RMIT University

Safety of probiotics

Nutrition Society of Australia
30th ASM

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Prestige 500 Probiotic Formula

Meticulously processed by **natural temperature fermentation** for 5 years

Award winning probiotic product formulated by acclaimed microbiologist

12 strains of natural live lactic acid bacteria including **award winning TH10 strain** proven 6.25 times stronger than any other probiotic

Bifidobacterium breve ss.breve	Lactobacillus bulgaricus
Bifidobacterium infantis ss.infantis	Lactobacillus casei ss.casei
Bifidobacterium longum	Lactobacillus fermentum
Enterococcus faecalis TH10	Lactobacillus helveticus ss.jagurti
Lactobacillus brevis	Lactobacillus plantarum
Lactobacillus acidophilus	Streptococcus thermophilus

Guaranteed to re-populate the colon with good microflora essential for healthy immune system and overall good health

Scientific studies conclude PPF is very strong immune enhancer effective against deadly superbugs

Methicillin-resistant **Staphylococcus aureus**
H. pylori - peptic ulcers, morning sickness, migraine, cluster headaches
E. coli O-157 - food poisoning
Bacillus cereus - intestinal anthrax
Other harmful micro-organisms

100 capsules for $119.95

Regular consumption strongly recommended for IBS, leaky gut, peptic ulcers, bloating, heartburn, ulcerative colitis, Crohn's disease, constipation or diarrhoea

Recommended for users of natural products, such as psyllium and other colon cleansers, which strip the colon of good bacteria

Read more Articles and Research at web site


BIO-BUBBLE
MEND
PHARMA FOODS
MICRODOPHILUS PLUS
150g net
BIFOLAC
BIFOLAC
As seen on Today Tonight
KForce Activator
PRE RINSE Bottle B
KForce Clean
Pauls
natural
set yoghurt
acidophilus
GREEK STYLE
Optimal
Yakult
Nestle
99% FAT FREE NATURAL YOGURT
VSL#3
The Living Shield
All-natural live lactic acid bacteria supplement
450 billion yoghurt bacteria per sachet
LATERO-FLORA
vaalia
Low Fat
Luscious Berries
probiotic PLUS
travel pack
FRIDGE FREE FORMULA
Low fat
Frozen Yogurt
Nestlé NAN 1 GOLD
PROBIOTICS
MiVitality

Marketed

- Mainly as dietary supplements
- As single or multiple organisms, ± supplements
- Variety of formulations or media
- As safe, natural & effective remedies for a myriad of symptoms & diseases
- Through pharmacies, health food shops, supermarkets and internet
- Not subjected to rigorous regulatory evaluation

- 2005 U.S. probiotic sales *est.* $764 million
- 2010 expected to be $1.1 billion AAGR 7.1%
  - Yogurts, kefirs & cultured drinks 65.2%

Nov.2006…

- 2,810,000 Google web hits
- 4,447 papers in 5 science databases
  - ☠ 345 relate to probiotic safety ☠

Probiotics in current use

LAB strains generally recognised as safe

- traditional food use
- epidemiology
- clinical studies
- without genetic modification

Bifidobacteria, Enterococci, Streptococci

Probiotics for the future

- Development of new probiotic strains
- Extended range of foods
- Specific therapeutic products
- Potential increased exposure of general population
- **Lack of safety regulations for new probiotic organisms**

Evidence to assess safety

- Intrinsic properties of the organism
- Pharmacokinetic studies
- Host-organism interactions

Properties intrinsic to organism

- Where does it come from?
- What is its identity?
- Is it infectious?
- Is it sensitive or resistant to antibiotics?
- Can it transfer antibiotic resistance?
- Does it modulate immune response?
- What is its profile of metabolic activity?

Assess risks linked to metabolic profile

- Quantify transfer of plasmids
- Extent of bile salt metabolism
- Formation of carcinogenic intermediates
- Effect of high doses on nutrition

Effects of probiotic on gut flora

Determine efficacy by dose-response

Pharmacokinetics

- Can organism survive in GIT?
- Does it colonise GIT?
- Can it cross intestinal barrier?
- Does it modify composition of gut microflora?

Host - organism interactions

- Potential for invasion
- Production of antimicrobial compounds
- Inhibition of pathogen growth
- Antimutagenicity
- Transfer of resistant plasmids
- Host immune interaction

Identify *in vitro* methods to assess virulence

- degradation of intestinal mucus
- adhesion properties
- exclusion of pathogens
- antimicrobial effects

Validate & confirm virulence factors in animal models

- assess infectivity
- modulation of host immunity

- Well designed & controlled clinical studies
  - Unequivocally defined strains of probiotic
  - Healthy human volunteers
  - Specific diseases
- Epidemiological surveillance for infection
  - Characterise clinical isolate
  - Compare with probiotic strains
  - Compare with endogenous strains

Safety concerns

- Infection
- Metabolic activity
- Immune hyperstimulation
- Transfer of drug resistance genes

