The Cell Types in the Adenohypophysis
of the Blind Mexican Cave Fish,
Anoptichthys jordani (Hubbs and Innes)*

J. A. M. Matejij**
Zoological Laboratory, State University of Utrecht, The Netherlands

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Summary. Staining sagittal sections of the pituitary of the Blind Mexican Cave Fish, Anoptichthys jordani, with a number of methods including Herlant's tetrachrome, Herlant's Alcian Blue (AB)-periodic acid Schiff (PAS)-orange G, Gabe's aldehyde fuchsin and lead hematoxylin according to Mac Conaill, made it possible to distinguish seven tinctorial cell types in the adenohypophysis: in the pro-adenohypophysis erythrosin-positive acidophils, and lead hematoxylin-positive amphiphils, lining branches of the neural lobe; in the meso-adeno-
hypphysis orange G-positive acidophils, large, weakly AB- and AF-positive, strongly PAS-
positive basophils, and smaller strongly AB- and AF-positive basophils; in the meta-
adenohypophysis lead hematoxylin-positive and -negative cells. These cell types are compared
with those in other teleosts.

In teleost fishes the adenohypophysis takes the same central position in
endocrine regulatory mechanisms as it does in other groups of vertebrates. To
that end it receives messages from the hypothalamus via the neurohypophysis
and secretes various hormones into the blood stream. These hormones are not
identical with those isolated from mammalian pituitaries (Fontaine, 1967), but
physiologically the adenohypophysial hormones in the higher and lower verte-
brates have much in common (Pickford and Atz, 1957). A prolactin like hormone,
a somatotropin, one or two gonadotropins, a thyrotropin, a corticotropin and a
melanotropin have been recognized, and it is generally believed, that each of these
hormones is produced by a separate cell type (Oliverneau, 1963a; Van Oordt,
1968).

In order to identify the functional cell types in the Characin Anoptichthys
jordani a morphological study of the adenohypophysis was made in normal as
well as in experimental animals. The description of the normal cytology follows
below; that of the adenohypophysis under various experimental conditions will
be the subject of other publications.

Material and Methods

Adult fishes of both sexes, measuring 6.0—8.5 cm and raised in the laboratory from
material imported from Mexico in 1955, were used. Following decapitation and removal of the
lower jaw, the heads were fixed in Bouin-Holland's fixation fluid to which 10% of a saturated
aqueous mercuric chloride solution had been added.

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photographs.
In order to allow for a sufficient penetration of the fixation fluid, openings were made at the dorsal and the rostral side of the skull. For decalcification an 18 hours treatment in five percent nitric acid appeared to be sufficient without interfering with the stainability of the material. The paraffin embedded tissues were sectioned sagittally at 4 or 5 μ. The sections were stained with Herlant's tetrachrome (HERLANT, 1960) using a fresh solution of acid alizarin blue of E. Gurr, with Alcian Blue (AB; pH 0.2) followed by periodic acid Schiff (PAS) with or without orange G (HERLANT, 1960), with aldehyde fuchsin (AF) according to GABE (1953), or with lead hematoxylin according to MAC CONAILL (1947). Additionally, sections were stained with Luxol Fast Blue-PAS-orange G (KERR, 1965) or with the trichrome staining method of BROOKES (1967).

Nomenclature

The adenohypophysis of teleosts can be divided into three zones, arranged in a rostro-caudal position. The nomenclature of these zones has been the subject of much debate. PICKFORD and ATZ (1957) suggested the non-committal, purely morphological names pro-, meso- and meta-adenohypophysis. OLIVEREAU (1963b) and GORBMAN (1965), however, in following the arguments of GREEN (1951), that the pro- and meso-adenohypophysis together are physiologically similar to the pars distalis of higher vertebrates and the meta-adenohypophysis to the pars intermedia of the latter, suggested the names rostral pars distalis, proximal pars distalis and pars intermedia respectively. However, it must be realized that too little is known of the adenohypophysis in groups of actinopterygians other than the teleosts, in elasmobranchs and petromyzonts, to justify a physiological nomenclature as the one of OLIVEREAU and GORBMAN. Hence, to avoid isolating the literature regarding the adenohypophysis in teleosts from that on the adenohypophysis in more primitive groups of fishes, we prefer with VAN OORDT (1968) the usage of the morphological nomenclature of PICKFORD and ATZ.

For the morphological names of the cell types in the adenohypophysis, the Greek letter system of ROMEIS (1940) has often been used. An international committee for nomenclature of the adenohypophysis (VAN OORDT, 1965) has, however, recently advised to avoid this system, as it has too often led to confusion. In following this advice, traditional names will not be introduced for the morphological cell types in the adenohypophysis of Anoptichthys jordani. Instead, arbitrary numbers will be used to go with detailed descriptions of the cell types.

Results

The hypophysis of Anoptichthys had an ovoid shape. In sagittal sections the irregular branches of the neurohypophysis could easily be seen penetrating from the pituitary stalk into the adenohypophysis. These two divisions of the pituitary were separated by a thin PAS-, AB-, AF-, and aniline blue-positive membrane. The adenohypophysis could be divided rostro-caudally into a pro-, meso- and meta-adenohypophysis (Figs. 1, 2). The pro-adenohypophysis formed about one sixth, the meso-adenohypophysis as much as two thirds, and the meta-adenohypophysis again about one-sixth of the adenohypophysis. Relatively few branches of the neurohypophysis ran rostrally towards the pro-adenohypophysis. Those that did, were void of AB- and AF-positive neurosecretory material. On its way to the meta-adenohypophysis, the neurohypophysis ran through the central part of the meso-adenohypophysis and here it gave off some narrow branches, that ramified between the cell lobules. Occasionally some AB- and AF-positive neurosecretory material was observed in these strands. Broad ramifications of neurohypophysial tissue, laden with AB- and AF-positive neurosecretory material, terminated in the meta-adenohypophysis, dividing it into lobules. Especially in this part of the neural lobe pituicytes were frequently seen, as well as large and small colloid droplets, which stained brilliantly with orange G and were PAS- and lead hematoxylin-positive.