they did not attack lactose and sucrose. H₂S was formed on Kligler's medium. The following differences were observed between the original strain of *S. kentucky* and the Palestine strains: the

former produced acid and gas from *m*-inositol, while the local strains failed to produce it. On semi-solid medium containing 1-7 parts of nutrient agar and 1% of glycerol *S. kentucky* produced acid and gas within 24 hr.; the Palestine strains showed only a slight acid production 3-5 days after the inoculation. On plain broth with the addition of 1% of glycerol (pH 7.4) *S. kentucky* produced acid and gas within 24 hr., the Palestine strains left the reaction unchanged within an observation time of 5 days.

SUMMARY

Salmonella strains isolated in Palestine from camels could not be differentiated from a human strain isolated in the same country. The Palestine strains differ from *S. kentucky* by lower fermenting activities, but are antigenically identical with it.

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