FACTSHEET

THE INFLUENCE OF THE GUT FLORA ON THE DEVELOPMENT OF IBS

WHAT IS IBS (IRRITABLE BOWEL SYNDROME)?

IBS is one of the most common gastrointestinal disorders, affecting 10-15% of adults.[1] Abdominal pain, alterations of bowel habits, bloating and flatulence, straining and urgency are all common symptoms.[1] Depending on the prevalent bowel habit, IBS has been subtyped using the Rome III criteria into diarrhoea predominant (IBS-D), constipation predominant (IBS-C), mixed (IBS-M) and un-subtyped IBS (insufficient abnormality of stool type to meet the criteria for the other three types).

Given the number of various symptoms, one single cause is unlikely to explain the development of the condition. Research suggests that many factors contribute and interplay in the development of IBS, such as:

- **Altered gut motility**
- **Altered gut epithelium**
- **Heightened visceral perception and inflammation**
- **Psychological factors**
- **Imbalances in neurotransmitters.[1]**

IBS AND THE MICROBIOME

Recent studies into the microbiome have provided support to the concept that an altered gut flora could promote the development and maintenance of symptoms in IBS.[1] It has been reported that IBS subjects have a lower diversity of gut microbiota compared to healthy controls.[2] A seven week study of healthy subjects found that those who experienced abdominal pain had significantly less bifidobacterium compared to those without pain.[3]

It appears that imbalances in the gut microbiome could have an impact on each of the factors that are believed to contribute to the development of IBS.

• Altered gut motility

The gut flora has been shown to alter gut motility by both stimulating gastrointestinal muscle,[4] as well as impairing muscle contractibility.[5] Methane is a by-product of fermentation by certain strains of bacteria (predominantly pathogenic strains) and has shown to slow intestinal transit time.[6] Studies have found that IBS-C sufferers produced higher levels of methane in breath tests. [7,8]

• Altered gut epithelium

The interaction of the gut flora and the gastrointestinal tract lining regulates absorption, secretion and intestinal permeability.[2] It is suggested that clinical symptoms of IBS could be associated with structural and functional abnormalities of the mucosal barrier. The disruption of this barrier could lead to the development of pain and discomfort,[9] and may also play a significant role in cognitive dysfunction in IBS.[2]

• Heightened visceral perception and inflammation

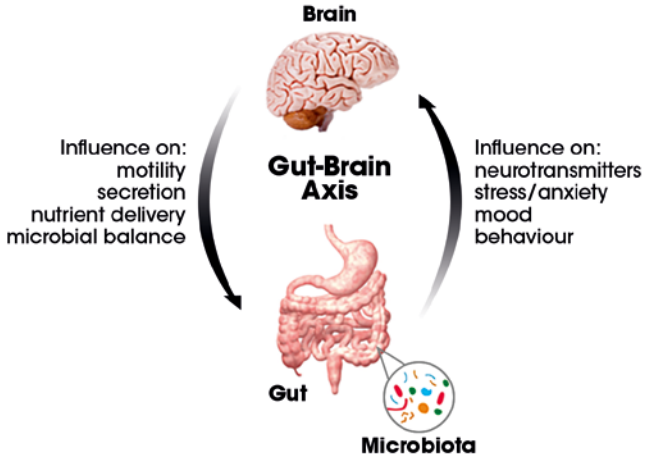
An overgrowth of pathogenic bacteria in the gut will lead to disturbed colonic fermentation.[11] This disturbed fermentation may produce toxic gases such as hydrogen sulfide (H2S), which has been linked to heightened visceral pain and inflammation.[12]

An altered microbiotia composition could potentially drive low grade inflammation and in turn support a pro-inflammatory microbial community.[2] Barbara *et al* 2004 found an increase in mast cells within the mucosa in close proximity to nerves, which significantly correlated with severity and frequency of abdominal pain in IBS patients.[10]

• Psychological factors

It has been well documented that alteration of gut microbiota could interfere with behaviour and mood in humans.[1] An altered gut flora found in some IBS patients appears to correlate with depression and anxiety.[1]

IBS is often referred to as a stress-related disorder, interestingly stress can alter the composition of the gut flora while the gut microbiome itself can regulate endocrine disorders.[2]



• Imbalances in neurotransmitters

Stress signals are sent from the brain to the gut which are translated into neurotransmitters and pro-inflammatory cytokines, both of which can have profound effects on the gastrointestinal physiology.[13] Serotonin is a major neurotransmitter in the gastrointestinal tract, and its receptors are involved in the control of gastrointestinal function.[14] Studies have shown a reduction in plasma serotonin in IBS patients with constipation, but increased plasma serotonin in those with diarrhoea.[15] Short-chain fatty acids synthesised by intestinal bacteria modulate serotonin secretion,[2] and are therefore an important determinant of serotonin production and homeostasis.[16]

PROBIOTICS IN IBS

Research suggests that probiotic effects appear to benefit intestinal motility, visceral hypersensitivity, altered gut epithelium and immune function, luminal metabolism, dysfunctions of gut-brain axis and psychological distress.[1] Many clinical studies have shown significant improvements in overall IBS symptoms with a multi-strain probiotic supplement.[17-20] It is suggested that multispecies probiotics may have more diversified effects on IBS symptoms because of an ability to colonise several areas of the gastrointestinal tract, a wider range of functional characteristics and synergistic effects between the strains.[21]

The table below provides details of clinical studies showing benefits of using probiotics to help modulate the possible developing factors of IBS.

IBS Developing Factor	Conclusion	Species Used	Study
Altered gut motility	Improvements in gastrointestinal transit (P = 0.026).[22]	*Bifidobacterium lactis, Streptococcus thermophilus, Lactobacillus bulgaricus*	Agrawal *et al* (2009)
	Normalisation of stool frequency in 6 out of 10 constipation patients and resolution of abdominal pain (P = 0.0012).[23]	*Lactobacillus plantarum*	Niedzielin, Kordecki and Birkenfeld (2001)
	Significantly reduced abdominal cramps and constipation.[24]	*Lactobacillus casei, Lactobacillus rhamnosus, Streptococcus thermophiles, Bifidobacterium breve, Lactobacillus acidophilus, Bifidobacterium longum, Lactobacillus bulgaricus*	Fateh *et al* (2011)
Altered gut epithelium, heightened visceral perception and inflammation	Effective relief of abdominal pain and bloating, in IBS patients fulfilling the Rome III criteria.[25]	*Lactobacillus plantarum*	Ducrotté, Sawant and Jayanthi (2012)
	Specific lactobacillus strains mediated analgesic functions in the gut-similar to the effects of morphine.[26]	*Lactobacillus acidophilus*	Rousseaux *et al* (2007)
Psychological factors	Modulate the stress response and improve mood and anxiety symptoms (p = 0.01).[27]	*Lactobacillus casei*	Rao *et al* (2009)
Imbalances in Neurotransmitters	Upregulate serotonin receptors in intestinal epithelial cells and mice intestinal tissues.[28]	*Lactobacillus rhamnosus*	Wang *et al* (2015)

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