THE EFFECT OF PROLONGED ORAL ADMINISTRATION OF OXYTETRACYCLINE ON THE COURSE OF HEARTWATER (COWDRIA RUMINANTUM) INFECTION IN SHEEP

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SUMMARY

The effect of the prolonged oral administration of tetracycline on the course of artificially-induced heartwater in sheep was investigated. It was shown that the course of the disease could be greatly modified by this treatment, only one sheep in thirty showing typical heartwater during a 38-day period post inoculation. All the remaining sheep were immune when challenged with heartwater after 38 days. The practical implications of these findings and the possible development of drug-resistance are discussed. Attention is drawn to the absence of significant side effects following high-level feeding of oxytetracycline to sheep for a prolonged period.

INTRODUCTION

Heartwater has been, and still is, a major cause of mortality in cattle, sheep and goats on the continent of Africa. In areas where the disease is endemic, stock-farming was practically impossible before methods of immunisation or therapy had been developed. Neitz (1939) showed that the sulphonamide drug “uleron” had a marked depressant effect on the course of the heartwater reaction. This discovery led to intensive investigation into the therapy of heartwater, and it soon became evident that a number of sulphonamides could be successfully used. Success in treatment was only achieved, however, when the drugs were administered early in the course of the disease, and for prolonged periods.

Weiss, Haig and Alexander (1952) showed that chlortetracycline was considerably more effective than the sulphonamide drugs in the treatment of heartwater. Haig, Alexander and Weiss (1954) later demonstrated that oxytetracycline was also effective in the treatment of the disease.

The active immunisation of calves against heartwater was first described by Neitz and Alexander (1941), when they showed that calves under 3 weeks of age inoculated intravenously with heartwater-infected blood showed little or no reaction, but developed a solid immunity to the disease. Older calves and adult cattle developed symptoms of heartwater and heavy losses occurred unless successful treatment was applied. Since the advent of the tetracycline antibiotics, however, successful active immunisation of adult animals has become a practical proposition. Heartwater-infected blood is inoculated intravenously and when a febrile response commences, tetracycline antibiotic is administered intravenously or intramuscularly, one treatment usually sufficient. The recovered animals are then solidly immune to heartwater as long as they are continually exposed to re-infection which serves to maintain the preimmune state.

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Adult sheep can be immunised in exactly the same way as cattle. Usually, however, larger numbers of animals are involved which renders the procedure difficult. The immunisation of sheep against heartwater has become an important problem in recent years, as more and more farmers are moving sheep into heartwater infected areas of Africa. Poole (1962) has shown that if sheep artificially infected with heartwater are injected intramuscularly with chlortetracycline on the 10th and 12th days post inoculation the disease will be suppressed and immunity would develop. A single administration of the drug on the 10th day did not suffice to control the infection.

This investigation was designed to determine whether oral administration of oxytetracycline could be used to replace parenteral administration of the drug in an immunisation scheme in sheep.

MATERIALS AND METHODS

The oral route of administration of the antibiotic was selected since this procedure requires a minimum of labour. To obviate daily handling of test animals the drug was mixed with a maize cob-meal base. A small trial was performed to determine the average daily intake of this meal, and it was found that sheep consumed an average of 500 gm of meal per head per day.

A palatability trial was then carried out to determine whether sheep would take the meal when oxytetracycline in the form of 'Terramycin A/D Fortified Crumbles'* was added to the meal. Levels of up to 200 mgm per 500 gm of meal proved to be acceptable to the sheep although at the highest level some hesitancy to feed was observed.

Three different levels of the drug were used, namely, 100, 150 and 200 mgm per 500 gm of meal.

Forty heartwater-susceptible, adult merino sheep were divided into four groups of 10 each, and each batch was housed in a separate pen in the same stable. Group A was the untreated control group, group B received 100 mgm per 500 gm meal per day, group C 150 mgm, and group D 200 mgm. The control group received exactly the same daily ration as the other three groups, the only difference being the absence of antibiotic in the meal.

Each morning the feed troughs were filled with the meal, and only when all four groups had completed this meal, did the sheep receive their daily ration of lucerne. Water was freely available at all times. The feeding of antibiotic was commenced one day prior to the inoculation of the heartwater agent, and continued for a period of 25 days.

Each sheep in the trial was inoculated with 5 ml of fresh sheep's blood infected with the Ball 3 strain of heartwater after which temperatures were taken daily. The sheep were observed for a period of 38 days.

All surviving sheep were challenged on the 38th day by the intravenous inoculation of 5 ml of Ball 3 heartwater blood. Eleven susceptible sheep were also inoculated as controls on the challenge procedure. Dead sheep were autopsied and brain smears prepared, stained with Giemsa, and examined for the causal agent of heartwater, *Cowdria ruminantium*.

RESULTS

Group A

All ten untreated control animals developed typical heartwater, with febrile responses of up to 107·6°F, hyperaesthesia, rapid breathing, and finally prostration, galloping movements and foaming at the mouth and nose. Despite efforts to salvage these sheep by the parenteral administration of antibiotics, 7 out of 10 died. Autopsies revealed lesions characteristic of heartwater infection, namely, swelling of the spleen and liver, ascites, hydropericardium, hydrothorax, sub-epicardial and sub-endocardial haemorrhages and mild gastroenteritis. Giemsa-stained hippocampus

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