Correspondence.

The Alimentary Glands of the Earthworm, *Eutyphœus*.

DR. G. S. THAPAR'S note on the alimentary glands of the earthworm *Eutyphœus* published recently in *Current Science* [1] contains observations and ideas originally made and put forward by me and communicated already to the Indian Science Congress[2] and the U. P. Academy of Sciences.[3] In appropriating these results of mine, Dr. Thapar has made mistakes, which would not have occurred, had he confined himself to his own observations. For instance, in the last para of his note, he states: "The blood-supply of the glands is *from* the dorsal vessel and *from* the subneural vessel." As a matter of fact, a subneural vessel simply does not exist in *Eutyphœus*, much less supply blood to any structure. Further, even the dorsal vessel does not supply *blood to the glands*; *it really collects* blood from them. In the earlier part of the note, a statement is made that "the glands are separated from each other by intervening septa" (page 129). The fact is that instead of being separated as stated by Dr. Thapar, all the five pairs of glands form one continuous structure. This fact was noticed by Beddard[4] as early as 1889 and I have verified it. It cannot escape observation. if one were to examine the sections under the microscope even with a little care.

In my paper on this subject read before the Zoology Section of the Indian Science Congress at Allahabad (1930), I with Mr. M. B. Lal reported that the glands opened into the gut by several small or large openings all along their length, to which Dr. Thapar makes no reference in his note, in which he has recorded a similar observation. Further, I have recorded two experiments of mine on these glands to prove that they have a digestive (peptic) function. In a paper which I read at the Lucknow Meeting of the U. P. Academy of Sciences (Dec. 1931), I put forward the two ideas that the nature of the blood-supply of these glands suggested a hepatic portal system and that the function of the glands indicated that of a liver or hepato-pancreas. In support of these ideas, I adduced relevant evidence. It is difficult to believe that Dr. Thapar, working in the same Department and at the same place, was unaware of these conclusions of mine when he wrote (p. 130) that "the branches of both the vessels (dorsal and subneural) ramify in the substance of the glands and form a complete anastomosis, thereby indicating a kind of portal system. Further investigation may show that the glands are of the nature of a liver that pours a digestive secretion into the gut."

It is obvious that a portal system cannot be formed out of vessels, one of which, at any rate, is non-existent. Dr. Thapar has, of course, not seen the large *ventral-intestinal vessel* which exists in the worm and really supplies blood to the glands, and not the dorsal and subneural vessels as he has wrongly assumed. The ventral intestinal runs along the ventral wall of the gut for the last 107 to 127 segments of the worm. I applied the term "liver" to these glands after I had made sure of their correct blood-supply and ascertained their digestive function and again after I had obtained preparations showing glycogen granules, within the cells by staining them with Best's carmine, knowing full well that the more important function of the liver is to store absorbed food. It is necessary to draw Dr. Thapar's attention to the fact that a mere imaginary portal system such as he has ascribed to the glands with no further proof or evidence of their hepatic character cannot make a "liver" of them in the sense understood even by an elementary student of Zoology.

K. N. BAHL.

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December 15, 1932.

With reference to the above note of Dr. K. N. Bahl, I wish to mention the following points :—

1. Colonel J. Stephenson,[5] then Principal and Professor of Zoology at the Government College, Lahore, suggested the problem to me in a letter dated the 19th August 1918 (still in my possession) and as a result of my investigations during the years 1918—1922, I read a paper on the "Alimentary glands of earthworms of the genus *Eutyphœus*" at the Tenth Indian Science Congress in 1923, when Dr. Bahl was himself present, and in participating in the discussions supported my results. This he was able to do because he had access to all my preparations and dissections. In further discussions, one of the members raised the question of the functions of these glands, which were regarded as digestive, something of the nature of a liver.

2. Dr. K. N. Bahl has himself included the abstract of the paper in his quinquennial report of the department published by the University of Lucknow in 1928 (page 112) and has accepted the priority of my work.

3. The work was left unpublished, as soon after I proceeded to England for advanced studies, where the entire manuscripts with the accompanying diagrams were seen by some friends, who are now in the Universities in India. Having taken up an entirely different line of work in England, and also due to pressure of work since my return, I did not have time to publish the results of my work earlier.

4. The work on the Physiology of the glands, now claimed by Dr. Bahl as his own was actually carried out as late as 1929 by one of our former students, now colleague in the department.

Now to the mistakes pointed out. I would reaffirm my conclusions by saying that :—

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[1] *Curr. Sc.*, **1**, 128, 1932.
[2] *Proc. Ind. Sc. Congress*, Allahabad, 248, 1930.
[3] *U. P. Acad. Sc.*, Dec. 21, 1931.
[4] *Q.J.H.S.*, **29**, 114, 1889.

[5] Then you might investigate "The peculiar diverticula which you will probably find on the intestine about the middle of the body; are they always in the same segments, or is the position variable? What is their histology, and does it differ from the intestine in general?....Note also any particular features in the blood supply." Extract from a letter from Col. J. Stephenson, dated 19th August 1918.

1. The glands are not five pairs as mentioned by Dr. Bahl, but there are four to five *double*-paired bodies, as can be seen by unaided eyes even in ordinary dissection.

2. The point raised by him that the septa do not divide the glands is also misleading. The septa are clearly present, as can be seen from the accompanying figure, extending between the glands of each segment, at any rate in the two species investigated by me.

Fig. 1.

Longitudinal (vertical) section of E. waltoni passing through the glands, showing the extension of septa. s. septum.

3. Each pair of bilobed glands communicate with the intestine below by *two* pairs of apertures, one for each lobe, and not by "several small or large openings all along their length" as stated by Dr. Bahl. If he intends to see these structures clearly, he should employ *double embedding Celloidin* method when he would be able to cut complete series of sections along with the intestine and body wall and come to the same conclusions.

4. As regards the blood-supply, I am sorry for certain typographical errors[1] in my original note, but I find that Dr. Bahl has committed a serious mistake. On further investigation he will realize that it is not the *ventral intestinal vessel* as stated and traced by him from segments 107-27, but it is the *supra-neural (ventral) vessel* that supplies the glands. This supra-neural vessel, on reaching segment 84, sends a pair of branches

[1] Errors in the original note:—read "supra-neural" for "sub-neural," and read in the references "Oxford, The Clarendon Press" for "Oxford University Press".

Fig. 2.

Glands seen from the ventral side, showing the distribution of the ventral blood-supply from the supra-neural vessel. Intestine is cut to show clearly the lateral loops (l).

that run laterally below the glands, one on either side and supplies blood by giving a branch to the glands in each segment (Fig. 2). This would still maintain the existence of a kind of portal system mentioned in my original note.

These facts will speak for themselves. It is needless to say that my note was a brief summary of the main facts dealt with in my longer paper, which was first sent to the Editor, *Current Science*, but from the nature of the work the entire manuscript could not be published. My critic probably thought that it was the last word I could write on the subject, but before he could discuss the morphological errors in my paper, he should have made conclusive observations himself and not have based his conclusions on meagre facts.

In fact I would not enter into controversy with Dr. Bahl, who claims to be "original author" of these glands, but I would certainly protest against his appropriation of the work of his colleagues and assistants. Dr. Bahl could have waited for the publication of my paper, which is now in press, when some further facts in the structure of these glands would also be known.

In conclusion, I am much indebted to the Editor for the courtesy shown in referring the counternote to me for a reply before its publication.

G. S. THAPAR.

Department of Zoology,
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January 24, 1933.