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Citation	Japanese Journal of Veterinary Research, 34(2), 156-156
Issue Date	1986-04-30
Doc URL	http://hdl.handle.net/2115/3003
Type	bulletin (article)
File Information	KJ00002374410.pdf



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ATROPINE- AND HEXAMETHONIUM-RESISTANT CONTRACTION INDUCED BY
SPLANCHNIC NERVE STIMULATION IN THE DOG STOMACH

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The aim of the present experiments was to investigate the mechanism of sympathetically induced contraction of the dog stomach.

1. The types of gastric response to electrical stimulation (50V, 10Hz for 30sec) of the splanchnic nerve varied depending on the duration (0.01~1msec) of the square wave pulses applied. In general, stimulation with a pulse of less than 0.1msec duration caused a relaxation, and more than that, produced a contraction.
2. The relaxation induced by splanchnic nerve stimulation was not affected by intravenous injection of atropine (0.2~2mg/kg) but was enhanced by phenoxybenzamine (10~15mg/kg) and abolished by hexamethonium (10~20mg/kg).
3. Atropine and phenoxybenzamine decreased the contractile response to splanchnic nerve stimulation by about $21.1 \pm 6.7\%$ and $62.3 \pm 12.0\%$ of the control, respectively.
4. Combined injection of atropine and phenoxybenzamine greatly reduced the contraction induced by splanchnic nerve stimulation in 4 out of 19 animals, and reversed it to a relaxation in 15 out of the same number of animals. When hexamethonium was further administered, a long lasting contraction appeared after a long latency in response to splanchnic nerve stimulation. This long lasting contraction required a much higher intensity of stimulation than the relaxation of the adrenergic origin.
5. In the animals pretreated with reserpine (20~30 hours after subcutaneous injection of 5mg/kg), either splanchnic or periarterial nerve stimulation caused only a contraction, regardless of the intravenous injection of atropine, phenoxybenzamine and/or hexamethonium. Atropine tended to prolong the duration of contraction.
6. Close arterial injection of substance P (SP) caused a dose-dependent contraction of the stomach. Atropine abolished the responses to small doses of SP (2×10^{-14} mol, 2×10^{-13} mol) and reduced but prolonged those to larger doses of SP (2×10^{-11} mol, 2×10^{-10} mol).
7. When SP was injected repeatedly at 2 or 3 minute intervals, the response gradually declined with repetition. Under this condition, the response to splanchnic nerve stimulation was also reduced or abolished, but it was partly restored some time after cessation of SP injection.
8. It is suggested that the long lasting contraction of the stomach induced by splanchnic nerve stimulation may be mediated by SP released from antidromically activated afferent fibers.