Trust your gut – Understanding **dysbiosis**

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Introduction

The human gastrointestinal tract (GIT) is a rich and diverse biological system and is one of the largest connections between the internal system of the human body and the outside world. The GIT houses a vast number of microorganisms, also known as the human microbiota, microflora or microbiome. Providing many benefits to the functioning of the human body, understanding the microbiome is one of the most exciting scientific advances in recent years.

Microbiome: The new "buzz" word

Defined as all the bacteria, viruses, fungi and microbes that inhabit the human body, the microbiome colonises various sites in the body such as the skin, mouth and vagina. However, the GIT is the most diverse of all. Interestingly, research has suggested that the development of the human intestinal microbiome may begin during foetal development, and is further influenced by type of delivery and type of feeding. This dynamic ecosystem of intestinal flora continues to develop until age two to three years, when the microbiome stabilises and is said to resemble that of an adult.

Influenced by various factors including food and genetics, the microbiome is involved in the following bodily functions (including but not limited to):

- Digestion and metabolic functions
- Sourcing energy from food
- Balancing the "good" versus "bad" bacterial composition
- Protection against bacteria and viruses that can cause invasive diseases
- Regulation and development of the immune system
- Manufacturing of:
  - Chemicals in the brain, such as serotonin
  - Enzymes
  - Vitamins, such as vitamin K

When the balance of the intestinal flora in the GIT is affected, the GIT is said to be in a state of dysfunction, a condition recently termed dysbiosis.

A balancing act

Dysbiosis has been defined as changes in quality and quantity in the intestinal flora, their metabolic activity and local distribution. Since the optimal functioning of the human body is influenced by a balanced microbiome, a state of dysbiosis negatively affects the body, resulting in symptoms that can range from mild discomfort to disease states.

Evidence suggests that dysbiosis plays a role in conditions affecting the GIT such as irritable bowel syndrome (IBS). The most common complaints associated with dysbiosis are digestive in nature, and include flatulence, bloating, stomach pain, cramps and constipation and/or diarrhoea. Dysbiosis can be harmful due to the production of bacterial toxins and therefore is a potential risk factor for the development of chronic diseases affecting the GIT such as inflammatory bowel disease (IBD). In addition, research suggests that dysbiosis can potentially lead to systemic conditions such as rheumatoid arthritis and ankylosing spondylitis.

Dysbiosis may be caused by various factors including viral and bacterial infections, diet, stress, medication and, in the case of infants, slow or underdevelopment of the intestinal

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flora. However, the leading cause of dysbiosis is antibiotic use, which, in destroying the "bad" bacteria, also destroys some of the good bacteria in the gut. This can lead to:

- Antibiotic-related diarrhoea
- Increased risk of infections due to harmful bacteria
- Electrolyte imbalance

The overgrowth of "bad" microorganisms is believed to cause the release of potential toxins which can cause diarrhoea as well as symptoms of IBS. To regain the balance of the intestinal flora, it can take months and there may be instances where the immune system has been affected to such a degree that the body is unable to regain this balance, leading to chronic conditions or complications.

Probiotics: not all bugs are bad

Probiotics are called the "good" microorganisms because they benefit the gut by contributing to the balance of intestinal flora. Commonly used organisms in dietary supplements for probiotics include the *Lactobacillus* species, *Bifidobacterium* species and *Saccharomyces boulardii* (a non-pathogenic strain of yeast). Many microorganisms are claimed to be used as probiotics and are becoming increasingly popular, but not all of these have been proven efficacious in clinical trials.

Probiotics have the ability to resist gastric acid and bile acids, allowing them to colonise the intestinal tract, creating a balanced microbiome. Therefore, the term probiotic should only be used when the product delivers live microorganisms with a count of strains that can deliver benefits. The genus and species of the probiotic strain is an important link to specific health benefits as is the dose and level of colony forming units (CFUs) in a serving or dose. The quantity of *Lactobacillus* and *Bifidobacterium* of at least 10 billion CFUs has been accepted as the minimum required dose. Since the health benefits of probiotics are dependent on the strain, a higher number of strains or CFUs does not necessarily prove greater efficacy.

The effect of probiotics

Although the mechanisms by which probiotics exhibit their benefits are not completely understood, their role is to contribute to the balance of the intestinal flora, thereby maintaining a healthy digestive system. Research suggests the following beneficial effects of probiotics:

- When used with antibiotics, *Lactobacillus* and *S. boulardii* probiotic strains minimise the changes in stool consistency and duration of loose stools, reducing the risk of antibiotic-related diarrhoea.
- *Lactobacillus GG* or *Lactobacillus reuteri* were found to significantly reduce the duration of acute diarrhoeal diseases by one to three days in children. In addition, *S. boulardii* was also found to assist with recovery. The use of probiotics provided better benefit in viral illness than in bacterial illnesses.
- Probiotics may reduce and relieve symptoms of IBS and maintain better overall gastrointestinal function.
- *Lactobacillus*, *Bifidobacteria* and *S. boulardii* have been the most investigated probiotic cultures for their effect on the immune system demonstrating potential benefit for the use of probiotics in infancy to help prevent immune-mediated diseases in childhood.

Points to consider

- Probiotics contribute to the balance of the intestinal flora.
- Strain-specific benefits cannot be generalised. Therefore, the evidence of clinical efficacy for a specific indication for a specific strain needs to be considered.
- Lactic acid bacteria used as probiotics are sensitive to antibiotics and therefore need to be taken no less than three hours after antibiotic administration.
- Being a yeast, *S. boulardii* is resistant to antibiotics and is therefore not affected by concomitant antibiotic administration.
- The core benefits of probiotics have been identified as:
  - Supportive of a healthy gut microbiome
  - Providing live microorganisms that naturally form part of, and contribute to, the gut environment
  - Possibly being resistant to various antibiotics

Conclusion

The microbiome in the GIT is diverse and rich in healthy bacteria, which can be significantly affected by antibiotic use as well as other factors, leading to a state of dysbiosis. Probiotics act as a protective barrier from potentially harmful bacteria in the gastrointestinal tract. This in turn helps restore and maintain the integrity of the intestinal flora, allowing it to assume its functions and promote a healthy gastrointestinal tract. The role of probiotics is an evolving area of study, with current data suggesting promise and safety with their use. In addition, the information that is currently known about the microbiome is just the "tip of the iceberg", as it is a subject not yet fully understood.

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