Table II

Brain and large intestine 5 HT concentrations (biological method).

Treatment	Time after treatment	Number of animals	Number of determinations	Encephalic Serotonine ng/g ± S.E.	Range	Intestinal Serotonine ng/g ± S.E.	Range
–	–	27	9	13 ± 4	6– 48	2300 ± 300	1200–3600
Electroshock . . .	10 min	27	9	360 ± 7	90–720	920 ± 100	480–1400
Electroshock . . .	1 h	22	7	160 ± 40	48–300	1530 ± 300	960–3000
Electroshock . . .	2 h	22	7	47 ± 10	12– 72	1780 ± 470	1080–3600
Electroshock . . .	24 h	22	7	13 ± 3	4– 36	2370 ± 300	1740–3600

Some assays were carried out on the test of rat's isolated uterus. Also in this test, 10 min after electroshock, an increase in cerebral serotonin can be observed. Also after cardiazol (80 mg/kg intraperitoneally), the variations in encephalic and intestinal serotonin are similar.

We also wish to point out the difference between our results and those obtained after reserpine administration, when a fall in brain 5 HT concentration (and not a marked raise, as in our experiments) parallels the fall of intestine 5 HT concentration.

Addendum: Further determinations, with spectrophotometric method, show after electroshock a second increase in brain 5 HT starting from the 36th hour to the 72nd hour. In the same time intestinal levels of 5 HT do not change.

S. Garattini, A. Valsecchi, and L. Valzelli

Institute of Pharmacology, University of Milano (Italy), March 14, 1957.

Riassunto

Si dimostra che dopo uno shock convulsivo elettrico o cardiazolico il contenuto in serotonina aumenta in maniera molto rilevante nell'encefalo e si abbassa nell'intestino crasso.

L'aumento encefalico e la diminuzione intestinale, che raggiungono gradi molto cospicui già 10 min dopo il trattamento convulsivante si attenuano poi nei tempi successivi: intensamente diminuiti dopo 1 h, non sono più rilevabili dopo 24 h.

Effects of Short Chain Fatty Acid Anions upon Cortical Blood Flow and EEG in Cats

It has recently been reported by White and Samson[1] and by Samson and Dahl[2] that buffered fatty acid anion solutions, injected intravenously in rabbits, produce slow waves in the EEG in combination with behavioural signs of sleep. Furthermore, it has been demonstrated that fatty acids to some extent may participate in the normal cerebral metabolism in man[3].

Investigating the influence of various metabolites upon the EEG and the cortical blood flow in the cat, recorded with a new method[4], we have injected small doses of butyric (1 *M*) and octanoic (0·5 *M*) acid solutions (buffered with NaOH) as well as a solution of oleic acid (dissolved in 10% human albumine)[5]. Heparinized preparations were used, either lightly anaesthetized (Nembutal) or unanaesthetized (*encéphale* or *cerveau isolé*). The EEG, the blood pressure and the cortical blood flow were recorded continuously during the experiments.

No effects were obtained by the oleic acid solution. Octanoic anions had the same effect as butyric anions.

[1] R. P. White and F. E. Samson, Amer. J. Physiol. *186*, 271 (1956).

[2] F. E. Samson and N. Dahl, Fed. Proc. *14*, 129 (1955).

[3] W. Sacks, Fed. Proc. *16*, 240 (1957).

[4] D. H. Ingvar and U. Söderberg, EEG Clin. Neurophysiol. *8*, 403 (1956).

[5] The solutions were kindly prepared by B. Borgström, M. D., Department of Biochemistry, University of Lund.

