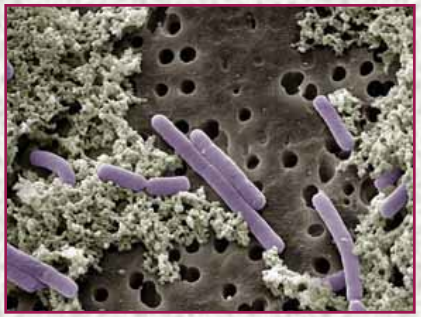


PREBIOTICS & PROBIOTICS

NEERJA HAJELA, PhD
Head Science
Yakult Danone India Pvt. Ltd.

What we already know ……

Functional Foods

- foods that provide a health benefit beyond the traditional nutrients it contains…..

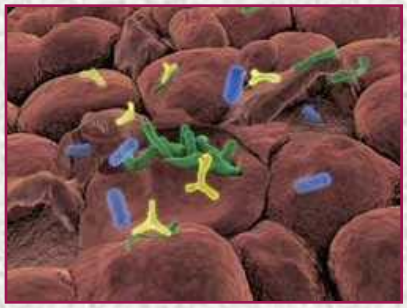
American Dietetics Association, 1995

- specific minerals, vitamins, fatty acids, dietary fiber or bioactive substances such as phytochemicals, antioxidants, probiotics and prebiotics etc.

The GI tract with its vast surface area is not just one of the largest organs in the body – it is also a major immune organ. This complex defense system can be separated into three areas: the intestinal micro biota, the mucosal barrier and the gut-associated lymphoid tissue.

Microbiology turns inwards

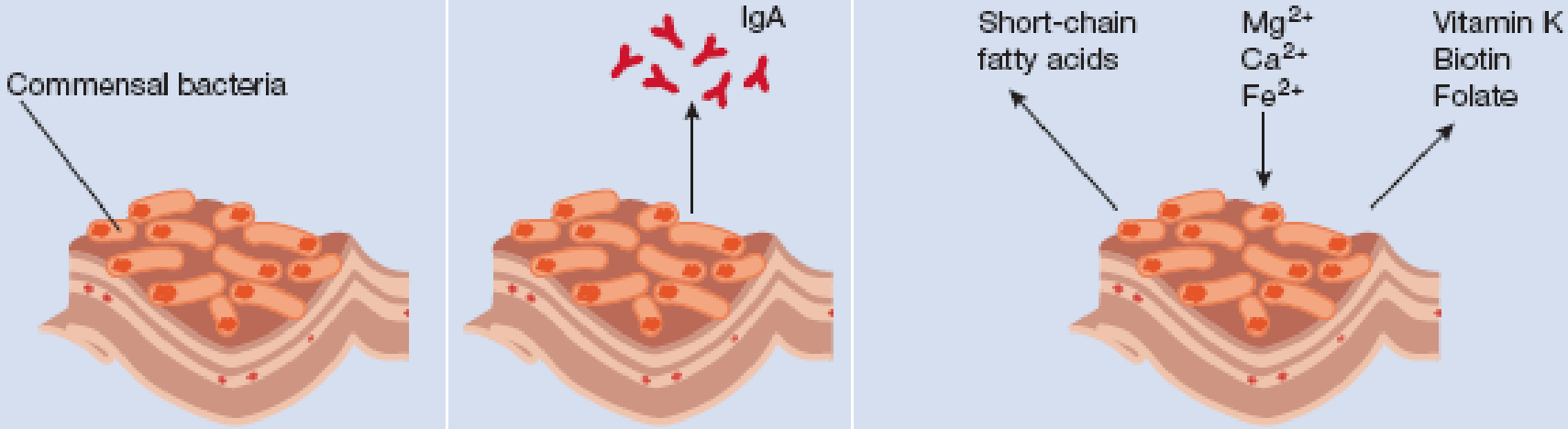
Human Genome project and Meta Hit project reveals that the gut micro flora has more than 1000 species and 100 trillion organisms….



