Why Gastrointestinal Disorders Afflict Women More Often

Boston (March 30, 2015)—Women are more likely to have irritable bowel syndrome and other gastrointestinal (GI) disorders than men are. Although this could be because men and women handle the condition differently—“toughing it out” versus getting it checked out—studies suggest that the GI system behaves differently in women because of sex-related features in the brain. Tanja Babic, a researcher at Penn State Hershey College of Medicine, found that the nerve cells that control the movement of food through the intestines are more sluggish in response to brain inputs in women than in men.

“Women are more likely to develop gastrointestinal disorder than men, but very little research has been done to investigate the reasons behind this,” Babic says. “Females also show differences in brain structure and function compared to males, including higher levels of GABA (γ-aminobutyric acid), an inhibitory neurotransmitter. Since GABA influences the activity of neurons that control digestion, I wanted to investigate whether GABA activity in these neurons is different in males and females. If we can selectively change the activity of these neurons in females, we would have a potential therapeutic target for better treatment of GI disorders in women.”

To identify these differences, Babic measured the type of nerve signal received from the brain and the nerves’ responsiveness to the signals in rats. She found that the nerves in female rats received more signals that suppress the intestinal movement of food. The nerves were also less responsive when stimulated. According to Babic, the data support that the nerves controlling the intestines in females are less excitable and receive more inhibitory signals from the brain, offering one explanation of why digestion problems are more common in women.

Full Abstract

Women have a higher prevalence of functional gastrointestinal (GI) disorders compared to men. Gastric motility is modulated by neurons of the dorsal motor nucleus of the vagus (DMV), and the activity of these neurons is regulated by a tonic GABAergic input. In general, females have been shown to have a higher expression of GABA throughout the central nervous system. The aim of this study was to investigate sex differences in the basic properties and GABAergic inputs to gastric-projecting DMV neurons.

In an in vivo anesthetized preparation, microinjections of bicuculline methiodide (BIC, 0.5-50 pmoles/60 nl) into the DMV of Sprague-Dawley rats increased gastric tone in a dose-dependent manner. Microinjection of 0.5 pmoles of BIC elicited a 32.0±12 mg increase in gastric tone (N=2) in males and a significantly greater increase in gastric tone in females (200.5±37; N=3; p<0.05).

Whole-cell patch-clamp recordings were made from gastric-projecting DMV neurons. Female rats displayed an increased afterhyperpolarization amplitude (19.8±1 mV, N=18) compared to males (15.3±1 mV N=18; p<0.05), and a lower action potential frequency response to injection of 280 pA of current (31.5±2 events/s in males; 25.5±2 events/s in females). Perfusion of slices with BIC (0.5-50 mM) increased the firing rate of gastric-projecting neurons. The increase in the firing rate during perfusion
with 50 mM BIC was significantly greater in females (237±53% of baseline; n=5) than in males (136.2±24%, n=3; p<0.05).

These data show that gastric-projecting DMV neurons in females are less excitable and receive a higher tonic GABAergic input compared to males and suggest that reduced gastric motility in females may be due to an increased inhibitory input to gastric-projecting neurons.

NOTE TO JOURNALISTS: To schedule an interview with a member of the research team, please contact Stacy Brooks at sbrooks@the-aps.org or (240) 432-9697.

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