Unit 4 Foodborne Illness and Disease
Lesson 2: Agents and Other Forms of Transmission

Only always do in health what you have often promised to do when you are sick: Sigismund (1388-1437). Roman Emperor.¹

According to Community Nutrition: Applying Epidemiology to Contemporary Practice, infectious disease has three components: an agent, a host, and an environment that is conducive to the transmission of foodborne illness and disease. However, it is possible for an agent alone to cause a disease if the agent is a chemical or toxin (Frank, 2008, pages 8-9).²

The manner in which food-borne illness and disease are transmitted to humans is a “...chain of factors” (Frank 2008, page 263, ¶2)³ process and follows a sequence of cause and effect involving a number of variables:

food → bacteria → employee → moisture → temperature → time ⁴

Each of the elements interacts with one another to transmit illness and disease. For example, in Figure 1-1, the host represents a human, the agent is the vehicle or instrument of the illness and the process is the transmission by the agent to the host of the chemical, toxin or bacteria.

⁴ Ibid.
Figure 1-1 A conceptual model for the process by which host and agent interact within an environment (Frank, 2008, page 9)\(^5\)

When a human ingests contaminated food containing toxins or bacterial agents the process of infection begins. As Schlosser discusses in the case of the *Escherichia coli* 0157:H7 infection in Pueblo, Colorado on July 11, 1997, the onset of the disease process was within an hour of ingesting “...soft chicken tacos...” from a Mexican restaurant. From the time of food ingestion by the human host (Lee Harding), the agent (*Escherichia coli* 0157:H7) began the process of infection caused by contaminated meat from the Hudson Food Plant in Columbus, Nebraska (2007, pp. 193-194).\(^6\)

**Person to Person Transmission**

Another variable mentioned by Eric Schlosser is “Person-to-person transmission...” which “...has been responsible for a significant proportion of *E. coli* 0157:H7 illness” (2007, page 201, ¶3).\(^7\) For support of his thesis, Schlosser points to the Jack in the Box outbreak in 1997.

Roughly 10 percent of the people sickened during the Jack in the Box outbreak did not eat a contaminated burger, but were infected by someone who did. *E. coli* 0157:H7 is shed in the stool, and people infected with the bug, even those showing no outward sign of illness, can easily spread it through poor hygiene. Person-to-person transmission is most likely to occur among family members, at day care centers, and at senior citizens homes. On average, an infected person remains contagious for about two weeks, though in some cases *E. coli* 0157:H7 has been found in stool samples two to four months after an initial illness (Schlosser, 2007, page 199, ¶3-4).\(^8\)

**Other Factors**

According to Gail Frank, “Bacteria are often transferred by infected food handlers, but unsanitary equipment or storage procedures can create the problem” (2008, page 263, ¶2).\(^9\) The following agents acting in combination with one another are capable of exposing individuals and families to food-borne illnesses and disease

- **Food:** All food contains bacteria with different bacteria having different food needs

- **Bacteria:** Many bacteria are beneficial to humans and the majority of bacteria are neither beneficial nor harmful to humans.

- **Handling Procedures:** Food service workers control the amount of time and the temperature of food during preparation procedures are not followed, then food held more than 2 [sic] hours even at ideal temperatures may initiate a food-borne illness.

- **Moisture:** Water or liquid is necessary for bacteria growth

- **Temperature:** Temperatures from 45 to 140°F promote bacterial growth with fastest growth between 72 and 98°F.

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\(^5\) Ibid.


• Time: At favorable temperatures, bacteria double about every 20 minutes with contaminated foods beginning with thousands of bacteria.

(Frank, 2008, pages 265-266)\(^{10}\)

Eric Schlosser maintains that the changes in the meat packing industry are to blame, at least in part for the transmission of food poisoning to American consumers. “Although the rise in foodborne illness has been caused by many complex factors, much of the increase can be attributed to recent changes in how American food is produced” (2007, page 195, ¶3) \(^{11}\) and that the US is seeing new pathogens emerge.

This is due in part to the fact that “…newly recognized foodborne pathogens tend to be carried out and shed by apparently healthy animals. Food tainted by these organisms has most likely come in contact with an infected animal’s stomach contents or manure, during slaughter or subsequent processing” (2008, page 197, ¶1).\(^{12}\)

**Summary**

This means that the mode of transmission may not be easily detected or may not be subject to regulation since the US government can only ‘suggest’ a recall of contaminated food products and “cannot order a meatpacking company to remove contaminated, potentially lethal ground beef from fast food kitchens from supermarket shelves” (2008, page 196, ¶2).\(^{13}\) Therefore prevention of foodborne illness and disease rests primarily on the food industry controls and consumer awareness.


