A Seasonal Study of the Kidney of the Five-Spined Stickleback, Encalia Inconstans Cayuga Jordan.

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During the greater part of the year the male kidney is an excretory organ. At the breeding season, however, the kidney tubules, for about one-third of their extent, as well as the urinary ducts, the bladder and the common urinary duct become modified for the purpose of producing slime. This secretion, which is used by the fish in constructing its nest, is produced entirely by the male kidneys and only at the breeding season.

In the process of slime secretion, the behavior of the nuclei is such that they evidently pour into the cell bodies certain products, in the form of secretion granules, which function in breaking down the granular cytoplasm of the cells, and thus form the secretion. These secretion granules appear to be produced from certain products of the karyoplasm, as this substance gradually diminishes in amount during this process. Since the nuclei become irregular and flattened, it is possible, but not probable, that the nucleolus functions in this process.

Only one kind of secretion is produced for constructing the nest. This material is not silk, nor is it composed of fine fibrils, but appears as a fine granular slime-like substance. It is sometimes exuded in ribbon-like masses, but it probably functions more as an adhesive substance, than as a string, in binding the materials of the nest together.

At the end of the breeding season the cytoplasmic granules are regenerated. They begin to appear on all sides of the nucleus at the time that the nucleus begins to enlarge and become spherical. Since they form about the nucleus and wander into the other parts of the cell it would seem that the nucleus must be the active agent in their formation.

During the resting or winter stage the cells which form the slime during the spring appear much like the cells near the glomeruli which secrete urine, except that their nuclei are much smaller and they contain only one nucleolus. At this season the nuclei of the urinary secreting cells are very large, often occupying at least half of the cell contents.

This investigation justifies the conclusion that the whole kidney is not transformed periodically into a silk or slime producing gland, as is maintained by certain authors, but that the process of slime secretion is due to the activity of the epithelial cells of various ducts and tubes of the system not engaged in the excretory function. It is comparable to the secretion of slime by the genital ducts of Amphibia during the breeding season.