the tonus of isolated guinea-pig lung parenchymal strip. Among the smooth muscle preparations tested, the most sensitive to PLS was found to be isolated, helically cut strips of rabbit arteries.

Based on the present findings the biological activity of PLS differs from that of PGE_2 or PGE_1 which eliminates the possibility that PLS could be one of the E-prostaglandins or a mixture of them, which confirms our previous findings. The observed spectrum of activity of PLS resembles that of PGI_2[10]; both relax bovine coronary artery and rabbit mesenteric and coeliac arteries; both contract the rat stomach strip and both typically inhibit spontaneous movements of the isolated guinea-pig ileum. Therefore, to check the possibility that PLS could be identical with PGI_2, their effects on platelet aggregation induced either by ADP or collagen have been determined.

PLS, similarly to PGI_2, inhibits platelet aggregation regardless of the inducer used. However, a few distinctions between the anti-aggregatory activity of PLS and that of PGI_2 have been noted. One is that the anti-aggregatory activity of PLS is heat resistant, i.e., it is not destroyed by immersion in a 100 °C water bath for 15 sec. Secondly, the anti-aggregatory activity of PLS is preferentially directed against collagen. When 10 µM of ADP is used to induce platelet aggregation, the IC_{50} for PLS is between 70–80 µl/ml; and when 5 µg of collagen per ml of PRP is used to induce platelet aggregation the IC_{50} for PLS is between 0.5–2.0 µl/ml. It therefore seems that the anti-aggregatory activity of PLS against collagen is about 70 times higher than that against ADP. Third, there is a quantitative difference between the de-aggregatory activities of PLS and PGI_2 (de-aggregation is defined as the light transmittance decrease, correlated to the amount of PGI_2 added at the height of collagen-induced aggregation). In that respect PLS is about 10 times weaker than PGI_2.

The prostaglandins and related compounds constitute a complex system both regarding their effects as smooth muscle stimulants and their ability to enhance or else inhibit platelet aggregation. This study indicates that PLS is not identical with primary prostaglandins or PGI_2. The present data confirm the powerful and specific biological activity of these compounds. Moreover, PLS possess a unique pattern in their anti-aggregatory effect on platelets. It seems that PLS constitute a new type of bacterial metabolite. However, how these substances contribute on the inflammatory sequelae of acne vulgaris remains to be determined.

1 S. Abrahamsson, N. Engström, L. Hellgren and J. Vincent, in preparation.
2 L. Hellgren, B. Lindblom, J. Vincent and L. Wilhelmsson, Experientia *35*, 1299 (1979).
3 E. Berlin, L. Hellgren, O. Thulesius and J. Vincent, Experientia *36*, 197 (1980).
4 L. Hellgren, G. Selstam and J. Vincent, Experientia *35*, 196 (1979).
5 J. Belsheim, A. Dalen, H. Gnarpe, L. Hellgren, O-J. Iversen and J. Vincent, Experientia *35*, 1587 (1979).
6 S. Abrahamsson, K. Gréen, L. Hellgren and J. Vincent, Experientia *36*, 58 (1980).
7 S. Abrahamsson, L. Hellgren and J. Vincent, Experientia *34*, 1446 (1978).
8 N. Chand and L. DeRoth, J. Pharm. Pharmac. *31*, 712 (1979).
9 N. Gilmore, J.R. Vane and J.H. Wyllie, Nature *218*, 1135 (1968).
10 C. Omini, S. Moncada and J.R. Vane, Prostaglandins *14*, 625 (1977).

The control of amygdaloid seizures by the globus pallidus[1]

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Summary. Both in acute and chronic cats entopeduncular stimulation inhibits, to a greater extent than caudate activation, focal paroxysmal activity in the ventro-basal complex of the amygdala. Lesion of entopeduncular neurons, by means of kainic acid injection, induces a decrease of the caudate inhibitory effect. It is suggested that neostriatal control of the amygdaloid seizures occurs partly through the globus pallidus.

