Studies on the embiotocid fish (*Detrema temmincki* Bleeker.)*

I. Histological studies on the foetal-sac of the embiotocid fish.

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Introduction

Kikukawa, one of the authors, studying on the physiology of reproduction of Cyprinidae, has considered it necessary to compare the physiology of reproduction of fish with that of mankind. And so we cooperatively began these studies in order to investigate histologically the foetal-sac of the embiotocid fish and to infer the reproductive function of fish from the view-point of its histological observations.

Samples and Experimental method.

Fish were caught in the rocky coast along Japan-Sea at Yosimi Matsi, Simonoseki City, Yamaguchi prefecture by spears during the parturitional period, from June to July, 1950. The obtained embiotocid fish were rapidly fixed with Formalin, then a part of the foetal sac was cut off, and the sections were made by the usual paraffin-method. Afterwards, we took the Haematoxylin-Eosin double stains and Van-Gieson's stain, and then observed them by microscopy.

Observations

When we incise the ventral body-wall, we can recognize a large, nearly spherical, grey-white, opaque mass, connecting with the genital pore and occupying most parts of body cavity. If a wall part of this mass is incised, it is understood that the outside part of this mass is almost perfectly covered with the opaque and somewhat thick membrane (we call temporarily it the "external membrane"), and the inside part of its membrane was divided into irregular directions by somewhat thin and transparent septa (we call this thin septum the "internal membrane").

From the microscopic observations of the sections which were made by cutting both external and internal membranes (Fig. 1.), we find (1) the external membrane is much thicker than the internal membrane, and the outside of the external membrane is flat, and it is covered with a simple layer of cells, and inside its layer there are comparatively thick muscle layers which are consisted of smooth muscle fibers, and still the inner part of the muscle layers are covered with many layers of flat epithelium. Furthermore the comparatively big bloodvessels in the muscle layers are surrounded directly by smooth muscle fibers, running towards indefinite directions. (2) However, the internal membranes, which are generally thin, have some layers of epithel tissue at the surfaces of both outsides. There are homogeneous, fiberless, connective tissues between them. On the contrary the part of running blood-vessels has somewhat different structures. Namely the place only becomes limitatively thick, and both sides of the thick membrane are covered with the epithel-tissues. But instead of the connective tissues there are the smooth muscle layers, around the blood-vessels, to which they are closely fixed.

Moreover, we can recognize the following internal membrane's organization histology: the internal membrane which is situated directly inside the external membrane, seems to have be-

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come the continuing septum by drawing out only many layers of flat epithelium covering the inside of the external membrane, from the muscle layers (Fig. 2.)

Fig. 1. Section of the histological structures of the external membrane (E.M.) and internal membrane (I. M.). The muscle tissues (M.T.) in the external membrane and also the same tissues around the blood-vessels (B.V.) in the internal membrane, are recognizable. (Ocular 5 × Object 10)

Fig. 2. Section of the internal membrane's organization histology. The internal membrane which is situated directly inside the external membrane, has become the connective septum by drawing out only the many layers of flat-epithelium (F.E.) covering the inside of the external membrane, from the muscle layers. (Ocular 5 × Object 10)

Discussion

From the above-mentioned observations, setting the embryological significance of the foetal-sac aside, we can infer that a part of the membrane, the external membrane by temporary name, is closely similar to the tissue of the human uterus, and therefore the physiological functions of the external membrane may be also considered to be similar to that of the human uterus. However, as compared with the human uterus, owing to the undevelopment of it in the growth and corpulence of the muscle layers, the functions of the parturition and gestation are not enough, and accordingly it is considered that when the parturition is occurred it will be perfectly finished by the concussing the whole body on right and left. And then we can conceive that by shrinking the external membrane, especially its muscle layers, the vessel-wall is pressed and the bleeding is rapidly stopped after the parturition.

The functions of the internal membranes seem to be similar with the functions of Amnion, and they act the part of the gestation mainly. It is supposed that the parturition of the embryos is done by the shrinking and stress of the external membrane and the vibrative motion of the whole body. Then the blood-vessels, having passed through the internal membrane and nursed the embryos, are rapidly pressed by shrinking the smooth muscle fibers, which surround the blood-vessels, after the parturition. These cases are considered to prevent and save the bleeding.

From above-mentioned considerations, as to the gestation time of the embiotocid fish, the membrane—the external membrane by temporary name—does the function of human uterus, and the membrane—the internal membrane by temporary name—exists, corresponding with the superfetation of human beings. But it is inferred that the parturition occurs in the conditions that the meeting and differentiation of the veins, forming the placenta, are not developed enough.

Conclusion

We have histologically investigated the foetal-sac of embiotocid fish, and supposing that the external membrane is closely similar to the tissue of human uterus, perhaps the functions of the membrane may be physiologically equivalent to human uterus. The internal membranes are suggested to have the function of human amnion.

Note : Bibliography will be issued in further reports.