

THE CORRELATION OF THE CONTENT OF SULFHYDRYL GROUPS WITH THE CEREBROSIDE METABOLISM OF THE BRAIN IN THE RABBIT

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In 1936 Thannhauser and Reichel [5] reported the discovery of the enzyme cerebrosidase in the brain, capable of splitting a molecule of galactose from the cerebrosides. According to these workers the enzyme is active only when high concentrations of compounds containing SH-groups are added to the incubation medium.

After analyzing these findings in connection with our previous discovery of a fall in the concentration of cerebrosides in the brain tissue of rabbits in general tetanus and strychnine poisoning [1], we suggested that this

Content of SH-Groups in the Brain of Rabbits (γ /g of Fresh Tissue)

Normal			Tetanus			Strychnine		
total	low molecular	protein	total	low molecular	protein	total	low molecular	protein
360	45	315	448	20	428	452	55	397
390	45	345	388	55	333	484	38	446
400	45	355	340	35	305	464	45	419
372	53	319	400	35	365	432	45	387
388	40	348	440	48	392	512	38	475
460	45	415	420	45	375	440	63	377
432	45	387	500	60	440	476	65	411
470	45	425	416	55	361	540	55	495
450	63	387	460	70	390	—	—	—
412	60	352	428	57	371	—	—	—
Mean values								
413,4	48,6	364,8	424,0	48,0	376,0	475,0	50,5	425,0

fall in the cerebroside content was associated with an increase in the activity of the cerebrosidase of the brain, and this, in turn, may have been due to an increase in the content of sulfhydryl groups.

In order to discover a possible correlation between the content of SH-groups and the concentration of cerebroside in brain tissue, we determined the content of SH-groups in the brain tissue of normal rabbits and of animals suffering from general tetanus or receiving half a lethal dose of strychnine.

EXPERIMENTAL METHOD

Tetanus toxemia was induced by injection of a lethal dose of tetanus toxin into a muscle of the left hind-limb. The animals were sacrificed in a state of general tetanus on the 7th-8th day after the toxin was injected. Strychnine nitrate was injected subcutaneously into the rabbits, in a dose of 1 mg dissolved in 0.5 ml of distilled water. After injection of this dose, convulsions developed in 10-15 minutes and were repeated periodically for 50-60 minutes. At the end of this period the animals were decapitated and the brain was extracted and frozen in a mixture of dry ice and ether. The total content of SH-groups in the brain was estimated by the method of A. S. Tsiperovich and A. L. Loseva [3], and the content of low molecular SH-groups by the method of Grunert and Phillips [4]. The difference between the total SH-groups and the low molecular sulfhydryl groups gave the content of free SH-groups of the protein.

EXPERIMENTAL RESULTS

During the investigation of the brain tissue of the normal rabbits, considerable individual variations were found in the content of protein SH-groups (see table). Similar individual variations in the content of sulfhydryl groups of the brain were noted in the work of other authors [2, 5, 6]. As will be seen from the results in the table, the total, low molecular and protein SH-group contents in the brain of the rabbit in a condition of general tetanus were practically indistinguishable from the normal values.

After strychnine convulsions in a rabbit, the brain showed a small (16.4%) but statistically significant increase in the content of protein SH-groups. The content of low molecular sulfhydryl groups was the same as in normal animals.

Since a fall in the content of cerebroside in the brain of rabbits was observed in both general tetanus and strychnine poisoning, but an increase in the content of sulfhydryl groups was found only in the latter case, it may be assumed that the fall in the cerebroside content in our experiments was not connected with the change in the content of SH-groups in the brain tissue. If the converse were true it would have been necessary to postulate that the mechanisms of the decrease in the content of cerebroside in the brain of the animals in the two forms of poisoning described above, each accompanied by severe convulsions, were different, which seems unlikely.

SUMMARY

The author studied the content of SH-groups in the brain tissue of healthy rabbits and in animals in a condition of general tetanus or after the administration of 50% of the lethal dose of strychnine. The data obtained led to the conclusion that there is no direct connection between the activity of the cerebroside and the content of SH-groups in the brain.

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