

Use of pre / probiotics in clinical nutrition

Dr Mohd Faisal Jabar

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Probiotics

A decorative graphic consisting of six circles arranged in two rows. The top row has two circles: a solid light purple one on the left and an outlined light purple one on the right. The bottom row has three circles: a solid light purple one on the left, an outlined light purple one in the middle, and a solid light purple one on the right.

- A preparation containing viable microorganisms which alter the microflora in a compartment of the host and by that exert beneficial health effects in the host

Prebiotics

A decorative graphic consisting of two groups of circles. The first group on the left has a solid light purple circle on the left and an outlined light purple circle on the right. The second group on the right has a solid light purple circle on the left, an outlined light purple circle in the middle, and a solid light purple circle on the right.

- A non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon

Synbiotics

A decorative graphic consisting of two groups of circles. The first group on the left has a solid light purple circle on the left and an outlined light purple circle on the right. The second group on the right has a solid light purple circle on the left, an outlined light purple circle in the middle, and a solid light purple circle on the right.

- Preparation which contain both probiotics and prebiotics, enhancing the survival of the microorganism



Criteria for probiotic agent

- Isolated from the same species as its intended host
- Demonstrable beneficial effect on the host
- Non-pathogenic
- Able to survive transit through the gastrointestinal tract
- On storage, large number of viable bacteria must be able to survive prolonged periods



Commercial probiotic species

- Lactic acid bacteria
 - *Lactobacillus*
 - *Bifidobacterium*
- Non pathogenic *E coli*
 - Nissle 1917 strain
- *Clostridium butyricum*
- *Streptococcus salivarius*
- *Saccharomyces boulardii*

