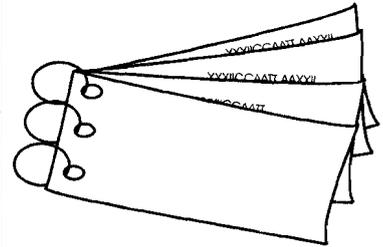


UNIT 7 EMERGING PATHOGENS OF CONCERN

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- Food borne illness is underreported in India and unless the person becomes seriously ill, the doctor is also not consulted. This makes documentation and consequently estimating the extent of the problem virtually impossible.
- In developed countries the surveillance mechanism is more advanced and there is greater chance of detecting new pathogens. Hence most of the reports of new virulent strains of pathogens are from developed countries such as USA, UK, Japan.
- Some of the newly identified pathogens cause more than the typical gastrointestinal symptoms of vomiting and diarrhoea. They have been known to trigger reactive arthritis, autoimmune disorders, encephalopathy, meningitis, septicaemia.
- Some of the recently identified pathogens and the foods in which they were identified are listed in the following table.

Table 7.1: Pathogens with Possible Sources of Infection

S.no.	Pathogen	Sources of Infection
1.	<i>Campylobacter</i>	Raw poultry, meat, unpasteurized milk
2.	<i>Cyclospora</i>	Raspberries, untreated water, basil, lettuce
3.	<i>Escherichia coli</i> O157:H7	Ground beef, contaminated water, unpasteurized milk, sprouts, lettuce, unpasteurized juice and cider, person-to-person contact
4.	<i>Escherichia coli</i> O39	Fresh fruits and vegetables

5.	<i>Helicobacter</i>	Mainly contaminated water
6.	<i>Listeria monocytogenes</i>	Uncooked meats and vegetables, unpasteurized (raw) milk or foods made from it

7.1 Helicobacter

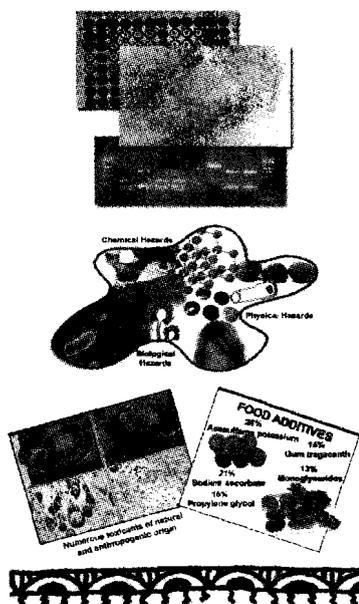
Helicobacter pylori (*H. pylori*) is a spiral shaped bacterium that is found in the gastric mucous layer or sticking to the epithelial lining of the stomach. It thus manages to protect itself from the acid secreted in the stomach. *H. pylori* causes more than 90% of duodenal ulcers and up to 80% of gastric ulcers. Approximately two-thirds of the world's population is believed to be infected with *H. pylori*.

Symptoms

- Most persons who are infected with *H. pylori* never suffer any symptoms related to infection. However it is known to cause gastritis in adults and children.
- The infection can lead to duodenal and gastric ulcers with increased risk of patients developing gastric cancer.
- The most common ulcer symptom observed is gnawing or burning pain in the stomach typically when the stomach is empty. Less common symptoms include nausea, vomiting, loss of appetite and bleeding. Prolonged bleeding may cause anaemia leading to weakness and fatigue.

Transmission

- It is not known how *H. pylori* is transmitted or why some patients develop symptoms while other do not. The bacteria are most likely to spread from person to person through faecal-oral or oral-oral routes.
- Possible environmental reservoirs include contaminated water sources.



7.2 Entero-pathogenic *Escherichia coli* (EPEC)

- *E.coli* is normally present in the gut. However, some strains are pathogenic. EPEC is the strain linked to a number of gastroenteritis cases.

Symptoms

- Infantile diarrhoea (either watery or bloody) is associated with attachment to, and physical alteration of the integrity of the intestine. Bloody diarrhoea is associated with attachment and tissue-destruction.
- Occasionally diarrhoea in infants is prolonged, leading to dehydration, electrolyte imbalance and death. (50% mortality rates have been reported in developing countries).

Transmission

- Common foods implicated in EPEC outbreaks are raw beef and chicken, although any food exposed to faecal contamination is strongly suspect. EPEC

outbreaks most often affect infants (especially bottle-fed) suggesting that water used to rehydrate infant formulae may be contaminated.

- One of the types of EPEC, *E.Coli* 0157:H7 is considered to be a leading cause of diarrhoea and haemolytic uraemic syndrome, the primary cause of renal failure in children in the US.
- Uncooked sprouts can transmit the strain. As sprouts germinate, they incorporate *E.coli* 0157: H7 from water or from seed surface into the interior tissue of the plant.

7.3 *Listeria monocytogenes*

Listeriosis is a serious infection caused by eating food contaminated with *L.monocytogenes*. The disease affects primarily pregnant women, newborns and adults with weakened immune systems.

