

Eat Bacteria to Cure Mental Illness; The New Era “Psychobiotics” vs the Current Era Psychotropics

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The gut microbiome

All the microorganisms and their genomes that reside in human intestinal tract are referred to as the gut microbiome. Research reveals that they regulate various physiological processes such as immunomodulation, adiposity, energy balance. They also play a significant role in regulating the electrophysiological activity of enteric nervous system(ENS) [1].

The bidirectional brain-gut axis

The complex two way signalling that happens between the brain and the gastrointestinal tract is delimited at hormonal, neural, and immunological levels. This paradigm is acknowledged as the brain-gut axis. The signals from central nervous system (CNS) affects the sensory, motor, and secretory functions of the GIT and visceral signals from intestinal tract has affects the neurological functions. The brain-gut axis is essential for sustaining the homeostasis [2].

The Brain-Gut-Enteric microbiota axis

The complex reflex network that includes the central nervous system(CNS), the enteric nervous system (ENS), autonomic nervous system (ANS), and the neuro-endocrine and neuro-immune systems, along with the gut microbiota forms the Brain-Gut-Enteric Microbiota Axis [2].

Top-down signalling

Stress and emotions that originates from CNS modulates of gastrointestinal function [3].

Bottom-up signalling

In abdominal pain syndromes, Visceral afferents to the CNS results in modulation of emotional reactions [3].

Probiotics

Group of beneficial bacteria that provides positive health outcomes are termed as probiotics.1 Bacteria such as Gram-positive Bifidobacterium and Lactobacillus families are the most commonly used probiotics. These bacterium lack pro-inflammatory lipopolysaccharide chains hence they do not trigger full-fledged immunological reactions in the gut. This trains the immune system to differentiate pro- and anti-inflammatory bacteria hence developing appropriate immunogenic reactions against pathogenic pro-inflammatory bacteria considering them as antigens [4].

Organisms and the psyche

Psychobiotics are the probiotics (beneficial bacteria) or prebiotics (sustenance for such bacteria) which has an impact on bacteria-brain associations.1 The enteric nervous system and the immune system are the Bacteria-brain communication channels through which psychobiotics exerts its actions. The live organisms, when consumed may yield health benefits in patients with psychiatric disorders such as anxiety and depression [5].

Psychobiotics exercise anxiolytic and antidepressant properties that are exhibited by changes in emotional and cognitive indices. Animal studies reveals the beneficial effects of probiotics in altered behavioral phenotypes. Specific psychobiotics such as *Lactobacil-*

lus helveticus and *bifidobacterium longum* reduced the depressive Symptoms in rodents [1,5].

The cosmos in chaos: Psychobiota

The microbiota–gut brain axis is termed as Psychobiota. It plays a major role in neuro-endocrine stress response, neuro-development, regulation of neuro-inflammation, modulation of mood and behaviour [6].



Figure 1

Mechanics of psychobiotics

Gut microbes regulates the release of neuroactive molecules from enterocytes along with the microbe-derived neurotransmitters plays a major role on the neural signalling of gut–brain axis. These signals are imperious in altering the sleep, appetite, mood, and cognition. microbe-derived neurotransmitters such as gamma-aminobutyric acid (GABA), and serotonin, decline the over activity hypothalamo-pituitary adrenal axis which potentiates anti-inflammatory effects that are helpful in treatment of various neuropsychiatric disorders [7].

Conclusion

Although Animal studies revealed positive results, the research data on the effect of psychobiotics on humans remain derisory. Further research on the comparative pharmacological effects of psychobiotics with psychotropic drugs are essential as psychobiotics may replace or minimise the usage of psychotropic drugs in treating various psychiatric disorders.

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