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Summary only

AN ATTEMPT TO CONTROL HYDATID DISEASE IN
ANIMALS IN AN ISOLATED REGION
OF NEW ZEALAND*

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A FIELD TRIAL to study problems of controlling hydatid disease in man was initiated in 1943 on 48 farms in the Maniototo County, Otago. The methods adopted for control of the disease were:

- (1) Educational efforts, by which farmers were instructed in the life cycle of the parasite, and the necessity to provide suitable kennels for dogs, the prevention of dogs gaining access to raw offal and effective burial of all dead sheep.
- (2) Dosing of dogs with arecoline hydrobromide at three-monthly intervals.

The trial was conducted in an area which is geographically isolated by hills although it is "open" to the movement of both stock and dogs. Altogether, some 50,000 sheep per year were grazed in the area and about 350 dogs presented for dosing. Further description of the trial is provided by Gemmell (1958).

The trial may be divided into three periods:

- (1) 1943-51: During this time, the extension programme and dosing of dogs was conducted by a livestock instructor, Department of Agriculture. Progress in the control of the disease was determined by examination of livers of sheep and lambs and noting the incidence of cysts.
- (2) 1952-57: Arecoline hydrobromide was made available for owners to dose their own dogs at three-monthly intervals, and dog owners continued without supervision to attempt to prevent animals gaining access to sheep offal. No examinations of livers were made.
- (3) 1958-63: Dosing of dogs with arecoline hydrobromide at three-monthly intervals was conducted by trained personnel. Also during this period, studies were con-

* Data to be published in full elsewhere.

ducted at 11 farms isolated in one of the valleys of the area — the Styx Valley — on the epidemiology of the species of taeniid tapeworm which cause economic loss to the meat industry, and on the value of the dosing programme.

The paper reported some of the major practical findings from the whole trial area and especially of the investigations undertaken in the Styx Valley, and these were discussed in relation to the problems of "limiting" the public health significance of *Echinococcus granulosus* and the economic significance of *Taenia hydatigena* and *T. ovis*.

During the first period of the trial there was a high incidence of "parasitic" lesions in the livers of both sheep and lambs, although, with the latter, a marked decrease in incidence of cysts occurred (from about 77% to 40%). The results from the last period suggested that the incidence of lesions in adult sheep remained high (about 40%), but that in lambs decreased and averaged less than 20%.

Examination of sheep randomly chosen from farms in the Styx Valley has shown that the prevalence of *E. granulosus* compared to other parasitic lesions in sheep has fallen and is now very low. During the last period of the trial a slight decrease in the percentage of sheep with cysts of *T. hydatigena* was observed, but the prevalence of cysts of *T. ovis* has probably increased.

The incidence of tapeworms in dogs decreased during the trial; most infections were due to *T. hydatigena* or *T. ovis*. While considerable between-farm differences in the patterns of liver infection in lambs were observed, there frequently was no close association between the number of dogs infected with tapeworm and the percentage of lambs with parasitic liver damage on the same farm. Factors concerned in the epidemiology of cestode infections on these farms were discussed and it was suggested that the widespread prevalence of parasitic lesions in lamb livers, even when none or only a few dogs were infected with *T. hydatigena*, was consistent with a high egg production, an efficient egg-dispersal mechanism, as well as a long survival time for the eggs of this species.

Data on the prevalence of cystercerci of *T. hydatigena* and *T. ovis* in sheep and lambs suggested there was a mechanism to limit the number of sites of infection in the animal, irrespective of the number of tapeworm eggs available and also that competition existed between these *Taenia* species.

The number of dogs available for treatment each dosing round was always less than the number registered. Exam-

ples were cited where undosed dogs were associated with spread of infection on some farms. In addition, the variability of arecoline hydrobromide in causing removal of *E. granulosus* and *T. ovis* from the animal and in purging dogs was important in limiting the efficiency of the dosing programme. Because of these limitations of arecoline hydrobromide, it seemed possible for tapeworm infection to reach patency and be naturally eliminated, up to two years later, despite regular three-monthly diagnostic treatments, without it being detected.

Testing of the dogs, however, has shown that some animals gained access to raw sheep offal throughout the trial, despite intensive field educational work. The human error continued to occur even when owner co-operation was excellent and when the prevalence of hydatid cysts in sheep had been greatly reduced. In spite of these problems, the "Styx" trial has shown it to be possible to obtain substantial improvements and to limit the prevalence of *E. granulosus*.

REFERENCE

Gemmell, M. A. (1958): *N.Z. Med. J.*, 57: 442.

DISCUSSION

G. C. THOMPSON (COMMENT): Mr Gemmell has claimed that it has been possible to limit hydatidosis in sheep. Only continued examination of slaughtered sheep will strengthen this claim, but complete elimination of *Echinococcus* infections cannot be hoped for when fresh sheep, possibly infected, are occasionally brought into the area. New dogs, in spite of previous dosing and testing with arecoline hydrobromide, may also introduce fresh infection.

The lower degree of improvement in the prevalence of *Taenia hydatigena* and the correspondingly lower improvement in clean livers probably indicate a higher biotic potential for this parasite, a greater resistance to the effects of arecoline, and a lower efficiency of dog owners in preventing access to the cystic stage in sheep.

Both of these trends, and also the increase of infection with *T. ovis* have been observed to some degree in the national hydatid control campaign. Some local areas have reduced the rate of infection in dogs with *Echinococcus granulosus* far below the level which could be expected by frequency of dosing alone, while very many individual dog-owners have maintained their dogs apparently free from infection for several years. Widespread reports from freezing works indicate a considerable reduction of infection in livers and a reduction in the number of cysts in livers still infected. A survey conducted by the Department of Agriculture throughout the past three killing seasons shows a reduction of 10% in the incidence of hydatid cysts in sheep livers.

Little progress has been achieved nationally in the control of *T. hydatigena*. While the present level of infection in dogs determined by periodic dosing with arecoline is less than half that found in 1959, this is probably due to the frequency of dosing rather than to improvement in prevention of access to infection. The tremendous biotic potential of this parasite has been demonstrated on Motutapu Island where, after a period of about two years' freedom from infection in dogs and a steady improvement in clean lamb livers to a level of above 94%, one dog apparently infected for one or two months caused a reduction in clean livers to 69%, infected at least 365 lambs in one consignment, of 1,196, and may in fact have infected several hundreds of lambs.

DR W. A. G. CHARLESTON:

- (1) *What is the reliability of removal by arecoline hydrobromide of T. hydatigena in the prepotent phase?*
 - (2) *Does the speaker know when lambs are exposed to first infection of T. hydatigena?*
 - (3) *What is the period of persistence of T. hydatigena eggs on the pasture?*
- (1) No information is available on any differential effects of arecoline hydrobromide between mature and immature *T. hydatigena*.
 - (2) We have not examined lambs at ages younger than three months. In some of them, of course, parasitic lesions are well established in the liver.
 - (3) The only work on this subject was reported by G. K. Sweatman and R. J. Williams (1963: *Res. vet. Sci.* 4: 199) at this Unit. These authors showed that tapeworm eggs may survive and are available for at least one year in Central Otago with its quasi continental climate. In the West Coast of New Zealand, with its high rainfall, most eggs were no longer available, being washed in the soil profile within the year.