MICROGLIAL AND ASTROGLIAL REACTIONS TO PERFORANT PATH AXONAL DEGENERATION

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The glial response to anterograde axonal degeneration was studied in the perforant path (PP) zone of the rat fascia dentata after ablation of the entorhinal cortex, using histochemical inosin diphosphatase (IDPase) staining for microglial cells and immunocytochemical staining for glial fibrillary acidic protein (GFAP), an astroglial marker.

As early as 24 hrs after the entorhinal lesion we observed an increased staining and accumulation of IDPase-reactive microglial cells corresponding to the denervated PP-zones in the dentate molecular layer. The increased IDPase stainability of the microglia occurred in parallel with a change in morphology of the microglial cells and an apparent migration of cells from the adjacent non-denervated parts of the molecular layer. At day 5 the IDP-reactivity of the microglial cells reached a maximum. At day 7 the PP-zones had begun to shrink due to atrophy, and the non-denervated commissural-associational zone had expanded due to the collateral sprouting of intact axons from this zone. After another week the IDP-reactivity began to decline, but it was still not normal after four weeks post-operation.

The astroglial reaction became apparent between 24-48 hrs after the entorhinal lesion, and by 3 days well-stained, hypertrophic GFAP+ astrocytes were prominent in the PP-zones. The astroglia reaction had its maximum around post-lesional day 5-7, after which it declined towards normal levels during the following 3-4 weeks postlesionally.

We conclude that the number and IDP-reactivity of microglial cells increase corresponding to the location of the anterograde axonal degeneration in the denervated PP-zones, and that the change in IDP-staining precedes the increase in GFAP-immunoreactivity and hypertrophy of astroglial cells in the same areas.

The glial reactions following other kinds of CNS lesions are presently being studied, using the same staining methods. It seems that the glial reactions to ischemic lesions of the hippocampus (CA4 and CA1) are basically similar to the reactions observed after anterograde axonal degeneration.

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