drying treatment. Drying of the skin next to the lateral line system did not affect the reaction ($P = 0.8$).

These experiments show that both the lateral line system and very probably the labyrinth are essential for the perception of surface waves.

The part of the labyrinth where the stimulus is perceived seems to be the organ of hearing. After removal of both columellae, the animals reacted in only 52% of trials compared with 68% before the operation ($P < 0.001$). It is not yet clear whether it is the sound of the surface waves which is heard or the noise made by dipping the rod. Our previous experiments (made partly in collaboration with P. MOLLER) support the former possibility: the time before the animal's reaction increases significantly with increased distance of the stimulus, and, as film studies show, the reaction does not take place before the maximum of the wave train has reached the toad. However, since the noise intensity caused by dipping the rod would decrease with increasing distance from the toad and might thus cause greater latency of reaction, we still cannot exclude the possibility that it is the actual dipping of the rod which is perceived rather than the surface waves caused by the rod. The experiments continue[11].

Zusammenfassung. Blinde Krallenfrösche reagieren auch dann auf konzentrische Oberflächenwellen, wenn das gesamte Seitenliniensystem zerstört wird. Weitere Ausschaltversuche zeigen, dass der Reiz (Eintauchen eines Stabes) sehr wahrscheinlich über das Labyrinth perzipiert wird. Ob die Oberflächenwelle selbst oder (und) das Geräusch beim Eintauchen des Stabes wahrgenommen wird, ist noch nicht sicher entschieden.

P. GÖRNER[11]

II. Zoologisches Institut der Freien Universität, Grunewaldstrasse 34, 1 Berlin 41 (Germany),
19 October 1972.

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Neurohumoral Regulation of Motility and Blood Flow in the Colon

The extrinsic nervous control of colonic motility and blood flow has recently been studied[1]. Electrical stimulation and reflex activation of the pelvic nerves produce an intense flushing of the mucosa in the distal two thirds of the colon. Corresponding in time with this mucosal flush there is a marked but transient increase of venous outflow and concomitantly with the vasodilatation a mucoid secretion. Intravenous administration of atropine (1 mg/kg) did not significantly interfere with the vasodilation and the motility response indicating that both might be brought about by a non-cholinergic mechanism largely secondary to an augmented secretion. The release of kinin-like substances similar to those involved in the atropine-resistant vasodilatation in the salivary glands and the pancreas[2,3] is suggested.

In the present study the effects of bradykinin and pelvic nerve stimulation on colon motility and blood flow were compared in an attempt to obtain evidence for bradykinin as a possible mediator in the pelvic nerve response.

Methods. By recording tissue volume and total venous effluent simultaneously, the resistance, the capacitance and the precapillary sphincter segments of the circulation of the cat colon were studied. This pletysmographic method was described in detail in a previous work[1]. In some experiments colonic motility and blood flow were recorded simultaneously. Motility was recorded by a volumetric method keeping intra-colonic pressure constant at about 10 cm H_2O. The pelvic nerves to the colon were cut centrally and mounted on ringformed electrodes for subsequent graded electrical stimulation. Synthetic bradykinin was administered close-intra-arterially.

Results. As is shown in Figure 1, close intraarterial infusion of bradykinin in a large dose (1 µg/ml) produced a marked and shortlasting blood flow increase and con-

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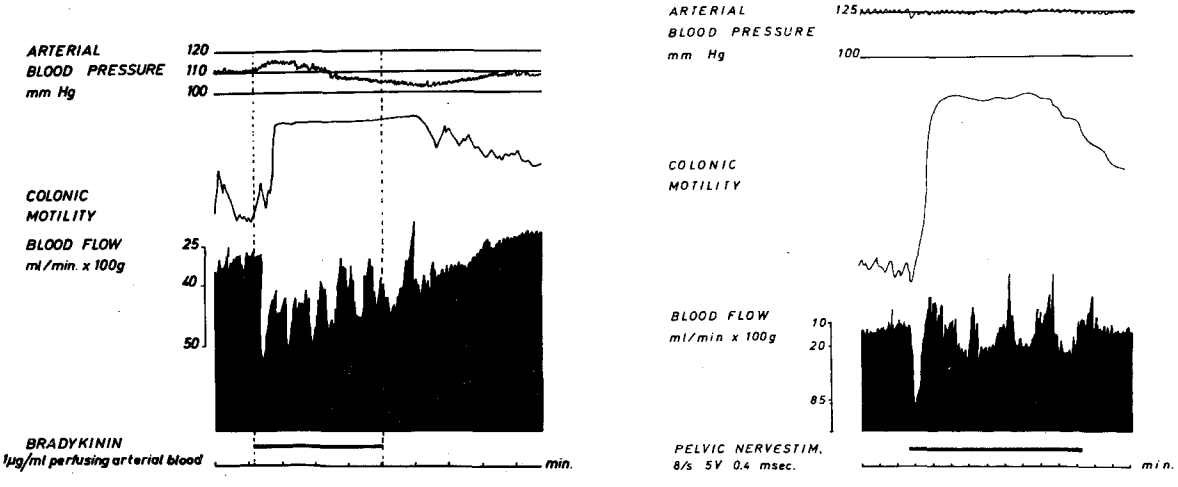

Fig. 1. The effect of supramaximal, intraarterial doses of bradykinin (left panel) and supramaximal pelvic nerve stimulation (right panel). Note the almost identical responses.

