

the propagation of worm diseases, distinguishing them from the kind of disease caused by bacterial or protozoan parasites, which are capable of multiplication within the body of the animal in which they are living.

Where parasites can multiply in this way there is some reason for supposing that the initial infection is a most important step in the disease-producing process. If, however, every individual parasite requires to be picked up from outside, as is the case with parasitic worms, the relative importance of the initial introduction of infection appears to be very little indeed, and is of no practical consequence at all where, as with the parasites under discussion, all communities of animals, both healthy as well as diseased, are invariably infected. In such an instance as this it must be concluded that the environment of the grazing animal, which so largely governs the increase of the parasites, is of paramount importance.

Egg-production Powers

The second important point to consider is the remarkable egg-producing

powers of the worms. The egg-production of some parasitic worms is numbered in tens of thousands daily per individual female, and although most of the worms with which we are concerned probably produce less, the daily output of eggs by infected grazing animals is very great indeed. A healthy sheep carrying an infection of trichostrongyles (intestinal worms) may pass some 200,000 to 400,000 eggs daily, and a diseased sheep between 9,000,000 and 30,000,000; a healthy horse carrying only a light infestation of strongyloid worms passes 1,000,000 to 2,000,000 eggs daily, and a diseased horse more than 50,000,000.

There is thus seen to be ample opportunity for the transmission of large numbers of worms under crowded grazing conditions, and this enormous output of eggs, which earlier in evolutionary time was developed to ensure the continuity of the species, is quite unsuited to present agricultural conditions.

The third important point to consider is the **longevity of the infective larvae of the worms in the herbage.** In the infective stage the larvae are

ensheathed in a second outer skin, the result of incomplete moulting, and in consequence are endowed with great powers of resistance against cold, dryness, or other adverse forces acting upon them. They are also able to survive for an inconveniently long time in the herbage. Patience may be said to be one of their vices, for some of them can wait 12 months, or even two years in exceptional cases, for a passing host.

Evil Effects of Overcrowding

In view of the enormous output of eggs, even by healthy animals, and the longevity of the larvae on the pasture, it is clear that under agricultural grazing conditions there is liable to be a more or less rapid accumulation of infective material during the whole of the time that a pasture is occupied by grazing animals.

The evil effects of overcrowding may now be more fully appreciated. It is obvious that the more animals that are put on to a field the more eggs will be disseminated, and the more infective larvae picked up. But the rate of increase is actually even greater than it

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