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A REPORT ON THE CARDIAC SWELLING OF THE MIDINTESTINE OF THE TUSSER-WORM

(*Antheraea pernyi* GUÈR.)

BY

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(With 3 figures)

柞蠶の中腸賀門部の構造

齋藤三郎

As the biological study of the silkworm, *Bombyx mori* L. which is in close connection to our life, has been made almost satisfactorily, it has become the case that the silkworm represents all members of the Lepidoptera family in any field of study without any objection. However, it is generally accepted that the animals under domestication from generation to generation suffer from so many caenogenetical changes that the original traits are hardly recognizable. The fact has already been ascertained by hundreds of famous authors. This might be the case of the silkworm.

The tusser-worm on the contrary offers great advantages for any biological research of lepidopteral insects as compared to the other members of the family. The worm, in one hand, is uncompetitively large in body size, measuring more than 70 mm. in length and on the other hand, its life history retains a very primitive aspect as it is cultured outdoors half-wild.

Thus in the comparative study of the anatomy of this worm and that of the silkworm, it is quite interesting to see how far the influence of domestication affects the palingenesis of the insect if at all.

Generally there should not be much difference in structure between the two worms. However, investigating the digestive system of the full grown tusser-worm the attention of the writer was attracted by the presence of some peculiar swellings on the foremost part of the midintestine. It has been noted by many authors that the wall of the intestine of the Lepidoptera is wrinkled in various degrees. Yet the cardiac swelling just mentioned is far from being a folding of the wall. As is shown in Fig. 1, about 20 very distinct swellings lie in a line like a necklace bordering the cardiac end of the stomach.

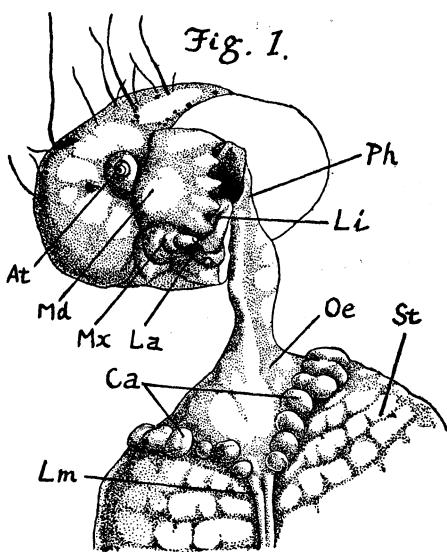


Fig. 1. Surface view of the cardiac swelling. $\times 40$

At, antenna. La, labium. Li, lingua.
Lm, ventral large longitudinal muscle.
Md, mandible. Mx, maxilla. Oe, oesophagus.
Ph, pharynx. St, stomach.
Ca, cardiac swelling.

Judging from the fact that the swellings are located constantly at the cardiac region of the mid intestine and that they are composed of typical glandular cells leaves little doubt but that the structure in question is of a secretory character.

The silkworm has also such swellings at the cardiac region of the mid-intestine though they are not so distinct. From the topographical anatomy,

The internal structure was investigated by means of a paraffin section. Fig. 2 gives the transversal section of the swelling. It is clear that each swelling is internally a pocketlike epithelial invagination free from food fragments. Being very large in size with a large nucleus, and having a typical cylindrical form, the epithelial cells of this part are very different from the other cells of the wall of the midintestine (Fig. 2).

As a whole, here the assumption of glandular structure is quite valid. In fact some part of the invagination is full of secretion and in the other part the secretion is just taking place from the free end of the cell, giving off mucous in various degrees (Fig. 3).

hand in hand with the microscopical study, I am convinced that the structure is analogous with that of the tusser-worm, notwithstanding that in the silkworm such a structure in the midintestine has not yet been reported and the homomorph of the epithelium is generally accepted (DEEGENER 1909, SHINODA 1926, TANAKA 1929). Whether the cells of the swellings in question undertake the resorption is not decided here. However, it is not unnatural to conclude that in the silkworm the structure analogous to that of the cardiac invagination of the tusser-worm is underdeveloped from the influence of the environment through long generation, feeding on the

Fig. 2a.



Fig. 2b.

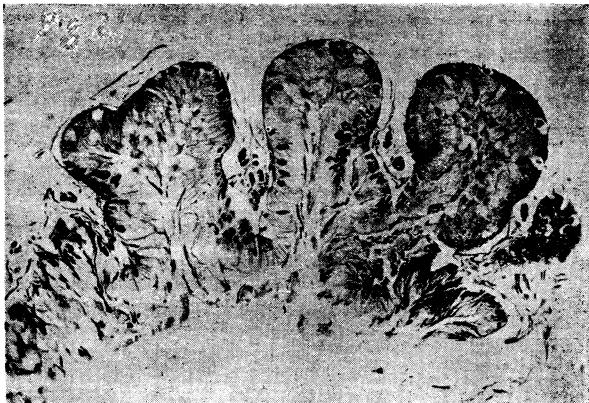
Fig. 2a. Longitudinal section through swelling. $\times 300$.Fig. 2b. Transversal section through swelling. $\times 110$.

Fig. 3.

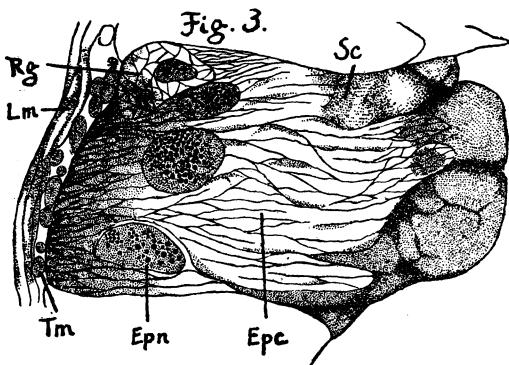


Fig. 3. A part of Fig. 2a enlarged.

$\times 500$; Epc, epithelial cell. Epn, epithelial nucleus. Tm, transverse muscle. Lm, longitudinal muscle. Rg, regeneration-cell. Sc, cell in the course of secretion.

soft and nutritious leaves of the mulberry tree. In the meantime this part of the midintestine of the tusser-worm is rather of a character of secretion than of resorption. It assumes rather a character of "Divertikel" of the other insects (FRENZEL 1885, FAUSSEK 1887).

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摘要

鱗翅目幼蟲の解剖學的研究は、殆んど家蠶を代表的材料となる。一般に飼育生物は環境の變化と人爲的の淘汰相待つて野生固有の體制に變化を及ぼし易し。著者は此の意味より稍野生的飼育にして且大形なる柞蠶を選び、其の一部の解剖學的研究をなせるに。一般鱗翅目幼蟲の中腸に認めらるる皺が前腸との境界線に沿ひて著しく膨大し居るを見、更に其の切片に依り鏡研せるに、其の表皮組織は中腸の他の部分に比し、細胞、核、共に大形にして且分泌細胞多く、一見分泌腺状を呈する中腸に開口する囊状をなすを知れり。尙家蠶に於ても微かに此の構造を認め得たり。

鱗翅目幼虫に於て中腸表皮細胞の一元説は信じ得るも、少なくも柞蠶に於ては中腸の此の部分に於ける表皮細胞は消化液の分泌特に著しきものならん。