

Bacteria in Food Production*

Cheeses

Parmesan, Romano	<i>Lactobacillus bulgaricus</i> <i>Streptococcus lactis</i> <i>S. cremoris</i> <i>S. Thermophilus</i>	fermentation
Cheddar, Colby, Edam, Gouda, Swiss	<i>Streptococcus lactis</i> <i>S. cremoris</i> <i>S. durans</i> <i>S. thermophiles</i> <i>Lactobacillus helveticus Propionibacterium shermanii</i>	fermentation
Brie, Cambembert, Limburger	<i>Streptococcus lactus</i> <i>S. cremoris</i> <i>Brevibacterium linens</i>	fermentation
Cottage Cheese	<i>Streptococcus lactis</i> <i>Leuconostic citrovorum</i>	fermentation

Other Foods & Drinks

Acidophilis Milk	<i>Lactobacillus acidophilus</i>	Lactic acid fermentation
Butter	<i>Streptococcus diacetilactis</i> <i>Leuconostoc cremoris</i>	Lactic acid fermentation
Sour Cream	<i>Streptococcus diacetilactis</i> <i>S. Lactis</i> <i>Leuconostic cremoris</i>	Lactic acid fermentation
Buttermilk	<i>Lactobacillus bulgaricus</i> <i>Streptococcus cremoris</i> <i>Leuconostoc citrovorum</i> <i>L. dextranicum</i>	Lactic acid fermentation
Yogurt	<i>Lactobacillus bulgaricus</i> <i>Streptococcus thermophilus</i>	Lactic acid fermentation
Cured Meats & Sausages	<i>Pedicoccus cerevisiae</i> <i>Micrococcus spp.</i>	Mixed acid fermentation
Pickles	<i>Lactobacillus plantarum</i> <i>Pedicoccus cerevisiae</i>	
Sourdough Bread	<i>Streptococcus exiguous</i> <i>Lactobacillus sanfrancisco</i>	Mixed acid fermentation
Green Olives	<i>Leuconostoc mesenteroides</i> <i>Lactobacillus plantarum</i>	
Soy Sauce	<i>Pectococcus halophilus</i> <i>Lactobacillus delbrueckii</i>	fermentation
Sauerkraut	<i>Leuconostoc Mesenteroides</i> <i>L. plantarum</i>	fermentation to produce acids and esters
Vinegar	<i>Acetobacter aceti</i>	fermentation converts alcohol to acetic acid
Coffee	<i>Erwinia dissolvens</i>	fermentation to loosen berry skins before roasting
Cocoa	<i>Geotrichum spp.</i>	fermentation to remove cocoa beans from pulp covering pod
Protein Supplement	<i>Spirulina</i>	A blue green bacterium used directly as food supplement

*some products above also require additional fungal species

Pharmaceutical Products from Bacteria*

Product	Microorganism	Uses for Product
streptokinase	<i>Streptococcus</i>	dissolves clots; prevents heart attacks
hyaluronidase	<i>Staphylococcus</i>	facilitates injections under skin
asparaginase	<i>E. coli</i> & <i>Erwinia</i>	used to treat some cases of leukemia
glucose oxidase	(several species)	used to measure glucose levels in urine
galactose oxidase	(several species)	used to diagnose galactosemia in children
miscellaneous antibiotics	many species	eg. amphotericin, erythromycin, used to treat certain infections
genetically engineered bacteria	many species	Used to make human insulin, human growth hormone, somatostatin, human interferon, etc

Industrial Chemicals & Products from Bacteria*

Product	Microorganism	Uses for Product
amylases	<i>Bacillus</i>	Bread, beer, whiskey, textile fibers,
proteases	<i>Bacillus</i>	Clarifying beer, whiskey, leather, baking bread and crackers; used in toothpaste to reduce plaque; some laundry detergents to improve cleaning
rennet	(several species)	prepares curd for cheese making
	bacterial mixture	Used to tan leather
	bacterial mixture	Linen processing
amino acids, vitamins	bacterial mixture	Millions of pounds of specific amino acids and vitamins are extracted from bacterial cultures
probiotics	Mixture of species	Used to enhance or replenish intestinal bacterial flora for better health
genetically engineered bacteria	many species	Used in numerous applications in food and industry
Mining of precious metals	several species	Used to extract and concentrate metals from low grade ores and slag; eg copper, gold
Manganese Nodules	many species	Fist sized clumps of mineral deposits formed by bacteria in the deep ocean that concentrate iron, manganese, copper, nickel, cobalt, etc
Recover palladium	several species	Bacteria are being used to recover palladium from spent catalytic converters
Bioremediation	many species	Remove explosives, petroleum, creosote, etc from contaminated soils and waters
Renewable energy	many species	Generate methane from decomposing organics in landfills, dung and the guts of herbivores that can be harvested for energy production
Fuel Cells	several bacterial	Bacteria can break down waste organics to make hydrogen gas to power fuel cells
Sewage Treatment	many bacteria	Bacteria are used to produce "activated sludge" to enhance breakdown of sewage and organic wastes
"natural" pesticide	<i>Bacillus thuringiensis</i>	Infects many species of pest insects and caterpillars to kill them with much less environmental damage

*some products above also require additional fungal species