

resulting from this penetration are caused partly by anaphylactic reactions and partly by bacterial invasion, those produced by *H. lineatum* being the more severe.

For the skin lesions the name of *hypodermal rash* has been proposed.

At this point there is a hiatus in the life history. It is not positively known how the larvæ reach the œsophagus, where they are subsequently found; most likely they travel in the loose connective tissues under the skin up to the region of the throat and into the œsophagus where the muscles bifurcate. Passing down the œsophagus they follow the submucosa and are almost always found lying along the long axis of the canal. Whilst in the œsophagus, small œdematous swellings are found surrounding the grubs; these are sterile and are anaphylactic in character; the exudate contains large numbers of eosinophilic leucocytes.

The earliest record made at Agassiz of larvæ in the œsophagus was on August 15, when a larva 3.4 mm. was found and several slightly larger. Continental observers have recorded smaller larvæ than this.

*H. lineatum* makes its appearance in the backs of cattle about December 15, and *H. bovis* about a month later. The larvæ at this time have grown to about 1.5 cm., and are similar in size to those which are found in the neural canal and under the skin. At this stage it is difficult to separate the larvæ of the two species, but Bishopp has, recently, discovered good distinguishing marks between them. The life histories overlap at this period making it difficult to follow the migration, but in the latter part of the season (the middle of March) the last larvæ to leave the œsophagus are at the paunch end. They pass out under the pleura and go to the neural canal, either up the crura of the diaphragm, or up the posterior border of the ribs entering the canal by the posterior foramen. The larva evidently makes use of the canal as an easy means of access to the lumbar region, the part of the animal which is best suited for passing its last stages within the host.

The larvæ follow connective tissue exclusively and no larvæ have been discovered in muscular tissue.

The mature larvæ leave the animals' backs from the early part of the year up to the first days of July.

The periods for the two species have not been fully worked out; but, judging from what records there are of the pupal period and the time of year the flies are on the wing, *H. lineatum* begins to emerge in February and finishes about May 1. *H. bovis* begins about May 1 and ends approximately on July 1. The average pupal period for *H. bovis* is 32.5 days, and for *H. lineatum* a little less. The duration of the life of the flies is short, seeing that they cannot feed. This life history applies to Agassiz, British Columbia; doubtless in other countries variations will be noticed, but the period spent by the larvæ within the host must be of the same duration, seeing that animals' temperatures are the same the world over.

*Prevention.*—Animals should be housed during the heat of the day to prevent the flies laying upon them. Warble grubs should be squeezed out as early as possible during the year. This method will lessen the damage to animals and their hides. If the total eradication of the pest is attempted, co-operative measures must be undertaken.

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