Metabolic activity of the gut flora is like a virtual organ within an organ……

The Gut Micro biota and its influence on health

Protective functions	Structural functions	Metabolic functions	
Pathogen displacement	Barrier fortification	Control IEC differentiation and proliferation	Ferment non-digestible dietary residue and endo-genous epithelial-derived mucus
Nutrient competition	Induction of IgA	Metabolize dietary carcinogens	Ion absorption
Receptor competition	Apical tightening of tight junctions	Synthesize vitamins e.g., biotin, folate	Salvage of energy
Production of anti-microbial factors e.g., bacteriocins, lactic acids	Immune system development		



O'Hara A.M. *et al.* EMBO reports 2006; 7: 688-693.

Dietary means for the Restoration of the gut micro flora

Probiotics

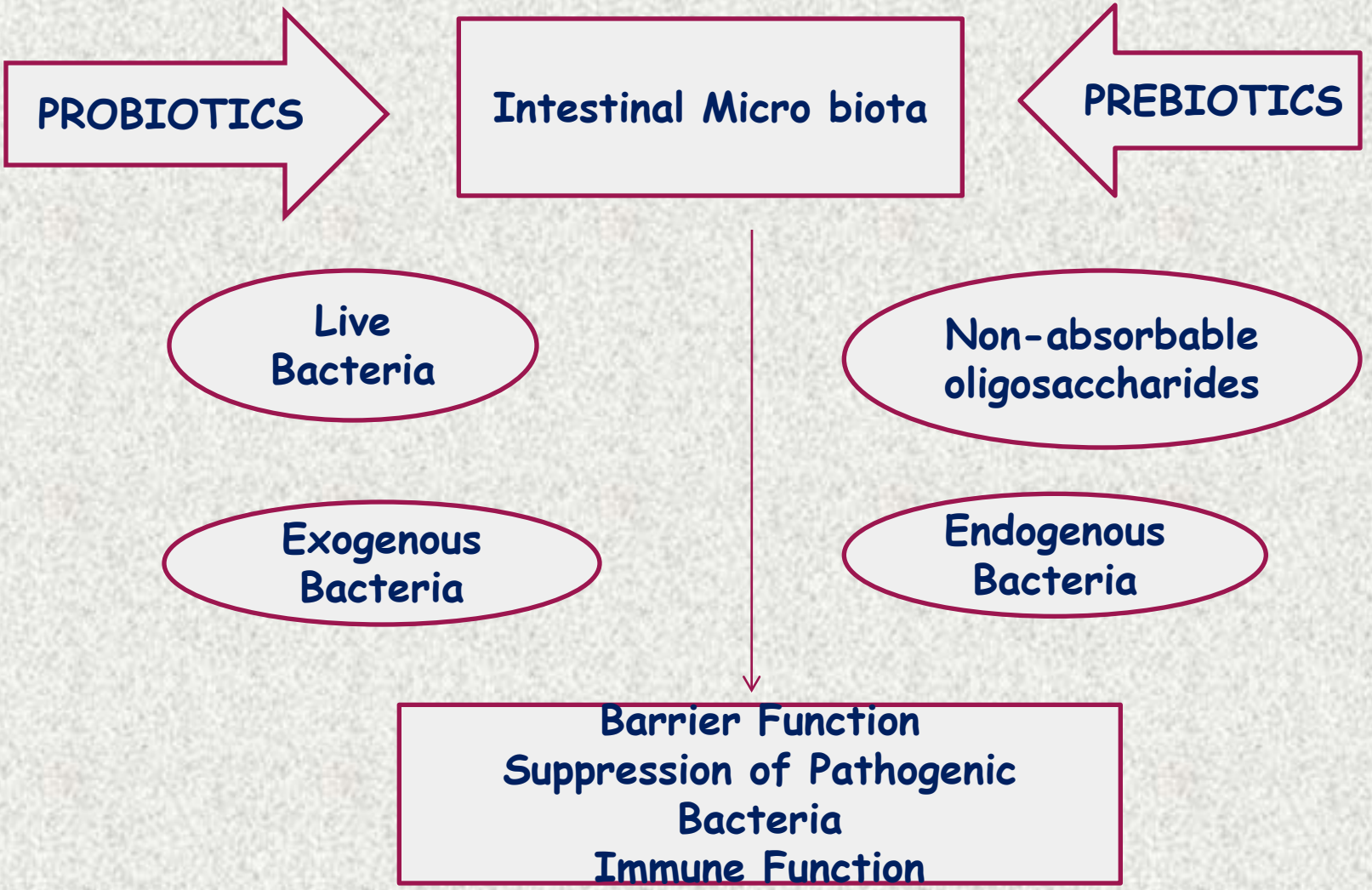
" *Probiotics are live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host.*"
(FAO/WHO 2002)

