

MIS Food - Pathogenic Bacteria Hazards Table

Genus	Pathogenic Species	Morphology and Characteristics	O ₂	T range (°C)	pH range	Optimum pH	Aw (>)	Origin + Food Products	MID	Illness	Regulations	Inactivation
Aeromonas	A. hydrophila, A. caviae, A. sobria	Gram-Rod-shaped Motile Biofilm-former	Facultative anaerobe	4 - 45	4.0 - 10.0	7.0 - 8.0	>0.97	Origin: Aquatic environments, soil. Food: Fish, shellfish, fresh produce, meat, dairy.	High	Gastroenteritis, with symptoms including diarrhoea, vomiting, and fever.	No specific microbiological criteria; general food safety and water quality rules apply.	Sensitive to standard pasteurisation temperatures. Survives refrigeration and freezing. Susceptible to high-pressure processing (HPP).
Bacillus	B. cereus	Gram+ Large rod-shaped Spore-forming Motile Biofilm-former	Facultative anaerobe	4 - 55	4.9 - 9.3	6.0 - 7.5	>0.91	Origin: Ubiquitous in soil, dust. Food: Rice, pasta, starchy foods, sauces, soups.	High	Two types of illness: one causing rapid vomiting and another causing diarrhoea and cramps.	No specific microbiological criteria; general food safety and water quality rules apply.	The cells are killed by pasteurisation, but the spores can survive boiling. The vomiting toxin is extremely heat-stable.
Brucella	B. melitensis, B. abortus, B. suis	Gram-Coccobacillus Non-motile	Aerobe	6 - 45	4.3 - 9.8	6.6 - 7.5	>0.95	Origin: Infected host animals. Food: Unpasteurised milk and dairy products ("fresh" cheeses).	Very low	Brucellosis (undulant fever), a serious infection with recurring fever and flu-like symptoms.	No specific microbiological criteria; control is primarily through animal health laws and eradication programs.	Killed by standard milk pasteurisation. Susceptible to common disinfectants but can survive for long periods in cool, moist environments.
Campylobacter	C. jejuni, C. coli	Gram-Slender, spiral/curved rod Motile	Microaerophile	30 - 47	4.9 - 9.0	6.5 - 7.5	>0.98	Origin: Guts of warm-blooded animals, especially poultry. Food: Raw/undercooked poultry, raw milk.	Low	Campylobacteriosis, one of the most common foodborne illnesses, with diarrhoea (often bloody) and fever.	No specific microbiological criteria; control is focused on process hygiene for poultry carcasses at the slaughterhouse.	Destroyed by thorough cooking and pasteurisation. It is sensitive to drying and acidic conditions but survives well at refrigeration temperatures.
Clostridium	C. botulinum	Gram+ Rod-shaped Spore-forming Motile (most)	Strict anaerobe	P: 10 - 50 NP: 3.3 - 45	P: >4.6 NP: >5.0	6.0 - 7.0	P: >0.94 NP: >0.97	Origin: Soil and aquatic sediments. Food: Improperly canned foods, vacuum-packed products, honey.	~0.03 µg for neurotoxin (by injection); oral dose is higher.	Botulism, a rare but severe illness from a potent neurotoxin that can lead to paralysis and death.	No specific microbiological criteria; safety is ensured through process controls, such as the "botulinum cook" for low-acid canned foods.	The toxin is destroyed by heating (e.g., boiling for 10 min), but the spores are extremely heat-resistant. Growth is prevented by acid, low water activity, or preservatives.
Clostridium	C. perfringens	Gram+ Large, rod-shaped Spore-forming Non-motile	Strict anaerobe	12 - 50	5.0 - 9.0	6.0 - 7.5	>0.93	Origin: Soil, sediments, gut of humans and animals. Food: Cooked meat, poultry, gravies (large batches).	High	Food poisoning with intense abdominal cramps and watery diarrhoea.	No specific microbiological criteria; control is based on proper temperature management.	Cells are killed by heat, but spores often survive boiling. Rapid cooling of food after cooking is the most critical control measure.
Coxiella	C. burnetii	Gram-Pleomorphic Coccobacillus Non-motile	Obligate intracellular	N/A	N/A	N/A	N/A	Origin: Infected animals (goats, sheep, cattle). Food: Unpasteurised milk and dairy products.	Very low	Q Fever, a flu-like illness with high fever and severe headache.	No specific microbiological criteria; control relies on animal health management and the legal requirement to pasteurise milk.	The most heat-resistant non-spore-forming pathogen in milk. Standard milk pasteurisation is designed to kill it.
Cronobacter	C. sakazakii & spp.	Gram-Rod-shaped Motile Biofilm-former	Facultative anaerobe	6 - 47	5.0 - 9.0	6.0 - 8.0	>0.95	Origin: The environment, processing plants. Food: Powdered infant formula (PIF), dried milk.	Low (<10 cells for infants)	Causes severe and often fatal meningitis and sepsis in infants.	• Regulation (EC) 2073/2005	Killed by pasteurisation when hydrated. Its key feature is extreme resistance to drying and dry environments.
