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THE EFFECTS OF LEAD ON MECHANICAL AND ELECTRICAL RESPONSES
IN SMOOTH MUSCLE OF THE CHICK PROVENTRICULUS

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1. The effects of lead on contractions induced by vagal stimulation (VS), transmural stimulation (TMS) and acetylcholine (ACh) were investigated using a vagus nerve-smooth muscle preparation isolated from the chick proventriculus.
2. The contractions induced by VS (0.5Hz) and ACh (0.18 μ M) were inhibited by lead at concentrations of over 3 μ M. The inhibitory effect of lead on VS-induced contractions was larger than that on ACh-induced contraction.
3. The frequency-dependent contraction induced by TMS (0.5, 2, 10, 50Hz) was also inhibited by lead.
4. Lead (5, 10, 20 μ M) inhibited the contraction induced by cumulative application of ACh (10^{-8} to 10^{-3} M). The lower the concentration of ACh was, the greater the inhibitory effect of lead.
5. Single TMS (pulse duration time 0.2, 0.5, 1.0msec) induced depolarization and contraction. Spike potentials were superimposed on the depolarization. Lead (50 μ M) caused inhibitions of the spike potentials and contraction. The inhibitory effect by lead developed much earlier and was greater on the contraction than on the spike potentials.
6. ACh in low concentrations such as 10^{-7} and 10^{-6} M failed to change the membrane potentials. The depolarization and contraction induced by 10^{-4} M ACh were insensitive to lead.
7. In rat gastric smooth muscle cells, after blockade of K current with Cs, depolarizing pulses produced inward Ca currents, which were abolished by nifedipine (1 μ M) and enhanced by BayK8644 (1 μ M). Lead (5, 50 μ M) inhibited the Ca currents.
8. These results suggest that lead has inhibitory effects on the autonomic neurotransmitter, ACh release and contractions of smooth muscle in the chick proventriculus.