Comparative Histology of the Corpuscles of STANNIUS and the Juxtaglomerular Cells in the Kidneys of Teleosts*1

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The secretory granules of the corpuscular cells of STANNIUS and the renal juxtaglomerular cells (JG cells) were examined histologically, using five species of teleosts. The granules in the corpuscular cells are stainable by the BOWIE'S method which is used exclusively for the staining of JG cell granules. However, remarkable differences were detected in the staining of both kinds of granules when the following stains were used: GOMORI'S chrome-hematoxylin and phloxine, HEIDENHAIN'S iron-hematoxylin, and PAS stain. Therefore, it may be concluded that the JG cells and the corpuscles of STANNIUS, histologically speaking, are composed of different kinds of cells.

The corpuscles of STANNIUS are an endocrine gland confined only to ganoid and teleost fishes. Ultrastructurally, the secretion of protein-like hormone(s) has been suggested to the corpuscles of STANNIUS.1−4) This suggestion is supported by the studies5,6) on the presence of renin or renin-like substance in the corpuscles. Furthermore, PANG et al.7) have been recently reported the presence of protein-like hormone “hypocalcin” having hypocalcemic effect in the corpuscles of STANNIUS of cod and killfish.

In mammalian kidneys, renin is secreted from the juxtaglomerular cells (JG cells) which contain special granules stainable with BOWIE's method.8,9) The JG cells are present also in the teleostean kidneys.10−18) The present report deals with the comparative histological observations on the renal JG cells and the corpuscles of STANNIUS, to get some histological informations on the secretory granules suggesting the nature of secretory hormone(s).

Materials and Methods

The fishes used in the present investigation are the following five species of teleosts: rainbow trout, Salmo gairdneri, eel, Anguilla japonica, yellowtail, Seriola quinqueradiata, grouper, Epinephelus moara, and goosefish, Lophius litulon. The kidneys and the corpuscles of STANNIUS of these fishes were fixed in ZENKER-formol fluid and embedded in paraffin. Sections of 7 μ were stained with BOWIE'S method.19) GOMORI'S chrome-
Figs. 1–8: Corpuscles of STANNIUS in the five species of teleosts examined.

Fig. 1. Rainbow trout, Salmo gairdneri.
Fig. 2. Eel, Anguilla japonica.
Fig. 3. Yellowtail, Sériola quinqueradiata.
Fig. 4. Grouper, Epinephelus moara.
Figs. 5–8. Goosefish, Lophius litulon.
Figs. 9-12: Juxtaglomerular cells in the kidneys of goosefish, *L. litulon*.

Figs. 1-5 and 9, Bower’s stain; Figs. 6 and 10, Gomori’s chrome-hematoxylin and phloxine stain; Figs. 7 and 11, Heidenhain’s iron-hematoxylin stain; Figs. 8 and 12, PAS and Mayer’s acid hemalum stain. All the photographs (Figs. 1-12) were taken under oil immersion. ×1,900
hematoxylin and phloxine, HEIDENHAIN'S iron-hematoxylin and light green, or periodic acid-SCHIFF (PAS) and MAYER'S acid hemalum.

Results and Discussion

Using five species of teleosts, it was ascertained that the coarse secretory granules observed in the cells of the corpuscles of STANNIUS were stainable with BOWIE's method (Figs. 1–5). The granules were also stained with phloxine in GOMORI's chrome-hematoxylin and phloxine (Fig. 6). Furthermore, the granules were siderophilic (Fig. 7), and weakly PAS-positive (Fig. 8). SOKABE et al. reported also that the granules were stainable with BOWIE's method in the corpuscles of STANNIUS of goldfish, Carassius auratus, and goosefish, L. litulon. Recently, NISHIMURA et al. obtained the same results in bowfin, Amia calva. These are contradictory to the result of the report of KRISHNAMURTHY and BERN. They reported that the granules of the corpuscles of STANNIUS did not show affinity to BOWIE's stain.

On the other hand, the presence of the JG cells has been ascertained in the kidneys of five species of teleosts used in the present investigation, as reported previously. Among these species the goosefish is the most suitable one for the purpose of the present study, because the clusters of the JG cells are abundantly distributed in several regions within the kidney. Accordingly, the JG cells of goosefish were exclusively examined in the present study. The granules in the JG cells of goosefish are minute in size, compared with those in the corpuscles of STANNIUS. The granules of JG cells were stained in intense blue-purple colour with BOWIE's method (Fig. 9). However, the granules were not stained with phloxine in GOMORI's chrome-hematoxylin and phloxine (Fig. 10) nor siderophilic (Fig. 11). However, the granules were strongly PAS-positive (Fig. 12). These results on the JG cells are in accord with those of Japanese mackerel, Scomber japonicus. The granules of teleostean JG cells have been reported to be PAS-positive.

From the present examination, the difference in size was observed in the secretory granules of JG cells and the corpuscles of STANNIUS. The difference was also known from the electron-microscopic observation on both kinds of the cells. The secretory granules in the corpuscular cells of STANNIUS were reported as about 0.5–1.0 μ in diameter, using chum salmon, Oncorhynchus keta, Japanese eel, Anguilla japonica, and goldfish, C. auratus. On the contrary, the granules in the JG cells of several species of teleosts were about 0.3–0.5μ in diameter. Both kinds of the secretory granules showed the same affinity to BOWIE's stain in the present study. The BOWIE's method has been exclusively used to stain the granules of JG cells not only in mammals but also in fishes. However, the method has been originally devised to stain the pepsinogen granules in the chief cells of the gastric glands. Accordingly, it may
be possible that some other protein granules than these in JG cells show affinity to the Bowie's stain. Except for Bowie's method, differences for other histological stains were observed between the JG cell granules and those in the corpuscular cells of Stanniuss. Therefore, it may be concluded histologically that the JG cells and corpuscles of Stanniuss are composed of different kind of cells. The recent report of Pang et al.7) dealing with the secretion of a new hormone "hypocalcin" from the corpuscles of Stanniuss is interesting in connection with this histological conclusion.

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References