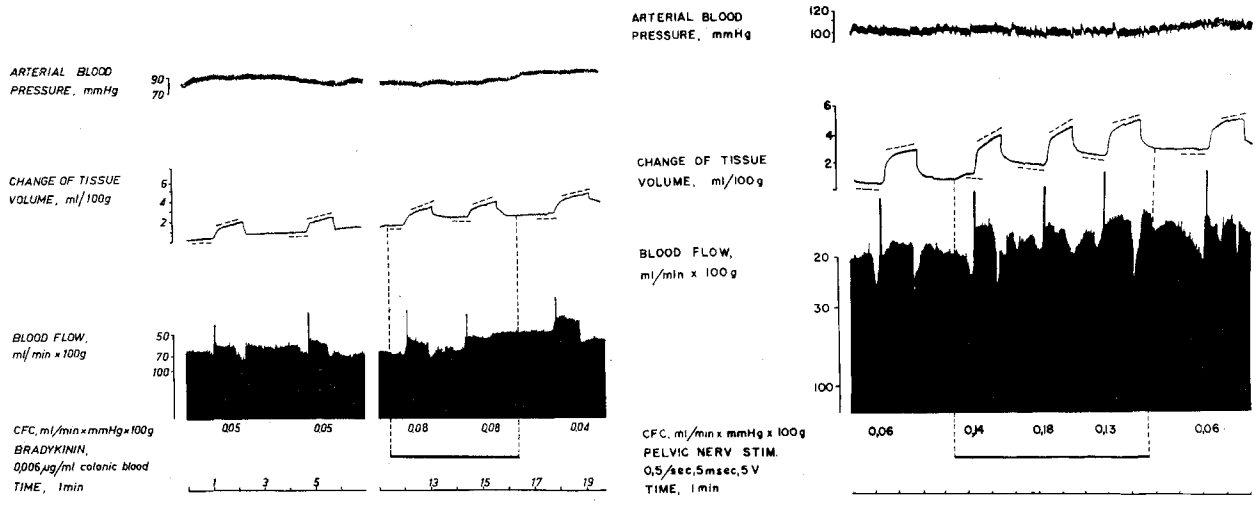

Fig. 2. The effect of subthreshold doses of bradykinin (left panel) and subthreshold stimulation of the pelvic nerves (right panel) on colonic blood flow, tissue volume and the capillary filtration coefficient (CFC). Note the almost identical responses.

comitantly a sustained and powerful motor contraction (left panel), an effect which is in many respects similar to that produced by efferent electrical stimulation of the pelvic nerves (right panel). Close intraarterial infusion of bradykinin in low doses (0.006 µg/ml) decreased vascular resistance only moderately, while the capillary filtration coefficient (CFC) increased considerably. As is shown in Figure 2 (left panel), a marked increase in CFC occurred following infusion of bradykinin in doses that did not affect blood flow at all. When the pelvic nerves were stimulated at high rates, the motor response interfered with the tissue volume recordings and made CFC determinations impossible. On the other hand, pelvic nerve stimulation at a low rate which did not affeet motility or blood flow resistance nevertheless increased CFC to a considerable extent, Figure 2 (right panel).

Discussion. Specific vasodilator fibres were previously assumed to be widely distributed throughout the gastrointestinal tract. In recent years this concept has changed, however, and it has been suggested that neurogenous vasodilatation, which occurs only in certain restricted parts of the gastrointestinal tract, i.e., the salivary gland, the pancreas and probably the stomach, is partly or mainly caused by the release of a stable vasodilator material, a plasmakinin [2–5]. The present results indicate that a similar mechanism might be involved, even in the regulation of colon blood flow and secretion.

The vasodilatation and the concomitant motor response following pelvic nerve stimulation are largely atropine-resistant. This coupled response is closely mimicked by infusion of bradykinin. Following infusion of subthreshold doses of bradykinin as well as after pelvic nerve stimulation at a frequency that did not affect motility or resting blood flow, CFC increased considerably. The magnificant increase in CFC which occurred despite unchanged blood flow might therefore be due to increased capillary permeability. CFC often reached figures comparable to those commonly recorded when the vascular bed is brought to maximal dilatation by an unspecific vasodilator drug.

Zusammenfassung. Indiz, dass Plasma-Kinin sowohl in den Regulationsmechanismus der Kolon-Motilität als auch der Blutströmung eingreift.

S. Fasth and L. Hultén

The Department of Surgery II, Sahlgrenska Sjukhuset, and the Department of Physiology, University of Göteborg, Göteborg SV (Sweden),
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A Quantitative Investigation of the Response to Injury of the Central Nervous System of Rats Treated with ACTH and Triiodothyronine

Although interruption of a tract in the mammalian central nervous system (CNS) is not usually followed by any functional regeneration, histological signs of axonal growth and/or indications of some return of function have been claimed following the administration of the thyroid hormones triiodothyronine (T3) and tetraiodothyronine (T4), [1,2] and adrenal corticoids [3,4] or substances which cause their release, such as ACTH [1,5] or the bacterial polysaccharide 'Pyromen' [3,6–9].

Most workers consider that circulating corticoids stimulate the phagocytic activity of macrophages, depress the cellular and fluid phases of inflammation and decrease the formation of connective tissue at the site of a wound in the CNS and thereby facilitate regeneration by providing an environment through which axons grow more easily. On the other hand thyroid hormones may promote regeneration by increasing protein synthesis in central neurons [1].