Escherichia	STEC/VTEC: E. coli O157:H7, etc.	Gram-Rod-shaped Motile Biofilm-former	Facultative anaerobe	7 - 50	4.4 - 9.0	6.5 - 7.0	>0.95	Origin: Guts of cattle and other ruminants. Food: Undercooked ground beef, raw milk, sprouts.	Low	Haemorrhagic colitis (bloody diarrhoea) and can lead to kidney failure (HUS), especially in children.	• Regulation (EC) 2073/2005	Killed by thorough cooking. It is tolerant of acidic conditions, allowing it to survive in some foods and stomach acid.
Listeria	L. monocytogenes	Gram+ Rod-shaped Tumbling motility Biofilm-former	Facultative anaerobe	0 - 45	4.4 - 9.6	6.0 - 8.0	>0.92	Origin: Soil, water. Food: Ready-to-eat (RTE) deli meats, soft cheeses, smoked fish.	Low	Listeriosis, a serious invasive disease causing meningitis and sepsis. Very high risk for pregnant women.	• Regulation (EC) 2073/2005	Killed by pasteurisation. Ability to grow at refrigeration temperatures. Tolerant of high salt.
Mycobacterium	M. bovis	Acid-fast Rod-shaped Non-motile	Aerobe	N/A	N/A	N/A	N/A	Origin: Infected cattle. Food: Unpasteurised milk and dairy products.	Low	Tuberculosis (TB), a chronic disease affecting the lungs and other organs.	No specific microbiological criteria; control is through animal health laws.	Effectively killed by milk pasteurisation. Resistant to some chemical disinfectants due to its waxy cell wall.
Salmonella	S. enterica (all serovars)	Gram-Rod-shaped Motile Biofilm-former	Facultative anaerobe	5 - 47	3.8 - 9.5	6.5 - 7.5	>0.94	Origin: Guts of animals (poultry, pigs). Food: Raw poultry, eggs, meat, contaminated produce.	Low	Causes Salmonellosis, a classic foodborne illness with diarrhoea, fever, and cramps.	Strict food safety criteria exist for many foods, especially poultry, eggs, and ready-to-eat products. National control programs aim to reduce it in live animals.	Destroyed by thorough cooking and pasteurisation. It can survive for very long periods in dry environments like chocolate or spices.
Shigella	S. sonnei, S. flexneri, etc.	Gram-Rod-shaped Non-motile Biofilm-former	Facultative anaerobe	6 - 47	4.8 - 9.3	6.0 - 8.0	>0.96	Origin: Intestinal tract of humans only. Food: Foods contaminated by infected food handlers (e.g. salads).	Very low	Shigellosis (bacillary dysentery), with bloody diarrhoea and fever.	No specific microbiological criteria; its presence indicates a direct failure of Good Hygiene Practices (GHP) and is unacceptable.	Easily killed by cooking. Control relies almost entirely on preventing contamination through strict personal hygiene of food handlers.
Staphylococcus	S. aureus	Gram+ Cocci in grape-like clusters Non-motile	Facultative anaerobe	7 - 48	4.0 - 10.0	6.0 - 7.0	>0.83	Origin: Humans. Food: Hand-made foods not reheated (e.g., salads, pastries).	>1 µg of toxin	Food poisoning with rapid and severe vomiting and nausea from a pre-formed toxin.	• Regulation (EC) 2073/2005	The bacteria are killed by pasteurisation, but the toxin is very heat-stable and survives boiling. Tolerant of low water activity and high salt.
Vibrio	V. parahaemolyticus, V. vulnificus, etc.	Gram-Curved rod-shaped Motile Biofilm-former	Facultative anaerobe	5 - 43	4.8 - 11.0	7.5 - 8.5	>0.94	Origin: Saltwater environments. Food: Raw or undercooked seafood, especially oysters.	Varies by species	Vibriosis, with symptoms ranging from watery diarrhoea to severe bloodstream infections.	No specific microbiological criteria; control is managed through good practices during and after harvest.	Destroyed by thorough cooking of seafood. Rapid chilling after harvest is critical to stop its growth. Freezing reduces numbers but does not eliminate it.
Yersinia	Y. enterocolitica	Gram-Coccobacillus Motile at <30°C	Facultative anaerobe	-1 - 42	4.2 - 10.0	7.0 - 8.0	>0.94	Origin: Guts of pigs. Food: Raw or undercooked pork, raw milk.	High	Yersiniosis, with fever, diarrhoea, and abdominal pain that can mimic appendicitis.	No specific microbiological criteria; control is focused on good hygiene practices at farms and slaughterhouses.	Killed by standard cooking and pasteurisation. A key characteristic is its ability to grow at refrigeration temperatures.