It seems not unreasonable to attribute the inhibitory effect of phosphate to a precipitating action on radiostrontium in the gut[4]. This might be the case should carrier strontium be present. With tricalcium phosphate, radiostrontium is most probably bound mainly by adsorption and ion exchange, especially when excess phosphate ions are added in the form of disodium phosphate. It should also be remembered that the latter acts as saline cathartic which is a certain advantage, because tricalcium phosphate alone causes constipation.

The carbonates tested, and also magnesium oxide, act as antacids. In vitro, calcium and magnesium carbonates in equimolar doses neutralize twice as much hydrochloric acid as sodium hydrogen carbonate; magnesium oxide has even greater antacid effect, because no carbon dioxide is formed during neutralization. In vivo, sodium hydrogen carbonate is a systemic antacid with a high neutralizing power, while calcium and magnesium carbonates and magnesium oxide act in the stomach as local antacids. The resulting calcium chloride is a mild astringent, whereas the magnesium chloride formed is a mild purgative.

In our experiments, magnesium oxide reduced the retention of Sr-85 twofold; carbonates, with the exception of calcium carbonate, were ineffective. Magnesium oxide was also administered immediately before the carbonates, because it was expected that in the alkalinized medium of the stomach they might be effective. In addition, the mixture of magnesium oxide and sodium hydrogen carbonate has both local and systemic antacid effect and the constipating effect of calcium carbonate might be balanced by the laxative effect of magnesium salt. However, the combinations were no more active than magnesium oxide alone.

Similarly, when sodium hydrogen carbonate was administered with calcium or magnesium carbonates, no marked effect on the retention of Sr-85 was observed. These results would indicate that strong alkalization of the stomach contents was not as important as the presence of magnesium oxide as such[7].

Zusammenfassung. Unter diversen Phosphaten, Karbonaten und Magnesium-Oxyd zeigte die Kombination Trikalzium-Dinatriumphosphat im Skelett die stärkste Reduktion des Radiostrontiumgehalts (fast 90%).

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[7] Acknowledgment: I wish to thank Eng. Z. ROTH for statistical cooperation.

A Histochemical Study on the Fundamental Plan of the Central Nervous System

As an architectural principle of the central nervous system, it has been known that the sulcus limitans of HIS runs rostrocaudally on both lateral walls of the neural tube and that the visceral areas derive from the portions along the sulcus. According to KINGSBURY[1], the sulcus limitans terminates rostrally in the hypothalamus, which plays the most important role as the automatic centre. On the other hand, BRODIE and SHORE[2] reported the significance of norepinephrine and serotonin as chemical transmitters for the visceral functions in the brain. Therefore, the authors decided to trace the distribution of monoamine oxidase metabolizing catecholamines and serotonin in the central nervous system, with due consideration of the sulcus limitans.

As material, chick embryos of 5, 9 and 14 days' incubation were used. The fresh and unfixed head of the chick embryos were cut into serial frontal and sagittal sections of 30 μ with use of the cryostat. The Glenner method was utilized for demonstrating monoamine oxidase. At the same time, the distribution of succinic dehydrogenase was demonstrated with the Nachlas method, in order to compare with the distribution patterns of monoamine oxidase.

After 5 days' incubation, the brain and the spinal cord scarcely show the reaction of monoamine oxidase and succinic dehydrogenase. After 9 days' incubation, the monoamine oxidase activity (Figures 1 and 2) is markedly demonstrable in the septal part, preoptic area, hypothalamus, periventricular part of the thalamus, central grey of the mesencephalon and areas along the sulcus limitans and the raphe of the medulla oblongata and spinal cord. After 14 days' incubation, the hippocampus and paleo- and archistriatum show an intense activity of monoamine oxidase, besides the portions representing the activity of this enzyme after 9 days' incubation. On the other hand, the succinic dehydrogenase reaction is not shown in areas which are positive for the monoamine oxidase activity, but appear faintly in the parts of each striatum facing the lateral ventricle, optic tectum and nucleus rotundus after 9 days' incubation, and moreover, in each nucleus of the thalamus after 14 days' incubation.

From the above-mentioned results, monoamine oxidase activity is recognizable intensely and clearly in the visceral portions adjacent to the sulcus limitans and the hypothalamus, and, moreover, the preoptic and septal areas, which are thought to be functionally the visceral parts extending rostrally to the hypothalamus. Furthermore, the hippocampus, the phylogenetically old parts of the striatum, and the raphe originating the floor plate, show a strong reaction of monoamine oxidase compared with the somatic areas. In contrast to the distribution pattern of monoamine oxidase, the succinic dehydrogenase activity is shown to be relatively intense in the somatic areas. It is emphasized that the activity of the enzymes metabolizing the chemical regulators, such as catecholamines and serotinin, is clearly shown in the neighbourhood of the sulcus limitans in early stages of the development of the brain compared with the activity of succinic dehydrogenase, which participates in aerobic respiration.

[1] B. F. KINGSBURY, J. comp. Neurol. *32*, 112 (1920).
[2] B. B. BRODIE and P. A. SHORE, Ann. New York Acad. Sci. *66*, 631 (1957).