It has been shown previously that caudate conditioning stimulation controls localized seizures in the amygdala, hippocampus and temporal cortex[2–5]. As regards the anatomical pathways through which the caudate nucleus may influence the activity of the amygdaloid neurons, no direct anatomical connection between neostriatum and amygdaloid complex has been demonstrated, whereas it is known that caudate efferent fibres project both to the substantia nigra and the globus pallidus[6]. In order to study the role of the globus pallidus in the control of focal paroxysmal activity of the amygdala, an experiment has been performed in which the effects of both stimulation and lesion of this structure have been observed. Preliminary accounts of these results have been presented[7].

Material and methods. The experiments were performed on 8 'encéphale isolé' cats with local anaesthesia of painful points and on 5 cats with chronically implanted electrodes. Focal paroxysmal activity in the ventro-basal complex of the amygdala has been obtained by repetitive stimulation of the contralateral nucleus (A 10–12, L 8–10, H 3–5)[8] or by activation of the ipsilateral pyriform cortex. Stimulation parameters changed between 20–60 c/sec; 3–5 sec; 0.2–3.5 mA; 0.1–1 msec (duration of single shock). Conditioning stimulation of the caudate (A 15–17, L 4–6, H 15–17) and entopeduncular nucleus (A 10–12, L 5–7, H 7–9), which in the cat corresponds to the internal pallidal segment of the primates, was performed by a bipolar method with coaxial electrodes (external diameter 0.5 mm, tip 25–50 µm), obliquely oriented in order to avoid lesions of the internal capsule. This stimulation immediately preceded the test stimulus apt to evoke the amygdaloid AD. Striatal nuclei, ipsilateral to the amygdaloid recording electrodes, have been stimulated with trains varying between 2 and 5 sec; 30–80 c/sec; 0.2–3 mA; 0.1–1 msec. Injection of kainic acid (0.5–1.5 µg in 0.5–1.5 µl, phosphate buffer, pH 7.4) into the entopeduncular nucleus was made by means of a Hamilton microsyringe. The position of the electrode tips, and the lesion of the entopeduncular nucleus induced by kainic acid injection, were controlled on serial Nissl sections.

Results and discussion. Stimulation of the ventro-basal complex of the amygdala evoked in the contralateral nucleus a focal paroxysmal activity (after-discharge, AD),

which was similar to the AD induced by activation of the ipsilateral pyriform cortex. The duration of the seizure in different animals varied between 15 and 95 sec, depending on the stimulation parameters and the position of the electrodes. In the same animal, the duration of the AD did not greatly change when stimulation parameters remained constant. In chronic animals free to move in a behavioural cage, the paroxysmal bioelectric pattern was followed by the appearance of the well-known critical phenomena: myoclonic movements, mydriasis, salivation. Conditioning stimulation of the entopeduncular nucleus constantly inhibited the focal AD evoked in the amygdala. In chronic animals, both the bioelectric activity and the behavioural pattern were inhibited. Using parameters of pallidal conditioning stimulation which induced the maximal inhibition of the amygdaloid seizure, conditioning stimulation of the caudate nucleus, with the same parameters, was less effective than entopeduncular activation to reduce the duration of the AD. For 5 animals the mean duration of the amygdaloid AD was 37.5 ± 8.10 sec. Conditioning stimulation of the caudate and entopeduncular nuclei reduced the duration of the seizures to 26.56 ± 4.57 and 15.07 ± 1.87 sec respectively. Injection into the entopeduncular nucleus with kainic acid, a neurotoxic drug analogous to glutamate, which causes an almost complete destruction of cell bodies in the striatum[9-11], resulted in a decrease (about 50%) of the inhibition induced by caudate nucleus on the amygdaloid AD. For 3 animals the mean duration, 39.06 ± 4.5 sec, of the amygdaloid seizure was reduced by caudate pre-stimulation to 26.08 ± 3.68 sec. After entopeduncular injection of kainic acid the mean duration of the AD, controlled by caudate activation, was 31.42 ± 3.99 sec. The effect, which appeared 120 min after injection, was permanent.

Our results show that conditioning stimulation of the entopeduncular nucleus inhibits, to a greater extent than the stimulation of the caudate nucleus, focal paroxysmal activity evoked in the ventro-basal complex of the amygdala both in acute and chronic animals. Permanent lesion in the entopeduncular neurons induces a decrease of the inhibitory effect of the caudate nucleus on the amygdaloid AD. It may be assumed that the globus pallidus represents one possible pathway through which the neostriatum controls the focal paroxysmal activity of the amygdala.

