

Foodborne Pathogens: Invisible Threats to Food Safety

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DESCRIPTION

Foodborne pathogens are microorganisms mainly bacteria, viruses, and parasites that contaminate food and cause illness in humans. These pathogens are a major global public health concern, leading to millions of illnesses, hundreds of thousands of hospitalizations, and thousands of deaths every year. Ensuring food safety through proper handling, cooking, and storage is essential to preventing the spread of foodborne diseases.

The World Health Organization (WHO) estimates that 1 in 10 people worldwide fall ill from contaminated food annually. With the global food supply chain becoming more complex, the need to understand and control foodborne pathogens is more urgent than ever.

Foodborne pathogens

Salmonella: Raw or undercooked poultry, eggs, meat, and sometimes fruits and vegetables. Symptoms include diarrhea, fever, abdominal cramps, and vomiting. Symptoms usually begin 6-72 hours after infection and last 4-7 days. Infants, elderly, and immunocompromised individuals are more vulnerable to severe infections.

Escherichia coli: Pathogenic strains; especially *E. coli* O157:H7. Undercooked beef (especially ground beef), raw milk, contaminated water or produce. Symptoms include severe stomach cramps, bloody diarrhea, and vomiting. Complications can lead to hemolytic Uremic Syndrome (HUS), especially in children.

Listeria monocytogenes: Ready-to-eat meats, unpasteurized dairy, and refrigerated smoked seafood. Symptoms include fever, muscle aches, nausea, and diarrhea; can lead to meningitis or stillbirths in pregnant women. High risk for pregnant women, newborns, elderly, and immunocompromised individuals. Unique feature of they can grow at refrigeration temperatures, making cold storage less effective at prevention.

Norovirus: Contaminated food, water, or surfaces; often associated with raw shellfish and ready-to-eat foods. Symptoms include vomiting, diarrhea, nausea, and stomach pain. Highly contagious, even in small quantities. Common in cruise ships, restaurants, and schools.

Campylobacter: Raw or undercooked poultry, unpasteurized milk, and contaminated water. Symptoms include diarrhea (sometimes bloody), fever, and abdominal cramps. In rare cases, it can lead to Guillain-Barré syndrome, a serious neurological disorder.

Clostridium perfringens: Improperly cooked or stored meat and poultry. Symptoms include abdominal cramps and diarrhea. Rapid-usually within 6-24 hours. Prevention by proper cooking and keeping hot foods hot.

Preventing foodborne illness requires a combination of proper food handling practices, regulatory standards, and consumer awareness. Key strategies include:

Cooking foods to safe internal temperatures (e.g., poultry to 74°C or 165°F) kills most pathogens. Keeping foods at or below 4°C slows microbial growth. Using separate cutting boards and utensils for raw and cooked foods. Washing hands, kitchen surfaces, and produce thoroughly. Heat-treating foods like milk and juices to destroy harmful microbes. Helps in tracking contaminated food sources during outbreaks.

Governments and health agencies also play a critical role through food inspections, recalls, and public education campaigns. The rise of antibiotic-resistant pathogens is a growing concern. Overuse of antibiotics in food animals can lead to resistant strains that are harder to treat when they infect humans. This highlights the need for antimicrobial stewardship in agriculture and stronger regulations on antibiotic use. Globalization of the food supply also increases the risk of widespread outbreaks, making international cooperation and surveillance crucial for food safety. Technologies such as whole genome sequencing are increasingly being used to track and identify outbreak sources more rapidly and accurately.

Foodborne pathogens pose a silent yet serious threat to public health, with consequences ranging from mild discomfort to life-threatening illness. Fortunately, most foodborne illnesses are preventable with proper food handling, hygiene, and public health interventions. Ongoing education, technological advancements, and strict safety standards are essential to reducing the burden of foodborne diseases and ensuring a safe food supply for everyone.

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