NATURE OF THE RHYTHMIC OSCILLATIONS RECORDED AT NEGATIVE POTENTIALS IN GASTROINTESTINAL SMOOTH MUSCLE

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The spontaneous rhythmic membrane potential oscillations (slow waves) recorded from gastrointestinal smooth muscle is thought to originate from interstitial cells of Cajal.{ICC's}[1]. The following experiments were performed to examine the nature of the previously reported rhythmic oscillations recorded at negative potentials[2].

Guinea pigs were killed by cervical dislocation and exsanguination and the proximal colon removed. Longitudinally cut full thickness T-shaped strips were pinned to the base of an organ bath and superfused with carbogenated modified Krebs solution warmed to 35^{o} C containing hyoscine (1µM) and nifedipine (1µM). Partition stimulation techniques were used to generate electrotonic potentials (EP's) of varying duration and intensity. Glass micoelectrodes were used to record changes in resting membrane potential (RMP) and to monitor extracellular and intracellular current injections.

Conditioning hyperpolarisations of between 10-30mV induced rhythmic oscillations in membrane potential that decreased in frequency and increased in amplitude with increasing hyperpolarisation.. Voltage current relationships revealed a `window' of membrane potential where there was a non linear decrease in membrane conductance.

Methylene blue (50µM) in combination with bright light illumination has been shown to selectively lesion ICC's and abolish slow wave activity[3]. Methylene blue did not appear to alter cell to cell coupling but did reduce the amplitude and disrupt the frequency of the rhythmic oscillations in membrane potential.

Heptanol (1mM), inhibits gap junction conductances and thus `uncouple' smooth muscle cells from ICC's[4]. Heptanol reduced the amplitude of EP's applied through extracellular current injection, increased the amplitude of EP's applied by intracellular current injection and abolished the rhythmic oscillations in membrane potential.

These preliminary results suggest that the mechanisms associated with `generating' these rhythmic oscillations in membrane potential rely on functional ICC's and cell to cell coupling.

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