Ontogenetic Changes in Myelin Protein Composition in Different Regions of Rat Central Nervous System

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(Z. Naturforsch. **29 c**, 94 [1974]; received November 8, 1973)

Myelin Proteins, Polyacrylamide Gel Electrophoresis, Central Nervous System Development

Developmental changes in protein composition of myelin obtained from whole brain of various species were the subject of several studies in recent years [1–3]. By contrast, very little was been published on the composition of myelin proteins derived from forebrain [4] and from spinal cord [4–7].

In relation to possible specific function of myelin in various regions of the central nervous system (CNS) and in relation to its different ontogenetic development the possibility existed that different compositional profiles of rat myelin proteins could be found in developing forebrain, cerebellum and spinal cord. Therefore, myelin was isolated from these regions of rat CNS by a slight modification of the Norton procedure [8]. Myelin proteins were extracted with sodium dodecyl sulfate and separated by disc electrophoresis on polyacrylamide gels as described [9]. By scanning the gels the composition of myelin proteins was studied between the 5th (spinal cord), 10th (cerebellum) and 15th day (forebrain), and the 90th day of rat life and was compared with that of adults.

During development of rat CNS there was a marked decrease in the larger basic protein L [6] and a concomitant increase in the smaller basic protein S [6] in all regions studied, *e. g.*, L of forebrain decreased in relation to total protein from around 34% to 18% and S increased from about 25% to 39% in 15-day-old and 60-day-old animals, respectively, based on staining with Coomassie Blue. The composition of myelin basic proteins for adult forebrain and spinal cord is in agreement with published data [4].

Relative to the basic proteins no major differences were observed in the densitometric tracings of myelin proteolipid protein PLP [10] throughout the period studied, with the exception of a slight increase in the initial period of development.

Depending on the dye used for staining marked differences appeared in the densitometric tracings of myelin proteins. Staining with Coomassie Brillant Blue showed an enhancement of PLP, reduced values of S and unchanged values of L, compared with staining in Amido Black. Moreover, using either of these dyes, significant regional differences in electrophoretic pattern of myelin proteins were expressed in varying contents of PLP and S in animals older than one month. The largest amount of PLP was found in forebrain, less in cerebellum, and the lowest was seen in spinal cord, with reciprocal changes in content of the basic protein S.

The percentages of values obtained for adult brain and adult spinal cord are generally similar to those reported by other investigators [5]. The high molecular weight acidic protein fraction, commonly labelled Wolfgram protein [11], showed a relative decrease in forebrain throughout the period examined, in contrast to the myelin protein fraction DM-20 of Agrawal *et al.* [10], which slightly increased with age. In spinal cord both Wolfgram protein and DM-20 showed decreasing relative proportions. Wolfgram protein decreased also in cerebellum, with DM-20 maintaining equal relative proportions during development. An increase in total CNS myelin protein during the time span studied was observed in all regions investigated, of which the largest was seen in spinal cord. The onset of myelination followed the sequence spinal cord-cerebellum-forebrain.

The differences found in the electrophoretic patterns indicate the necessity to investigate the metabolism of these myelin proteins in various regions of the CNS during development.

As a recipient of a fellowship, one of us (B. Z.) would like to express her gratitude to the Alexander von Humboldt-Stiftung for financial support.

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