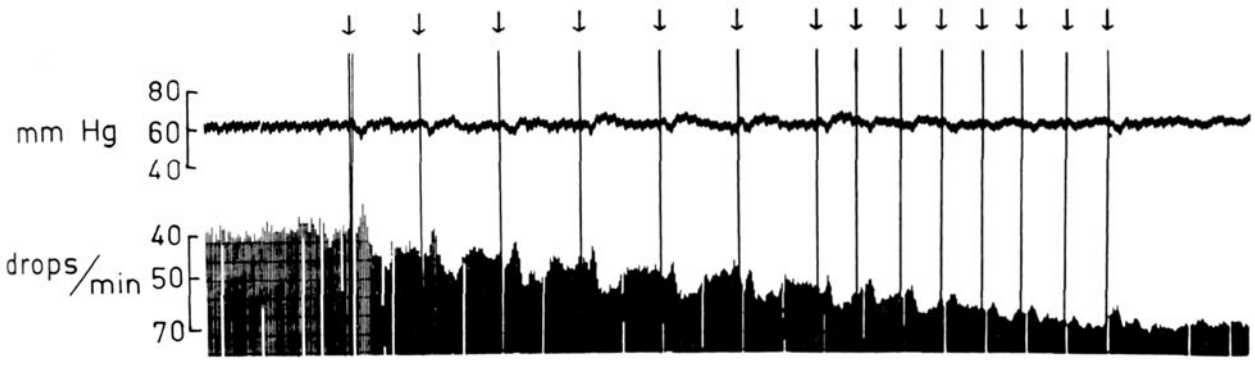

Fig. 1. – Cat. *Cerveau isolé* preparation. Cervical sympathetic nerves sectioned. Records of *blood pressure* (recorded by damped electromanometer in the brachial artery) and *cortical blood flow* in rostral parts of the brain. The flow record consists of dense vertical lines. The height of each line is proportional to the interval between blood drops from the cannulated superior sagittal sinus. Decreasing height of vertical lines therefore means increasing flow. Record interrupted every 30 s. Arrows indicate intravenous injections of 1 ml of 1 *M* buffered butyric acid solution. Note increase of cortical blood flow in spite of constant blood pressure.

