ELECTROPHORESIS OF SERUM AND CSF PROTEINS IN SHEEP NEUROLOGICAL DISEASES*

B. SIGURDSSON, D. KARCHER, M. VAN SANDE AND A. LOWENTHAL

Neurochemical Laboratory, Department of Neurology, Institute Bunge, Berchem-Antwerp (Belgium)

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IN SHEEP NEUROLOGICAL DISEASES

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Neurochemical Laboratory, Department of Neurology, Institute Beige, Berchem-Antwerp (Belgium)

The results obtained by the Institute of Experimental Pathology in Keldur (Iceland), on two diseases in sheep called respectively, visna and rida, suggested a possible comparison with multiple sclerosis. In order to check this hypothesis, we have carried out serum and cerebrospinal fluid (CSF) electrophoretic examinations.

The first signs of visna appear with an increased CSF cell count, followed one or two years later by paresis. During this interval the CSF does not necessarily remain pathological. Finally the animal dies in total prostration. Histologically, a marked demyelination of the white matter is found along with an inflammatory reaction of the meninges and the ependyma, accompanied by a secondary cellular cortical repercuision. One of us (B.S.) transmitted visna by intracranial injection, and was thus able to study the disease throughout its entire development.

We have studied serum and CSF of sheep affected with visna by means of paper electrophoresis following the method of GRASSMANN and HANNIG and with agar gel as supporting medium, following the method of WCRETE, along with the measurement of the relative mobilities. In 22 controls, we found 7 fractions on paper, and 12 in agar gel, for serum as well as CSF. We asked Prof. SCHULTEZ to identify the different serum fractions, as they differed considerably from those in man. The α-lipoprotein, and haptoglobin were revealed by direct coloration, whereas albumin, α2-macroglobulin, α2-lipoprotein, transferrin, β-lipoprotein, γ-globulins were identified by immunological reactions. The pathological changes for sheep affected with visna were found primarily at the level of the γ-globulins. In serum, the decrease of the γ-globulins seems to indicate the existence of a progressing visna: the γ-globulins however remained normal in the following conditions: (1) in sheep which after injection showed no clinical signs with a normal CSF cell count; (2) in those which had a temporarily increased cell count after inoculation, but had no further clinical sign, and were considered to have entirely recovered.

The serum γ-globulin was increased in sheep after intracranial injection. The CSF γ-globulins were markedly increased in all cases of visna showing a cellular reaction. This increase was apparent from the onset of pleocytosis, but this does not imply that it runs in parallel, although two cases, which were followed very closely during the course of the disease, might suggest it. The CSF γ-globulins in case 397 decreased as pleocytosis regressed; in case 487 increases of the γ-globulins and the cell count occurred simultaneously. In both cases, the serum γ-globulins were at all times decreased. A temporary decrease of the CSF γ-globulins in those two cases occurred

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shortly after paresis. This could be very significant and should be further investigated.

Rida is a chronic encephalitis with no cell count modification. The anatomopathological examination revealed an important demyelination of the white matter. Rida is transmissible by intracranial injection of CSF of affected sheep. All cases studied showed undoubted clinical symptoms. The serum $\beta\gamma$ and $\gamma$-globulins were increased, while the CSF $\gamma$-globulins remained normal.

From our findings, visna can be compared to human meningo-encephalitis, although the latter still exhibits changes in the CSF electrophoretic pattern after the cellular reaction has subsided. Changes in the serum are seldom found in meningoencephalitis or even in other diseases of the central nervous system. Human CSF $\gamma$-globulins can be fractionated to a greater extent with the help of microelectrophoresis in agar gel and the measurement of the relative mobilities. We have thus been able to identify the CSF of multiple sclerosis from that of leucoencephalitis; the total $\gamma$-globulins are quantitatively increased in both cases, but in leucoencephalitis alone slow-migrating $\gamma$-globulins appear in excess. From our results, there is no analogy to be found between visna and multiple sclerosis. The quantitative and qualitative changes can more readily be compared to those found in syphilis and trypanosomiasis. Rida is an entirely different disease; it shows important changes in the serum but none in the CSF, and cannot be compared to any well defined human disease.

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