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Changes in the Gut Microbiome Following Traumatic Stress Exposure in a Mouse Model of Post-Traumatic Stress Disorder (PTSD)

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Posttraumatic stress disorder (PTSD) can occur following exposure to extreme adverse events, affecting 6.8% of adult Americans. There is a positive correlation between PTSD and gastrointestinal (GI) pain and upset, with the origin of these GI issues attributed to bacterial changes in the gut microbiome. Animal studies have shown a relationship between stress and GI dysfunction, leading to increased systemic lipopolysaccharide (LPS) levels, which have been linked to neuroinflammation and cognitive impairment. The bidirectional and complex communication between microbiota and the brain is not fully understood and therefore would benefit from further experimental studies. Therefore, the goal of my project is to quantify the changes in the concentrations of microbiome bacteria after exposure to mouse Single Prolonged Stress (mSPS), a mouse model validated for the use of studying PTSD, in order to gain fuller understanding of interactions between stress, the brain, and the gut microbiome. Single-housed C57Bl/6 mice were exposed to mSPS, with fecal and blood samples collected prior to and 7 days after mSPS. Using quantitative polymerase chain reaction, bacterial DNA levels of several bacterial phyla were quantified from the fecal samples. LPS levels present in blood from animals were also measured and analyzed with enzyme-linked immunosorbent assays. It is expected that Actinobacteria and Firmicute bacterial levels will decrease, as these phyla are associated with stress. Likewise, elevated blood LPS levels are also expected after mSPS. Greater understanding of the gut-brain axis through these studies will be critical in the development of novel treatment and assessment methods in PTSD patients.

Key Words: PTSD, gut microbiome, mouse, gastrointestinal, qPCR, lipopolysaccharide, single prolonged stress, bacteria