Prebiotics

Prebiotics are non-digestible food ingredients that have a beneficial effect through their selective metabolism in the intestinal tract." G.R. Gibson et al. (2004)

Synbiotics: *Combination of Prebiotics and Probiotics*

Prebiotic & Probiotic Concept



Characteristics of a Prebiotic

- Resistant to gastric acidity and hydrolysis by mammalian enzymes and GI absorption
- Can be fermented by intestinal micro flora
- Selectively stimulates the growth and /or activity of intestinal bacteria associated with health and well being

A prebiotic is a fiber found in some plants that reaches the colon undigested.

Prebiotics

- Lactulose
- Inulin type fructans
- Trans Galacto oligosaccharides

OTHER PREBIOTICS

- Poly dextrose
- Soy bean Oligosaccharides
- Lacto Sucrose
- Iso maltooligosaccharides
- Glucans
- Xylo oligosaccharides

MISCELLANOUS

- Pectic Oilgo saccharides
- Manno oligosaccharides

Prebiotic – Mechanism of action

- Changes in composition and functionality of the micro biota
- Selective stimulation of beneficial bacteria
- Facilitating competitive exclusion of pathogens
- Immunomodulation and enhancing host defense

Evidence for the efficacy of Prebiotics

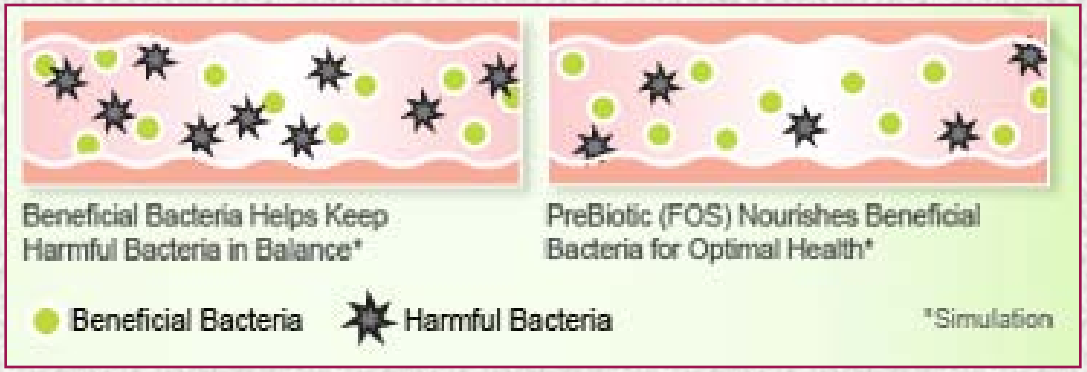
- In-vitro Studies
- Animal Studies
- Observational Human Studies

  Experimental Human Studies

  * *Randomized Controlled Studies*
  * *Other types of trials*

Clinical Application of Prebiotics

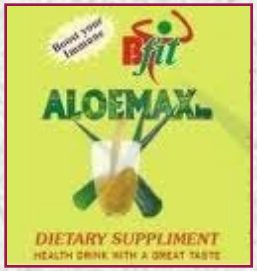
- Inflammatory Bowel Disease
- Antibiotic Associated Diarrhoea
- Traveller's diarrhoea
- Calcium absorption and bone health
- Colon cancer



Prebiotic Products

Ecomos (Prebiotic poultry food supplement – Polchem Hygiene Labs.)

Naturon FOS (Sugar free prebiotic syrup – FOS – Agron India Pvt. Ltd.)

