

PROBIOTIC BACTERIA IN MILK PRODUCTS

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Rezumat

În viitor industria alimentară va trebui să producă noi alimente cu caracteristici profilactice pentru un segment de consumatori care a cunoscut o dinamică impresionantă în ultimii ani. Alimentele funcționale sunt definite ca alimente ce conțin ingrediente specifice ce ajută la buna funcționare a organismului uman. Bacteriile probiotice au devenit o componentă importantă a produselor lactate funcționale, menite să ajute organismul uman să facă față numeroșilor factori de stres la care este supus în condițiile societății actuale. Pe lângă bacteriile probiotice cunoscute, cercetătorii trebuie să investigheze noi microorganisme cu caracter profilactic, cum ar fi drojdiile și mucegaiurile. Această lucrare își propune să definească un set de caracteristici funcționale minime pe care trebuie să le îndeplinească un microorganism pentru a fi încadrat în categoria probioticelor.

Abriss

In der Zukunft die Lebensmittelindustrie muss neue Lebensmittel mit prophylaktischen Eigenschaften produzieren für einen Verbraucherabschnitt der sich in einer ergreifenden Dynamik befindet. Die funktionellen Lebensmittel bedeuten die Lebensmittel die spezifischen Ingredienzien enthalten die ein gutes Wirken des menschlichen Organismus dienen. Die probiotischen Bakterien sind eine wichtige Komponente der funktionellen Milchprodukte die dienen als Hilfe des Organismus in dem Kampf gegen die zahlreichen Stressfaktoren der heutigen Gesellschaft. Neben den bekannten probiotischen Bakterien, die Forscher müssen neue Mikroorganismen mit prophylaktischem Charakter – wie z.B. die Hefen und die Schimmelpilze – studieren. Dieses Werk setzt sich als Ziel ein minimaler Satz von funktionellen Eigenschaften zu bestimmen die ein Mikroorganismus erfüllen muss um als probiotisch eingepasst sein soll.

Résumé

À l'avenir l'industrie alimentaire devra produire des nouveaux aliments avec des caractéristiques prophylactiques pour un segment de consommateurs qui a connu une dynamique impressionnante pendant les dernières années. Les aliments fonctionnels sont définis comme des aliments qui contiennent des devenues un composant important des laitages fonctionnels destinés à aider l'organisme humain résister à nombreux facteurs de tracas auxquels celui-ci est soumis dans les conditions de la société actuelle. En plus de bactéries probiotiques connues, les chercheurs scientifiques doivent faire des investigations sur de nouveaux micro-organismes au caractère prophylactique, tels les levures et les moisissures. Ce travail se propose de définir une série de caractéristiques fonctionnelles minimales qu'un micro-organisme doit accomplir pour être intégré dans la catégorie des probiotiques.

2500 years ago Hippocrates stated "Let food be thy medicine and medicine be by food" Today those words are more actual than ever. Thanks to advances in biology and medicine the scientists have identified a number of diet-related factors contributing to human health and well-being. There is almost no bound between food and medicine. The consumers are more and more about the fact that is much easy and cheaper to prevent than to cure so the first step is to start being more careful with what you are eating. Studies show us that over 50% of consumers to day are now practicing some form of consumers to day are now practicing some form of healthy eating. Many here started with low-fat, low-sodium, sugar free and functional foods.

Functional foods may be defined as foods which contain a nutritional component which affects one or more functions of the body so as to confer positive health benefits to the consumer (Roberfroid, 1998).

In 2001 the global functional foods market was estimated to 47,6 billion \$, up from around 30 billion \$ in 1995. The United States is the largest market segment at 18,25 billion \$, followed by Europe at 15,4 billion \$ and Japan at 11,8 billion \$. In Europe, Germany is the largest

functional food market at 5,59 billion \$, followed by France at 3,37 billion \$ and the United Kingdom at 2,4 billion \$.

The functional foods market is lead by the probiotic milk-based products due to the healthy perception to the consumer. Probiotics are living microorganisms, which upon ingestion in certain numbers expert health benefits beyond inherent basic nutrition.

