A Study of Normal Human Cerebrospinal Fluid by the Immuno-Electrophoretic Method

THE immuno-electrophoretic method¹ allows the definition of the constituents of a mixture of antigenic substances by means of their relative electrophoretic mobilities, and their enumeration, by specific precipitation, by means of a homologous immune serum. The study of normal human serum by this method has allowed the enumeration of at least sixteen different constituents².

We have studied, by the same method, normal cerebrospinal fluid concentrated by ultra-filtration³, by using horse immune serum (No. 31) anti-normal human serum, which has been used in the study of human serum. In a parallel manner we have submitted the same samples of cerebrospinal fluid to ordinary electrophoresis on agar under the same conditions as used for immuno-electrophoretic analysis. The agar gels were then dried, and the protein and lipid constituents were stained *in situ* by methods similar to those used previously⁴.

The plain electrophoretic analysis in a gelified medium shows (Fig. 1) that the cerebrospinal fluid contains: a substance which migrates more quickly than albumin; much albumin; a small amount of α -globulins; β_1 - and β_2 -globulins and a small amount of γ -globulins.

Fig. 1

Fig. 2

The immuno-electrophoretic analysis (Fig. 2) allows us to distinguish the following: a constituent which migrates more rapidly than albumin and which would seem identical with the ρ -constituent of blood serum²; serum albumin; a constituent having the same mobility as albumin which is probably identical with the χ -constituent in blood serum²; one or probably two α_1 -globulins; three α_2 -globulins; at least one β_1 -globulin; a single antigenic constituent having, however, two different migration-rates. This latter corresponds to the β_2 -globulins and the small amount of γ -globulins which corresponds to the slow γ -globulins of the serum.

As we have used a total immuno-serum human antiserum, we could only distinguish in the cerebrospinal fluid constituents existing in the serum; there may also be other constituents specific to the cerebrospinal fluid. Our results do, however, demonstrate that the distribution of protein constituents in the

cerebro-spinal fluid is not the same as in the serum itself.

Detailed results will be published in the *Bull. Soc. Chim. Biol.*

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⁴ Uriel, J., and Scheidegger, J. J., *Bull. Soc. Chim. Biol.*, **37**, 165 (1953). Uriel, J., and Grabar, P. (in the press).

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Effect of Heat Stress on Serial Reaction Time in Man.

EXPERIMENTAL studies of the effects of ambient temperatures on simple reaction time have suggested that there may be a negative correlation between simple reaction time and temperature, but results appeared to be rather inconclusive. In fact Teichner¹, in a review of studies of simple reaction time, concludes that ambient temperatures between -50° and 117° F. have little or no effect on either simple reaction time or more complex reaction times.

In a series of experiments on the effects of ambient temperatures ranging from 90° to 104° F. (90–95 per cent saturation), we had occasion to study the effects of such temperatures on both simple reaction time and serial reaction time. In serial reaction time the signals are presented to the subject continuously with irregular occurrence of the signals to action, and without the warning signals customary in experiments on simple reaction time. It may reasonably be argued that serial reaction time is a more realistic measure than simple reaction time, since in the skills of everyday life we are seldom given warning of the arrival of a significant stimulus.

The apparatus used in these experiments was the Cambridge visual vigilance test², coupled to a photo-electric cell and a pulse-height discriminator operating a clock-starting relay. This gave a very accurate measure of reaction time.

Seven subjects were tested over a period of five days, serial reaction time being measured before entry into the heat chamber, after one hour exposure to the above range of temperatures, and after two hours exposure. For each measurement of reaction time the subject was presented with a large number of stimuli in a short time (forty stimuli in 5 min. in random order). The mean serial reaction times are shown in Table 1. It will be seen that the rise in reaction time under heat stress is small but statistically significant.

Table 1

	Mean serial reaction time (sec.)	P
Control	0.247	
First hour	0.256	
Second hour	0.267	
Control v. first hour		0.05*
Control v. second hour		0.01†
First v. second hour		0.05*

* Significant.

† Highly significant.