Enhancing human gut health with probiotics and prebiotics in ageing population

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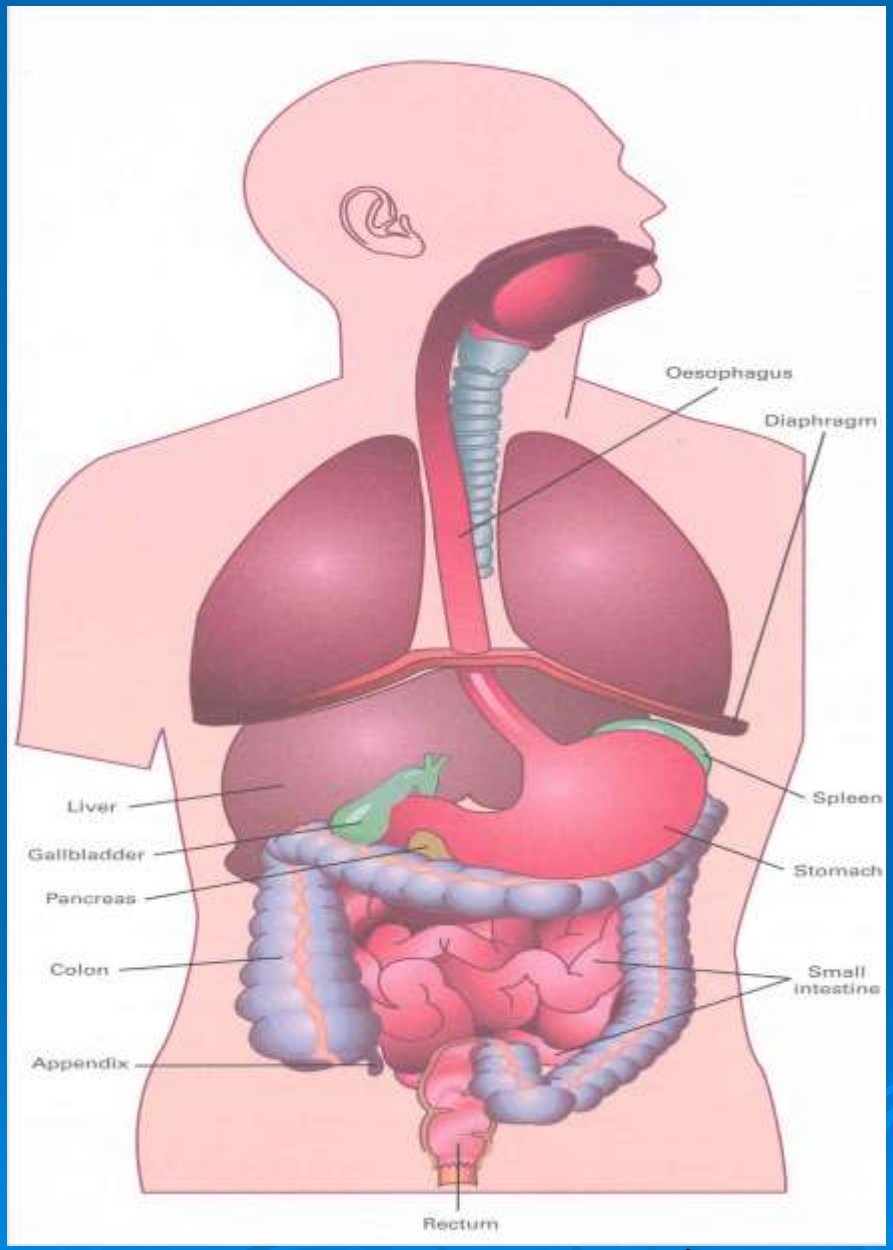
On today's menu…

- Human GIT as an important organ and effects of ageing
- Bad vs good bacteria
- What are probiotics and prebiotics?
- What is a functional food?
- Do we need to consume probiotics and prebiotics?
- Health benefits of probiotics and prebiotics
- Examples of products containing probiotics and prebiotics


Oesophagus
Diaphragm
Liver
Gallbladder
Pancreas
Spleen
Stomach
Colon
Small intestine
Appendix
Rectum

