

The effect of adaptogens on stress management by the regulation of the HPA and gut-brain axes

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The study proposes a way to reduce stress and anxiety by regulating the HPA and gut-brain axes with an adaptogenic blend. When an organism is under stress, the hypothalamus signals the pituitary gland, which sends a signal to the adrenal gland to produce cortisol. Adaptogens can reduce the amount of cortisol in the bloodstream and thus manage stress and anxiety.

The vital role of the gut-brain axis in stress-related responses is much appreciated nowadays. The microbiota has recently emerged as a key player in controlling the Brain, especially during stress conditions. The brain and the gut communicate in many ways which include the vagus nerve, gut hormone signaling, the immune system, tryptophan metabolism, and microbial metabolites such as short-chain fatty acids. The communication between the Brain and the gut is bi-directional. Therefore, stress can in turn influence gut health as well. Studies have shown that individuals under long-term (chronic) stress, depression, and anxiety are more susceptible to dysbiosis and leaky gut disorders. A diet containing adaptogens can significantly alter the gut microbiome as seen in some animal studies. Also, adaptogens have the property of regulating cortisol in the bloodstream, thus reducing stress and anxiety through hormonal signaling. Therefore, it is interesting to see how an adaptogen blend affects the gut microbiome creating a positive impact on stress and anxiety.

Ashwagandha, Rhodiola, Curcumin, and Ginseng are some of the most popular herbs that are categorized as adaptogens. In ancient times, they were widely consumed in erstwhile Europe, India, China, and Russia but without the true knowledge of their properties. In the year 1947, Soviet scientist Dr. Lazarev gave them the name - adaptogens because of their ability to adapt according to the body's needs. The main objectives of this study are to achieve the following:

- 1) Develop a mixture of adaptogen extracts and characterize them using HPLC. The formulation will then be encapsulated in nanocapsules with the property of controlled release.
- 2) Include the nanocapsules in the diet of mice and observe their behavior patterns over a period of time while maintaining a control setup of mice that are not given the adaptogen dose.
- 3) Perform behavior and activity tests on mice such as mirror maze tests, foot shock tests, etc. Additionally, changes in the gut microbiome will also be analyzed using metagenomics on the fecal matter of mice.

The efficiency of the adaptogen blend can be tested by studying the changes it causes in the hormone concentration and gut microbiome community. These changes can be monitored using techniques such as:

- 1) Blood tests to determine the changes in hormone concentration

- 2) Differential gene expression analyses to find out if the adaptogen blend affects certain gene-regulating pathways.
- 3) Metagenomic analyses to determine the colonies of microbes forming in the gut before and after the diet and also in comparison with the control group.

The analysis of the effects of adaptogen on the gut-brain axis is carried out and its impact on stress and anxiety is studied, leading to the development of an adaptogen blend formulation that can be used as a supplement.

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