Role of probiotics



- As therapy
- As prophylactic agent

- Diversity and wide range of perceived applications
- Complementary therapy

Reid G, Jass J, Sebulsky MT, McCormick JK. Clin Microbiol Rev 2003

Boyle RJ, Robins-Brown RM, Tang MLK Am J Clin Nutr 2006

Sharp RR, Achkar J-P, Grinich MA, Farrell RM. Am J Gastroenterol 2009



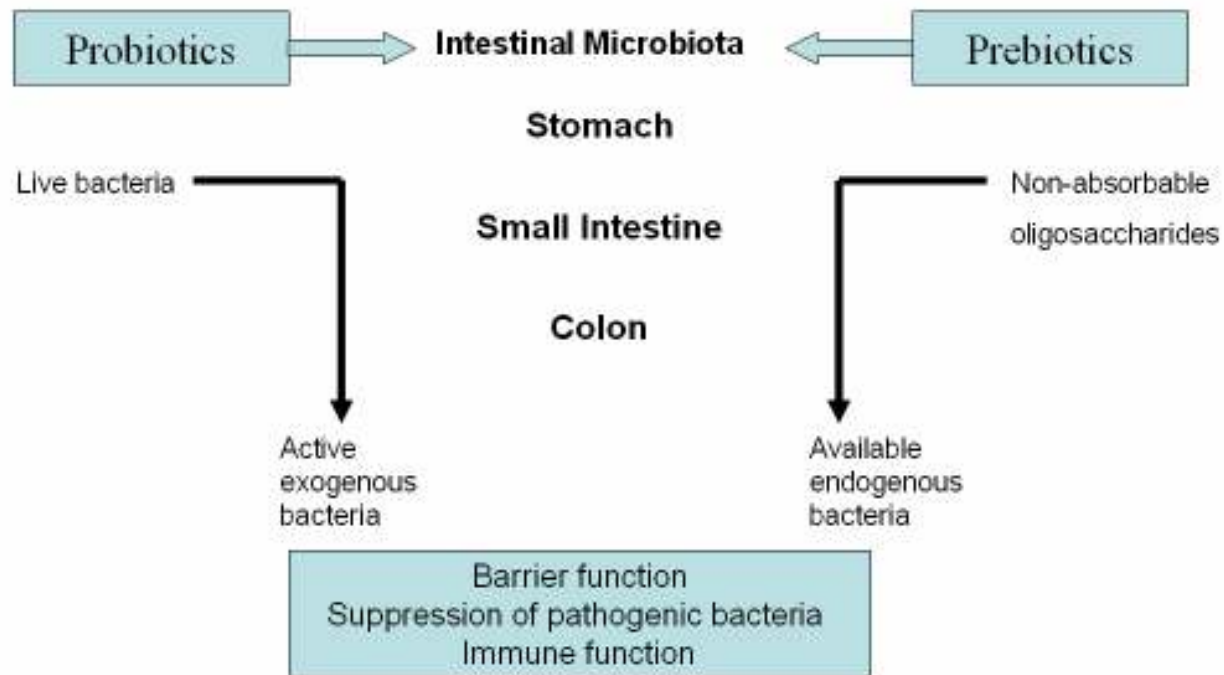
Rationale for probiotics

- Repopulate intestinal flora
- Inhibit pathogenic bacteria colonisation
- Repopulate flora of organs which are affected by intestinal commensal
- Regulate immunity
- Modify inflammatory response
- Improve barrier function of intestinal epithelium
- Improve physiological function
- Prevent or treat intestinal and other diseases

Reid G, Jass J, Sebulsky MT, McCormick JK. Clin Microbiol Rev 2003

Sharp RR, Achkar J-P, Grinich MA, Farrell RM. Am J Gastroenterol 2009

Pre/probiotic mechanism of action



Range of diseases with perceived or potential for probiotic applications

- Gastrointestinal
 - Acute infective diarrhoea
 - Antibiotic-associated diarrhoea
 - Gastric / *Helicobacter pylori*
 - Inflammatory bowel disease
 - Irritable bowel syndrome
 - Colorectal cancer prevention
 - Diverticular disease
 - Neonatal necrotising enterocolitis
- Childhood atopic dermatitis
- Female urogenital infections
- Surgical site infections
- Nosocomial infections

Other clinical situations where beneficial probiotic activity might be desirable

- Post chemotherapy
- Functional constipation
- Immunocompromised patients
- Critically ill patients



Consensus Statement for probiotic use

- “... there is adequate scientific evidence to indicate that there is potential for probiotic foods to provide health benefits and that specific strains are safe for human use.”



Evidence for probiotics

- Level I evidence for acute infectious diarrhoea and preventing antibiotic-associated diarrhoea
 - *Lactobacillus rhamnosus* GG and *Saccharomyces boulardii*
- Level II evidence in preventing recurrent *Clostridium difficile* diarrhoea
- Level I evidence for traveller's diarrhoea
- Level I evidence in preventing pouchitis
- Level II evidence in preventing relapse in patients with ulcerative colitis.



Evidence for probiotics

Mixed results for :

- Gastric / *Helicobacter pylori*
- Inflammatory bowel disease
- Irritable bowel syndrome
- Colorectal cancer prevention
- Diverticular disease
- Childhood atopic dermatitis
- Female urogenital infections
- Surgical infections
- Nosocomial infections

Reid G, Jass J, Sebulsky MT, McCormick JK. Clin Microbiol Rev 2003

Pham M, Lemberg DA, Day A. MJA 2008

Risks with probiotics



- PROPATRIA RCT in severe acute pancreatitis
 - Increased intestinal ischaemia (29% vs 0% $p=0.004$)
 - Increased deaths (41% vs 15% $p=0.01$)
- Known deaths from its use
 - UPennsylvania volunteer
- Fungaemia
 - Neonatal necrotising enterocolitis
 - ICU patients

Besselink et al. BMC Surg 2004

Ltherm et al. *Intensive Care Med* 2002

Risks with probiotics



- “...insufficient data to make a recommendation on the use of pre/pro/synbiotics in critically ill patients.”

Risks of probiotics



- Controversial
- Age old 'neo'therapy
- Attractive alternative therapy
- Aggressive marketing
- Over the counter availability



Safety-related considerations

- Unpredictable behavior of naturally occurring microorganisms
- Unpredictable behavior of genetically altered microorganisms
- Unexpected interactions of bacteria within the specific local environment of the human host
- Unexpected release of novel bacteria into the (external) environment



Conclusions

- Probiotics are generally safe and well tolerated
- Probiotics can be beneficial in healthy individuals
- Probiotics are found to be beneficial or at least do not cause any harm in patients with infective diarrhoea, AAD and IBD
- More evidence is required for other claims of probiotic efficacy
- Probiotics are not recommended for routine use in the immunocompromised and the critically ill