

NEUROGASTROENTEROLOGY

ICC act as pacemakers to control segmentation motor activity in the gut

Motor activity in the intestine comprises propulsion (to move contents forward) and segmentation (to mix contents for absorption of nutrients). The underlying mechanisms to control the 'switch' from propulsion to segmentation are poorly understood, but the dominant theory indicates a role for alternate excitation and inhibition from the enteric nervous system (that is, a neurogenic mechanism). Findings from Jan Huizinga and colleagues, however, now indicate a myogenic mechanism, with a key role for interstitial cells of Cajal (ICC, or pacemaker cells).

"One day, we discovered that the typical segmentation motor pattern occurred in the presence of total nerve blockade," explains Huizinga. "This prompted us to study a new idea—that it was not a neurogenic, but a myogenic mechanism (involving smooth muscle and ICC) that was underlying segmentation."

Segmentation was found to develop when pacemaker activity was induced in a network of ICC. Two types of pacemaker activity exist in the gut. The dominant one ('slow wave') is generated by ICC associated with the myenteric plexus and promotes propulsion. When this slow wave activity interacts with the nutrient-induced activity from another ICC network (associated with the deep muscular plexus) by phase amplitude coupling, it leads to segmentation.

The nutrient-induced activity leads to a waxing and waning of the amplitude of the slow wave that regulates segmentation motor activity. "The finding of interacting pacemakers to generate segmentation is entirely new," concludes Huizinga.

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