The human gastrointestinal tract includes a complex microbial ecosystem consisting of over 400 different species of bacteria. The equilibrium of the ecosystem is dynamic and may be negatively altered by aging, diet and other environ metal factors. When the balance is broken certain undesirable bacteria overgrow the intestines and create major problems in their host. Early in the 1900's Eli Metchnikoff was the first scientist to postulate that consumption of fermented dairy products would balance the intestinal microbial flora and would prevent intestinal upset.

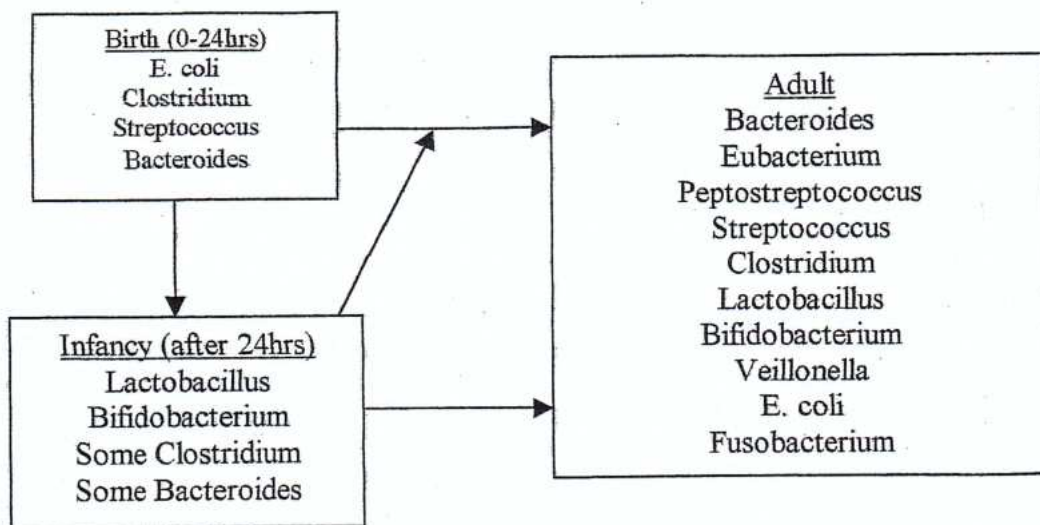


Fig. 1: The four of microbial succession in mammalian gastrointestinal tract

The human fetus is sterile until shortly before birth as long as the amniotic membrane remains intact. As baby travels through the vagina at birth the gastrointestinal tract is seeded with a wide variety of microorganisms originating from both the material microbial flora and the environment. Further by natural selection the best suited organisms will survive in the intestinal tract.

The process of the microbial colonization in the human intestinal tract can be divided into four major phases.

The intestinal microflora of most healthy humans contains species of the *Lactobacillus* genera (*L. acidophilus*, *L. salivarius*, *L. casei*, *L. plantarum*, *L. fermentum* and *L. brevis*) and various *Bifidobacterium* spp. This is the reason why the scientist started their studies with some species of *Lactobacillus* and *Bifidobacterium*. Probiotic microorganisms are widely distributed in

nature. Many of these naturally occurring microorganisms can be isolated from soil and leaves of green plants. They also are quite prevalent in the gastrointestinal tracts of mammals and are often found in colostrum of humans and particularly bovine animals. Because not all microorganisms make good probiotics researchers follow a specific protocol for isolation and characterization.

Unfortunately not all the probiotic products from the market contains probiotic strains extensively characterized and tested in clinical trials. Using probiotic well documented strains is very important for safety considerations and also to build consumer confidence in product labeling.

