These results could explain at least in part how, under the conditions of the primitive Earth, the first enzymes could have come into existence, and how they could have survived their exposure to elevated temperatures and strong UV-light[11,12].

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Zusammenfassung. Thermisch hergestelltes Polylysin beschleunigt die Übertragung von Aminogruppen des Harnstoffs auf α-Ketoglutarsäure. Das pH-Optimum dieser Reaktion, die die Anwesenheit von Cu-Ionen erfordert, liegt bei 7.00. Die Transaminierungsreaktion folgt der MICHAELIS-MENTEN-Kinetik. Thermisch hergestelltes Polylysin wird durch Erhitzen in Pufferlösungen nicht inaktiviert, während Depolymerisation oder Modifizierungen der Aminogruppen den Verlust der Aktivität zur Folge haben.

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Secretory Responses of the Submaxillary Gland in Hypophysectomized Rats after Treatment with Thyroxine

Endocrine glands, mainly the hypophysial and thyroid glands and the gonads, are known to affect the structure of salivary glands in rodents[1–3]. Regarding glandular function, previous results indicate that hormonal factors, particularly thyroxine, are of great importance for the secretory responses of the rat's submaxillary gland to parasympathomimetics[4]. To study the role of thyroxine its effects on the threshold dose of acetylcholine and on the maximal secretory responses to stimulation of the chorda-lingual nerve or pilocarpine of the submaxillary gland were determined in hypophysectomized rats.

Twenty-five female rats were used. Hypophysectomy was performed at the age of 110–120 days in all animals. The experiments were performed 7 weeks after the operation. Thirteen rats were untreated while 12 received daily s.c. injections of a physiological dose of thyroxine[5], 6.5 μg L-thyroxine, for 3 weeks starting the treatment 4 weeks after hypophysectomy. The completeness of hypophysectomy was checked[6]. The hypophysectomy was incomplete in 6 animals. The results refer to 19 rats where microscopic examination revealed no other hypophysial cells than small pars tuberalis cells lining the pituitary stalk.

To study the secretory responses the rats were anaesthetized using chloralose (100 mg/kg) i.v. after preliminary ether. The submaxillary ducts were exposed in the neck and cannulated with small glass cannulae giving about 100 drops out of 1 ml of distilled water. Secretion appearing at the tip of the cannula was marked on a smoked drum. A series of doses of the hydrochloride of acetylcholine (0.05–5 μg/kg) was given i.v. to estimate the threshold dose. The maximal secretory response of the gland was estimated by stimulating the chorda-lingual nerve by 20 shocks/sec, which is known to cause a secretion of maximal rate[7], or by giving pilocarpine i.v. in increasing doses from 50–200 μg/kg every 30–60 sec until the maximal flow rate was reached. The maximal secretory response is expressed as μl saliva/min/gland or μl saliva/min/mg glandular tissue (dry weight). After the experiments the submaxillary glands were carefully cleaned and weighed (wet weight). The dry weight was determined after heating to 105–110 °C for 48 h.

The size of the submaxillary gland was found to be increased by about 50% in hypophysectomized rats after

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Weight of submaxillary glands and maximal secretory responses to chorda stimulation or pilocarpine in rats after hypophysectomy and in hypophysectomized rats given thyroxine

	Glands			Maximal secretory responses					
	No.	Wet weight (mg)	Dry weight (mg)	Chorda stimulation			Pilocarpine		
				No.	μl/min	μl/min/mg	No.	μl/min	μl/min/mg
Hypophysectomy	11	66 ± 3.7	14.1 ± 0.87	7	13 ± 1.6	0.89 ± 0.083	7	4.5 ± 0.30	0.32 ± 0.026
Hypophysectomy + thyroxine	8	100 ± 6.4[a]	21 ± 1.4[a]	4	40 ± 5.7[b]	1.9 ± 0.18[a]	7	10.9 ± 0.86[a]	0.53 ± 0.049[b]

Values are mean ± S.E.M. [a] $P < 0.001$. [b] $P < 0.01$ when compared with hypophysectomy.

treatment with thyroxine (Table). The gain in gland weight is specific since the body weight was similar in both groups of animals; it decreased by about 15–20% in 7 weeks.

The threshold dose to acetylcholine was found to be 0.5–5 μg/kg after hypophysectomy. Treatment with thyroxine seemed to lower the threshold dose; e.g. 0.5 μg acetylcholine/kg or lower was the threshold dose in 40% after hypophysectomy alone but in 90% after treatment with thyroxine.

