ISSN : 2348-8069 Int.J.Adv. Res.Biol.Sci.2014; 1(5):19-32

International Journal of Advanced Research in Biological Sciences

www.ijarbs.com

Review Article

Review on mechanism of food poisoning by microorganisms

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Abstract

Food production and marketing chains are often not without contamination except when good hygienic start is maintained through proper cooking. Even at that microbial spore's formation, producing poisoning on food before cooking and after cooking are determined by nutrients in substrate, state of substrate or cell. Personal care and hygiene must be maintained to handle the equilibrate state of microorganism on substrate or cells. The paper examined the meaning of food poisoning and its ways on spores formations, features, pathogenesis and preformed spores during food handling, food preparation, food born illness and its relations with how home makers could understand its primary insurgence on food substrates or cells and diagnosis. The content revealed measures to attain pre-intoxication and post - intoxication of microbial causing illnesses from food and living cells at home and therefore recommend the individual effort on hygiene, government legislation and safety rules in handling certain food tissues

Keywords: Mechanism, microorganisms, food poisoning.

Introduction

Food poisoning is defined as an illness caused by the consumption of food or water contaminated with bacteria and/or their toxins, or with parasites, viruses, or chemicals. The symptoms, varying in degree and combination, include abdominal pain, vomiting, diarrhea, and headache; more serious cases can result in life-threatening neurologic, hepatic, and renal syndromes leading to permanent disability or death. Most of the illnesses are mild and improve without any specific treatment. Some patients have severe disease and require hospitalization, aggressive hydration, and antibiotic treatment.

Food is one of the basic needs of man and man cannot live without food, hence man is found in virtually every part of the earth surface but threatened by mechanistic invasion by microorganisms on his food. Food handling practices in home which bring illness in the family, insufficient cooking, and improper storage can allow bacteria in food to increase to dangerous levels which may depend on the state of food Ogori and Utim (2013) ,storage period ,P^H ,water activity of that food or cell, and subtract concentration and it solute gradients. Some bacteria produce toxins and preformed toxins which depend on this factor.

(A)Food Poisoning	Source and Clinical Features	Pathogenesis	Diagnosis and Treatment
Staphylococci	Improperly stored foods with high salt or sugar content favor growth of staphylococci Intense vomiting and watery diarrhea start 1-4 hours after ingestion and last as long as 24-48 hours.	Enterotoxin acts on receptors in gut that transmit impulses to medullary centers.	Symptomatic treatment
B cereus	Contaminated fried rice (emetic) Meatballs (diarrheal) Emetic: Duration is 9 hours, vomiting and cramps Diarrheal: Lasts for 24 h Mainly vomiting after 1-6 hours and mainly diarrhea after 8-16 hours after ingestion; lasts as long as 1 day	Emetic enterotoxin (short incubation and duration) - Poorly understood Diarrheal enterotoxin (long incubation and duration) - Increasing intestinal secretion by activation of adenylate cyclase in intestinal epithelium	Symptomatic treatment
C perfringens	Inadequately cooked meat, poultry, or legumes	Enterotoxin produced in the gut, and food causes hypersecretion	Culture of clostridia in food and stool

		in the small intestine.	Symptomatic treatment
	Acute onset of abdominal cramps with diarrhea starts 8-24 hours after ingestion.		
	Vomiting is rare. It lasts less than 1 day.		
	Enteritis necroticans associated with *C perfringens* type C in improperly cooked pork (40% mortality)		
C botulinum	Canned foods (eg, smoked fish, mushrooms, vegetables, honey)	Toxin absorbed from the gut blocks the release of acetylcholine in the neuromuscular junction.	Toxin present in food, serum, and stool.
			Respiratory support
	Descending weakness and paralysis start 1-4 days after ingestion, followed by constipation.		Intravenous trivalent antitoxin from CDC
	Mortality is very high.		
Listeria monocytogenes	Raw and pasteurized milk, soft cheeses, raw vegetables, shrimp	Highly motile, heat-resistant, gram-positive organism	CSF or blood culture
			Must treat with antibiotics if bacteremic
	Systemic disease		

