

increase of the positive going wave without any change in fast rhythmic oscillations and latency, which remained identical: 35 msec. However, the late slow potential was abolished. The OFF stimulus, as expected<sup>8</sup>, evoked a complex response the magnitude of which was smaller than that of the ON responses. (Also compare the averaged amplitudes of the summated ON and OFF responses in the upper part of the Figure). Nevertheless, the OFF response consistently presented more rhythmic oscillations than the ON response. This difference in shape cannot be related to a different electrode position since both responses were recorded from the same site and with the same electrode. The effects on collicular OFF responses, after KCl application upon cortical surface, were identical with those produced in ON responses, i.e. a general increase in magnitude of the evoked OFF response, without modification in latency: 35 msec (Tracings 3 and 4, Figure). It can be noticed that the amplitude of the rhythmic oscillations was enhanced but not their number. The KCl blockage of the cortical activity also augmented the amplitude of the early positive going wave evoked by electrical stimulation of the optic nerve ( $5 \times$  above threshold), but abolished the latest slow wave (Tracings 5 and 6). The tracing 7 shows that the cortical evoked response, which has inverted its polarity from surface positive to negative in depth, is abolished following KCl application (Tracing 8). 30 min after the application of KCl on visual cortex, the cortical activity reappeared and the collicular evoked response decreased in magnitude. They reached approxi-

mately their original amplitude about 1 h after KCl application (recorded but not shown).

**Discussion.** The results reported suggest that a cortical control upon collicular activity exists in rabbit. The responses with the shortest latency and the fast rhythmic oscillations show an enhancement of their amplitude following cortical depression. The latest component was abolished and thus is due to the activity of the cortico-collicular pathway. Comparing our results to those obtained in the cat, an interesting discrepancy emerges. In the cat, visual cortex ablation reduces the collicular evoked responses<sup>13</sup>. Studies carried out on receptive field properties of collicular neurons have shown that the most specific characteristics such as direction and orientation sensitivity, require cortical integrity in cats<sup>1</sup>. In rabbits, the above-mentioned properties are of retinal origine<sup>4</sup>. Consequently, the visual cortex ablation does not produce any loss of receptive field characteristics at collicular level. However, our results suggest that the cortex could exert upon collicular activity a tonic type of action which would modulate the collicular cell responsiveness. Such a tonic action has been already proposed for the cat, where cortical depression instead of enhancing, reduces collicular evoked responses<sup>13</sup>.

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## Effect of Subdiaphragmatic Vagotomy on Production of Gastric Ulcers in Pylorus-Ligated Albino Rats

A. K. GANGULY and S. K. LAL

*Department of Physiology, Jawaharlal Institute of Post-Graduate Medical Education and Research, Pondicherry-6 (India), 12 May 1975.*

**Summary.** A reduction in volume and free and total acidity of gastric content was noted along with reduction in ulcer index, with a shift of the site of ulceration from fundus to the glandular part of stomach, following vagotomy in pylorus-ligated rats. Low volume and acidity explains the absence of ulcers in the fundus, but the increased involvement of glandular part in ulceration is possibly due to weakening of the mucosal barrier following vagotomy.

Our experiments<sup>1,2</sup> indicate that alteration of blood sugar level influences the production of stress-induced gastric ulcers, a connection which involves the hypothalamus. Hypothalamus influences gastric secretion through vagal and adrenal pathways<sup>3-5</sup>. That the vagal and adrenal pathways are both important in producing stress-induced gastric ulcers is evident from our observation that, even after bilateral adrenalectomy restraint ulcers did develop, although with a low ulcer index in albino rats<sup>6</sup>. The present experiment was planned in order to study the effect of complete, subdiaphragmatic gastric vagotomy on production of gastric ulcers in pylorus-ligated rats.

**Materials and methods.** 16 albino rats, obtained from the central animal house, of either sex, weighing between 130 and 176 g, housed in separate cages, were divided into 2 groups of 7 and 9.

In the first group, pylorus ligation was done, and in the second, sub-diaphragmatic vagotomy was followed by pylorus ligation. The completeness of vagotomy was confirmed by electric stimulation test<sup>7</sup>. Oesophageal end of the stomach was occluded by introducing a polythene tube, closed and slightly dilated at its terminal end

through the oesophagus. A ring electrode was positioned around the distended lower oesophagus and square wave pulses of 10 V, 5 msec duration and 10/sec frequency for 30 sec, used in order to stimulate vagal fibres, if any were left after vagotomy. Completeness of vagotomy was confirmed by absence of noticeable contractions of gastric wall, which is the basis for gastric pressure changes.