Human GIT

- Diverse range of microbiota (>500 bacterial spp.) Area equals a football field
- Bacteria in oral cavity, small and large intestine and colon
- Variation of bacterial numbers in parts of GIT (acid, alkaline, neutral pH, and oxygen, gut emptying rate, intestinal transit time, mucosal surface for attachment)
- Greater population in the colon
- Individuals vary in the microbiota composition

Human GIT

- 1-1&1/2 kg of bacteria, number and type depends: diet, age, antibiotic use, immunity, peristalsis, may influence obesity
- Diet affect emptying rate & transit times
- Different pH, oxygen and bacterial profiles
- Proximal (ascending colon): more bacterial growth; distal (descending colon): accumulation of waste, less growth
- Proximal colon: heavily populated and important in gut health

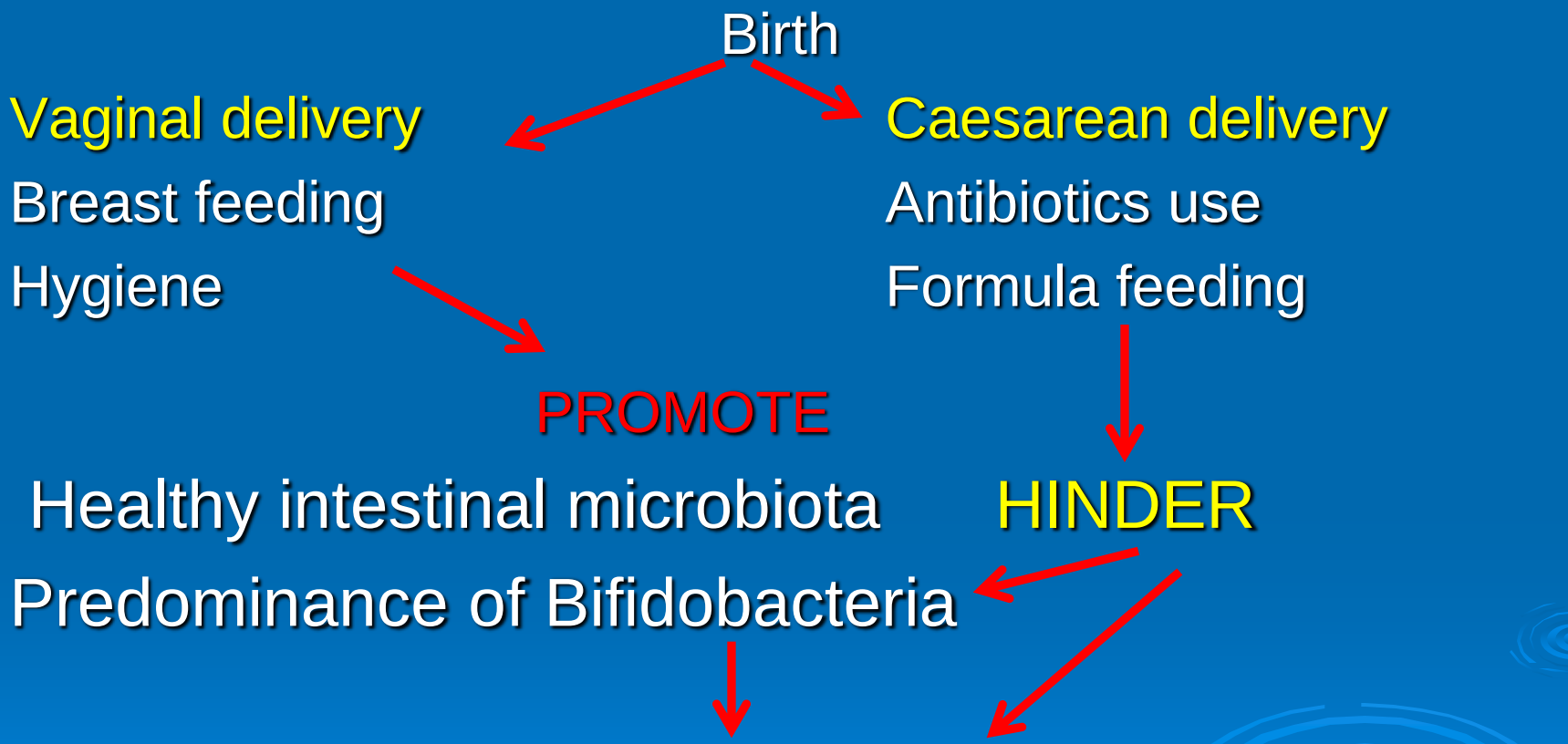
Human GIT

- Small intestine: immune apparatus
- Proximal colon: rapid fermentation, toxins
- Aged population: bacterial population changes, greater numbers of putrefying and pathogens
- Absence of a carbon source (eg, fibre): colonic bacteria utilise gut epithelial tissue (proteins) and may liberate cancer agents
- Delivery: vaginal versus caesarian