	associated with bacteremia Intestinal symptoms precede systemic disease Can seed meninges, heart valves, and other organs Highest mortality among bacterial food poisonings		
Enterotoxic *E coli* (eg, traveler's diarrhea)	Contaminated water and food (eg, salad, cheese, meat) Acute-onset watery diarrhea starts 24-48 hours after ingestion. Concomitant vomiting and abdominal cramps may be present. It lasts for 1-2 days	Enterotoxin causes hypersecretion in small and large intestine via guanylate cyclase activation.	Supportive treatment No antibiotics
Enterohemorrhagic *E coli* (eg, *E coli*)	Improperly cooked hamburger meat and previously spinach Most common isolate pathogen in bloody	Cytotoxin results in endothelial damage and leads to platelet aggregation and microvascular fibrin thrombi	Diagnosis with stool culture Supportive treatment

	diarrhea starts 3-4 days after ingestion. Usually progresses from watery to bloody diarrhea. It lasts for 3-8 days May be complicated by HUS or TTP		No antibiotics
Enteroinvasive *E coli*	Contaminated imported cheese Usually watery diarrhea (some may present with dysentery)	Enterotoxin produces secretion Shiga-like toxin facilitates invasion.	Supportive treatment No antibiotics
Enteroaggregative *E coli*	Implicated in traveler's diarrhea in developing countries Can cause bloody diarrhea	Bacteria clump on the cell surfaces	Ciprofloxacin may shorten duration and eradicate the organism
V cholera	Contaminated water and food Large amount of nonbloody diarrhea starts 8-24 hours after ingestion. It lasts for 3-5 days.	Enterotoxin causes hypersecretion in small intestine. Infective dose usually is 10^7 -10^9 organisms.	Positive stool culture Prompt replacement of fluids and electrolytes (oral rehydration solution) Tetracycline (or

			fluoroquinolones) shortens the duration of symptoms and excretion of *Vibrio*.
V parahaemolyticus	Raw and improperly cooked seafood (ie, mollusks and crustaceans) Explosive watery diarrhea starts 8-24 hours after ingestion. It lasts for 3-5 days.	Enterotoxin causes hypersecretion in small intestine. Hemolytic toxin is lethal. Infective dose usually is 10^7 -10^9 organisms.	Positive stool culture Prompt replacement of fluids and electrolytes Sensitive to tetracycline, but unclear role for antibiotics
V vulnificus	Wound infection in salt water or consumption of raw oysters Can be lethal in patients with liver disease (50% mortality)	Polysaccharide capsule Growth correlates with availability of iron (esp. transferrin saturation >70%)	Culture of characteristic bullous lesions or blood Immediate antibiotics if suspected (eg, doxycycline and ceftriaxone)
C jejuni	Domestic animals, cattle, chickens Fecal-oral transmission in humans Foul-smelling watery diarrhea followed by bloody diarrhea	Uncertain about endotoxin production and invasion	Culture in special media at 42°C Erythromycin for invasive disease (fever)

	Abdominal pain and fever also may be present. It starts 1-3 days after exposure and recovery is in 5-8 days.		
Shigella	Potato, egg salad, lettuce, vegetables, milk, ice cream, and water Abrupt onset of bloody diarrhea, cramps, tenesmus, and fever starts 12-30 hours after ingestion. Usually self-limited in 3-7 days	Organisms invade epithelial cells and produce toxins. Infective dose is 10^2 - 10^3 organisms. Enterotoxin-mediated diarrhea followed by invasion (dysentery/colitis)	Polymorphonuclear leukocytes (PMNs), blood, and mucus in stool Positive stool culture Oral rehydration is mainstay. Trimethoprim-sulfamethoxazole (TMP-SMX) or ampicillin for severe cases No opiates
Salmonella	Beef, poultry, eggs, and diary products Abrupt onset of moderate-to-large amount of diarrhea with low-grade fever; in some cases, bloody diarrhea Abdominal pain and	Invasion but no toxin production	Positive stool culture Antibiotic for systemic infection

