CLASSIFICATION OF FOODBORNE PATHOGENS

SOURCES OF CONTAMINATION

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Taxonomic classification

Prions
Viruses
Bacteria
(Algae, cyanobacteria)
Fungi
Protozoa
Metazoan parasites
Toxic plants and animals

Classification by mode of pathogenesis

Infectious agents (viable [infectious] agent present in food when ingested; must multiply in host’s body to cause disease [incubation period])

Prions — new variant Creutzfeldt-Jakob disease (vCJD)
Viruses — hepatitis A, noroviruses, etc.
Bacteria — Campylobacter, Clostridium perfringens, Escherichia coli, Listeria, Salmonella, Shigella, Vibrio, etc.
Protozoa — Cryptosporidium parvum, Entamoeba histolytica, Giardia lamblia, Toxoplasma gondii, etc.
Metazoan parasites (helminths) — roundworms, tapeworms, flukes

Intoxicating agents (toxic substance present in food when ingested; onset of illness may be rapid)

Bacteria — Bacillus cereus, Clostridium botulinum, Staphylococcus aureus (Algae, cyanobacteria)
Fungi— Aspergillus, Fusarium, Penicillium, etc.
Toxic plants and animals — mushrooms, cassava, fugu, etc.

“Exceptional” foodborne diseases

Allergy — serologic reaction
Intolerance — enzyme deficiency (abnormal people?)

Idiopathic illnesses

Acute — “Chinese restaurant syndrome”
Chronic — cancer, heart disease
Sources of foodborne pathogens

Preharvest
- Inherent toxicants — acorns, cassava, olives, etc.
- Zoonoses — enterohemorrhagic E. coli, Trichinella sp., (Brucella sp., Coxiella burnetii, Mycobacterium bovis, prions of bovine spongiform encephalopathy [BSE]), etc.
- Field contaminants — Cryptosporidium parvum, enterohemorrhagic E. coli, Vibrio parahaemolyticus, etc.

Harvest or slaughter
- Cross-contamination — Listeria, Salmonella
- Water — enterohemorrhagic E. coli, hepatitis A virus, etc.
- Humans — hepatitis A virus, Salmonella, etc.?

Processing
- Problems rare in U.S. at present
- Colonization of facilities by Listeria, Salmonella
- If bakeries are included, viruses

Storage and distribution — most problems with temperature control, rather than contamination

Retailing and food service — opportunities for human-source contamination: hepatitis A virus, noroviruses, Shigella, pathogenic E. coli (other than EHEC); cross-contamination with EHEC, Listeria, Salmonella, etc.

Final preparation and serving — opportunities for human-source contamination: bacteria & viruses, Giardia lamblia, Taenia solium, etc.

Summary
- Foodborne pathogens can be classified by conventional taxonomic systems, but also on the basis of the ways they cause foodborne disease
- Every stage of progress of food from production to the final consumer has some potential for the introduction of pathogens; some of these risks are more easily remedied than others.
Bibliography


International Association for Food Protection (IAFP). 1999. Procedures to Investigate Foodborne Illness, 5th ed. [formerly IAMFES], Ames, IA.