Human GIT

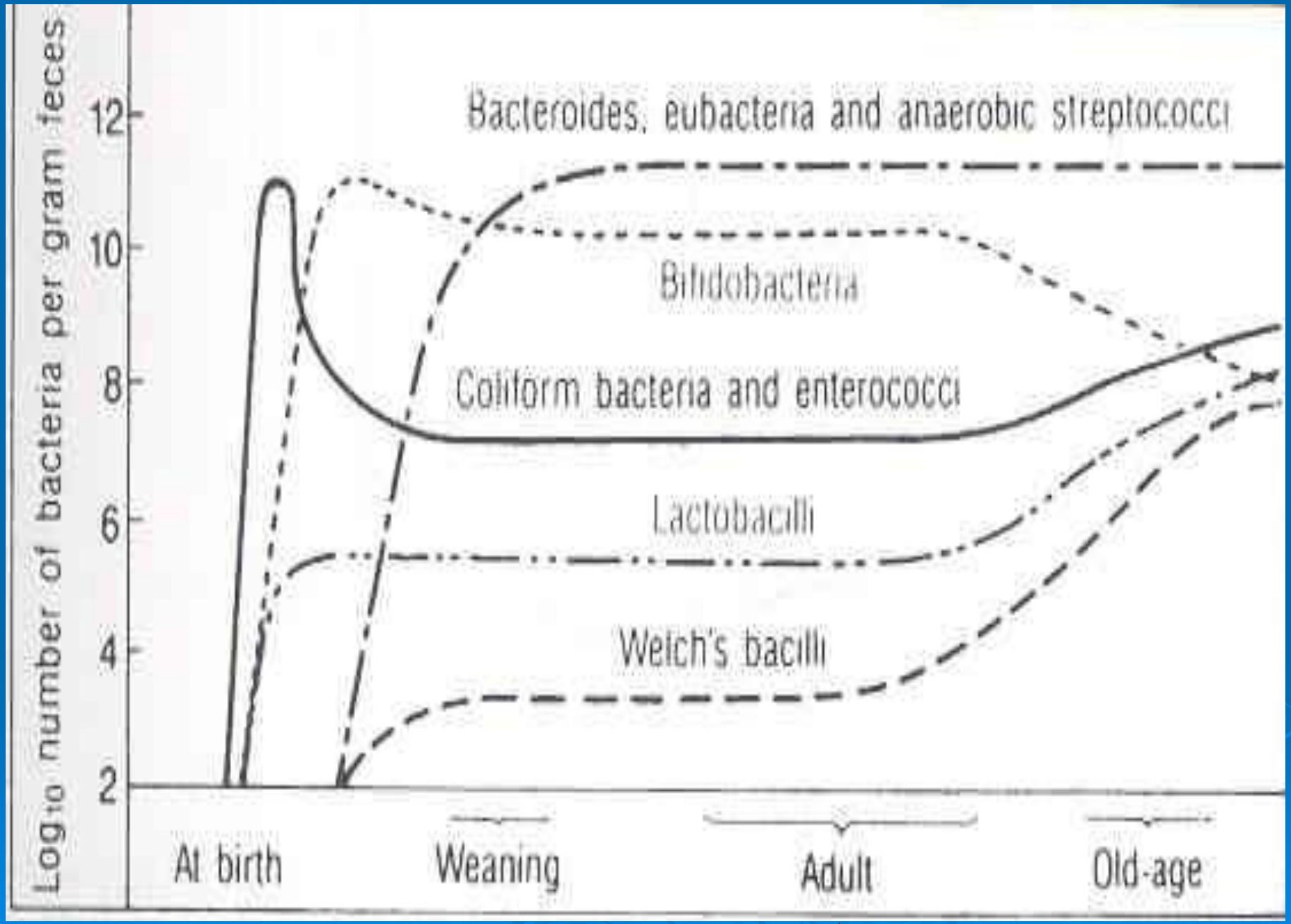
- Second brain: effect on whole body Eg. immunity, weight loss, mood swings etc.
- >100 million nerve cells (GIT lining) communicate to brain
- 70-80% of immune tissue, 90% seratonin
- Need balance of good bacteria to be healthy
- Bloating, diarrhoea, gas, anxiety, depression, mood swings, skin problems, food intolerance, allergies, frequent infection, chronic fatigue: your GIT needs maintenance

