äusserst feine Nerv lokale Anschwellungen erkennen, die sich – ähnlich wie die Corpora cardiaca – vom übrigen Nervengewebe durch ihre weiss-bläuliche Färbung unterscheiden. Die histologische Untersuchung dieser Region nach PAF-Färbung ergibt folgendes: Von der Austrittstelle des Nervus corporis allati II an der Ventralseite des Corpus allatum bis kurz vor seiner Einmündung in das Unterschlundganglion lassen sich dicht mit Neurosekret beladene Fasern verfolgen, die – wie das Querschnittpräparat zeigt – vornehmlich im peripheren Bereich verlaufen (Figur 2). Atypisch für ein reines Nervengewebe sind die zahlreichen kleinkernigen Zellelemente, die im Fasernetz eingebettet liegen. Solange wir jedoch über die histologische Struktur und den Ursprung dieser neurosekretorischen Verbindung im unklaren sind, mag der Hinweis genügen, dass die Intensität der histologisch nachweisbaren sekretorischen Aktivität individuellen und möglicherweise auch funktionellen Schwankungen unterliegt.

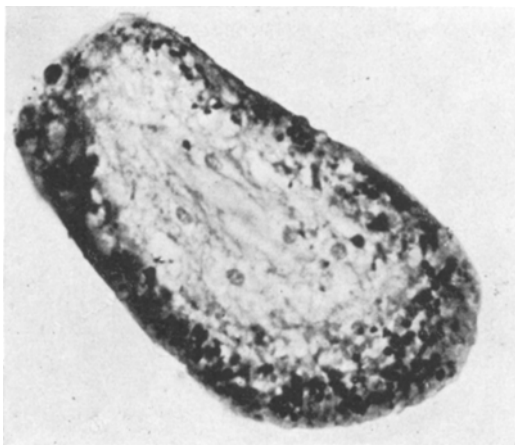

Fig. 2. Querschnitt durch den Nervus corporis allati II mit peripher gelegenem Neurosekret. Paraldehydfuchsin. × 1100.

Im Bereich des Unterschlundganglion und der Bauchganglienkette lassen sich drei verschiedene sekretorisch tätige Zelltypen unterscheiden: (1) Das Unterschlundganglion und alle Bauchganglien führen CHP- und PAF-positive Zellen in konstanter Zahl und symmetrischer Anordnung. Sie liegen stets in unmittelbarer Nachbarschaft einer oder mehrerer Vakuolen. (2) Vom 3. Thorakalganglion bis zum 5. Abdominalganglion finden sich ventrolateral symmetrisch liegende Zellen mit phloxinophilen Einschlüssen. Das 3. Thorakalganglion, das entwicklungsgeschichtlich die beiden ersten Abdominalganglien in sich vereinigt, zeigt diese Zellen gegenüber den Abdominalganglien in doppelter Anzahl. (3) Im ventralen Bereich des Unterschlundganglions liegen zwei PAF-positive Zellen, deren sekretführende Axone weiter distalwärts verfolgt werden können.

Untersuchungen zur Funktion der einzelnen Elemente des neurosekretorischen Systems sind im Gange.

Summary. PAF-positive material, which is found in the brain and stomatogastric system of adult *Acheta domesticus*, can in addition be demonstrated in the Nervus corporis allati II. In the suboesophageal ganglion and the ventral nerve cord 3 different types of neurosecretory cells are described.

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Interaction Patterns of Preoptic and Olfactory Bulb Evoked Responses in the Rat

Although afferent projections from the amygdala and olfactory bulb to the anterior hypothalamus have been rather extensively described anatomically, few studies are available concerning electrically evoked activity inthe preoptic area by stimuli delivered to these former regions[1,2]. Scanty evidence exists, moreover, on evoked activity in the olfactory bulb elicited by central nervous structure stimulation[3,4]; no analysis of interaction patterns in these regions have yet been attempted in mammals.