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2 R. Mutani, Epilepsia *10*, 339 (1969).
3 V. La Grutta, G. Amato and M.T. Zagami, Electroenceph. clin. Neurophysiol. *31*, 57 (1971).
4 V. La Grutta, G. Amato and S. Avellone, Archs int. Physiol. Biochim. *80*, 907 (1972).
5 R. Fariello, Exp. Neurol. *51*, 515 (1976).
6 M.B. Carpenter, in: Advances in Neurology, p.7. Ed. R. Elridge and S. Fahn. Raven Press, New York 1976.
7 G. Amato, F. Sorbera, G. Crescimanno and V. La Grutta, 11th Epilepsy Int. Symposium, Firenze 1979, abstr. 1.39.
8 R.S. Snider and W.T. Niemer, A stereotaxic atlas of the cat brain. Univ. Chicago Press, Chicago 1961.
9 J.W. Olney, V. Rhee and O.L. Ho, Brain Res. *77*, 507 (1974).
10 T. Hattori and E.G. McGeer, Brain Res. *129*, 174 (1977).
11 M.R. De Long and J.T. Coyle, Appl. Neurophysiol. *42*, 95 (1979).

Coxsackievirus B_4 infection of spinal sympathetic ganglion[1]

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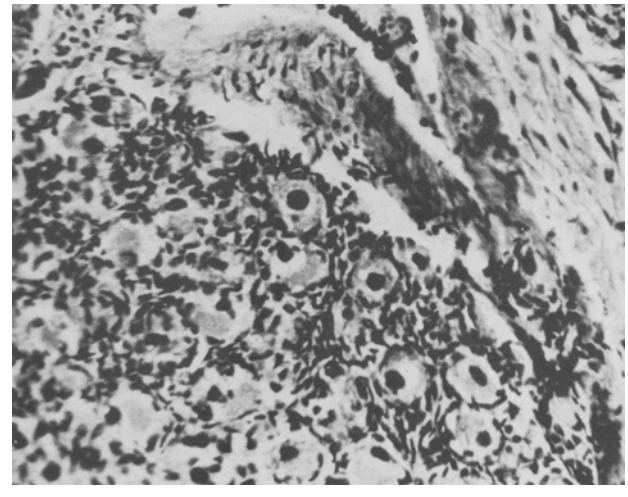
Summary. Coxsackievirus B_4 infection of a spinal sympathetic ganglion of a squirrel monkey is described. Chromatolysis and neuronophagia were extensive. It is suggested that such viral sympathetic ganglial infections may be responsible for dysfunction of organ systems.

Pathologic changes have been found with Coxsackievirus B infections in all types of organs and tissues of experimental animals during studies in this laboratory for over 15 years. In a previous report[2], we described infection of many sympathetic ganglia produced by Coxsackievirus B_4 in mice. Infection of a spinal sympathetic ganglion was recently observed in a squirrel monkey inoculated i.v. with Coxsackievirus B_4. This finding is important because the observation reveals that a viral infection can produce ganglionitis in a primate.

Material and methods. 9 young squirrel monkeys, *Saimiri sciureus*, aged 6 days to 175 days and held individually in isolator cages, were inoculated i.v. or i.p. with 0.5 ml of Coxsackievirus B_4 grown in Vero cells and having a titer of $10^{-6.5}$ $TCID_{50}$ per ml. The animals were killed by pentobarbital injection from 7 to 120 days after inoculation. Each animal was carefully examined grossly and all organs were removed immediately after death. In 1 monkey a small mass (approximately $1 \times 1 \times 2$ mm) was noted near the posterior thoracic wall where the sympathetic ganglia are normally found. The mass had the gross appearance of a lymph node. Because of its rather unusual gross appearance and its location, it was collected along with other tissues. A



Spinal sympathetic ganglion of a monkey killed 88 days after Coxsackievirus B_4 inoculation, showing inflammatory cell extension into surrounding tissue and vascular congestion and perivascular edema. H&E, × 112.