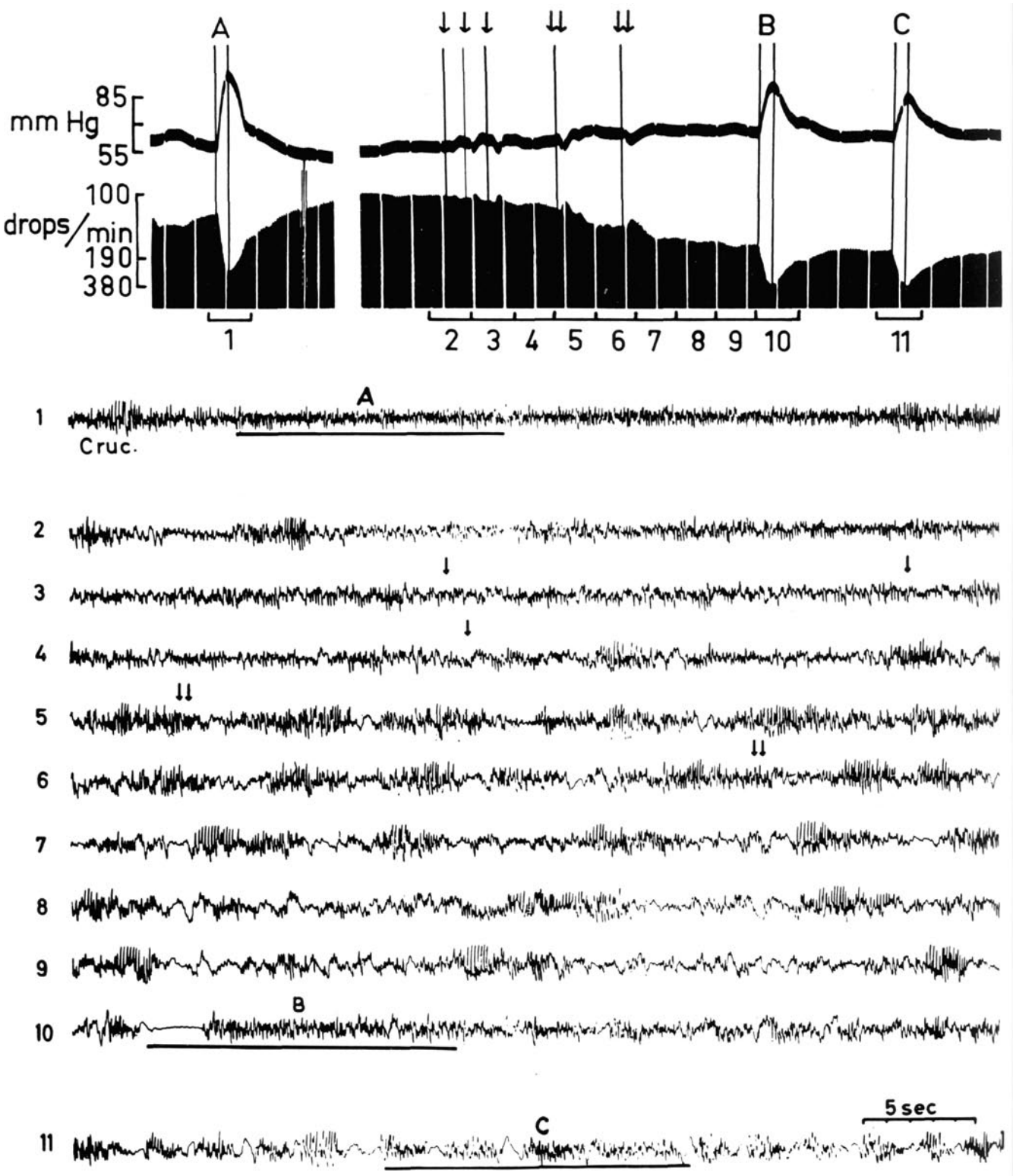

Fig. 2.—Cat. Light Nembutal anaesthesia. Vagi and cervical sympathetic nerves sectioned. *Upper diagram:* Records of *blood pressure* and *cortical blood flow* as in Figure 1. *Lower diagram:* Samples of *EEG* from cruciate area. Numbers correspond to periods marked below upper diagram. Calibration 200 microvolts. *A*, *B* and *C* electrical stimulation of the mesencephalic reticular formation (threshold intensity, 250/s, 1 ms duration). Each arrow indicates injection of 1 ml of 1 *M* buffered solution of butyric acid. Note: *1* Slow waves in the EEG started to develop after third dose of butyric acid. *2* Increase of cortical blood flow evident from period 6 and on. *3* The brain stem stimulation which at *A* gives a typical arousal reaction of the EEG becomes less effective after butyric acid in *B* and is without effect in *C*. The pressor responses are also diminished in *B* and C as compared to *A*.

Both were found to produce the change of EEG previously described[6]. It was furthermore observed that at the same time as developed of slow waves and spindles in the EEG, there was a pronounced increase of the cortical blood flow due to a reduction of the cortical vascular resistance (Fig. 1). A relative increase of flow of up to 100% was thus recorded after administration of 4 *mM*/kg of butyric acid. Minor effects upon the EEG and the blood flow were seen already after injection of 1-2 ml of the solution used. The presence of glucose in large concentrations in the blood did not alter the effects described.

When arousing stimuli (adequate stimulation, electrical stimulation of the brain stem, injection of Metrazol) were employed as a test of brain stem functions, it was found that the arousal reaction of the EEG disappeared completely with increasing doses of the fatty acid solution (Fig. 2). Pressor effects following brain stem stimulation also diminished. These facts demonstrate that the fatty acid anions block the general activating influence of the reticular system upon the cortex[7].

The finding of synchrony in the EEG with slow waves in combination with cortical vasodilatation following injection of short chain fatty acids is of interest for several reasons. This state contrasts with the one obtained with e.g. barbiturates, which also induce synchrony but with some cortical vasoconstriction[8]. On the other hand, the fatty acid effects show principal similarities with the state of physiological sleep in which there is a sleep pattern in the EEG as well as some cortical vasodilatation[9]. It is known that local metabolites are of great importance for the adjustment of the cortical vasomotor tone during changes in EEG[10]. In view of the findings reported here, it seems an interesting suggestion for further investigation that fatty acids as humoral agents may participate in the normal regulation of cortical excitability and vasomotor tone.

B. Holmquist and D. H. Ingvar

Institute of Physiology, University of Lund (Sweden), March 12, 1957.

Zusammenfassung

Die Wirkung von intravenös injizierten Fettsäureanionen (0,5–1,0 molare Lösung in NaOH von Buttersäure und Kapronsäure) auf das Elektroencephalogramm, auf den Blutdruck und auf die kortikale Durchblutung wurde bei leicht narkotisierten und nichtnarkotisierten Katzen untersucht. Es wurde bestätigt, dass Fettsäureanionen eine ausgesprochene Depression des Elektroencephalogramms herbeiführen. Weiterhin wurde gezeigt, dass sich mit dieser Depression auch eine bedeutende Herabsetzung des kortikalen Gefässwiderstandes entwickelt.

[6] R. P. White and F. E. Samson, Amer. J. Physiol. *186*, 271 (1956). – F. E. Samson and N. Dahl, Fed. Proc. *14*, 129 (1955).

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[8] D. H. Ingvar and U. Söderberg, EEG Clin. Neurophysiol. *8*, 403 (1956).

