Enterococci in Milk Products

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Abstract

This review examined the benefits and risks of enterococci in dairy products. Enterococci are ubiquitous bacteria present in the environment and in the gastrointestinal tract of healthy animals and humans. In milk products, they are used as probiotics resulting in positive effects on human digestibility. As adjunct starter cultures, enterococci release natural antimicrobial substances inhibiting adulteration due to food-borne pathogens. Thanks to the efficient utilisation of organic acids, enterococci contribute to the development of unique sensory characteristics in fermented dairy products. In contrast to these positive roles, some enterococcal strains were suspected to have pathogenic properties for humans, mainly based on specific virulence factors found in some strains of *Enterococcus faecalis* and to a lesser extent in strains of *Enterococcus faecium*. In addition, they were regarded as being resistant to several antibiotics. Since virulence factors and antibiotic resistance were found to be genetically encoded and transmissible, they may be transmitted to other enterococcal strains and even to other bacteria species. So far however, no genetic similarities and clear strain specificities have been observed among traits isolated from clinical or food sources. Thus, a pathogenic potential could only be associated with clinical strains, not food strains. Moreover, there is currently no evidence for pathogenic effects on humans. However, evidence for pathogenicity exists from three experimental models in animals. Due to the efficient removal of enterococci during processing, enterococci may be regarded as 'contaminants' if found in processed dairy foods.

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ABAB	Azide blood agar base
Ace	Adhesin of collagen from *E. faecalis*
AD broth	Azide dextrose broth
AS	Aggregation substance
BA agar	Bile aesculin agar
Bar medium	Barnes medium
BB broth	Bromocresol purple azide broth
BEA agar	Bile aesculin azide agar
BHI broth	Brain heart infusion broth
CATC agar	Citrate azide tween carbonate agar
CFU	Colony-forming units
CHEF	Contour-clamped homogenous electric field electrophoresis
Cyl	Cytolysin
DNA	Deoxyribose nucleic acid
$EfaA_{fm}$	Adhesin-like *E. faecium* endocarditis antigen
$EfaA_{fs}$	Adhesin-like *E. faecalis* endocarditis antigen
ESD medium	*Enterococcus* selective differential medium
Esp	Enterococcal surface protein
fGTC agar	Fluorogenic gentamicin thallous carbonate agar
FSR system	*E. faecalis* regulator system
G + C	Glycine + Cytosine
Gel	Gelatinase
GelE	Gelatinase gene
GREF	Glycopeptide-resistant *E. faecium*
HTST pasteurisation	High temperature short time pasteurisation
KAA medium	Kanamycin-aesculin-azide medium
LAB	Lactic acid bacteria
LDL cholesterol	Low-density lipoprotein cholesterol
mE agar	Membrane filter *Enterococcus* agar
mmol	Millimol/es
MRS medium	Man, Rogosa and Sharpe medium
NaCl	Sodium chloride
PCR	Polymerase chain reaction
PFGE	Pulsed-field gel electrophoresis
ppm	Parts per million
PYR test	Pyrrolidonyl-ß-naphthylamide test
RAPD	Random amplified polymorphic DNA
RNA	Ribonucleic acid
rRNA	Ribosomal ribonucleic acid
SB agar	Slanetz-Bartley agar
SMP	Skim milk powder
Spr	Serine protease
SprE	Serine protease gene
SREF	Streptogramin-resistant *E. faecium*
TS broth	Trypticase soy broth
TTC	Tripheniltetrazolium chloride
UHT process	Ultra high temperature process
VRE	Vancomycin-resistant enterococci
VSE	Vancomycin-susceptible enterococci
w/v	Weight/volume
WMP	Whole milk powder