



# Gut-brain Axis and Alcohol Dependence: Exploring the Role of Psychobiotics in Treatment

Gayatri Bhatia<sup>1\*</sup>, Arpit Parmar<sup>2</sup>

<sup>1</sup> DM (Addiction Psychiatry) All India Institute of Medical Sciences, Rajkot, AC block, Shalimar Bagh, Delhi, India

<sup>2</sup> DM (Addiction Psychiatry) II India Institute of Medical Sciences, Bhubaneswar, India

**\*Corresponding author:**

Gayatri Bhatia, NDDTC hostel room 11, meera bai road, kamla nehru nagar, Ghaziabad, India.  
Tel: +918368296642  
Email: gayatribhatia90@gmail.com

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**Abstract**

Chronic alcohol use adversely impacts the gut, including increased intestinal permeability and alteration in gut microbiota. Recent research has pointed to the association between alteration in gut microbiota and the induction of alcohol cravings. The term “psychobiotics” has been coined for microorganisms that, when ingested in sufficient amounts, may have beneficial effects on psychiatric illnesses. This letter to the editor highlights the possible mechanism underlying the therapeutic role of psychobiotics in addictive disorders and urges the scientific community to direct research focus on this avenue.

**Keywords:** Alcohol dependence, Gut-brain axis, Psychobiotics, Psychotherapeutics

## Dear Editor

The relationship between the gut and brain which is regulated at immune, endocrinal, and neural levels, has been established for decades. Alteration in the gut microbiota has been shown to impact the Hypothalamic-Pituitary-Adrenal (HPA) axis negatively and predisposes an individual to stress-related disorders. The brain affects GI motility, blood flow, and microbiota composition. Many microbiotas have been found to produce tryptophan, tyrosine, Gamma-aminobutyric acid (GABA), Glycine, and other amino acids, performing a major role in mood, cognition, behavior, and pain sensitivity [1]. The term “psychobiotics” has been coined for microorganisms that, when ingested in sufficient amounts, may have beneficial effects on psychiatric illnesses. Psychobiotics have been studied in animal models and among humans with various psychiatric illnesses, including depression, anxiety, autism, irritable bowel syndrome, and other stress-related conditions [1]. Many randomized controlled trials suggest some beneficial effects of psychobiotics on these psychiatric conditions [2]. These studies provide evidence regarding the possible effectiveness of psychobiotics in stress-related responses in certain psychiatric conditions.

The role of the gut in alcohol and drug dependence

has been studied recently. It has been proposed that chronic alcohol use leads to an adverse impact on the gut, including increased intestinal permeability and alteration in gut microbiota [3]. This may allow gut microbiota to reach systemic circulation, causing a release of pro-inflammatory cytokines, the important mediators of gut-brain axis response. The caused neuroinflammation leads to changes in emotions, mood, and behaviors (including drinking). Peptidoglycans and lipopolysaccharides from gut microorganisms are also found to stimulate peripheral blood mononuclear cells, which have been found to be associated with alcohol cravings, as per recent research [4].

Alcohol-dependence patients with gut leakiness have higher anxiety, depression, and alcohol craving even after 3-week abstinence, suggesting their potential role in alcohol relapse [5]. Gut microbiota are known to cause alterations in the brain neurotransmitters, such as dopamine (a commonly involved neurotransmitter in the reward pathway), serotonin, GABA, and Glycine [5]. Stress is an important risk factor in the development of drug dependence and is governed by the HPA axis, an axis known to be affected by the gut microbiota [6]. Apart from stress, depression and anxiety are among the most common psychiatric comorbidities

associated with drug dependence. Furthermore, leaky gut and inflammation are also reported in non-cirrhotic alcohol dependence; moreover, systemic inflammation and alcohol craving have been linked to depression [7]. Therefore, probiotics might have a role in the treatment of alcohol dependence (with or without anxiety/depression/stress). One study suggested an altered brain response to emotional stimuli after the administration of probiotics, a mechanism that may have a role in dealing with alcohol-related cues [8].

In conclusion, gut microorganisms may have a role in alcohol dependence, and therefore, there is a need to study this further in the context of alcohol dependence. The gut microbiota modulation using probiotics and its impact on drinking-related behavioral aspects need to be studied in rigorously conducted randomized controlled trials.

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