The maximal secretory responses to chorda stimulation or pilocarpine were increased after treatment with thyroxine by about 150–200% when expressed per gland. The increase in maximal flow rate was more marked than the gain in gland weight in thyroxine-treated animals. Therefore, the maximal secretory responses were also augmented when expressed per unit weight (Table).

The sensitivity of the rat's submaxillary gland to parasympathomimetics is affected by the hypophysial gland; it is decreased after hypophysectomy[4]. The endocrine sensitivity control seems to be at least partly via the thyroid gland since the threshold dose of acetylcholine was decreased in hypophysectomized animals treated with thyroxine.

The maximal secretory responses to chorda stimulation or pilocarpine have previously been estimated in unoperated controls[7]. The maximal flow rate was markedly decreased after hypophysectomy both when expressed per gland and per unit weight. It was increased in hypophysectomized rats after treatment with thyroxine but still somewhat lower than that of controls[7] when expressed per gland. The well-known glandular atrophy after hypophysectomy which is located to the tubules of the gland, was only partly abolished by treatment with thyroxine. Therefore, the maximal secretory responses in thyroxine-treated animals were similar or higher than those of controls[7] when expressed per unit weight. These results indicate an important role for thyroxine regarding the maximal flow rate of the gland and they further strengthen a previous suggestion[8] that the tubules of the gland to a large extent determine the parasympathetic secretion.

Zusammenfassung. Das Gewicht der Submaxillarisdrüse der Ratte nimmt nach Wegnahme der Hypophyse ab; die Gewichtsabnahme wird teilweise nach Behandlung mit Thyroxin verhindert. Die Empfindlichkeit der Drüse gegen parasympathische Substanzen und die maximale Fähigkeit zur Sekretion sind in hypophysenlosen Ratten verringert, aber nach Behandlung mit Thyroxin wieder gesteigert.

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Effect of Copulation or Vaginal Stimulation on Melanocyte-Stimulating Hormone Content of the Hypophysis

Copulation has been shown to provide a stimulus which triggers off the mechanism that produces liberation of gonadotropins in the so-called 'reflex ovulators' animals like the rabbit[1], as well as in the rat in which ovulation occurs 'spontaneously'[2]. Since copulation and vaginal stimulation were also shown to induce pseudopregnancy, a situation in which the release of ovulating hormones is inhibited and that of luteotrophic hormone (LtH) is enhanced, a dual effect of these stimuli on the hypothalamus could be presumed. Secretion of melanocyte-stimulating hormone (MSH), which is to a certain extent controlled by a similar mechanism to that of LtH, may also provide information about the effect of such stimuli on the hypothalamus.

The effect of coitus on pituitary MSH content was studied in male and female albino rats. To study the effect in males 2 or 3 of them were placed in a cage with 2 or 3 females pretreated with estrogen-progesterone to increase their receptivity. For each animal the sexual behaviour was allowed to proceed for a period of about 10 min after the first mounting, which was taken as the beginning of the test. Only those males which displayed active sexual behaviour with repeated mountings and intromissions during the test period were used as pituitary donors.

Female donor animals were used in the afternoon of the day of proestrus. Two or 3 of them were placed in cages with 3 or 4 vigorous, active males. The first intromission was taken as the beginning of the test and sexual behaviour was allowed to proceed for about 10 min. During this time repeated intromissions occurred and at the end of this period a mucus plug was usually found in the vagina. Only those females receptive to the males and showing lordosis during coitus were used.

The animals were killed with ether 1 h after mating and their pituitaries were taken immediately, weighed, suspended in an appropriate volume of distilled water and kept frozen until the MSH was assayed. Pools of 2 glands were used in each determination.

In a group of rats vaginal stimulation were made by means of a glass rod during 2 min the day after the vaginal smears showed a typical proestrous stage. The animals were killed 30, 60 or 120 min later and the hypophyses were taken for MSH determination.

MSH was assayed in vitro using the skin of toads as test material[3]. The hypophyses were assayed at 2 dose levels and the activity/mg gland was compared to that of control animals in the same stage of the cycle. Control pituitary MSH concentration was also tested at 2 dose levels and taken as 100%. Five to 7 pieces of skin were assigned to each point and the interval between doses was

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