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Vasomotion induces regular major oscillations in jejunal mucosal tissue oxygenation.

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The mucosa of the small intestine has some unique microcirculatory features that may result in significant tissue oxygenation changes even under physiological conditions. To prove this hypothesis we investigated mucosal and serosal oxygenation in an autoperfused, innervated jejunal segment in pigs. Eight animals (30-40 kg) were anesthetized, paralyzed, and normoventilated. A small segment of the jejunal mucosa and serosa was exposed by a midline laparotomy and an antimesenteric incision. Mucosal and serosal oxygen tensions were measured using Clark-type surface oxygen electrodes. Mucosal hemoglobin saturation and concentration were determined by tissue reflectance spectrophotometry. Systemic hemodynamics, mesenteric-venous acid base, and blood gas variables, as well as systemic acid-base and blood gas variables and jejunal electromyogenic potentials, were recorded. Measurements were performed after a rest period at 0, 30, 60, and 90 min. All animals remained hemodynamically stable. At time 0 the jejunal oxygen extraction ratio was 0.33 ± 0.05 , the mean serosal PO₂ was 60.25 ± 7.69 , the mean mucosal PO₂ was 25.47 ± 4.41 mmHg, and the mean mucosal hemoglobin saturation was $46.36 \pm 6.22\%$. Mean values did not change with time. In contrast to serosal PO₂, mucosal PO₂, mucosal hemoglobin oxygen saturation, and hemoglobin concentration showed rhythmic oscillations with a frequency of 3.4-5 cycles/min that were unrelated to systemic hemodynamic parameters, respiratory frequency, and intestinal peristalsis. From this we concluded that the jejunal mucosa demonstrates significant, regular changes in oxygenation parameters that are locally mediated. We speculate that the physiological basis for this phenomenon is the countercurrent arrangement of microvessels in conjunction with vasomotion. (ABSTRACT TRUNCATED AT 250 WORDS)

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