

THEILERIOSIS

Report of
a workshop held
in Nairobi, Kenya,
7-9 December
1976

Editors:
J.B. Henson
and
Marilyn Campbell

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International
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on /cattle production/, various means of effective /disease control/,
incidence in other species of /bovidae/; discusses /research/ activities;
and the need for /scientific cooperation/ and /information
dissemination/; includes /recommendation/s.

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Research in Theileriosis at the Faculty of Veterinary Medicine, University of Nairobi

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Pathology and Pathogenesis of East Coast Fever (ECF)

Gross lesions in natural bovine East Coast Fever (ECF) found at necropsy were pooled together and described to give an indication of the variety of lesions and their incidence in various organs. Of particular importance was the discovery of macroscopic lymphoid aggregates (pseudoinfarcts) in the gallbladder, heart, and small intestines. Such foci of lymphoid hyperplasia had been reported by previous workers to form in the kidney, abomasum, liver, and lungs in that descending order of frequency (1).

The pathological lesions in bovine experimentally infected with ECF have been described. At autopsy the most common findings were lung edema, abomasal ulcers, and straw-coloured fluids in the body cavities. Enlargement of the lymph nodes and the spleen was also observed in all those cases that had short courses of the disease.

Histological examinations of the organs showed aggregates of lymphocytic cells especially in the liver, kidneys, lungs, and the glandular mucosae of the abomasum.

In the majority of cases the lymphocytic cell infiltration was seen especially around the blood vessels. However, in the lungs and in the kidneys the cells were also seen around the walls of the bronchioles and glomeruli, respectively. They were also seen around hepatic triads in the liver. In a few cases the blood vessels of the brain were infiltrated with lymphocytes. Degenerative

changes were also observed in the liver and kidneys and some of the lymphocytic aggregates in the body organs were necrotic (2).

A study of the pathogenesis and pathology of ECF induced by irradiated *Theileria parva*-infected ticks has been described. The infected adult *Rhipicephalus appendiculatus* ticks were subjected to radiation from a ⁶⁰Co source at the rate of 3.59 krads per minute. Ticks were irradiated at dose levels of 0, 10, 20, 30, 50, and 70 krads, and then attached to ECF-susceptible steers. Irradiation at 10 krads had no effect on the parasites whereas at 20 and 30 krads the pathogenicity of *T. parva* was reduced and the course of the disease in the steers altered to such an extent that it could only be detected by the presence of agglutinating antibodies revealed by a C.A. Test. The steers were not affected by 10-tick challenge. Three steers infected with ticks irradiated at 50 krads died after a 10-tick challenge infection and at 70 krads ticks did not attach on the steers (3).

Salivary gland acini of adult *R. appendiculatus* ticks and bovine tissue infected with *T. parva* (Muguga) have been studied by electron microscope. Different forms of the organisms, representing different stages of the developmental cycle in the ticks and bovine tissue, are described. The mode of division at different stages of development is also described (4).

The sequence of ultrastructural changes of bovine platelets during the fatal course

of ECF was swelling, formation of vacuoles, pseudopodia, and indentations; then thrombocytorrhexis and degranulation; and finally, thrombocytolysis. These changes lead to thrombocytopenia and release of serotonin, resulting in petechiations and pulmonary edema (5).

Immunology

A study was made of the effects of serum and α -globulins from vaccinated cattle (donor cattle) given to cattle (principals) exposed to *T. parva* infection (ECF). The principals were treated with normal serum, with serum containing high antibody titre against *T. parva* (as evaluated by Indirect Fluorescent Antibody (IFA) technique), or with globulins prepared from normal and from immune serums. For exposure, the principals were inoculated with standardized suspension of the tick *R. appendiculatus* containing *T. parva* infective particles. Comparison was made between treatments with normal serum and globulin and treatments with immune serum and globulin, using observations of time lapse after exposure to febrile response (39.5 °C) to appearance of the *T. parva* macro-schizonts and to death. In addition hematologic changes were determined. Neither establishment of infection nor the clinical and hematologic changes in the principals were influenced by their treatment with immune serum or concentrated globulin; all died of ECF. Humoral antibodies did not protect cattle against fatal ECF nor was enhancement of *T. parva* infection observed (6).

Bovine peripheral leukocytes were used in a migration inhibition test to detect sensitization to *T. parva* antigen. Of animals exposed to *T. parva* antigens, 76% yielded sensitive cells. The reaction was most efficiently induced by use of living *T. parva*. Migration of cells from control animals was not inhibited. In some animals the presence of sensitive cells in the peripheral circulation was shown to persist for up to 8 mo after exposure to experimental *T. parva* infection. The

significance of cells that are sensitive to *T. parva* antigens in ECF is not known (7).

Treatment

The calves were infected with ECF parasites and after development of the disease, evidenced by fever, lymph node enlargement, and demonstration of macro-schizonts in the lymph node smears, they were treated with Actinomycin D.

Treatment for 5 consecutive days at a dosage level of 0.1-4.8 μ g per kg body weight, and for 2 days with 9.0 μ g per kg, failed to suppress the disease and all died. One calf treated with Actinomycin D for 4 days at a level of 9.0 μ g per kg completely recovered from the disease. After recovery this animal had high antibody titre and failed to react to ECF challenge (8).

Present Research

Physiochemical heterogeneity of gamma globulin in cattle experimentally infected with ECF (*T. parva* infection) is being studied, including:

- (a) isolation and characterization of the two serum globulin population IgG and IgM where antibody activity is usually localized; and
- (b) sequence of occurrence and persistence of each molecular species of the globulin as the disease progresses.

Chemotherapy studies on the treatment of cattle infected with *T. parva* using three antimitotic and anticancer drugs isolated from plants in Kenya are also being done, as well as a study of the development of *T. parva* at the point of injection on cattle using an electron microscope.

There are five professional staff and four technical staff involved in research on theileriosis.

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