An overall concept on Pre and Probiotics

Comment [BB1]: Tittle is inappropriate in relation to the content of the chapter.

ABSTRACT :

The gut of the human body contains several microorganisms in it which are collectively known as gut microbiota, microbiome or Intestinal microflora. Prebiotics and probiotics help in qualitative and quantitative improvement of microbiome thereby favoring many health benefits if taken through diet or as formulation. Marketing scale of pre and probiotics is being increasing day by due to the health benefits shown by them in consumers.

Key words :Gut microbiota, microbiome, Intestinal microflora, Prebiotics, probiotics

Comment [BB2]: Abstract of a book chapter must contain the summary of the chapter. This abstract is missing insights on the concepts of Pre and Probiotic. Needs elaboration. I recommend this be rewritten with through review of litterature.

1)INTRODUCTION :

Comment [BB3]: Introduction may include historical prospects, definitions, types, detail characteristics, commomn used, advantages, complications, source of pro and prebiotics etc….

1.1)Prebiotics :

prebiotics are indigestible fiber content of food which are not digested by the enzymes of small intestine and on fermentation in the large intestine provide nutrition to the gut friendly bacteria in intestine. **[1]** Fructooligosaccharides (FOS), Galacto Oligosaccharides (GOS) are the important group of prebiotics. **[2]**

Carbohydrate type	Chemical composition	Bacteria Benefited	Source
Fructans (Inulin and fructooligosaccharide)	Linear chains of fructose with beta extensions	Latic acid bacteria	Fruits(Bananas), vegetables (sugar beet, chicory,asparagus, garlic, onion,tomato), Honey
Galacto Oligosaccharides	Extensions of lactose	Bifidobacteriumadolescentis and lactic acid bacteria	Human milk and cow milk
Glucose derived Oligosaccharides	Resistant starch(resistant to digestion by upper GIT)	Bifidobacteriumadolescentis	Honey, soy sauce, Black potato starch, cyclodextrins

Table1 : Types of prebiotics based on carbohydrate content in it. **[2]**

1.1.1)Characteristics of prebiotics : [1,2]

- These should neither be degraded not absorbed in the GIT.
- It can be fermented by the intestinal microbiota.
- They should have the ability to change the gut microflora into healthier and beneficial composition.

1.2)Probiotics :

The World Health Organization(WHO) ,an agricultural organization, defined probiotics as live microorganisms which when given to hosts in adequate amounts improves health benefits in hosts. **[3,4,5,6,7]** The probiotics concept was introduced for the first time in 1995 by Glenn Gibson and Marcel Roberfroid**. [8]** Parker explained probiotics as organisms and chemicals that aid intestinal homeostasis **[9]**The term prebiotic is derived from Greek word pro and bios means for life; which is opposite to antibiotic means against life **[10,11,12]** Mainly seven types of microbial species are used as probiotics *Lactobacillus, Bifidobacterium, Saccharomyces, Streptococcus, Enterococcus, Escherichia,* and *Bacillus***[13]** Among these Lactobacillus and Bifidobacterium species are mostly approved.

Lactobacillus species: L. acidophilus L.rhamnosus L. gasseri, L. casei L. reuteri, L. plantarum, L. salivarius L. johnsonii, L. gallinarum, L. plantarum, L. fermentum L. helveticus, L. brevis L. murinus, L. crispatus, L. amylovorus

Bifidobacterium species : B. infantis, B. longum B. lactis, B. adolescentis B. bifidum, B. animalis B. breve, B. thermophilum B. pseudolongum

1.2.1)Characteristics of prebiotics : [14]

- Should have beneficial impact.
- Should be non-toxic, non-allergic
- It must be suitable for gut environment.
- Should be stable at storage conditions.

2) APPLICATIONS :

Marketing of pre and probiotics have grown rapidly making probiotics as a part of food supplement due to their wide range applications. **[15]**

2.1) Important Therapeutic applications of pre and probiotics are :

In the prevention of acute diarrhea, Crohn's disease, cardiovascular and Urogenital infections, Dental caries and oral diseases. **[16]** Also pre and probiotics correct microbial dysbiosis. Microbial dysbiosis is known as imbalance in the structure and functions of intestinal flora. **[17]** They detoxify xenobiotics and environmental pollutants. **[18]** Also used in atopic dermatitis, antibiotic associated diarrhea, hypercholesterolemia[and obesity. **[8]** In irritable bowel disease(IBD) colorectal cancer, necrotisingenterocolitis, It boosts immune system by improving antibody reactions, improves neuronal and endocrine pathway. **[2]** relieves pain by influencing the central nervous system. **[25]** Used to treat disorders like gastrointestinal infections, bacterial vaginosis and urinary tract infections. **[33, 34]**Lactose intolerance **[16, 35,36,37]** Show anti inflammatory response **[25,35,36,37]** Pre and probiotics inhibits enteric pathogens, maintains gut permeability, modulates immune system **[35,36,37]** In treatment of rotavirus infections, bacterial gastroenteritis, Helicobacter pylori infections, reduces the risk of cancers, maintains gut mucosal integrity, maintains women reproductive health, heals the surgical wound site. [**40]**

3) MECHANISM OF ACTION :

Comment [BB4]: Mechanism of action must be in detail, preferably use flowcharts and images to depict the steps in their mechanism of action

3.1)Prebiotics :

Prebiotics mainly act like an energy source for gut microbiota , so that they can improve the composition and functions of these microorganisms. **[19]** Specific probiotic favors growth of specific bacterial strains. **[20]** Also prebiotics modulate the gut microbiome by altering the gut P_H .Change in one point of gut p_H from 6.5 to 5.5 will lead to change in the composition and population of microbiota. **[21, 22]** This P_H alteration changes the population of acid specific species and promotes butyrate production; known as butyrogenic effect. **[21]**

