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The Lactic Acid Content of Cerebrospinal Fluid.

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The lactic acid content of a series of normal and pathological specimens of spinal fluid was investigated, and in a number of cases compared with the blood lactic acid of the same patient after one-half hour of absolute rest following the lumbar puncture. Analyses were made by the sulphuric acid method of Clausen.[1]

A spinal fluid was considered normal if it was clear and colorless, under normal pressure, had 10 or less cells per cm., gave a Pandy test plus one or less, a negative Wasserman and a Lange curve not rising over 2. Of 13 spinal fluids which could be considered normal, using this standard, the lactic acid content varied from 11 to 27 mg. per 100 cc., with an average of 19 mg. In 9 cases in which the lactic acid of the blood was also examined, the value for lactic acid in the spinal fluid was found to be 60 to 100 per cent of that in the blood. The average was 75 per cent. Killian[2] reported a lactic acid content of 8 to 15 mg. per 100 cc. in 5 normal cases and in 15 miscellaneous cases found a percentage ratio of spinal fluid lactic acid to blood lactic acid of 80 to 90 per cent. In our series a number of cases of syphilis of the central nervous system, of old hemiplegia, of epilepsy (between convulsions), and of amyotrophic lateral sclerosis, the values for lactic acid in the spinal fluid were within normal limits. In 2 cases of acute meningitis the lactic acid content was found to be greatly increased. A case of influenzal meningitis had a lactic acid content of 91 mg. per cent and one case of *Streptococcus meningitis* 150 mg. per cent. Blood lactic acid studies could not be made in these cases. In a case of xanthochromia, caused by trauma to the spinal meninges and of four days duration, the lactic acid content was 35 mg. per cent and the percentage ratio to the blood lactic acid was 140. In a case of brain abscess the spinal fluid lactic acid was 46 mg. per cent.

The most interesting specimen was from a patient with a probable spongioblastoma of the medulla (diagnosis confirmed

by operation) who underwent a spinal tap before the diagnosis of brain tumor was made. The spinal fluid lactic acid was 24 mg. per cent, well within the normal limits, but the blood lactic acid was only 10 mg. per cent, giving a percentage ratio of spinal fluid lactic acid to blood lactic acid of 240. We also studied another patient who undoubtedly has a brain tumor, though none was found on exploratory craniotomy. The ventricular fluid of this patient contained 41 mg. per cent of lactic acid, and the blood lactic acid just before operation (which was done under local anesthesia) was 20 mg. per cent, giving a percentage ratio of 205. The increased lactic acid in the fluid of these cases may perhaps be explained by the observations of Warburg and Minami[3] on the large amounts of lactic acid produced by tumor cells. A number of additional cases of brain tumor were studied in which the lactic acid content of the ventricular fluid was normal. In these cases, however, as demonstrated by operation, no surface of the tumor was in contact with the fluid from which a specimen for analysis was obtained.

[1] Clausen, S. W., *J. Biol. Chem.*, 1922, lii, 263.
[2] Killian, J. A., PROC. SOC. EXP. BIOL. AND MED., 1926, xxiii, 255.
[3] Warburg, O., and Minami, S., *Klin. therap. Woch.*, 1923, ii, 776.

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Effect of Drugs Upon Tonus Waves in Excised Auricle and Coronary Vessels of Terrapin.

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Excised terrapin auricles show continuous tonus waves 20 to 42 hours after excision, when kept in oxygenated Ringer's solution pH 7.8 to 8.0, at room temperature 20.5 to 27° C. Immediately after excision, decreasing the pH from 7.4 to 7.0 causes a disappearance of the tonus waves.[1] These waves reappear when the auricles are replaced in a solution of pH 7.4. Eighteen to 42 hours after excision these same auricles fail to respond by disappearance of tonus waves until a pH of about 6.2 to 6.0 is