	vomiting also present, beginning 6-48 hours after exposure and lasts 7-12 days		
Yersinia	Pets; transmission in humans by fecal-oral route or contaminated milk or ice cream Acute abdominal pain, diarrhea, and fever (enterocolitis) Incubation period not known Polyarthritis and erythema nodosum in children May mimic appendicitis	Gastroenteritis and mesenteric adenitis Direct invasion and enterotoxin	PMNs and blood in stool Positive stool culture No evidence that antibiotics alter the course but may be used in severe infections
Aeromonas	Untreated well or spring water Diarrhea may be bloody. May be chronic up to 42 days in the United States	Enterotoxin, hemolysin, and cytotoxin	Positive stool culture Fluoroquinolones or TMP/SMX for chronic diarrhea
(B)Parasitic Food	**Source and Clinical Features**	**Pathogenesis**	**Diagnosis and Treatment**
E histolytica	Contaminated food	Invasion of the mucosa	Criterion standard is

	and water 90% asymptomatic 10% dysentery Minority may develop liver abscesses	by the parasites	colonoscopy with biopsy Ova and parasites may be seen in the stool but has low sensitivity Luminal amebicides (eg, paromomycin) Tissue amebicides (eg, metronidazole)
G lamblia	Contaminated ground water Fecal-oral transmission in humans Mild bloody diarrhea with nausea and abdominal cramps starts 2-3 days after ingestion; lasts for 1 week May become chronic	Unknown Highest concentration in the distal duodenum and proximal jejunum	Initial diagnostic test is stool ELISA Duodenal aspiration or small bowel biopsy Cyst in the stool Metronidazole
(C)Seafood/Shellfish Poisoning	**Source and Clinical Features**	**Pathogenesis**	**Diagnosis and Treatment**
Paralytic shellfish poisoning	Temperate costal areas Source - Bivalve	Fish acquires toxin-producing dinoflagellates	General observation for 4-6 hours

	mollusks Onset usually is 30-60 minutes. Initial symptoms include perioral and intraoral paresthesia. Other symptoms include paresthesia of the extremities, headache, ataxia, vertigo, cranial nerve palsies, and paralysis of respiratory muscles, resulting in respiratory arrest.		Maintain patent airway. Administer oxygen, and assist ventilation if necessary. For recent ingestion, charcoal 50-60 g may be helpful.
Neurotoxic shellfish poisoning	Coastal Florida Source - Mollusks Illness is milder than in paralytic shellfish poisoning.	Fish acquires toxin-producing dinoflagellates	Symptomatic
Ciguatera	Hawaii, Florida, and Caribbean Source - Carnivorous reef fish	Fish acquires toxin-producing dinoflagellates Toxin increases intestinal secretion by changing intracellular	Symptomatic Anecdotal reports of successful treatment of neurologic symptoms with mannitol 1 g/kg IV

	Vomiting, diarrhea, and cramps start 1-6 hours after ingestion and last from days to months. Diarrhea may be accompanied by a variety of neurologic symptoms including paresthesia, reversal of hot and cold sensation, vertigo, headache, and autonomic disturbances such as hypotension and bradycardia. Chronic symptoms (eg, fatigue, headache) may be aggravated by caffeine or alcohol	calcium concentration	
Tetrodotoxin poisoning	Japan Source - Puffer fish Onset of symptoms usually is 30-40 minutes but may be as short as 10 minutes. It includes lethargy, paresthesia, emesis, ataxia, weakness, and dysphagia. Ascending paralysis occurs in severe cases. Mortality is high.	Neurotoxin is concentrated in the skin and viscera of puffer fish.	Symptomatic

