

However, this assumption as to the structure of "vitamines" does not appear to be borne out by the more or less complete failure of several of the above synthetic compounds to protect birds against polyneuritis though capable of relieving the severe symptoms when once developed. No conclusion has been reached as to the cause of this apparent discrepancy.

Future work will take the direction of a search for similar desmotropism in the pyrimidine series.

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#### Quantitative chemical studies in spinal fluids.

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Quantitative determinations of total, non-protein and urea nitrogen, creatinine, creatine and sugar have been carried out on spinal fluids of poliomyelitis and various forms of meningitis. Traces of ammonia, uric acid and cholesterol have also been demonstrated in these fluids.

With the exception of urea, which has been extensively studied by French workers,<sup>1</sup> quantitative studies in spinal fluids are comparatively meager, due undoubtedly to the fact that until recently, micro-methods not being available for these determinations, large quantities of fluid had to be used for any single chemical test.

The direct Nesslerization method for nitrogen determinations recently reported by Folin and Denis<sup>2</sup> has been with slight modifications adopted for the determinations of total, non-protein urea and ammonia nitrogen in spinal fluids. The total nitrogen in poliomyelitis is in the neighborhood of 25 mgm. per 100 c.c. In various forms of meningitis the total nitrogen was found to be considerably increased, extending from about 35 mgm. to 150 mgm. per 100 c.c. The non-protein nitrogen content is about 50 to 70 per cent. of the total nitrogen and urea, about 60 to 80 per cent. of the non-protein nitrogen. The determinations of am-

<sup>1</sup> Soper, W. B. and Granat, S., *Arch. Int. Med.*, XIII, 131, 1914, review the literature.

<sup>2</sup> Folin, O. and Denis, W., *J. Biol. Chem.*, XXVI, 473, 1916.

monia were unsatisfactory because sufficiently large quantities of a single fluid required for a test were not available. Mixed water-clear sterile fluids obtained from poliomyelitis cases, were used. The results range from 0.1 mgm. to 0.9 mgm. of ammonia nitrogen per 100 c.c.

For the determinations of creatinine and creatine the Folin and Denis methods were employed. These methods have been recently criticized by McCrudden and Sargent.<sup>1</sup> The results nevertheless seem worth reporting in view of the creatinine and creatine studies on blood with the same methods. About half mgm. creatinine and from 0.3 to 0.7 of creatine were found in fluids examined.

Sugar was determined by means of the Lewis and Benedict method. The findings in poliomyelitis are at a somewhat lower level than that of the blood.

Uric acid also was determined on mixed fluids, the results indicating that measurable amounts are present in this fluid.<sup>2</sup>

Attempts to determine cholesterol by Bloor's<sup>3</sup> method showed the presence of traces only.

AVERAGE CHEMICAL FINDINGS IN SPINAL FLUIDS EXPRESSED IN MGM. PER 100 C.C.

Number of Cases.		Total Nitrogen.	Non-protein Nitrogen.	Urea Nitrogen.	Creatinine.	Creatine.	Sugar (Per Cent.).
2	Meningism...	15	13		.36		.07
12	Epidemic cerebro-spinal meningitis...	51 (24-120)	23 (15-33)	14 (10-21)	.44	.70	Traces
8	Tubercular meningitis ..	30 (25-42)	15 (13-17)	9 (7-14)	.48	.56	Traces-.06
3	Influenza meningitis ..	76		6			
45	Poliomyelitis.	23 (16-34)	15 (11-24)	10 (5-20)	.44 (.35-.51)	.38 (.19-.49)	.07 (.05-.09)
	"	Ammonia Nitrogen = .58		Uric Acid = Traces -.5		Cholesterol = Traces	

The figures in parenthesis indicate the lower and upper limits.

<sup>1</sup> McCrudden, F. H., and Sargent, C. S., *J. Biol. Chem.*, XXVI, 527, 1916.

<sup>2</sup> Compare Fine, M. S., and Myers, V. C., *PROCEED. SOC. FOR EXP. BIOL. AND MED.*, XIII, 126, 1916.

<sup>3</sup> Bloor, W. R., *J. Biol. Chem.*, XXIV, 227, 1916.