As the preoptic area represents the most sensitive hypothalamic locus for electrically induced ovulation in the rat[5], which can also be accomplished by amygdala stimulation[6], and since olfactory bulb activity seems also closely related to the mechanisms underlying mammalian reproduction[7,8], an exploration of bioelectric responses and evoked activity interaction patterns at these levels was undertaken as part of a general plan concerned with central nervous system influences on hypophyseal hormonal output.

Methods. Female albino rats (200–250 g) under urethane-chloralose anaesthesia were stereotaxically implanted with bipolar stainless steel stimulating and recording electrodes in the following regions, according to de Groot's atlas: preoptic area (F: 7.8; L: 1; H: – 1), amygdala (F: 5; L: 4.5; H: – 2) and homolateral olfactory bulb. Evoked potentials elicited by brief rectangular pulses (0.01–0.1 msec; 1–10 V) were photographed from the screen of the oscilloscope on Kodak orthochromatic paper. Sciatic nerves were stimulated at the thigh through a pair of silver wire electrodes. Electrode location was performed in all brains on unstained frozen sections under direct microscopical observation.

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Results. A highly responsive and restricted area was clearly identified in the preoptic area to both amygdala and olfactory bulb stimulation. Inversion of polarity in the response evoked by stimulation of amygdala occurred when the tip of the recording electrode passed from zero depth to -1 mm, according to DE GROOT's atlas (Figure 1). The evoked potential consisted of a biphasic short-latency (2.2 msec, mean) wave with an initial positive high-voltage (300–400 μV), 10–15 msec sharp potential followed by a slow (30–40 msec) broad negative wave. Tertiary waves were also sometimes observed. Preoptic responses, derived by olfactory bulb stimuli, appeared as short-latency high-voltage biphasic waves (Figure 2).

When olfactory and amygdala stimuli were sequentially paired, interaction took place between the preoptic evoked potentials resulting in constant attenuation or abolition of the test responses, when the conditioning evoked potential preceded the former for periods up to a maximum of 200 msec. Generally, interaction took place when both potentials were separated by shorter interstimulus periods, i.e. 10–50 msec. When these became so close that one response partially superimposed and deformed the other, algebraic subtraction regularly disclosed the occlusive effect on the test potential.

This took place whether the amygdala evoked response preceded or followed olfactory activation. Negative waves were mainly affected, resulting in a 50–100% reduction (Figure 3). Primary responses were less easily modified, although complete blocking occasionally occurred.

A similar pattern of interactions took place when recording was attempted from the olfactory bulb. Attenuation and abolition of test responses regularly occurred, whether the first or conditioning stimulus was preoptic or amygdaloid (Figure 4).

Homo- and contralateral sciatic stimulation did not evoke a regular activity in the preoptic area; occasionally a long-latency (20–25 msec) surface-negative sometimes biphasic wave could be detected (Figure 5). Contrary to the above findings, no interactions occurred between these potentials and responses generated by amygdala or by olfactory bulb stimulation. Complete cancellation of negative waves resulted when the amygdala-preoptic evoked activity was preceded by low-frequency stimulation (50 c/sec, 3 sec duration) of the mesencephalic reticular formation (Figure 6).

These results prove that amygdaloid and olfactory bulb generated activity converges upon the anterior hypothalamus (i.e. preoptic area) and that conditioning potentials regularly depress test responses at specific interstimulus latencies. Convergence of different sensory modalities upon single hypothalamic cells have been found in the rat, and similar occlusive effects of one sensory modality upon activity generated by another one have also been mentioned[9]. Olfactory projections to the preoptic area in our study seemed to be mediated directly

