Effects of Red Meat and Proton Pump Inhibitors on Rat Gut pH and Claudin-2

Charityn Fernandez, Tianying Wu, Martin Rosas, Hoa Tuyet Luu, Liyue Zhang, Vanessa Nungaray, and Mee Young Hong

San Diego State University

Objectives: Prolonged use of Proton Pump Inhibitors (PPIs) may alter the gut pH and integrity of the gut barrier which play significant roles in health and the aging process. High consumption of red meat may lead to inflammatory gastrointestinal (GI) conditions, including colorectal cancer; however, research results have been inconsistent. There is limited research evaluating the effects of red meat vs white meat and the interaction with PPI treatment, focusing on the integrity of the gut. Therefore, the purpose of this study was to examine the effects of white meat vs red meat on GI organ pH, and claudin-2 levels in rats treated with and without PPI.

Methods: In a 2 (diet) × 2 (treatment) factorial design, 28 nine-month-old Sprague Dawley male rats were arranged into four groups: white meat, white meat with PPI, red meat, red meat with PPI. Diets consisted of 70% rat chow and 30% meat powder with or without PPI administered at 0.05 g/kg in the feed. After an 8-week feeding intervention, blood samples were collected to examine claudin- 2 levels. Gut pH levels were taken in the stomach, duodenum, ileum, cecum, proximal colon, distal colon, and anus.

Results: PPI administration increased pH in the stomach ($P = 0.026$). Red meat diets exhibited a decreased pH in the cecum ($P = 0.005$) and the proximal colon ($P = 0.013$). Red meat with PPI increased pH in the proximal colon ($P = 0.009$). Red meat groups showed greater claudin-2 levels ($P = 0.007$), especially with PPI ($P = 0.026$).

Conclusions: Increased levels of claudin-2 are associated with leaky gut and inflammation in the digestive system. Our study demonstrated that red meat with PPI may disturb gut integrity as compared to non-PPI, or to white meat groups. Elevated pH by PPI may reduce symptoms in patients with acid reflux but also increase their chance of leaky guts, especially with red meat. Further studies are needed to investigate the association of lowering gut pH in red meat diets with the risk of inflammation. It is vital to investigate these relationships because PPIs are often used for gastric acid problems, and diet is a critical component of such treatment.

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