Promote or hinder acquisition of healthy microbiota in infants



Aged population

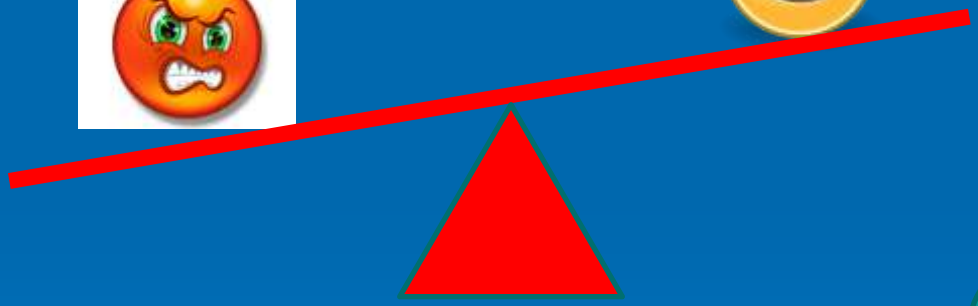
- Change in bacterial composition (more pathogens and putrefying bacteria)
- Reduced secretion of acid, enzymes, less digestion and absorption and reduced intestinal movement, less gastric emptying and intestinal transit time
- Less mucous (colon), easy attachment to intestinal surface by pathogens
- Under/malnutrition, constipation
- Reduced capacity to resist infection (immunocompromised)


Log10 number of bacteria per gram feces
12
10
8
6
4
2
Bacteroides, eubacteria and anaerobic streptococci
Bifidobacteria
Coliform bacteria and enterococci
Lactobacilli
Welch's bacilli
At birth
Weaning
Adult
Old-age

Factors upsetting balance of intestinal flora

Bacterial Infection Food poisoning

Unbalanced diet Overeating Excessive alcohol



Antibiotics

Ageing

Stress, overwork

PROBIOTICS

"Live micro-organisms which when administered in adequate amounts confer a health benefit on the host"

Grass and weedicide – Comparison

(WHO &FAO, 2001)

Pioneers: Eg. Prof Eli Metchnikof (1907) , Dr Minoru Shirota (1930)

Diarrhoea in children living in slums of Kolkatta, India









Shirota strain probiotics

Lactobacillus casei


SELECTION CRITERIA FOR PROBIOTICS

- Non-pathogenic, non-allergenic, non-toxic
- Survival, competitiveness, physiologically active
- Exert beneficial effect on host
- Adhere to intestinal mucosa
- Prevent adhesion of pathogens
- Positive effects on immune functions
- Technologically stable and applicable
- Remain viable during storage and use

