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The effects of progressive anemia on jejunal mucosal and serosal tissue oxygenation in pigs.

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Anemia may promote intestinal hypoxia. We studied the effects of progressive isovolemic hemodilution on jejunal mucosal (Po2muc), and serosal tissue oxygen tension (Po2ser, Clark-type surface electrodes), mucosal microvascular hemoglobin oxygen saturation (Hbo2muc), and hematocrit (Hctmuc; tissue reflectance spectophotometry) in a jejunal segment. Twelve domestic pigs were anesthetized, paralyzed, and mechanically ventilated. Laparatomy was performed, arterial supply of a jejunal segment isolated, and constant pressure pump perfused. Seven animals were progressively hemodiluted to systemic hematocrits (Hctsys) of 20%, 15%, 10%, and 6%. Baseline for Po2muc, Po2ser and Hbo2muc was 23.5 +/- 2.1 mm Hg, 57.5 +/- 4 mm Hg, and 47.0% +/- 6.4% which were not different from the five controls. Despite a significant increase in jejunal blood flow, jejunal oxygen delivery decreased and oxygen extraction ratio increased significantly at Hctsys 10% and 6%. Po2ser decreased significantly below or at Hctsys of 15%, whereas Po2muc and Hbo2muc were maintained to Hctsys of 10%, but less than 10% Hbo2muc and mesenteric venous pH decreased significantly, implying that physiological limits of jejunal microvascular adaptation to severe anemia were reached. Decrease of Hctmuc was less pronounced than Hctsys. In conclusion, redistribution of jejunal blood flow and an increase in the ratio of mucosal to systemic hematocrit are the main mechanisms maintaining mucosal oxygen supply during progressive anemia.

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