[9] L. Sokoloff, *Neurochemistry* (Ed. S. R. Korey and J. I. Nurnberger; Hoeber-Harper, New York 1955), pp. 216–229.

[10] D. H. Ingvar: *Cortical state of excitability and cortical circulation*. Symposium on the reticular formation of the Brain, Henry Ford Hospital, Detroit, March 14–16, 1957.

Elektrophysiologische Untersuchungen über die Ultraviolettempfindlichkeit von Insektenaugen[1]

Bei der Frage nach der spektralen Absorption der Schstoffe im Komplexauge der Insekten nehmen elektrophysiologische Messungen der spektralen Empfindlichkeit einen bevorzugten Platz ein, da wegen methodischer Schwierigkeiten direkte Bestimmungen bisher fehlen. Für das sichtbare Spektrum liegen solche Messungen bereits vor[2]. Schon ältere Verhaltensversuche haben indessen gezeigt, dass von vielen Insekten ausser dem sichtbaren auch das für uns weitgehend unsichtbare ultraviolette Licht (UV) wahrgenommen wird und zum Teil erstaunlich reizwirksam ist[3]. Da diese Versuche wenig Rückschlüsse auf die spektrale Absorption der Pigmente zulassen, lag es nahe, die spektrale Empfindlichkeit für das UV elektrophysiologisch zu bestimmen.

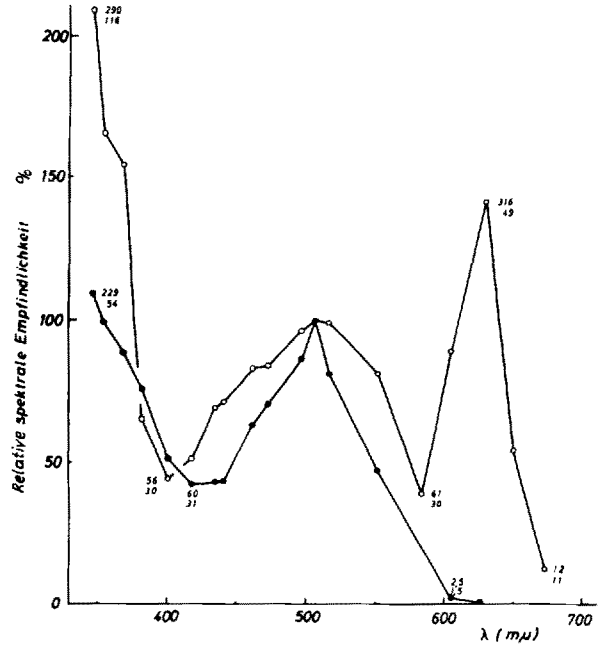

Abb. 1. Relative spektrale Empfindlichkeit von *Calliphora erythrocephala* (o) und *Periplaneta americana* (oberer Augenteil; •) bei Dunkeladaptation. Relative spektrale Empfindlichkeit: Reziprokwerte derjenigen Quantenzahlen, die als Einzelreiz Ein-Effekte gleicher Höhe erzeugen, in Prozent des Maximums bei 507 mμ. Mittel der Werte aus 7 bzw. 6 Versuchen, deren Variabilität durch die angeschriebenen Extrema demonstriert wird.

Als Lichtreizgerät diente ein Doppelinterferenzfilter-Monochromator mit einer Xenonlampe als Lichtquelle[4]. Es wurden Fliegen (*Calliphora erythrocephala*, Wildform[5]) und Schaben (*Periplaneta americana*, nur oberer Augenteil) untersucht, deren spektrale Empfindlichkeitsverteilung im für uns sichtbaren Spektrum bekannt ist[6]. Die sonstigen Versuchsbedingungen entsprechen im wesentlichen den Angaben dieser Autoren.

[1] Mit Unterstützung der Deutschen Forschungsgemeinschaft.

[2] V. J. Wulff, Physiol. Rev. *36*, 145 (1956).

[3] K. Daumer, Z. vgl. Physiol. *38*, 413 (1956), dort weitere Literatur.

[4] E. Dodt, *Elektroretinographie*, Hamburger Symposion 1956, Bibl. Ophthal. *48*, 32 (1956).

[5] Die Versuchstiere verdanken wir Herrn Prof. Dr. H. Autrum (Zoologisches Institut, Universität Würzburg).

[6] H. Autrum und H. Stumpf, Z. vgl. Physiol. *35*, 71 (1953). – J. B. Walther, im Druck (1957).