3.1.1)Probiotics :

Probiotics act by colonizing in the gut mucosa variably based on baseline microflora, probiotic strain and GIT region. **[22]** These show health benefits by non-specific, species specific and strain specific mechanisms. **[23]** Non-specific mechanisms include growth inhibition of pathogenic microorganisms in the GIT, production of bioactive metabolites like short chain fatty acids, reduction of p_H in the colon. Species specific mechanisms include synthesis of vitamins, strengthening gut barrier, metabolism of bile salts. Strain specific mechanisms include cytokine production, immunomodulation. **[13]** Probioticsimpact both enteric and central nervous system thereby relieving symptoms of abdominal pain by activation of opioid and endocannabinoid receptors. **[26]** probiotics also reduce the duration of rotavirus diarrhea by competitive inhibition of receptor site to which rotavirus has to bind there by prevents the adhesion and invasion of bacteria. **[37]** probiotics will decrease the levels of beta glucuronidase and carcinogens there by prevents cancer formation. **[39]**

4) ADVERSE EFFECTS AND CONTRAINDICATIONS OF PRE AND PROBIOTICS :

4.1) Adverse effects : [24]

- Mainly gastrointestinal symptoms like nausea, abdominal pain,flatulence, bloating unpleasant taste, constipation or diarrhea.
- Other symptoms include coryza like symptoms, arthralgia, fatigue, stress and depression.

4.1.1) Contraindications :

- Patients with short gut syndrome, immunocompromised patients, elderly patients may have severe side effects hence avoided. **[27]**
- When patients undergoing central catheter insertion. **[28]**

4.1.1.1)Harmful consequences of using pre and probiotics as self medication:

In some individuals pre and probiotics due to their immunomodulatory effects show antagonistic effects to Lactobacillus and Bifidobacterium strains.

[29,30,31,32]

5) DOSES AND DOSAGE FORMS OF PRE AND PROBIOTICS :

5.1) Dosage forms :

Probiotic bacteria should remain alive while processing, storage and delivery. Various enteric dosage forms of probiotics like liquids, powders, tablets, capsules are available. **[41, 42,,43,44,45]** Also special dosage forms like vaginal suppositories and eye drops are also used. **[46, 47,48]**

5.1.1) DOSES :

Measuring parameters of probiotics are Colony Forming Units(CFU). Most of the probiotics contain 1 to 10 billion Colony Forming Units (CFU) per dose. **[13]**

6) PRE AND PROBIOTIC FORMULATIONS AVAILABLE IN INDIAN MARKET :

Comment [BB5]: I would suggest the author concentrate more on applications of pre and probiotics in combating common ailments suffered by the targeted readers. (This can be segregated disease wise)

6.1) Probiotics :

Indian foods naturally contain probiotics in it. Mainly in dairy products like yogurt, curd, kefir, lassi, icecream, buttermilk and cheese. **[49]** Innon dairy food products like coffee, tea, coconut milk. Traditional fermented foods of India like idli, dosa, ambali, kalappam in South India and dhokla, kanji and khadi in North India are rich in probiotics. **[50]**

Lactic acid bacteria and Bifidobacteria strains are the main microorganisms found in fermented foods. **[51]** A study conducted in newdelhi in 2014 reveals that a total of 25 probiotic products were available in different chemist shops and none of the chemist shop contain all 25 products, 10% of shops have 75% of products and 5% shops doesn't contain any of the probiotic products. **[52]**

6.1.1) Prebiotics :

Natural sources of Prebiotics in India are milk, cereals like wheat,barley,wild black rice,pulses such as green gram, black gram, chickpeas,vegetables like cabbage, banana, plantain,gourd,tomato,sweetpotato,chicory root.**[54]**At present inulin, galacto-oligosaccharides(GOS), gructo-oligosaccharides(FOS) , xylo-oligosaccharides(XOS) are the main Prebiotics used in processed probiotic foods. **[53]** An online survey on probiotics showed that Prebiotic supplements are available in dosage forms like powders, chewing tablets. **[50]** Lately seaweed, microalgae have also been identified as potential sources of Prebiotics. **[55]** Recently a pan-India survey revealed that knowledge on Prebiotics was less in Indian adults when compared to knowledge on probiotics. **[53]**

7) LATEST ADVANCES IN PRE AND PROBIOTICS :

Comment [BB6]: Latest advances must elaborate on the ongoing research findings in the field citing works at both national and international levels.
A separate heading should be created to address the use of traditional foods and beverages rich in probiotics.

Nowadays nanotechnology has become the field of attention. Due to the nature of materials in atomic and molecular level , nanotechnology became novel and innovative. **[56]** This is because nanoparticles have some exceptional properties like small size, remarkable reactivity, high surface area and ability to cross biological barriers, so that nanoparticles can reach specific organs or cells. **[57]** Among all nanotechnologies encapsulation techniques are most widely used. **[56]** By using this encapsulation technique micro capsules of probiotics. Micro capsules are very small capsules containing medicine which is released when the capsule is broken, melted or dissolved. **[58]** This encapsulation will help the probiotic bacteria to remain viable on freezing and drying. **[59]**

8) CONCLUSION :

Comment [BB7]: Conclusion is to brief and lacks adequate information.

Prebiotics are the undigested fiber content of food which on fermentation feeds the gut friendly bacteria of the host and probiotics are live microorganisms which when given in certain amounts provides health benefits to the host. Indians consume a lot of pre and probiotics through their diet but even though awareness of their health benefits is still less. Chemists, nutritionists and physicians need to educate the people about their health benefits. Especially in India very less formulations of pre and probiotics available and some chemist shops don't contain probiotics at all.

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