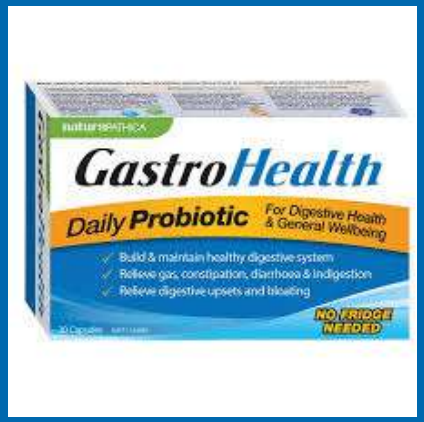
PROBIOTIC MICRO ORGANISMS

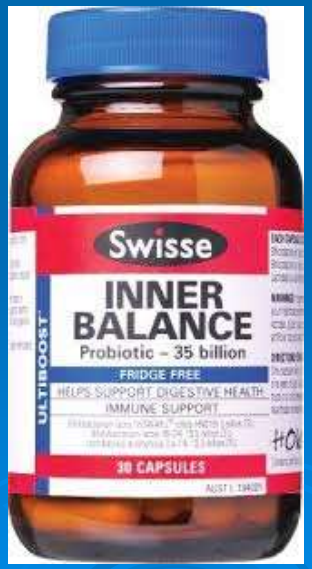
L. Johnsonii NCC 533 (La1)	: Nestle (Switzerland)
L. acidophilus NCFM	: Rhodia (USA)
L. acidophilus SBT-2062	: Snow Brand (Japan)
B. longum SBT-2928	: Snow Brand (Japan)
L. rhamnosus GG	: Valio Dairy (Finland)
L. paracasei CRL 431	: Chr. Hansen (Denmark)
L.casei DN 0001	: Danone (France)
L. plantarum 299V	: Probi AB (Sweden)
L. salivarius ucc 118	: Univ. College (Ireland)

Popular Probiotics

- ***Lactobacillus acidophilus,***
- ***L. rhamnosus,***
- ***L. casei***
- ***Bifidobacterium* spp.**

Probiotic capsules





PROBIOTICS MARKET SIGNIFICANT DRIVERS OF GROWTH

- Increased consumer health awareness
- Increased popularity of yoghurt as healthy food

Antibiotic resistance, super bugs

- Ageing population demographic
- Stress induced life style diseases create search for food-based drug substitutes
- Self-medication approach due to busy life style

Functional foods

"LET FOOD BE YOUR MEDICINE"

Hippocrates (460-377 BC)

Approx. 2500 years ago

For thousands of years fermented foods consumed

HEALTH EFFECTS

- **GI tract disorders-** control infections, IBS, IBD (ulcerative colitis, crohn's disease), prevent bacterial/viral diarrhoea (rotavirus), lactose intolerance, suppress pathogens (antibiotic-associated diarrhoea, travellers diarrhoea), normalisation of stool transport, treat peptic ulcers, faecal transplant

Health effects…

- Effects on extra GI tract disorders- alleviate food allergy (infants), reduce urogenital infections (bacterial vaginosis), prevent dental caries & provide oral health, reduce upper respiratory tract & related infections
- Immunomodulation- Enhance innate immunity, prevent immunosenesence
- Metabolic effects-lower toxigenic/mutagenic reactions, deconjugation of bile salts, lower cholesterol, reduce risk factor for colon cancer (supply short chain fatty acids), balance glucose metabolism

Health effects….

- **Other effects-** weight regulation, HIV immune function, hypertension, arthritis, postmenopausal disorders, anticarcinogenic and antitumor activity, reduction in bladder cancer, colon cancer, breast cancer, neurology and psychiatry

What are prebiotics?

- Non-digestible food ingredients (not bacteria) that can increase the activity of select “good” bacteria
- Should not be digested and absorbed in the small and large intestine
- Only be utilised by resident bacteria and probiotics
- Natural component: banana, asparagus, leeks, onions, garlic, chicory, and whole grains (wheat, rye, barley and oats)
- Resistant starches and dietary fibres

Food sources of prebiotics (examples)

Health benefits of prebiotics

- Prebiotics are fermented in the colon, provide nutrients (reduce mal/under nutrition in elderly), and release physiologically active substances (anticancer causing agents, immune enhancing agents)
- Have laxative effects (beneficial to avoid constipation in elderly)

Prebiotic supplements

Prebiotics vs Probiotics

Prebiotics	Probiotics
Prebiotics are defined as nonliving non-digestible special form of fiber or carbohydrates.	Probiotics are referred to as live active microorganisms that when administered in adequate amount will have beneficial effects to its host.
The powder form of prebiotics can survive heat, cold, acid.	• more fragile. • vulnerable to heat. • may be killed over time.
Prebiotics perform their role by nourishing the bacteria that live in the intestines.	Probiotics fight the harmful bacterial species present in the gut.

Synbiotics

Diet (synbiotics)

- Probiotic food/capsules
- Prebiotic foods(resistant)

Healthy gut

Diet (no synbiotics)

- Highly digestible foods
- No probiotic foods

- Unhealthy gut

"A Yogurt a day may keep your doctor away"

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THANK YOU

Questions?