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Independence of Taste Organs with Respect to Their Nerve Fibers Demonstrated in Living Salamanders.

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In these experiments the development of taste organs in embryos and larvae of *Amblystoma punctatum* has been studied in the living specimen under high magnification with the aid of micro-aquaria. In one series part of the anlagen of the tongue from the endodermal floor of the pharyngeal cavity was transplanted to the side of the body and oriented so that the smooth glistening surface of the endoderm was exposed to the outside. The donor and recipient in a single experiment were usually similar in age. These grafts were from donors ranging in ages from the tail-bud to the early swimming reaction stages and long before the first appearance of taste organs normally takes place. This series contains donors in which either no cranial nerves had yet formed or no nerve fibers had reached the region from which the graft was taken.

They showed that normal taste organs appeared in the transplants at the normal time (about stage 40 of Harrison series, several days before the mouth is open) and that they increased in number and persisted up to and through metamorphosis as the grafted tongue grew in size. The increase in the number of organs is by a process of budding brought about by mitosis and often a migration of the peripheral supporting cells. This is similar to that described by the author[1, 2] in the case of accessory lateral-line organs.

These results prove that the taste organs in this form develop *in situ* and are independent of any specific influence on the part of gustatory nerves to initiate their formation. The results also strongly suggest that the initiation of their development is entirely independent of any reaction on the part of nerve fibers which might grow in from the new environment. Whether later their maintenance is dependent upon an association with a nerve supply of a new source is not proved.

A second series of experiments were made on older stages. In these cases the grafts of the tongue anlagen, placed upon the side of

[1] Stone, L. S., *Anat. Rec.*, 1933, **55**, 38.

[2] Stone, L. S., *J. Comp. Neur.*, 1933, **57**, in press.

the body, were taken from donors just before, during and after taste organs normally appear. The operation had no effect upon the appearance of the organs. They were normal in structure and rapidly increased in number as in the first series of experiments. These grafts were followed for weeks throughout the larval period of development and finally through metamorphosis.

In a third series of experiments a still older group of specimens was taken. As in the other series the donors and recipients of grafts were similar in age and length. They include stages from the time of the beginning of feeding (Harrison stages 45-46, about 15 mm. in length), up to 33 mm. larvae. In these a small portion of the tip of the tongue with taste organs was grafted to the side of the body and on the tail fin. The organs in these cases not only did not disintegrate when isolated from their normal nerve supply but continued to give off bud organs and by this process rapidly increased the number of new structures. Grafts containing a few organs, in some cases 1 or 2, were conveniently placed upon the transparent tail fin. In such a transplant a complete new bud-organ is seen to form within 3 days after operation. The new organ may or may not start a new bud formation immediately. The detail can be followed under high power.

In the *A. punctatum* larvae it is evident from the second and third series of experiments that an immediate isolation from the nerve supply does not interfere with any developmental stage in which the taste organs may be. It also does not cause a disintegration of organs already formed or in the process of budding. The rapidity of the onset of the normal process in the formation of new organs following operation seems to suggest that its initiation is independent of any intimate relation with a new and strange nerve supply.

The results of these 3 series of experiments leads one to the conclusion that the suggestions of a hormonal-like influence of the peripheral nerves[3-7] in maintaining the structure of the taste organs and in initiating[8] their development can not be applied to the embryos and larvae of *Amblystoma punctatum.*

[6] May, R. M., *J. Exp. Zool.*, 1925, **42**, 371.
[4] Olmstead, J. M. D., *J. Comp. Neur.*, 1920, **31**, 465.
[5] Olmstead, J. M. D., *J. Exp. Zool.*, 1920, **31**, 367.
[6] Parker, G. H., 1922, Philadelphia and London.
[7] Torrey, T. W., *Proc. Nat. Acad. Sc.*, 1922, **17**, 591.
[8] Landacre, F. L., *J. Comp. Neur.*, 1907, **17**, 1.