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EPIDEMIOLOGICAL CHARACTERISTICS OF FOOD POISONING AND MODERN PREVENTIVE MEASURES

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Abstract: This scientific article presents a comprehensive analysis of the modern etiology, clinical manifestations, and contributing factors of food poisoning. It examines the distribution dynamics of foodborne toxicoinfections and bacterial toxicosis in the context of recent developments in the food industry and the expansion of global logistics chains. The article provides a scientific rationale for comprehensive preventive measures, including enhancing sanitary and hygienic awareness among the population, implementing the HACCP (Hazard Analysis and Critical Control Points) system in food service establishments, and preventing highly dangerous forms of food poisoning, such as botulism.
Keywords: food poisoning, botulism, salmonellosis, toxicoinfection, prevention, hygiene, HACCP, food safety.

Introduction

In medical practice and the field of hygiene, food poisonings are categorized into three major groups based on their origin and pathogenesis: microbial (bacterial and fungal), non-microbial (chemical and toxic), and those of unknown origin. Among these, microbial poisonings are the most prevalent, accounting for 85–90% of all cases.

Microbial Food Poisoning

Microbial food poisoning is categorized into toxi-infections, bacterial toxicoses (intoxications), and mycotoxicoses:

Toxi-infections – this group is caused by the ingestion of large numbers of live bacteria via food products; these bacteria subsequently break down within the body, releasing endotoxins. Primary causative agents include bacteria from the *Salmonella* group, *Escherichia coli* (pathogenic strains), *Proteus vulgaris*, and *Clostridium perfringens*.

Bacterial toxicoses – in these cases, the illness develops not because a living microorganism enters the body, but because an exotoxin—produced by the microorganism and accumulated within a food product—is ingested. Prime examples of this include toxicoses caused by *Staphylococcus aureus* and *Clostridium botulinum* (the causative agent of botulism). *Staphylococcus* primarily proliferates in cream-filled confectionery, as well as in dairy and meat products, where it releases an enterotoxin that is resistant to heat treatment.

Mycotoxicoses – these occur following the consumption of grains, nuts, or other products contaminated with mycotoxins—substances produced by various fungi (such as molds belonging to the *Aspergillus* or *Fusarium* genera).

Non-microbial food poisoning

Non-microbial food poisoning occurs as a result of consuming plants that are inherently toxic (such as poisonous mushrooms, *rishol*, or the amygdalin found in bitter almonds) or animals (certain types of fish or specific fish organs). It can also be caused by the entry of chemical substances—such as heavy metal salts (lead, copper, zinc), pesticides, nitrates, or nitrites—into the food chain.

Materials and Methods

Among foodborne illnesses, botulism is the most severe, potentially leading to dire consequences, including death. It is caused by *Clostridium botulinum*, an anaerobic, spore-forming bacterium (a rod-shaped organism that thrives in an oxygen-free environment). This microorganism is widespread in nature—particularly in soil—and can contaminate food products through soil particles.

The toxin produced by *C. botulinum* (botulinum toxin) is one of the most potent biological poisons known. The bacterium multiplies and releases this toxin primarily in home-canned, hermetically sealed food products—such as preserved tomatoes, cucumbers, eggplant spreads, mushrooms, or smoked fish and meats—where an oxygen-free environment is created. The most dangerous aspect is that the toxin does not noticeably alter the smell, taste, or appearance of the food.

The clinical presentation of botulism is distinct, characterized primarily by damage to the nervous system. Following mild gastrointestinal symptoms, the patient develops neurological signs, including blurred vision, double vision (diplopia), drooping eyelids (ptosis), and difficulties with swallowing and speech (dysphagia and dysarthria). If the disease is not treated in time (i.e., if anti-botulinum serum is not administered), death occurs due to asphyxia resulting from paralysis of the respiratory muscles.

Laboratory diagnostics play a crucial role in identifying the type of poisoning and determining the appropriate pathogenetic therapy. For diagnostic purposes, samples are collected from the patient—including vomitus, gastric lavage fluid, stool, and urine—as well as remnants of the consumed food. Microbiological (bacteriological) methods are used to isolate the pathogenic microorganism and determine its sensitivity to antibiotics. In cases of suspected botulism, a biological assay (a neutralization test in mice) or modern ELISA (enzyme-linked immunosorbent assay) techniques are employed to detect botulinum toxin in the patient's blood serum.

The first and most urgent step in treatment is the immediate lavage (washing out) of the stomach and intestines. This allows for the removal of toxins that have not yet been absorbed by the body. The patient is provided with large volumes of solutions containing salts and glucose (rehydration therapy), or, in severe cases, intravenous infusions (such as Trisol, Quartasol, or normal saline) are administered. Enteral sorbents (e.g., activated charcoal, Enterosgel) are prescribed to bind the toxins. Antibiotics are not used in cases of bacterial toxicosis, as the illness is caused not by the

bacteria themselves, but by the toxins they produce. However, in cases of severe toxic infections and salmonellosis, broad-spectrum antibiotics may be used under the supervision of a physician.

Results

Preserving human health and improving the quality of life are among the most critical tasks of modern medicine and healthcare systems. On a global scale, the acceleration of urbanization, population growth, and the expansion of food service sectors have brought the issue of food safety to the forefront. According to the World Health Organization (WHO), millions of people worldwide fall ill each year as a result of consuming poor-quality or microbiologically contaminated food products.

The World Health Organization has developed five "golden rules" for food safety, which are recognized globally; applying these in daily life can significantly reduce the incidence of illness:

1. Maintain cleanliness – wash your hands with soap before and during food preparation, as well as after using the restroom. Keep kitchen utensils, knives, and cutting boards clean and sanitized at all times.

2. Separate raw and cooked foods – keep raw meat, poultry, and seafood separate from ready-to-eat meals and other food items. Use separate knives and cutting boards for raw and cooked products.

3. Cook food thoroughly – ensure that items such as meat, eggs, and fish undergo complete thermal processing (cooking). The internal temperature of the food must reach a level sufficient to kill microorganisms.

4. Store food at safe temperatures – do not leave cooked food at room temperature for more than two hours. Place perishable items in a refrigerator (below 5°C) immediately.

5. Use safe water and raw ingredients – use only clean, filtered water and fresh, high-quality ingredients. Do not, under any circumstances, consume products that are past their expiration date.

Discussion

Foodborne illnesses (alimentary toxi-infections and intoxications) are multifactorial in nature; they not only cause physical suffering for the affected individuals but also result in significant economic and social costs. This issue remains particularly pressing in regions with hot climates—including Uzbekistan—where conditions are highly favorable for the proliferation of pathogenic and opportunistic microorganisms in food products. The objective of this study is to analyze the modern classification of foodborne illnesses, their underlying causes, and the effectiveness of both innovative and traditional preventive measures in curbing them.

In conclusion, food poisoning remains a global issue that poses a serious threat to public health. Technological advancements and the increasing complexity of the food supply chain necessitate a new, systematic approach to this field. Research indicates that most cases of food poisoning stem from a failure to follow basic sanitary rules, as well as improper storage and inadequate thermal processing of food products.

To address this problem, it is essential to strictly implement international HACCP standards within manufacturing facilities and to strengthen public awareness campaigns—particularly within educational institutions—aimed at fostering a culture of hygiene. Furthermore, adhering to proper preparation protocols when canning food at home is a key factor in preventing tragic outcomes, such as botulism. Ultimately, ensuring food safety is the foundation for a healthy future and a stable society.

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