Vascularization of the Pars distalis of the Hypophysis in the Toad, *Bufo bufo* (L.) (Amphibia, Anura)

A Comparative Light Microscopical and Scanning Electron Microscopical Study I*

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**Summary.** The vascularization of the pars distalis of the hypophysis of the toad, *Bufo bufo* (L.), was studied by the traditional method of injecting a mixture of India-ink and gelatine into the circulatory system of the head via the arteria carotis communis. Further, methyl-methacrylate corrosion casts of the brains were made; the hypothalamo-adenohypophysial region of these corrosion casts was studied with the scanning electron microscope. The results showed that the portal vessels which arise from the median eminence do not supply distinct areas in the pars distalis as is supposed by the point-to-point-hypothesis. The portal vessels enter the ventro-median region of the pars distalis and branch off into a three-dimensional network of the secondary capillary plexus of the pars distalis. The plexus is made up mostly by four- to six-sided meshes. This angioarchitecture guarantees an optimal supply of the glandular cells of the pars distalis with nutritional factors and releasing hormones, on the one hand, and facilitates the removal of the hormones which are released by these cells, on the other hand. The venous drainage of the pars distalis is exerted mainly by two large veins, which bilaterally leave the dorso-lateral region (venous pole) of the pars distalis and by a few small veins, which drain into the wide, sinus-like vessel, which curves around the dorso-caudal region of the pars distalis and joins bilaterally the vena hypophysea transversa.

**Key words:** Hypophysis, pars distalis — *Bufo bufo* (L.) — Vascularization — Corrosion casts — Scanning electron microscopy.

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Introduction

The cytology of the pars distalis of the hypophysis of *Bufo bufo* (L.) has been studied by several authors (van Oordt, 1963a, b; van Dongen et al., 1966; van Oordt, 1968). According to van Oordt (1974), the pars distalis of the anuran hypophysis contains five morphological cell types which produce hormones. The synthesis and release of these hormones is controlled by releasing (inhibiting) hormones of the hypothalamus which reach the pars distalis via median eminence and portal vessels. In this respect the vascular arrangement of the median eminence and the pars distalis is of interest. Previously, the vascularization of the hypophysis of the toad, *Bufo bufo* (L.), has been studied by injection of India-ink and tissue sectioning (Green, 1947; Houssay, 1949; Rodriguez and Piezzi, 1967; Rodriguez, 1949; Lametschwandtner and Simonsberger, 1975). A three-dimensional reconstruction of the vascularization of the pars distalis is, however, lacking. In this work an attempt was made to give a three-dimensional presentation of the vascular arrangement of the pars distalis by means of scanning electron microscopy of corrosion casts.

Materials and Methods

Adult male toads of the species *Bufo bufo* (L.) were used.

1. Light Microscopy

   a) 7 μm sections. Animals were decapitated and the brains removed immediately. For this purpose two ventro-lateral incisions through the prootic and the parasphenoid bone, beginning from the foramen occipitale magnum, were made with fine scissors. The ventral portion of the endocranium was then gently lifted while the pars distalis of the hypophysis was cautiously held in position with forceps. Then, the orbitosphenoid bone was opened by two more ventro-lateral incisions; the nerves of the brain were severed, the brain removed and fixed in Bouin’s solution. After dehydration in alcohol the brains were embedded in paraplast. The sections were stained with AzAN (Heidenhain).

   b) 1 μm sections. The animals were anesthetized by injection of MS 222 (Sandoz, Basel). The brains were perfused with 2.5% buffered glutaraldehyde via the arteria carotis communis. To remove the brain the method mentioned under 1a was used. The brains were further fixed by immersion in 2.5% buffered glutaraldehyde and postfixed in 1% OsO₄, dehydrated in ethanol and embedded in EPON 812 (SERVA). The sections were stained with Toluidine blue.

   c) India-ink injected specimens. After anesthesia (see 1b) the animals were perfused with Ringer solution followed by injection of a mixture of India-ink and gelatine (1:9). As soon as the injected mass was hardened, the brains were removed (see 1a) and treated according to the method of Spalteholz (see Krause, 1926). For photography a Wild stereomicroscope was used.

2. Scanning Electron Microscopy

   After anesthesia (see 1b) of the animals the resin-mixture (methyl-methacrylate; for preparation of the mixture, see Lametschwandtner and Simonsberger, 1975; Lametschwandtner, 1976; Lametsch-