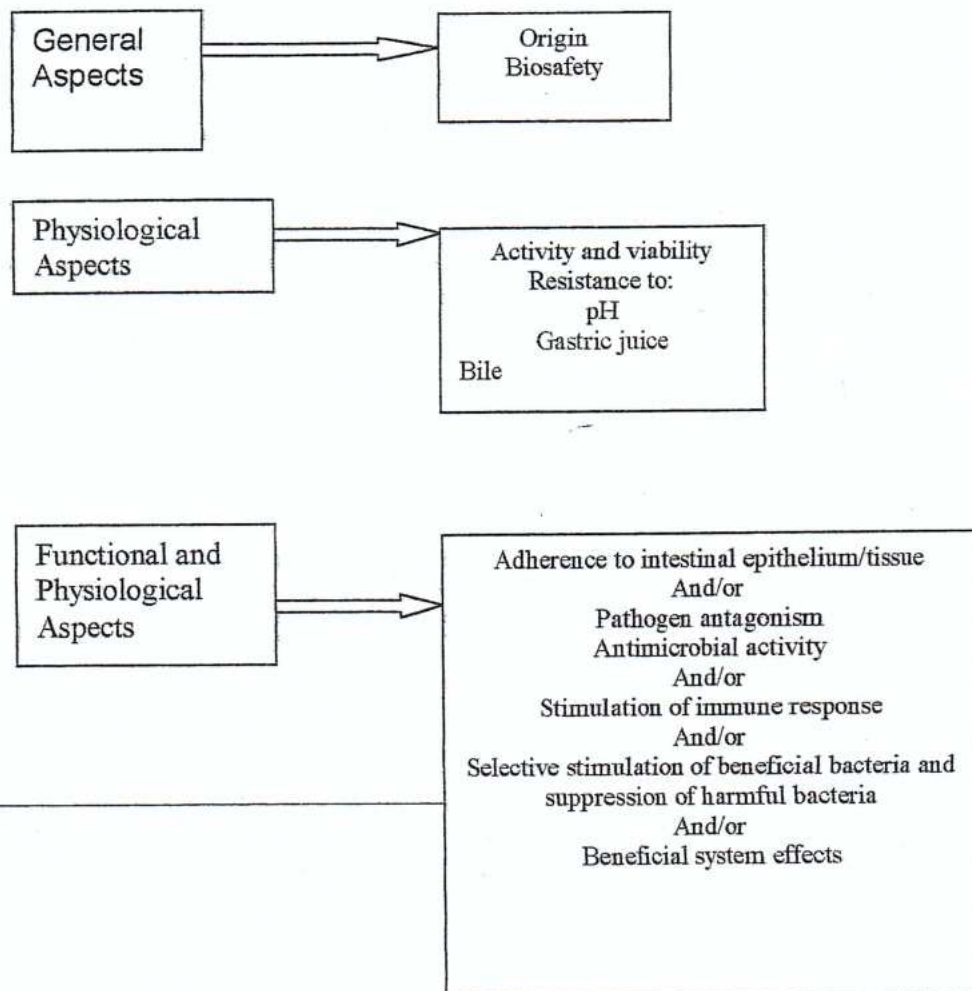


Figure 2: Protocol for isolation of probiotic Strains

Characteristics of controlled clinical studies

- defined and well-characterized microbial strains
- double –blind; placebo controlled
- designed in consultation with regulatory agencies
- randomized statistical design
- validated biomarkers in combination with clinical endpoint

- results confirmed in different test groups and by different researchers
- negative and positive data publication in peer-reviewed scientific journals

Table 1

Desirable properties of probiotic lactic acid bacteria

Probiotic strain characteristics	Functional and technological properties
Human origin	Species-dependent health effects and maintained viability; applicability to fermented foods
Acid and bile stability	Survival in the intestine
Adherence to human intestinal cells	Competitive exclusion of pathogens; immune modulation
Colonization of the human intestinal substances	Multiplication in the intestinal tract at least temporarily, immune modulation
Production of antimicrobial substances	Pathogen inactivation in the intestine, normalization of gut flora
Antagonism against cariogenic and pathogenic bacteria	Prevention of dental decay, prevention of pathogen adhesion
Safety in food and clinical use	Accurate strain identification (genus, species, strain), documented safety
Clinically validated and documented health effects	Dose-response data for minimum effective dosage in different products
Shelf life and stability during processing and storage	All of the above properties should be maintained during processing and storage especially adherence, antimicrobial activity, anticarcinogenic properties

Maintenance criteria essential for commercial manufactures of probiotic products

- guaranteed level of viability through product shelf life
- strain purity and genetic stability
- desired strain pharmacokinetic characteristics
- host and strain interaction

Important criteria of finished probiotic products

- well-characterized and documented strains
- specific potency of efficacious dose stated
- clinical trials documenting efficacy of product
- guaranteed shelf life

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