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Stress and gastrointestinal (GI) motility

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Stress is highly associated with the development of functional gastrointestinal (GI) disorders. Stress stimuli, both acute and chronic, import different physiological mechanisms and neuroendocrine responses. Oxytocin (OXT) is mainly synthesized in the paraventricular nucleus (PVN) and supraoptic nucleus (SON) of the hypothalamus. Central OXT attenuates hypothalamic–pituitary–adrenal (HPA) axis in response to stress, via inhibiting corticotropin releasing factor (CRF) expression.

Acute restraint stress delays gastric emptying, while it accelerates colonic transit in rodents. Delayed gastric emptying induced by acute stress is mediated via central CRF_2 receptors and sympathetic pathways. In contrast, accelerated colonic transit induced by acute stress is mediated via central CRF_1 receptors and parasympathetic pathways. Although motor responses to acute stress differ between upper and lower GI tract, it should be noted that both responses are mediated via central CRF. Delayed gastric emptying and accelerated colonic transit observed in acute stress were restored to normal levels following repeated stress for 5 days (chronic homotypic stress). Restored GI motility following chronic homotypic stress was inhibited by central-injection of OXT antagonists. OXT knockout (KO) mice failed to restore GI motility following chronic homotypic stress. It is suggested, therefore, that upregulated central OXT expression inhibits CRF expression, resulting in restoration of GI motility following chronic homotypic stress.

Once rats were loaded different types of stressors for 7 days (chronic heterotypic stress), delayed gastric emptying and accelerated colonic transit were still observed. Chronic heterotypic stress showed a lower OXT expression and higher CRF expression at the PVN. This indicates that GI motor responses failed to adapt to chronic heterotypic stress due to impaired OXT expression. GI dysmotility associated with stress could be treatable once OXT expression is upregulated.