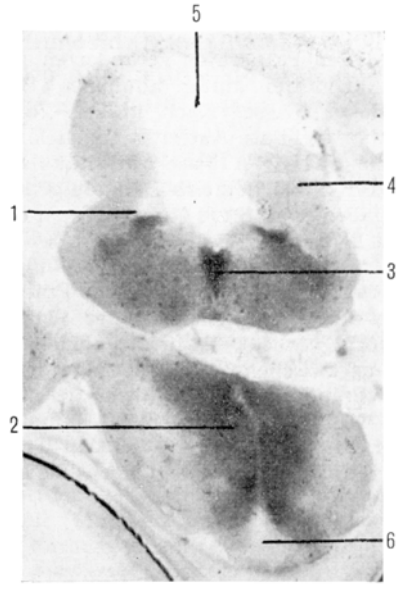

Fig. 1

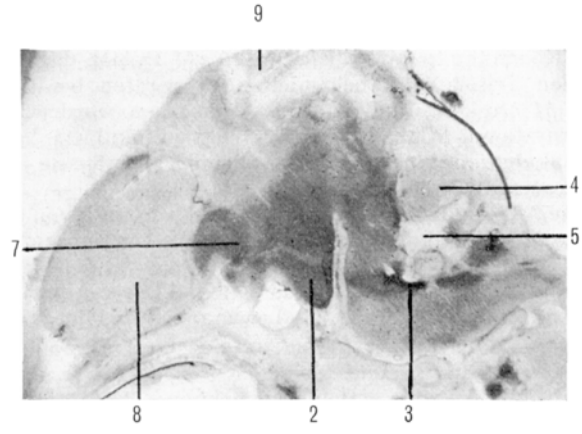

Fig. 2

Fig. 1. A transverse section (× 2.6); Fig. 2, a sagittal section (× 2.5) of the brain of chick embryo at 9 days' incubation. The hypothalamus, the preoptic area, the part adjacent to the sulcus limitans, and the raphe show an intense activity of monoamine oxidase. 1 sulcus limitans, 2 hypothalamus, 3 raphe, 4 cerebellum, 5 fourth ventricle, 6 third centricle, 7 preoptic area, 8 striatum, 9 tectum opticum.

The fundamental idea that the neural tube is divided into longitudinal columns may also be adapted to the chemoarchitectonics, as far as the visceral and somatic columns are concerned. In addition, the monoamine oxidase distribution in the mammalian brain[3] is assumed to be able to be explained from the author's results.

Zusammenfassung. Die histochemische Verteilung der Monoaminoxydase- und Succinodehydrogenase-Aktivität im Zentralnervensystem des Hühnerembryos wurde nach der Methode von Glenner und Nachlas geprüft. Die Monoaminoxydasereaktion ist in der visceralen Säule, entlang dem Sulcus limitans, in Hypothalamus, Area preoptica, Hippocampus und Raphe stark, während die Succinodehydrogenasereaktion nur in den somatischen Teilen stärker zu sein scheint. Auf Grund dieser Befunde ist es wahrscheinlich, dass das Neuralrohr in longitudinale, viscerale und somatische Säulen unterteilt ist.

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[3] P. H. Hashimoto et al., Med. J. Osaka Univ. *12*, 425 (1962).

Na^+-K^+-aktivierbares Adenosintriphosphatase-System: Die Wirkung von Triton-X-100 auf die SH-Gruppen

Der Effekt von Triton-X-100[1] auf die Na^+-K^+-ATPase[2] von Rattengehirn ist biphasisch[3,4]. Bis zu einer gewissen Konzentration wird die Enzymaktivität gesteigert, bei höheren Konzentrationen hingegen wird sie gehemmt. Da die Funktion der Na^+-K^+-ATPase an SH-Gruppen gebunden ist[5], wurde untersucht, ob eine Detergensbehandlung des Enzympräparates die Reaktionsfähigkeit der SH-Gruppen verändert.

Als Folge der Einwirkung von Triton-X-100 werden maskierte SH-Gruppen freigesetzt (Figur 1). Bei einer Konzentration von 0,025%, bei der die Na^+-K^+-ATPase-Aktivität maximal gesteigert wird, wurden 45% mehr SH-Gruppen gefunden als bei der Kontrolle. Eine Triton-X-100-Konzentration von 0,15% verdoppelt etwa die erfassbare Menge der SH-Gruppen. Die Triton-X-100-Behandlung des Enzympräparates verändert die Wirkung von SH-Giften auf die ATPase-Aktivität. Halbmaximale Hemmung der Na^+-K^+-ATPase wurde in Kontrollpräparaten bei einer PCMB[6]-Konzentration von 20 μM erreicht, eine annähernd vollständige Hemmung bei 40 μM. (Die Aktivität der Na^+-K^+-ATPase = Aktivität in Gegenwart von Mg^{++} + Na^+ + K^+ minus Aktivität in Anwesenheit von Mg^{++} allein.) Unter gleichen Versuchsbedingungen lag die halbmaximale Hemmung in den Triton-X-100-behandelten Präparaten bei etwa 60 μM

[1] Triton-X-100, Octylphenol-decaäthylenglykoläther, Firma Serva, Heidelberg.
[2] Na^+-K^+-ATPase, Na^+-K^+ aktivierbares Adenosintriphosphatase-System.
[3] J. Somogyi, Naturwissenschaften *50*, 157 (1963).
[4] J. Somogyi, Naturwissenschaften *51*, 143 (1964).
[5] J. Chr. Skou, Biochem. biophys. Res. Commun. *10*, 79 (1963).
[6] PCMB, *p*-Hydroxy-mercuribenzoat, Na-Salz, Firma Serva, Heidelberg.