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POSSIBLE PEDOGENESIS IN THE BLOW-FLY, *Calliphora erythrocephala* MEIGEN.

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In the early autumn of 1918 I prepared a number of cultures of larvae of the common blow-fly, *Calliphora erythrocephala*, and in several of these cultures the numbers of maggots seemed to exceed considerably the numbers of eggs that had been introduced. This aroused the suspicion that some unusual form of multiplication such as polyembryony or pedogenesis was occuring and to test this definite experiments were attempted.

On November 25, 1918, thirty bottles closed with aluminum caps through each of which a minute hole had been punched, were supplied with small pieces of fish-meat carefully inspected to see that they carried no fly eggs. In each of twenty of these bottles a single blow-fly egg was placed, ten bottles having been retained as checks. On December 9, 1918, all these bottles were carefully examined. Seven of the infected bottles contained no maggots, ten contained each one maggot, one contained two maggots, another three, and a third four. One of the check bottles, however, contained nine small maggots showing that the procedure that had been followed was defective. Either unseen eggs had been accidentally introduced with the meat, or flies had slipped eggs into the bottle through the small hole in the cap. Hence the increased numbers in several of the infected bottles could not be said to be due to multiplication within the bottle itself and this type of test was, therefore, abandoned.

In the spring of 1919, with the return of the flies, a new procedure was employed. Fifty clean quart jars were prepared by pouring into them enough coarse sand to cover their bottoms. This sand had previously been sterilized by baking. Into each

jar was then introduced a small glass beaker containing a bit of carefully inspected fish meat. The jar was then closed by having mosquito netting tied over its open end and by setting in place on this netting the glass cover of the jar without, however, clamping it down. Thus it was believed that the jars were effectively protected against the introduction of eggs from the outside and that the gases generated by the decomposing meat within could escape. Fluid could be introduced into the jar by removing the glass top and pouring it in through the meshes of the netting without, however, allowing the accidental entrance or escape of flies should there be any at hand. The fish-meat in the jars was not sterilized by cooking, for it was found to decompose much more freely and satisfactorily when uncooked.

The fifty jars thus prepared were set aside April 2, 1919, and allowed to stand twenty days. After this period a searching inspection showed that none of them contained maggots. These would surely have been seen had they been introduced by accident with the meat. On April 23 twenty-five jars were infected each with a single fly egg and the remaining twenty-five were held unchanged as checks. From time to time during the next few weeks a small amount of distilled water was poured into each jar but otherwise the jars remained closed for this period. On May 14 the contents of the jars were examined. The twenty-five jars used as checks contained no evidence of flies. In the twenty-five infected jars seven were without maggots or pupæ and eighteen contained each a single pupa. Thus there was no evidence of increase. A second trial carried out in the same way in May and June yielded similar results.

In the autumn of 1919 tests were resumed. These were of two kinds, one to ascertain what hatched from an individual egg and the other to find out what came from the larva. To determine what came from a single egg, twenty eggs on October 29 were put with a few drops of water each into a separate Syracuse watch-glass. Twelve of these had hatched by October 30 and each produced a single larva. Eight failed to hatch probably because of mechanical injury. Between October and the end of

December, 1919, 502 eggs were hatched in this way and in no instance did an egg produce more than a single larva. It was therefore concluded that Calliphora gave no evidence of polyembryony such as has been found so abundantly in certain hymenopters.

To test again the possible production of maggots from other maggots, the experimental procedure of April 2, 1919, was repeated. On October 2, fifty jars were set up with fish-meat. They were examined on October 28 and were found to contain no maggots. On the next day into each of twenty-five of these jars a single newly hatched maggot was introduced and the remaining twenty-five were kept as checks. On November 10 an examination of the jars showed no maggots in the twenty-five check jars, no maggots in three of the infected jars, probably because of accidental death, one maggot each in twenty of the infected jars, eight in one infected jar, and twenty-one in another. The maggots in the last two jars were carried on to pupation and hatched. All proved to be Calliphora erythrocephala. Of the eight in the first jar, five were males and three were females. Of the twenty-one in the second jar, five failed to hatch, nine emerged as males and seven as females.

On October 18, a second set of fifty jars was started in the same way as in the preceding test. On November 15 these jars were examined and found to contain no maggots showing that they had not been accidentally infected. Into each of twenty-five of them a single newly hatched maggot was introduced and the jar closed. On November 26 pupation was completed and an examination of the set showed that the twenty-five check jars were without pupæ as well as six of the infected jars; eighteen of the infected jars contained each a pupa, and one contained seven. These seven were subsequently hatched and all proved to be *Calliphora erythrocephala,* four females and three males.

The tests of October 2 and October 18 were carried out with such precautions that it seems impossible that the results could be due to accident. The increases observed have always occured in the autumn and never in the spring and I am, therefore, led to believe that in October and November or even later

Calliphora erythrocephala occasionally multiplies in an unusual way, and that this way is not polyembryony but pedogenesis.

At the appropriate season it is planned to conduct an investigation of the maggots of Calliphora to ascertain whether they contain parthenogenetic eggs or young. If they do, the blow-fly will constitute another instance among insects of pedogenesis. The original and best known case of this kind is that of the fly Miastor and its allies discovered by Wagner (1862, 1865) and studied by Kahle (1908) and by Felt (1911). Less clear is the case of Chironomus reported by Grimm (1870) and of its near ally Tanytarsus observed by Johannsen (1910). All these are Dipterans but within a few years Barber (1913a, 1913b) has claimed an instance, Micromalthus, among the beetles. The wingless female aphids must also be regarded as pedogenetic. Possibly this form of reproduction is more generally spread among insects than was originally supposed.

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