

den Schwund des Ectoderms und der Entodermhöhle jede embryonale Grundlage einer bestimmten Formbildung zerstört wird, bleibt im Grunde ebenfalls ein unorganisierter Haufen von gleichartigen Zellen (Entoderm) zurück, in welchem durch histiologische Differenzierung einzelner Zellengruppen sich die Organisation des Schwammes entwickelt. Der Inhalt einer Gemmula verhält sich also in den Bedingungen seiner weiteren Umbildung genau so wie die Zellenmasse einer metamorphosierten Larve mit noch indifferentem Entoderm.

3. Some observations opposed to the presence of a parenchymatous or intra-cellular digestion in *Salpa*.

By Dr. Ch. S. Dolley.

eingeg. 27. October 1884.

During the year I hope to make public the results of my winters work on the histology of *Salpa*, which I have carried on concurrently with a study of the budding of *Salpa*, by Prof. W. K. Brooks, at whose suggestion and under whose supervision I have pursued my studies. I desire, however, preliminary to giving the results of my work in full, to make a few remarks in reference to statements recently made by Dr. A. Korotneff¹ of Moscow, which I am unable to confirm and which I consider erroneous in so far as they indicate the presence of a huge amoeboid cell or plasmodium occupying the oesophagus and stomach of *Salpa*. Korotneff speaks as follows in regard to this point. »In the stomach (of young *Anchinia*) I found a large cell, which gradually enlarged, and at last filled the entire lumen. Later it is seen to be no longer a single cell, but several, not accumulated in a mass, but in rows one next the other, not only in the stomach, but in the oesophagus, portions extending as well into the intestine proper. These cells arise through a separation of the cells of the stomach wall; or more correctly, it is only the first cell which is separated and which later subdivides itself. A section of the stomach of a fully developed *Anchinia* shows the wall of the stomach as consisting of two layers; the inner formed of cylindrical cells the outer of spindle-shaped cells. The lumen encloses a large cell with a round and distinct nucleus. In the lower half of the oesophagus as well as in that portion of the intestine which lies next to the stomach, the same contents and structure to be observed. The plasma of this inner cell is coarsely granular, and contains the various remains of a completed digestion.

¹ Dr. A. Korotneff, Über die Knospung der *Anchinia*. in: Zeitschr. f. wiss. Zool. 40. Bd. 1. Hft. 1884.

The chyle from this cell is carried into the wall of the intestine by means of pseudopodia. We have here a peculiar kind of parenchymatous nourishment, which in such a form has never been described in any other animal. I have examined the structure of the intestinal canal in *Salpa africana*, and to my astonishment I found a very similar condition. When a section is made through the oesophagus of *Salpa*, we find on one side the epithelium cylindrical and beset with cilia, but on the other side a different condition, characteristic throughout. All along the base of the cell-layer, when the nuclei are to be seen, one can easily distinguish the boundaries of the cells; but nearer the lumen of the oesophagus the elements lose their individuality and form a common plasma mass, in which are distributed vacuoles of different sizes. A lumen exists in this portion of the intestine. A peculiar change which is to be seen here only on one side, gradually extends itself in the direction of the stomach over to the other side: then follows what is most important, a complete obliteration of the lumen, the only indication of which is a stripe. On one side the faint contours of the cells may be seen still forming rows; the nuclei are arranged closely together, each nucleus having its own distinct area of protoplasm; but on the other side the cellular elements have entirely lost their individuality, the nuclei stand completely isolated and vacuoles are found even up to the cell membrane. (Membrana propria of the stomach). We have here to do with a true plasmodium. In the interior, cells are scattered which are entirely defined from their surrounding. These are analogous to the great stomach cell of *Anchinia*. To grasp the fact physiologically, we must ascribe to *Salpa africana* a parenchymatous digestion. It is possible that the same thing occurs in other Tunicates. As is known we find this kind of digestion only in the lower organisms and for that reason we have in our case occasion to question the high genetic place to which the Tunicates have been ascribed.

Now the phenomenon of intracellular digestion is not an uncommon one among animals, being readily observed in the endoderm cells of *Plumularia* and *Hydra*, but by far the majority of cases in which it has been noted, have occurred in mesodermic tissues; whether in sponges, the larvae of Echinoderms and Ascidians, or in the amoeboid blood-corpuscles, connective tissue and lymph cells of higher Metazoans. Such a form as Korotneff describes in the above extract has however never been met with, and his description stands alone and anomalous, both as regards the situation and size of the digestive plasmodium, and as to the method of its formation. For in all cases in which such structures are found in invertebrates, they have always

arisen by the fusion of separate cells, not from the repeated division of one cell².