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Effect of sub-diaphragmatic vagotomy on gastric ulcer produced by pylorus ligation in albino rats

Experimental situation and No. of rats	Part of the gastric mucosa involved in ulceration (No. of rats)				Ulcer index	Gastric content (ml)	Free acidity (U)	Total acidity (U)	
	Fundus alone	Fundus + body	Body alone	Body + fundus					
Pylorus ligation with vagus nerve intact (7)	5	2	—	—	0.40 ± 0.36	7.64 ± 1.84	22.14 ± 24.62	74.57 ± 23.35	
Pylorus ligation with confirmed vagotomy (9)	—	—	6	1	0.039 ± 0.035	3.43 ± 1.63	2.44 ± 7.33	34.33 ± 21.41	
Statistical analysis ( <i>t</i> -values)						Ulcer index	Gastric content	Free acidity	Total acidity
Between pylorus ligation with vagus-intact rats and pylorus-ligation with vagotomized rats						3.04 *	4.89 *	2.31 <sup>b</sup>	3.70 *

\*Significant at 1% level; <sup>b</sup>Significant at 5% level.

Pylorus ligation was performed after the method of SHAY et al.<sup>8</sup>. Prior to operation, food was withheld for 40–48 h and following operation water was also withheld; 10 cm<sup>3</sup> of 25% glucose was allowed after 24 h of fasting to prevent hypoglycemia of fasting. Then 19 to 22 h after pylorus ligation, the stomach was removed with a clamp on the lower oesophagus. Gastric content was collected, volume was noted and free and total acidity were determined by using Töpfer's reagent and alcoholic phenolphthalein as indicators.

Ulcers were stained by ROBERT and NEZAMIS' method<sup>9</sup>. The stomach was carefully opened along the greater curvature, cleaned in running water, spread on a cardboard with mucus surface upwards. The total area of stomach mucosa and that of ulcers were taken into consideration for determining the ulcer index<sup>10</sup>. A transparent perspex plate, with mm<sup>2</sup> rulings on it over an area of 4 square inches, was positioned over the mucosa for determining the area of stomach and that of ulcers. The ulcer index was expressed as 10/X, where X was taken as the ratio between the total area of stomach mucosa and that of ulcers<sup>6</sup>.

**Results.** The results are summarized in the Table which shows that after complete subdiaphragmatic vagotomy, the ulcer index is reduced from 0.40 to 0.039 in pylorus-ligated rats. The volume and free and total acidity of the gastric content are also significantly lower in the vagotomized group. The Table also shows that the main area of involvement is the fundus of the stomach in the vagus-

intact group, whereas it is the glandular portion in the case of vagotomized rats.

**Discussion.** The reduction of mean ulcer index from 0.40 in vagus-intact pylorus ligated rats to 0.039 in vagotomized pylorus-ligated rats with concomittant reduction of volume, free and total acidity of gastric content clearly shows that the beneficial effect of vagotomy against development of ulcers must be due to the reduction in vagus and gastrin-mediated gastric secretion. So far as the site of ulceration is concerned, it can easily be explained how ulcers develop in the unprotected fundus in vagus-intact rats due to accumulating acid<sup>8</sup>, whereas in vagotomized group, the fundic area escapes from ulceration due to low volume and acidity of gastric content. But it is not clear why there should be a development of ulcers in the glandular part following vagotomy, whereas in the vagus-intact group glandular part of the stomach is involved only to a minor extent.

Although the volume and acidity is reduced to a great extent after vagotomy, it is possible that adrenal pathway becomes active during the stress of pylorus ligation and corticosteroids, or that vagotomy by itself weakens the mucosal barrier in the glandular part of the stomach, thus making the area susceptible for development of ulcers.

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<sup>9</sup> A. ROBERT and J. E. NEZAMIS, *Fedn. Proc.* 20, 182 (1961).  
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Effect of Cholestasis and Biliary Diversion on the Absorption of Na Octanoate in the Rat<sup>1</sup>

G. LAURENDEAU and C. C. ROY

Department of Pediatrics, Hôpital Sainte-Justine, The University of Montreal, 3175 chemin Sainte-Catherine, Montréal H3T 1C5 (Québec, Canada), 31 July 1975.

**Summary.** The intestinal absorption and portal vein transport of Na octanoate by isolated jejunal segments perfused in vivo were unchanged in rats studied 48 h after bile duct ligation or fistula.

Medium chain fatty acids (MCFA) are rapidly taken up by enterocytes and pass directly into the portal circulation without forming chylomicrons<sup>2</sup>. Administered as medium chain triglycerides (MCT), they are useful in clinical situations where the digestive and transport phase of fat absorption are defective<sup>3</sup>. Having shown previously

<sup>1</sup> This work was supported by grant No. MT 4433 from the Medical Research Council of Canada.  
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