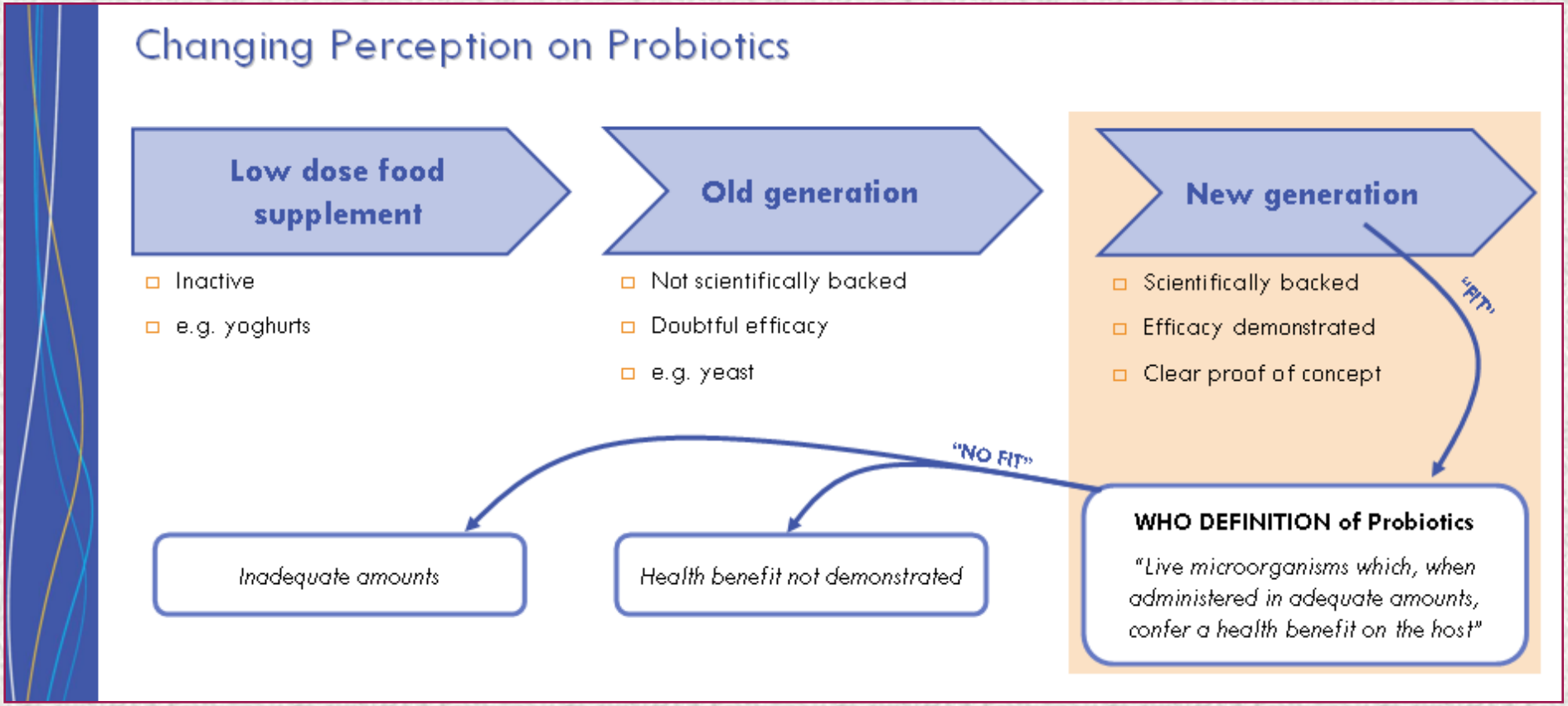


ALOE MAXim – Aloevera Juice (Aloe Juice, Fenugreek Fiber, Prebiotic Oligosaccharides, Vit- C – Prist Herbochem)

Stimup Flora (Probiotic and Prebiotic capsule – Naticon Research Labs)

FOS (Superior quality Fructo Oligo Sacharide: FOS – high fibre – Arun & Co.)

