Biome Lift™ Probiotic

Mechanism of Action

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Background

Numerous animal studies (in mice and rats) have shown that probiotics can reduce depressive and anxiety-like behaviours. These observations have been replicated in clinical trials in humans, with a recent systematic review and meta-analysis concluding that 'probiotic consumption may have a positive effect on psychological symptoms of depression, anxiety, and perceived stress in healthy human volunteers' (McKean et al, 2017). The mechanisms of action by which probiotics can exert benefits on our mood are largely speculative and not well-defined, but are believed to be mediated via the microbiota-gut-brain axis.

Interestingly, depression is associated with compositional differences in the gut microbiota compared to healthy controls. One study which transferred gut microbiota from depressed human patients into healthy rats (via faecal microbiota transplantation) induced the behavioural and physiological features of depression in the rats, including anhedonia (inability to feel pleasure in normally pleasurable activities) and anxiety-like behavior (Kelly et al, 2016).The

pathophysiology of depression involves:

- **Brain abnormalities**, including unbalanced neurotransmitters, impaired neuroplasticity, and abnormal neural circuitry
- **Dysfunction of the hypothalamic pituitary adrenal (HPA) axis**, which coordinates the body's response to physical and psychological stress
- **Chronic inflammation**, resulting from an increase in pro-inflammatory cytokines and reduction in anti-inflammatory cytokines
- **Dysfunction in the microbiota-gut-brain axis**, i.e. the bidirectional communication between the gut and the brain via neural, immune, endocrine and pathways, influenced by the gut microbiota

Depression as an inflammatory condition

This chronic low-grade inflammation seen in depressed patients is thought to be caused in part by increased intestinal permeability ("leaky gut", which can be induced by chronic stress), which allows bacterial endotoxin (lipopolysaccharide or LPS) to translocate into the bloodstream, triggering the release of pro-inflammatory cytokines. Probiotics strengthen the integrity of the gut barrier (reducing permeability), which prevents the translocation of LPS and subsequent inflammation.

The mechanisms by which probiotics modulate brain function (including cognition, mood and emotional state) is thought to be related to their ability to:

- **Produce neurotransmitters**, including GABA and dopamine
- **Modulate the activity of the immune system**, decreasingly pro-inflammatory cytokine production
- **Produce neuromodulators**, such as short-chain fatty acids (via the fermentation of fibre)
- **Enhance barrier function**, preventing bacterial translocation (and immune activation)

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