

Early-life stress causes digestive problems and anxiety in rats

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Traumatic events early in life can increase levels of norepinephrine—the primary hormone responsible for preparing the body to react to stressful situations—in the gut, increasing the risk of developing chronic indigestion and anxiety during adulthood, a new study in the *American Journal of Physiology—Gastrointestinal and Liver Physiology* reports.

Functional dyspepsia, also known as indigestion with no clear origin, affects an estimated 25 to 40 percent of adults. The most common symptoms include pain or discomfort in the upper abdomen, upset stomach, bloating and feeling full quickly while eating. Because the symptoms cannot be pinpointed to a cause, such as an ulcer or gastritis, [functional dyspepsia](#) is challenging to treat and many patients continue to experience symptoms years after diagnosis.

How functional dyspepsia develops is not well understood. Population studies have reported that early-life trauma—including abuse, psychological stress and gastrointestinal infections from sources such as contaminated food and water—increases the risk of developing functional dyspepsia in adulthood. Patients with functional dyspepsia also have a higher prevalence of anxiety, but whether functional dyspepsia and anxiety are linked is a contentious issue.

A research team from the University of Texas Medical Branch at Galveston reported in a previous study that inducing inflammation in the colon—such as what occurs during gastrointestinal infections—of neonatal [rats](#) caused gut hypersensitivity when the rats became adults.

The researchers found that colon inflammation did so by increasing levels of stress hormone norepinephrine. Norepinephrine is produced in nerves all over the body. When stimulated, the nerves release norepinephrine into the blood stream, which affects cells in the surrounding area. This new study aimed to explain the increase in norepinephrine and determine whether rats were more susceptible to anxiety after having colon inflammation as newborns.

The researchers induced inflammation in the colons of 10-day-old rats. After six to eight weeks, the adult rats were evaluated for stomach hypersensitivity and anxiety-like behavior. The researchers found that colon inflammation increased the levels of tyrosine hydroxylase, a protein that makes norepinephrine, in the nerves in the upper abdomen. The nerves released more norepinephrine, increasing levels of norepinephrine in the upper abdomen. The rats also displayed anxiety-like behavior.

The study shows that increased norepinephrine release in the upper abdomen increases stomach sensitivity and susceptibility to anxiety-like behaviors in rats. "Our findings extend the clinical observations that adverse early-life experiences are risk factors for the development of functional dyspepsia symptoms," says Sushil Sarna, PhD, of University of Texas Medical Branch at Galveston and lead investigator of the team. The team also included John Winston, PhD, of University of Texas Medical Branch at Galveston.

The research group will continue to study the link between functional dyspepsia, anxiety and early-life stress. Anxiety worsens the symptoms of functional dyspepsia, but whether it causes or is a result of functional dyspepsia remains to be investigated, according to Sarna. The experimental method used in this study can be used to answer these questions, Sarna says. The research team is also working to identify potential targets for treating the condition and finding biomarkers to

diagnose and evaluate the severity of functional dyspepsia symptoms.

The article "Enhanced sympathetic nerve activity induced by neonatal colon inflammation induces gastric hypersensitivity and anxiety-like behavior in adult rats" is published ahead of print in the *American Journal of Physiology—Gastrointestinal and Liver Physiology*.

More information: John H Winston et al. Enhanced sympathetic nerve activity induced by neonatal colon inflammation induces gastric hypersensitivity and anxiety-like behavior in adult rats, *American Journal of Physiology - Gastrointestinal and Liver Physiology* (2016).

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