Changing Perception on Probiotics

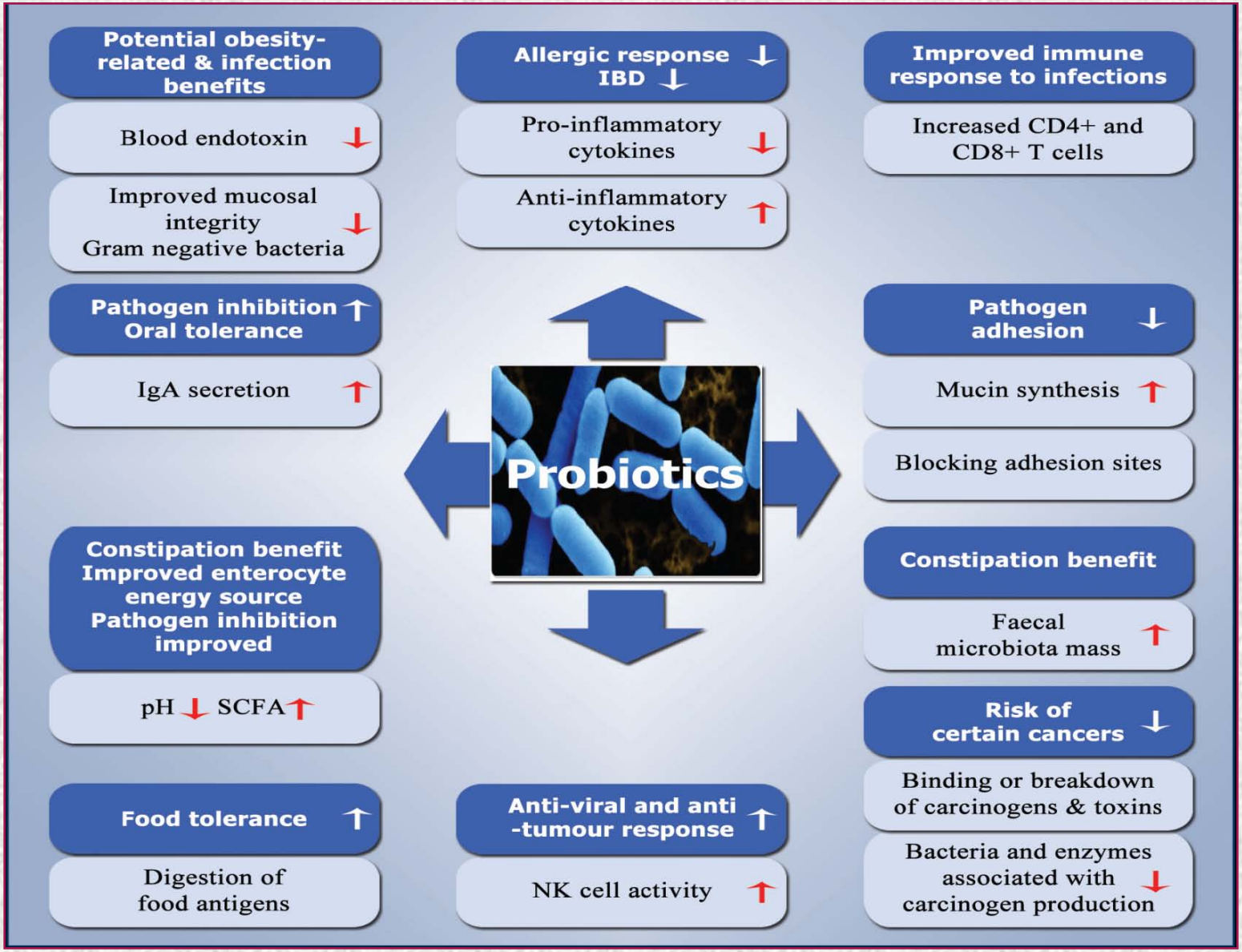


What makes a probiotic???