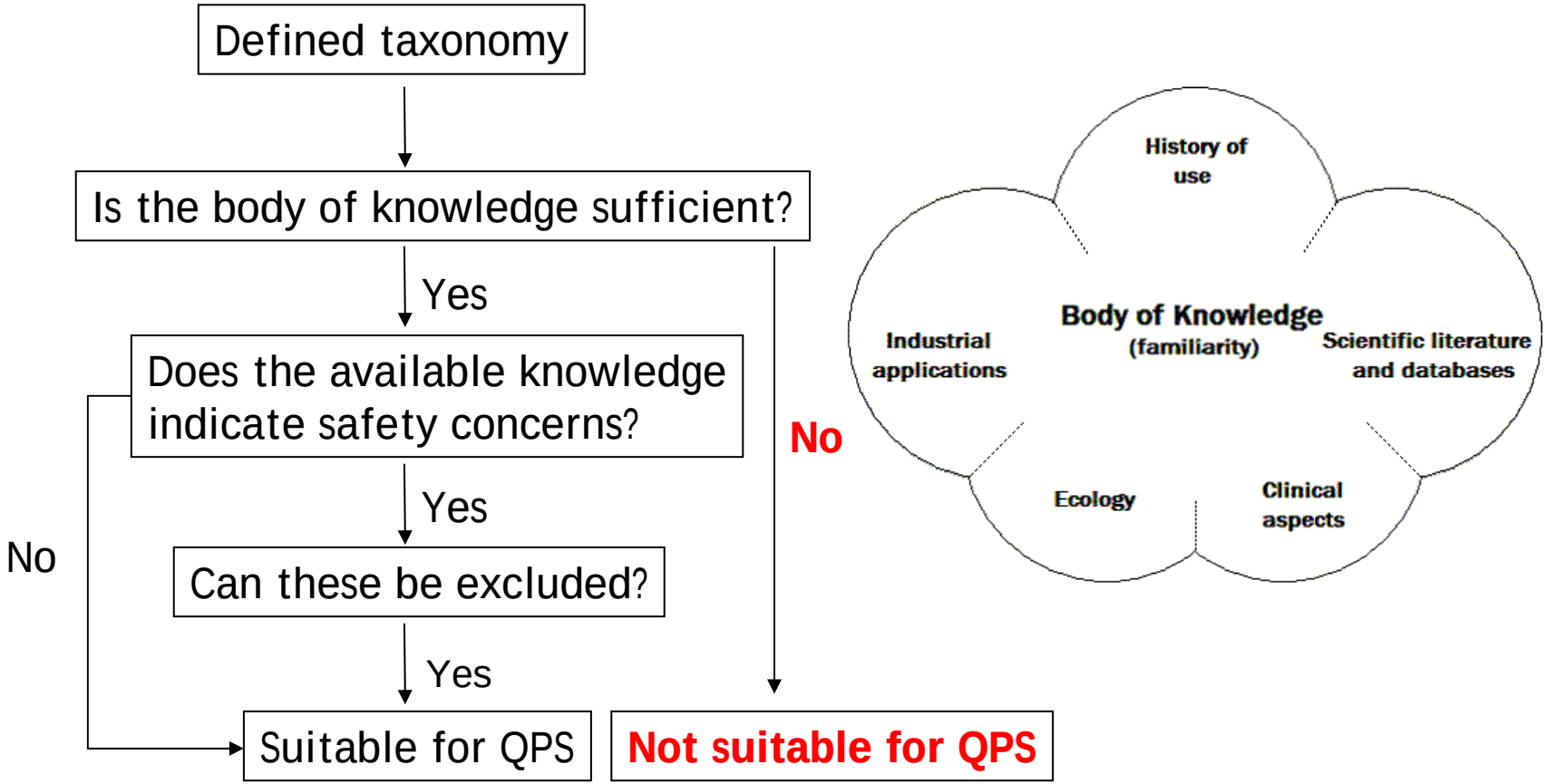
Quality control for the consumer

- Is the label accurate?
- Are listed bacteria what they purport to be?
- Are they alive?
- Can they survive in GIT?
- Is the dose effective or optimal?
- Do clinical studies support health claims?
- How will product be used?
- Who will use it?

No universal probiotic organism

- Characterise identity of organism
- Test individual strains
- Validate *in vitro* results
- Scientifically identify safe & beneficial strains suitable for industrial processes

EFSA scheme to assess QPS status



Adapted from EFSA Scientific Colloquium Summary Report, Brussels, 2004

Challenges for the future

- Faecal samples alone cannot characterise gut microflora
- Influence of dose, duration on immune effect for each strain
- Assessing safety in the immuno-deficient
- Mechanisms of immune modulation

Safety summarised

- Probiotic safety cannot be assumed from that of closely related strains
- Evidence of probiotic safety must be demonstrated by rigorous science
  - *in vitro* models with high predictive value
  - *in vivo* studies
  - gold standard clinical studies
- Peer review, independently confirmed results
- Quality control & accurate product labelling