The oesophageal *Amoeba* of Korotneff, however, originates »by the separation of a single cell, which later subdivides itself« with as little precedence for so doing as it has for its unique size and position. After reading the preliminary mention which Korotneff gave of this peculiar structure in *Salpa*³, I made a number of series of sections, according to the ribbon method, for the special purpose of finding it. While I failed in this, I found the structure of the walls of the stomach and oesophagus as described by him, in so far as the epithelial cells of one side »being cylindrical and beset with cilia«, while on the other side the cells were more definitely outlined near the basal membrane, than toward the lumen of the digestive cavity, but nowhere did I find »the lumen obliterated« by these cells, and nowhere did I find them completely losing their individuality and forming a true plasmodium. I made moreover a model of the visceral nucleus after Born's 'plattenmodellirmethode'⁴, in which the lumen of the oesophagus is shown to be completely free throughout. I did however get sections which gave pictures, almost identical with those portrayed by Korotneff, i. e. the lumen is filled up, with what he describes as a huge nucleated granular cell containing various food particles. Now I could trace this so-called cell, not only back into »that portion of the intestine lying next to the stomach« but through the rectum into the cloacal chamber, and through the oesophagus into the branchial sac, and I account for it as follows. The endostyle of *Salpa* has been very carefully studied by Herman Fol⁵ who demonstrated by means of carmine suspended in water, that it threw out a constant stream of mucus, when excited by the presence of nutritive material in the same water, with a reflex action like a salivary gland. The mucus is by an arrangement of cilia, spread out like a curtain over the inner surface of the branchial sac, where it acts as a means of catching the food particles of the ingurgitated water. By the action of the ciliary bands bordering the groove of the endostyle, the mucus is swept towards the oesophagus, and as it approaches this it is, by means of the stiff cilia on the sides of the gill, twisted into a thread and carried by the continuation of the afore-said bordering bands through the oesophagus and into the stomach.

² Metschnikoff, On Intracellular Digestion in Invertebrates. in: Quart. Journ. Microsc. Soc. Jan'y 1884.

³ Zoologischer Anzeiger No. 148. VI. Jahrg. p. 483—487.

⁴ Archiv f. Micr. Anat. 12. Bd. p. 584. 1883. Also Amer. Naturalist. April 1884.

⁵ Über die Schleimdrüse oder den Endostyl der Tunicaten. in: Morphöl. Jahrb 1. Bd. 1876.

Now in studying a series of transverse sections of a *Salpa* which had had abundant food, we find as we approach the oesophagus a mass of material answering to the description of Korotneff's 'rhizopod'. It takes staining readily and may be traced backwards into and through the oesophagus, stomach and intestine. As the sections approach the rectum however, the mass gradually ceases to take staining and is much more distinctly marked out from the intestinal wall, having had all the organic matter digested out, and consisting only of the inorganic remains which do not take stain. »The alimentary matter of *Salpae* is composed of animal and vegetable elements in nearly equal proportions, and the microscope reveals the calcareous shells of Foraminifera, the beautifully sculptured frustules of Diatomaceae, keen silicious needles, and the sharp armatures of minute Crustacea⁶.« In the forepart of the intestinal canal, the mass takes staining almost as readily as the walls of the gut itself, seeming to merge into the ill defined epithelium of the latter, and it is scarcely possible to say, where the food-bearing mucous thread ceases, and the intestinal epithelium begins, especially as this has a rugous arrangement.

That we have here to do with a form of digestion entirely anomalous and unprecedented I cannot believe and must beg leave to differ from Dr. Korotneff on this point. Fol and others have recognized the endostyle as a sort of salivary gland and have traced its food-laden mucous thread into the stomach of the living animal; while I have been able to trace the same thing in well preserved specimens.

I have also several series of sections from animals which must have been without food for some time previous to death, in which the lumen of the intestine is not only free of food, but of any obliterating mass of cells, or plasmodia. The only protoplasmic bodies not food are certain Gregarina-like organisms adhering to the walls in various parts of the intestine, and which I consider to be parasites. These give on section the appearance of the large »scattered cells entirely free from their surroundings« which Korotneff figures, and regards as »analogous to the great stomach cell of *Anchinia*.« I shall take my first opportunity to examine these structures in the living *Salpa*, but I am now forced to conclude that Dr. Korotneff has endowed the food-bearing mucous thread with a power it does not possess, and that *Salpa* do not exhibit any unusual form of digestion, and that there is no immediate cause on their account for questioning the high genetic place occupied by the Tunicates.

⁶ J. O. Macdonald, An account of the examination of the alimentary matter of *Salpae*. Ann. Mag. Nat. Hist. 1857. XX.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Zoologischer Anzeiger](#)

Jahr/Year: 1884

Band/Volume: [7](#)

Autor(en)/Author(s): Dolley Ch.S.

Artikel/Article: [3. Some observations opposed to the presence of a parenchymatous or intra-cellular digestion in Salpa 705-708](#)