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Paper Title: Measurement and Time-Frequency Analysis of Electrical Activity in the Rat Intestine

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## Abstract

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With a view to the future development of wearable intestinal monitors and to the future application of vagus nerve stimulation (VNS) for intestinal activity modulation, a dedicated system for measuring intestinal electrical activity in rats was constructed. Stimulation experiments using a peristalsis agent (neostigmine) or VNS were conducted in five rats, to evaluate the system. Combined with a dynamic analysis of stomach video images, a time-frequency analysis of the recorded electrical activity yielded the following findings: 1) a low-frequency component (LFC) ranging from 0.25 to 0.40 Hz was observed in four out of five rats, in association with intestinal activity but independent of respiratory variation with a 1.0-1.5-Hz frequency range; 2) an increase in the power of the LFC was visible in the middle of defecation in rat #C, around 25 min after neostigmine administration; and 3) an enhancement of the power of the LFC was detected about 30 min after the initiation of VNS in rat #D. These results suggest the capability of the system to measure electrical activity, the applicability of VNS for intestinal activity modulation, and the usability of the time-frequency analysis for the visualization of intestinal activity, respectively.

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