Morphogenetic Action of the Subcommissural Organ on Tail Regeneration in Xenopus larvae*

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Summary. In an earlier paper (Hauser, 1969) it was suggested that the subcommissural organ (SCO) in the roof of the diencephalon might control normal straight regeneration after amputation of the tail tip in Xenopus larvae, by means of Reissner's fibre (RF) its secretory product in the central canal of the spinal cord. This hypothesis has been experimentally tested, with results that appear to confirm it, as follows:

1. Elective destruction of the SCO caused characteristically disturbed tail regeneration, while other brain lesions did not affect normal tail regeneration.
2. RF degenerated within 24 hrs in the caudal neural tube after it had been severed at the base of the tail. In most cases the separated parts of the neural tube resumed contact within less than 4 days in such a way as to allow RF re-entry into the central canal of the caudal piece, but occasionally reconstitution of RF was prevented by complete or partial obstruction of the central canal. Histological examination revealed that whether or not the tail regenerated normally depended entirely upon the reconstitution of RF, and not on the restoration of central canal continuity as such.

The implications of these results, and of similar results recently obtained by Rühle (1971), for the understanding of SCO function are discussed.

Introduction

Regeneration of the amputated tail tip in Xenopus larvae is morphologically disturbed if the continuity of the neural tube at the base of the tail is permanently

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Fig. 1a and b. Regenerated tail tips of *Xenopus* tadpoles, 15 days after amputation of 7 mm. a Normal straight regenerate (N-type). b Characteristically distorted regenerate (R-type). Regenerates of this type are formed after permanent severance of the caudal neural tube interrupted (Hauser, 1965). Instead of being straight the regenerates are bent and distorted in a characteristic way (Fig. 1). Similar defects in tail regeneration are produced by occlusion of the brain ventricles with 1% agar (leaving the nervous structures intact), or by electrocoagulation of the distal region of the diencephalic roof. Destruction of the whole telencephalon or of parts of the mesencephalic roof, however, leave tail regeneration unaffected, provided the operation did not abolish patency between the 3rd and 4th brain ventricles. From these results it was concluded that normal tail regeneration in *Xenopus* is dependent on an influence derived from the diencephalic roof and transmitted to the regeneration site through the central canal of the neural tube (Hauser, 1969).

Histological examination of the diencephalic roof revealed the existence of an active secretory ependymal region at its junction with the mesencephalon, which proved to be the so-called subcommissural organ (SCO). The SCO gives rise to Reissner's fibre (RF), a mucopolysaccharide-protein thread which passes along the whole length of the central canal. In the *ampulla terminalis* it enlarges into the *massa caudalis*, which gradually dissolves and releases the material through the ependymal wall of the ampulla into the surrounding tissues. Hence, RF is not so much a static structure as a permanent "stream of secretion" (Hofer, 1964; Altner, 1965; Sterba, 1969; and others). It is quite obvious that this SCO-RF system would very well fit all the requirements for being the source and vehicle of the proposed "regeneration-promoting influence". I therefore put