- non pathogenic and non toxic
- contains a large number of viable cells
- exerts a beneficial effect when consumed
- has the capacity to metabolize and survive in the gut
- retains its viability during storage and use

Genus	Species
Gram-positive bacteria	
Bacillus	*coagulans, subtilis*
Bifidobacterium	*adolescentis, animalis, bifidum, breve, infantis, lactis, longum, thermophilum*
Enterococcus	*faecium*
Lactobacillus	*acidophilus, brevis, casei, delbrueckii, fermentum, helveticus, johnsonii, lactis, paracasei, plantarum, reuteri, rhamnosus, salivarius*
Lactococcus	*lactis*
Propionibacterium	*freudenreichii*
Streptococcus	*thermophilus*
Gram-negative bacteria	
Escherichia	*coli*
Yeasts	
Saccharomyces	*cerevisiae var. boulardii*

Probiotic -Mechanism of action



Clinical Applications of Probiotics

- Gastrointestinal disorders
  - Diarrhoea
  - Constipation
  - Irritable Bowel Syndrome
  - Inflammatory Bowel Disorder
- Prevention of allergic disorders
- Prevention of cancers
- Reduction of respiratory diseases
- Immune stimulation
- Vaginal diseases
- Possible role in Obesity and autism????

Evidence for various indications

Indication	Study Design	Conclusion	Reference
Acute Infectious Diarrhoea	63 RCT and quasi RCT with total of 8014 participants	Duration of diarrhoea was reduced by 25 hours. Risk of diarrhoea lasting 4 days or more by 59%. Probiotics appear to be safe and show beneficial effects in shortening the duration and reducing stool frequency.	Allen SJ *et al* 2010.
Constipation	Systematic review of 5 RCT's (n=377) to evaluate the safety and efficacy of various probiotic strains in adults	*Bifidobacterium lactis* DN-173 010, *Lactobacillus casei* Shirota and *Escherichia coli* Nissle 1917 are effective on defecation frequency and stool consistency in adults. In children, *Lactobacillus casei rhamnosus* Lcr 35 showed a beneficial effect.	Chimielewska *et al.* 2003
Irritable Bowel Symptoms (IBS)	19 RCT's in 1650 patients were conducted	Significant effect in reducing IBS symptoms is shown by probiotic treatment. There was no difference between the different types of probiotics that were used, with Lactobacillus (three trials, 140 patients),Bifidobacterium (two trials, 422 patients), Streptococcus (one trial,54 patients) all showing a trend towards benefit.	Moayyedi P. *et al*. 2010

Evidence for various indications

Indication	Study Design	Conclusion	Reference
Inflammatory Bowel Disorders (IBD)	Meta-analysis of 13 RCT - seven studies - remission rate and eight studies - recurrence rate, two studies - both remission and recurrence rate	Probiotic treatment was more effective than placebo in maintaining remission in ulcerative colitis.	Sang L. *et al* 2010.
Allergic Disorders	Meta-analysis of 12 studies on therapeutic effect of probiotics of which 4 studies were conducted on children	Nine of the 12 articles showed benefits from the use of probiotics in allergic rhinitis showing a reduction in symptom severity, recurrence of episodes and use of medication for rhinitis but not for asthma.	Vliagoftis *et al.* 2008

Randomized controlled field trial at National Institute of Cholera and Enteric Diseases (NICED) Kolkata – Role of *Lactobacilus casei* strain Shirota in preventing diarrhoea

- Double blind RCT involving 3758 children between 1 and 5 years was conducted in an urban slum community in Kolkata
- Probiotic group -1802 children, Nutrient group -1,783 children
- Intake period – 12 weeks, Follow up – 12 weeks
- Incidence of diarrhea in the probiotic group (0.88/child /year) was significantly lower in the probiotic group than in the placebo group(1.029/child/year).
- Protective efficacy -14% (95% CI, 4-23%, p<0.01)

Epidemiol. Infect., Page 1 of 8. © Cambridge University Press 2010
doi:10.1017/S0950268810001780

Role of probiotic in preventing acute diarrhoea in children: a community-based, randomized, double-blind placebo-controlled field trial in an urban slum

D. SUR[1]*, B. MANNA[1], S. K. NIYOGI[1], T. RAMAMURTHY[1], A. PALIT[1], K. NOMOTO[2], T. TAKAHASHI[2], T. SHIMA[2], H. TSUJI[2], T. KURAKAWA[2], Y. TAKEDA[3], G. B. NAIR[1] AND S. K. BHATTACHARYA[4]