Scombroid	Source - Tuna, mahi-mahi, kingfish Allergic symptoms such as skin flush, urticaria, bronchospasm, and hypotension usually start within 15-90 minutes.	Improper preservation of large fish results in bacterial degradation of histidine to histamine.	Antihistamines (diphenhydramine 25-50 mg IV) H2 blockers (cimetidine 300 mg IV) Severe reactions may require subcutaneous epinephrine (0.3-0.5 mL of 1:1000 solution).
(D)Heavy Metal Poisoning	**Source**	**Symptoms**	**Treatment**
Mercury	Ingestion of inorganic mercuric salts	Causes metallic taste, salivation, thirst, discoloration and edema of oral mucous membranes, abdominal pain, vomiting, bloody diarrhea, and acute renal failure	Consult a toxicologist. Remove ingested salts by emesis and lavage, and administer activated charcoal and a cathartic. Dimercaprol is useful in acute ingestion.
Lead	Toxicity results from chronic repeated exposure. It is rare after single ingestion.	Common symptoms include colicky abdominal pain, constipation, headache, and irritability. Diagnosis is based on lead level (>10 mcg/dL)	Other than activated charcoal and cathartic, severe toxicity should be treated with antidotes (edetate calcium disodium [EDTA] and dimercaprol).

Arsenic	Ingestion of pesticide and industrial chemicals	Symptoms usually appear within 1 hour after ingestion but may be delayed as long as 12 hours. Abdominal pain, watery diarrhea, vomiting, skeletal muscle cramps, profound dehydration, and shock may occur.	Gastric lavage and activated charcoal Dimercaprol injection 10% solution in oil (3-5 mg/kg IM q4-6h for 2 d) and oral penicillamine (100 mg/kg/d divided qid for 1 wk)

Outbreaks of illness from food contaminated by harmful bacteria are especially common during hot season when perishable foods are left in the kitchen or carried on picnics without proper refrigeration ,this indicates that microbial population depend on solute substrate dilution which is the function of state of foods. Similarly, freezing and refrigeration of food have been examined to allow certain bacteria food proliferation such as the mesophyles and psychotrophs in refrigerated storage, showing wide stearic angle in water molecules which could be reduce to prevent wide vibration within water bond angle by increasing refrigeration timing, which may tend to freezing or increase in refrigerating temperature.

The home has become a primary source of food contamination and therefore calling on the home makers and food professionals to battle with. There is a need to understand the state of food and mechanism of infection or intoxication safety of food in home by home maker and food professionals and nutrient in food state to avoid contaminating microorganism.

Food poisoning mechanisms and effects

Food poisoning is any illness resulting from consumption of contaminated food, with pathogenic bacteria, viruses or parasite that had contaminated food as well as it toxin. The science of hygiene is based on the understanding of danger of invisible dirt (Microorganism) domain at prokaryote nature and ambiguous. The contamination of food refers to the presence of harmful chemical and microbial food which can cause consumer illnesses. This contamination may be virus, bacterium prion, fungus causing host diseases.

Food poisoning or contaminable agent can be planted from disease producing bacteria causing infection preformed toxins on the food eaten causing food born -illness . Food contain salmonella can cause infection in man called salmonelloises Vail et al (1993). These disease infections are difficult to control and they result from contact by infected persons and large salmonella infested colony of food, usually from rate, tics and minces. Staphylococcus and clostridium botulinuim are toxin producing microorganism that produces preformed toxin and usually on the skin and mucous membrane of human and other organism as well as soil microbial flora. The prolonged proliferations of staphylococcus poison can or accelerate botulism food poisoning.

According to Well et al (1996), poor handling and preparation of meat, poultry, and leftover food can result to per fringes called Wllchil. This food poisoning microorganism are component of decaying vegetation, Marine Sediment, intestinal

tract of human and other vertebrate insects called clostridium per fringes. Botulism is another serious form of food poisoning form food certain toxic produced by clostridium. The secondary stage of botulism in fatal paralytic illness and respiratory failure through paralyzing the muscle of the chest.

Conclusion

Food poisoning activities by microbes is a function of food cell substrate in relation to its place environment, hygiene practice by food handler and the home makers.

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