EXPERIMENTS ON THE LOSS OF *DICTYOCaulUS FILARIA* FROM THE LUNGS OF INFECTED SHEEP.

V. SOME GENERAL CONCLUSIONS

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Abstract. Consideration of the pattern of daily worm loss via the bronchial mucus in experimental infections of *Dictyocaulus filaria* in sheep leads to the conclusion that this phenomenon is due to the accidental displacement of the worms from their position in the bronchioles. The worms constitute a heterogeneous population in their susceptibility to this hazard.

Earlier papers of this series (Michel 1968 a, b, c) have shown that in experimental infections of *Dictyocaulus filaria* worms are lost from the host by way of the bronchial mucus, the first worms appearing about the 10th day, shortly after they have completed their migration to the lungs. Numbers in the mucus reach their peak about the 15th day and only very small numbers are lost by this route after the 30th day. The worms that are lost via the mucus are fully viable. In term of size they represent a random sample of those present in the lungs. The phenomenon occurs even if the host is very young and the infection light, circumstances in which the immunity of the host is not likely to be implicated. Decreases in worm numbers which are associated with the host’s immunity are not attributable to the loss of worms via the bronchial mucus. The time when worms are lost in the mucus depends on the age of the worms and not on how long the host has been infected. The phenomenon is not affected by cortisone treatment of the host.

These findings suggest that the loss of worms via the bronchial mucus is not the consequence of an immune response but that the worms are displaced and carried out of the lungs in a random fashion and from accidental mechanical causes. If this were so then it should be reflected in the curve of the numbers lost daily.

The pattern of worm loss. The typical pattern of the daily loss of worms after infection was derived from the pooled data from all foregoing experiments. Counts of the worms recovered each day from the mucus were available for 28 sheep which survived for 30 days or more after infection. To bring them to a comparable scale these counts were expressed as a percentage of the total lost during the first 30 days after infection. Means of these figures are plotted in fig. 1. These data suggest that
the rate of loss rapidly reached a peak and that from the 15th to the 30th day it decreased logarithmically. This implies that the chance that any particular worm was lost on any given day remained constant during this period.

The number of sheep which survived for longer periods was rather smaller and the data from which the pattern beyond the 30th day may be derived are to this extent less satisfactory. Mean values of figures derived as described above from 15 sheep which survived for 54 days or more are plotted in fig. 2. From this it appears that after the 30th day the rate of loss does decrease further, at any rate until the 54th day.

**Discussion.** Two interpretations of the data are possible. According to the first, the hazard to which the worms were exposed was constant after the 15th day but the population was heterogeneous, a part being less susceptible than the remainder. According to the second interpretation the hazard, and hence the rate of loss, is related to the number of worms present.

The first of these interpretations is favoured as it accords well with the finding (Michel 1968 b) that when the loss of worms via the mucus is all but complete, a substantial number of worms may still be present in the lungs. Probably these represent that part of the population which is lost at a much smaller rate. No suggestion is offered as to what constitutes the difference between the different parts of the populations. The observations may be relevant, however, that while at an early stage in infections of *D. filaria* the worms tend to be evenly distributed through the lung, at a later stage they appear to be very largely restricted to the diaphragmatic lobes.

The evidence presented in this series of papers leads to the conclusion that the loss of worms via the bronchial mucus depends on the accidental displacement of the worms. This seems not improbable when the position of the worms in the lungs is considered. The worms are situated in the finer bronchioles and, as pointed out