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[4] *Indian Council of Medical Research, New Delhi, India*

(*Accepted 29 June 2010*)

Gaps and Recommendations

- The safety and clinical effects of one strain cannot be extrapolated to another strain
- Need for well designed randomized controlled trials
- Validated clinical outcome measures
- Optimal dose
- Long term safety of pro and prebiotics

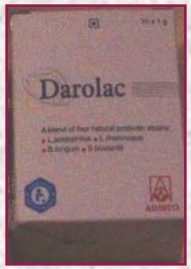
Probiotic Drugs

- ✓Enterogermina
- ✓VSL#3
- ✓Sporlac
- ✓Darolac
- ✓Bifilac
- ✓Econorm

Bacillus subtilis

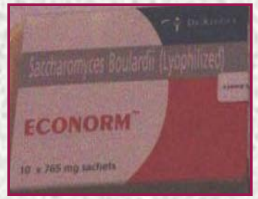
(8 Strains) 450 billion live lactic acid bacteria, 3 strains of Bifidobacteria

B.coagulans



Lactobacillus acidophilus, Lactobacillus rhamnous, Bifidobacterium longum, Saccharomyces boulardii

Streptococcus faecalis, T-11, Clostridium butyricum, Bacillus mesentericus, Lactobacillus sporogenes



Saccharomyces boulardii

Probiotics Food Sources

- ✓ Usually found in fermented dairy products
- Yakult
- Nesvita
- B-Activ
- Nutrifit

Bifidobacterium BB-12

Lactobacillus casei Shirota

Lactobacillus acidophilus

LA5 and BB12

Dairy as delivery vehicles

- Viability
- Refrigeration encourages probiotic survival in product
- Low pH of the product
- Deliver functional nutrition
- Good option for incorporating beneficial bacteria
- Compliance - Food vs. Pill

The diet of nomads included milk fermented by lactic acid bacteria. Thousands of years later, at the beginning of the 20th century, the work of Metchnikoff inspired the probiotic concept, now widely accepted in scientific and medical fields.

ICMR – DBT guidelines for Probiotic foods in India

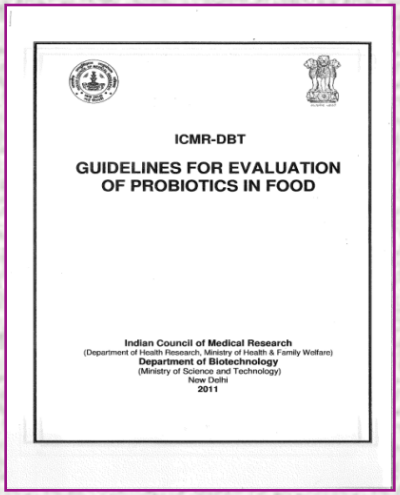
Label –

Genus, species, strain designation

Minimum viable number of the probiotic strain to be specified at the level at which efficacy is claimed and at the end of shelf life

Evidence Based Health claims

Proper storage conditions


ICMR-DBT

GUIDELINES FOR EVALUATION OF PROBIOTICS IN FOOD

Indian Council of Medical Research
(Department of Health Research, Ministry of Health & Family Welfare)
Department of Biotechnology
(Ministry of Science and Technology)
New Delhi
2011

Regulations governing production and distribution of functional foods

Japan –FOSHU

- "Foods for Specified Health Uses" (FOSHU) is a regulatory system to approve the claims made on food labels in 1991
- Safety and efficacy has been scientifically validated
- FOS, Soy bean oligosaccharides, soy protein, probiotic bacteria such *Lactobacillus casei* strain Shirota, *Bifidobacteria breve*.

