

**2010 年度受賞者****Interstitial cells of Cajal generate spontaneous transient depolarizations in the rat gastric fundus**Yoshihiko KITO

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The electrical properties of intramuscular interstitial cells of Cajal (ICC-IM) have not been directly studied. Most of what is known about ICC-IM has been deduced from studies of unitary potentials recorded from small bundles of circular smooth muscle cells (CSMC) that contain few ICC-IM. The present study was designed to investigate the spontaneous electrical activity of circular muscles of the rat gastric fundus with intracellular microelectrodes. The majority of cells generated an ongoing discharge of electrical activity that were  $\leq 10$  mV in amplitude (unitary potentials). A second pattern of electrical activity, recorded in less than 1% of all impalements, was characterized by high frequency, large amplitude spontaneous transient depolarizations (STDs) with a maximum rate of rise ( $dV/dt_{\max}$ ) of  $0.5 \text{ Vs}^{-1}$ . Injection of fluorescent dye propidium iodide into cells and double labeling with an antibody against the Kit receptor revealed that unitary potentials were recorded from CSMC, while STDs were generated by ICC-IM. Sustained injection periods ( $>15$  min) resulted in the spread of dye between CSMC, between ICC-IM and between CSMC and ICC-IM. Two types of STDs were observed: regularly occurring continuous STDs and irregular noisy bursting STDs. The amplitude of STDs varied between the two types of STDs. Single units summed to develop STDs with a maximum amplitude of 30 mV. Hyperpolarization induced by sodium nitroprusside or pinacidil decreased the amplitude of unitary potentials generated by CSMC. In contrast, the amplitude of STDs generated by ICC-IM was increased with membrane hyperpolarization. These observations indicate that STDs generated in ICC-IM spread passively to the adjacent CSMC to evoke the discharge of unitary potentials in the gastric fundus.