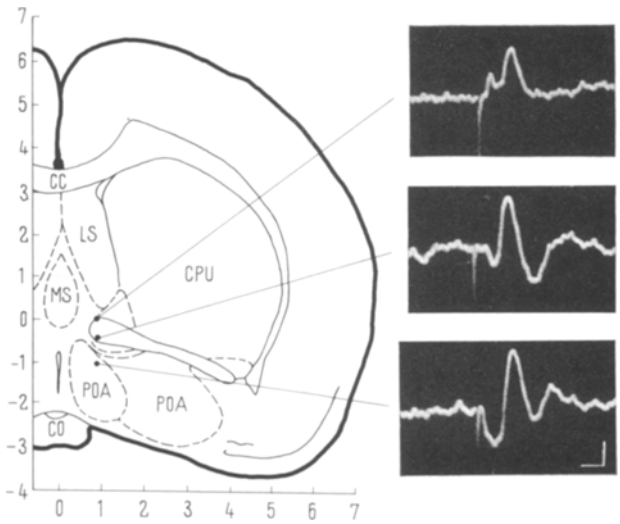

Fig. 1. Responses evoked by stimulation of the amygdala in the rat. Evoked potentials recorded from a single track in the anterior hypothalamus (A 7.8 frontal plane) POA-preoptic region. Note turnover of response. Time (horizontal) 40 msec; amplitude (vertical) 100 μV. Negativity upwards.

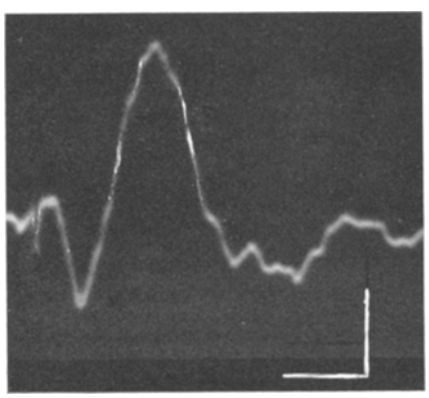

Fig. 2. Preoptic response to stimulation of homolateral olfactory bulb. Time 40 msec; amplitude 150 μV.

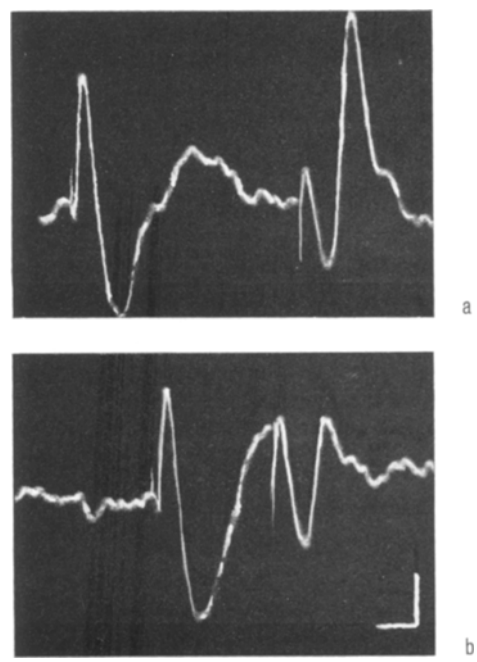

Fig. 3. Interaction of evoked potentials in preoptic region evoked from olfactory bulb (1st stimulus) and amygdala (2nd stimulus). (a) No interaction. (b) The conditioning stimulus is approximated to the test response until a critical interstimulus distance of 120 msec is reached. Note blocking of negative wave of the test response. Time 40 msec; amplitude 50 μV.

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(short-latency potentials) a fact that agrees with previous anatomical data[10].

A striking fact was the finding that stimulation of central structures (amygdala, preoptic area) generated conspicuous potentials in the homolateral olfactory bulb, and, moreover, that these responses interacted between them in an analogous way as the preoptic potentials did. A similar occlusive phenomenum has been observed to occur in amphibian olfactory bulbs between evoked responses generated by stimulation of anterior diencephalon and olfactory nerve[11]. Efferent fibres to the bulbs that probably convey this activity have been described anatomically by CAJAL[12] and others[13,14] as running centrifugally through the lateral olfactory tract. Effective interactions (negative wave depressions, occlusions) appear to take place at preoptic level only between short-latency potentials generated by amygdala and olfactory bulb stimulation, since peripheral long-latency responses evoked by sciatic stimuli did not interact with either of them.