Symptoms

- A person with listeriosis has fever, muscle aches and sometimes gastrointestinal symptoms such as nausea or diarrhoea.
- If infection spreads to the nervous system, symptoms such as headache, stiff neck, confusion, loss of balance or convulsions can occur.
- Infections during pregnancy can lead to miscarriage or still birth, premature delivery or infection of the newborn.

Transmission

- Vegetables can become contaminated from soil or from manure used as fertilizer.
- Foods from infected animals can be contaminated e.g. meats and dairy products.
- The bacterium has been found in a variety of raw foods such as uncooked meats and vegetables as well as in processed foods that become contaminated after cooking but before packaging.
- Cooking and pasteurization kill the organism.

7.4 Other Pathogens

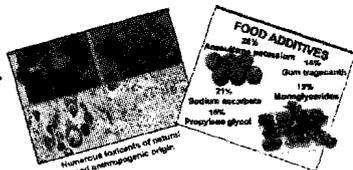
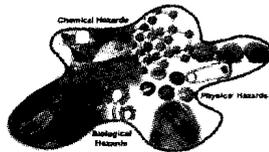
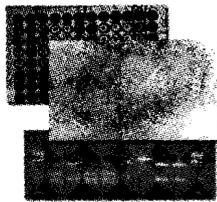
- Contaminated beef products are suspected to transmit *mad cow disease* (Creutzfeldt Jakob disease or CJD). The disease is caused by prions, modified forms of a normal protein. These proteins accumulate in the brain causing holes or plaques leading to dementia and ultimately death.
- *Cyclosporiasis* is caused by a coccidian-like organism that produces prolonged, watery diarrhoea after incubating in the host for more than a week. Sources of contamination are unclear.
- *Campylobacter jejuni* infection now exceeds *Salmonella* as the most common bacterial food-borne pathogen in most countries. Antibiotic-resistant *Campylobacter* species have emerged.

- There have been reports of widespread disease and death from *Asian Influenza Virus or Bird Flu*. The virus infects mostly domesticated birds like chicken and turkey and spreads through contact with contaminated saliva, nasal secretions, faeces. Contact of humans with infected birds can transmit the infection causing symptoms like fever, cough, sore throat, muscle aches to eye infections, pneumonia and other life threatening complications.

7.5 Reasons for Emergence

Some of the major reasons for emergence include:

- Changes in food consumption behaviour (e.g. increased consumption of salad with raw ingredients);
- Global distribution of foods;
- Expansion of commercial food services;
- New methods of large-scale food production;
- Changing demographic profile of the population (ageing; people with lowered immunity such as AIDS patients);
- Increasing mobility of the population;
- Greater strain on public health infrastructure; and
- Indiscriminate use of antibiotics resulting in antibiotic-resistant strains of pathogens.



7.6 Measures for Prevention

Some critical measures we can take for prevention include:

- Implementation of Hazard Analysis Critical Control Point (HACCP) strategies and taking appropriate food safety measures;
- Coordinated effort by production, processing, transportation and preparation industries to prevent food-borne disease;
- Education on importance of hand washing and risk of cross contamination.

General guidelines for prevention of food-borne illnesses include:

- Thoroughly cook raw food from animal sources, such as beef, pork, or poultry.
- Wash raw vegetables and fruits thoroughly before eating.
- Keep uncooked meats separate from vegetables and from cooked foods and ready-to-eat foods.
- Avoid unpasteurized (raw) milk or foods made from unpasteurized milk.
- Wash hands, knives, and cutting boards after handling uncooked foods.
- Consume perishable and ready-to-eat foods as soon as possible.
- Refrigerate or freeze foods to slow down the growth of microbes.

Key Terms

Arthritis: Inflammation of a joint

Autoimmune disorders: A disease in which the body produces antibodies against substances naturally present in the body

Cocci: Spherical (here referring to cocci or spherical shaped bacteria)

Electrolyte imbalance: A disturbance in the balance of salts of sodium, potassium, chlorine etc. in the blood, tissue fluids and cells

Encephalopathy: Any dysfunction of the brain

Enteric: Pertaining to the small intestine

Entero-pathogen: Any microorganism that causes intestinal disease

Deli (or delicatessen): A shop selling cooked meats, cheeses, and unusual or foreign prepared foods

Gastritis: Inflammation of the stomach

Gastroenteritis: Inflammation of the stomach and intestinal tract

Gut flora: Microbes present in the intestine

Haemolytic uraemic syndrome: An acute condition, which occurs mostly in children, in which there is anaemia due to breakdown of red blood cells and degenerative changes in the kidneys

Meningitis: Inflammation of the membranes of the spinal cord or brain

Mortality: The number of deaths in a given period

Pasteurized: Use of heat treatment to kill pathogenic and spoilage microorganisms

Septicemia: Presence of pathogenic bacteria in the blood leading to infection

Surveillance: Close observation



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YOU MUST REMEMBER TO STUDY THE COMPLETE UNITS GIVEN BOTH ONLINE AND ON CD-ROM. THEY MAY CONTAIN FURTHER DETAILS NOT GIVEN IN THIS SUMMARY VERSION. THE EXAMINATIONS WILL TEST YOU ON THE COMPLETE UNITS NOT ON THE SUMMARY VERSION.