Percentage of FOSHU per Type of Food

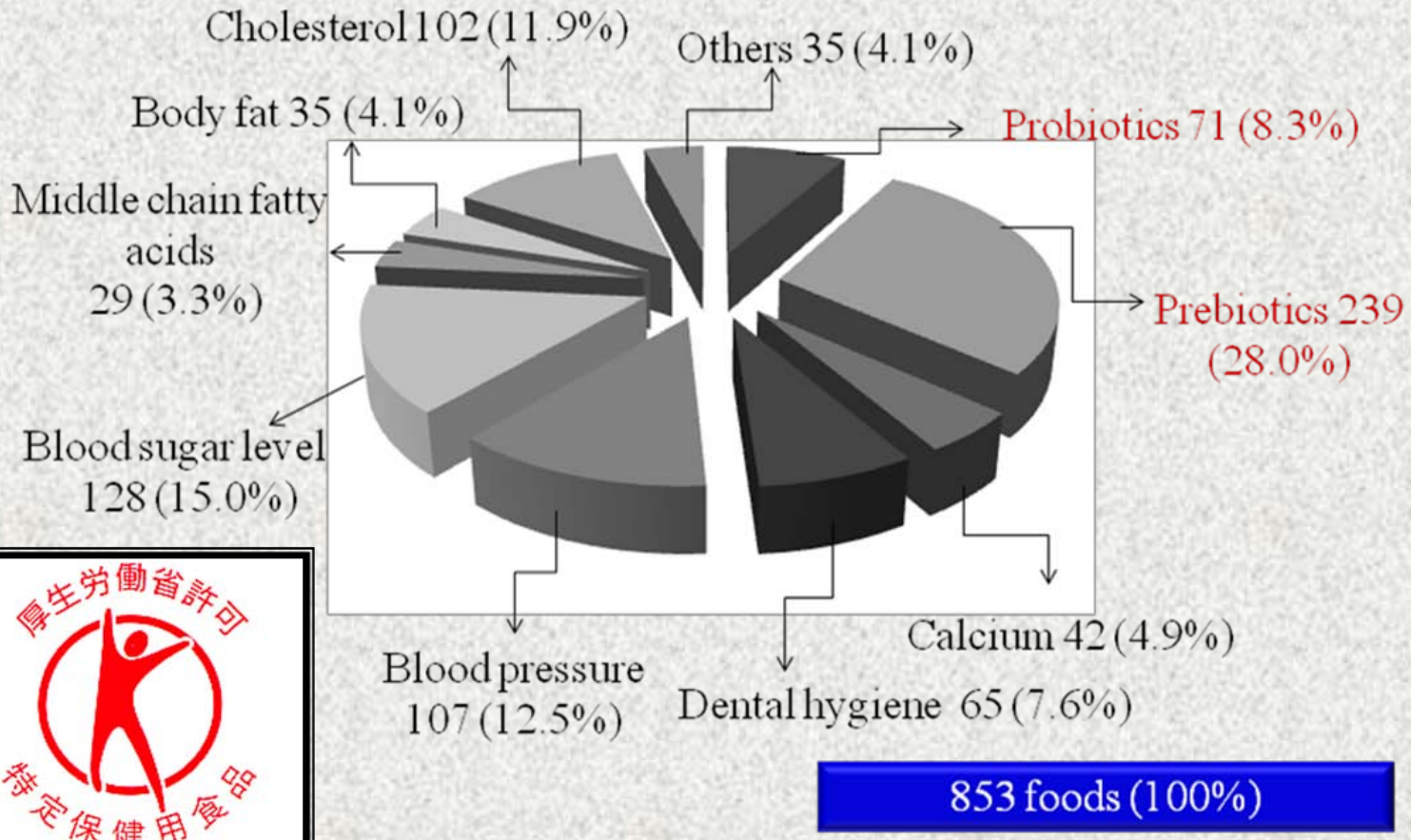


Fig. 3 Number of functional foods recognized as FOSHU in Japan as of 2 June, 2009


厚生労働省許可
特定保健用食品
厚生労働省許可
特定保健用食品《トクホ》
Foods for Specified Health Uses (FOSHU)
ブランフレーク
サイリウム
ファイバースー
ビルクル
Go-Sign

The vision for India

- A Fundamental change in perception
- Developing a diet based intervention strategy
- Formulating foods tailored to meet specific health need
- Concept to get ingrained in the public health system without being seen as a medicine

Thank You