The long effective interstimulus period (up to 200 msec) that separates conditioning and test responses favours the view that the depression or blocking of the second response is not merely the result of an occlusion effect due to the normal refractory period of the involved structures, but rather that an active inhibitory process is operative in the attenuation or cancellation of the test responses. A similar mechanism has been suggested as playing a major role in the blocking of amygdaloid potentials evoked from preoptic and neocortical areas[15] and of cortical activity elicited from lemniscal and extralemniscal systems[16–18].

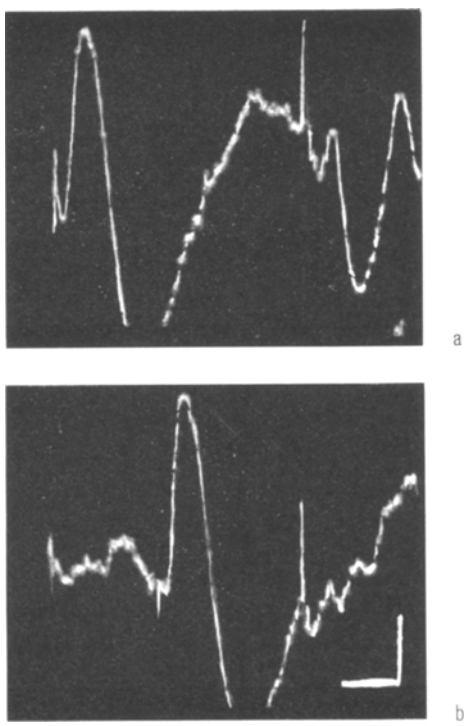

Fig. 4. Interaction of evoked potentials in olfactory bulb evoked from amygdala (1st stimulus). (a) No interaction. (b) Complete blocking of the second response. Time 40 msec; amplitude 100 μV.

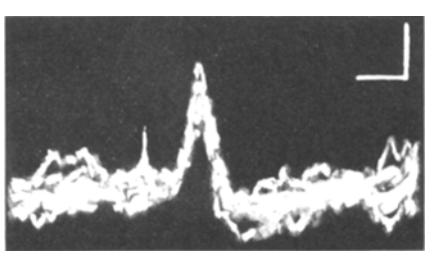

Fig. 5. Long-latency potential registered in preoptic area by contralateral sciatic stimulation. Ten superimposed traces. Negativity upwards. Time 50 msec; amplitude 100 μV.

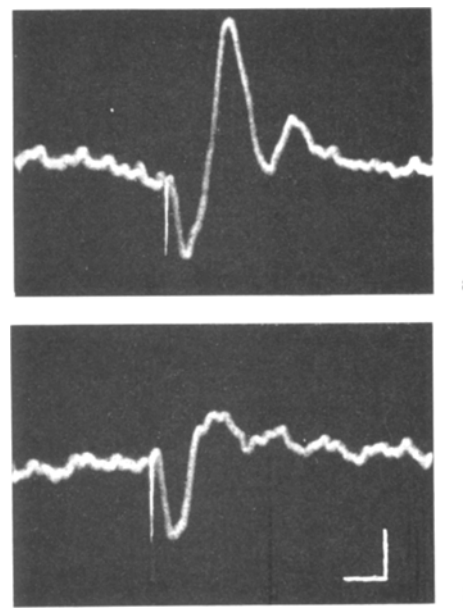

Fig. 6. (a) Evoked response to amygdala stimulation registered in preoptic region. (b) Blocking of negative waves 2 sec after low frequency (50 sec; 3 sec) stimulation of reticular formation. Time 50 msec; amplitude 100 μV.

Résumé. Des interactions de type occlusif ont été observées au niveau de la région préoptique entre des potentiels d'origine amygdalienne et olfactive (bulbe), et au niveau du bulbe olfactif, entre des réponses évoquées par stimulation préoptique et amygdalienne. Les résultats suggèrent l'existence de connexions directes entre le bulbe olfactif et la région préoptique; il existerait aussi des projections centrales efférentes aux bulbes olfactifs chez le rat.

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[18] Supported by Grant No. 111d from the Consejo Nacional de Investigaciones Científicas y Técnicas of Argentina.
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