

exert important influences on the nerve fibre until this continuity is broken. It would be of particular interest if experiments could be devised to test whether the rate of degeneration in a given nerve fibre is slower during indirect Wallerian degeneration compared to direct Wallerian degeneration. The existence of such a difference might render indirect Wallerian degeneration a suitable model for studying the process of Wallerian degeneration *per se*, since the extended time course would facilitate study of relatively short-lived changes.

## V. Summary

The ultrastructural changes occurring distal to a nerve fibre lesion, so-called direct Wallerian degeneration, have been studied in the intramedullary root fibre region of the kitten hypoglossal nerve 6 hours to 23 days after unilateral lesions of the hypoglossal nucleus.

6 to 20 hours after the operation axons are found with tightly packed filaments located centrally and vesicles, mitochondria and lamellar formations peripherally. Electron-dense axons (a sign of axonal degeneration) are occasionally observed 20 hours postoperatively and frequently observed 2 to 10 days postoperatively. Signs of myelin sheath degeneration, mainly in the form of myelin bodies occur from 2 to 23 days.

At an early stage of the degenerative process microglial cells completely covered by myelin are found. These cells seem to participate in the phagocytosis of degenerating axoplasm. At a somewhat later stage degenerating glial cells completely or partially covered by myelin appear. Fragments of degenerating myelinated nerve fibres are phagocytosed by microglial cells located outside myelin. Concomitant with the disappearance of the degenerating nerve fibres, hypertrophic astrocytes and increased numbers of astrocytic processes are observed.

The results are discussed in relation to previous findings on indirect Wallerian degeneration in the same nerve fibre system of the kitten. It is concluded that the principal ultrastructural changes are the same in direct as in indirect Wallerian degeneration in this system of the kitten. Of particular relevance is that a certain type of myelin-covered microglial cells, prominent during indirect Wallerian degeneration, have for the first time been implicated in the process of direct Wallerian degeneration.

*Acknowledgement.* My sincere thanks are due to Professor G. Grant, M. D. Department of Anatomy, Karolinska Institutet, Stockholm, for his constant encouragement and support during the course of this study.

The constructive criticism of the manuscript by Drs. C. Hildebrand and Renée Schild is gratefully acknowledged.

Excellent technical assistance was given by Miss Maj Berghman, Mrs. Siv Blomquist, Mrs. Gunvor Petterson and Miss Brita Robertsson.

This work was supported by grants from the Swedish Medical Research Council (Project nos. B71-12X-553-07C, B72-12X-553-08A and B73-12X-553-09B) and from Karolinska Institutet.

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