The Usual Suspects: Common microorganisms causing infections in the digestive tract"

Bacteria

Gram-positive

Bacillus cereus Clostridium difficile Clostridium perfringens Listeria monocytogenes Stophylococcus aureus Streptococcus mutans

Gram-negative

Compylobacter jejuni Escherichia coli O157:H7 Other Escherichia coli Helicobacter pylori Salmonella species Shigella species Vibrio cholerae Yersinia enterocolitica

Fungi

Candida albicans

Viruses

Epstein-Barr virus Hepatitis A Hepatitis B Hepatitis C Hepatitis E Mumps virus Rotavirus

Protozoa

Cryptosporidium Entamoeba histolytica Giardia lamblia

Case 5.1

You are at dinner with four of your friends. A local outbreak of *Escherichia coli* 0157:H7 has been in the news. The news stories suggest that the source of the infection was unpasteurized apple cider, but the group wants to know if hamburgers are safe. They remember that there was a big outbreak of *E. coli* associated with burgers from a fast-food restaurant in the Northwest. They turn to you, since you are a nurse. You tell them to order steaks. They ask if you're buying!

- 1. Why steaks instead of hamburgers?
- 2. One of your friends acts disgusted and says she'll order a salad instead. Will this guarantee her safety? Why or why not?
- 3. One of your friends says that her sister gives her baby apple juice every day. Should she stop? Explain your answer.
- 4. What are the symptoms of *E. coli* 0157:H7 infection?
- 5. Another friend says that his family has always eaten rare hamburgers and no one has ever gotten sick. He thinks it's all a bunch of overblown media coverage and says he will continue to eat his favorite delicacy, raw hamburger meat on crackers. What should you tell him?

Case 5.2

Last week you were on a clinical rotation at the local hospital as part of your second-year nursing program. On this rotation, your instructor took a hands-off approach and left you on your own for hours at a time. You spent most of your time hanging around at the nursing station, following nurses as they went about their duties from bed to bed, and listening to conversations between doctors, and nurses about patients.

Then, one day one of the nurses who had just emerged from his fourth trip to the bathroom collapsed behind his desk. He had been losing weight and today looked, especially pale. You ran to get the attending physician who was just across the hall. He took one look at the prostrate nurse and said something like "see dif" to the nursing instructor who had arrived on the scene. She replied that he had been on multiple antibiotics for the past few months in an attempt to treat a particularly nasty sinus infection.

After the sick nurse is transferred to a bed. Your instructor asks you for a written report on the condition. You didn't want to admit that you weren't really sure what condition was involved here, so you figured you could look it up in your books or on the internet at home.

- 1. Your Internet search of all kinds of different spellings of "see dif" yields nothing. What section of your microbiology text would likely contain the help you need? What clues lead you in that direction?
- 2. Now that you've found the right category of infections, can you identify what "see dif" is?
- 3. Your book has only a small paragraph on this infection. But now you know what to search for on the Internet to find more Information. Your instructor wants you to report on the epidemiology of this infection. You find that it is referred to as an opportunist and this accounts for its epidemiological patterns. First of all, what is an opportunist?
- 4. Part of an epidemiological description of an infection involves knowing who is most often affected by it. Let's consider opportunistic infections as a group. People in which age groups are most likely to suffer symptoms from an opportunistic infection?
- 5. In this case the affected nurse is in his mid-30s. Is it his age or something else that predisposes him to the infection? Discuss.
- 6. What is the major virulence factor for this microorganism?

Note on using the Internet for research purposes: Always be sure that you use a reliable website, such as the Centers for Disease Control site, www.cdc.gov. You will probably find hundreds of sites from other sources, such as class notes posted by professors from various universities and student reports, as well as information from pharmaceutical companies that are marketing drugs to treat the infection. Your search may even return personal web pages of people who have suffered from the disease. This information may or may not be reliable.

Case 5.3

Your sister Pam called you last night, upset about her recent visit to the pediatrician (she has a 3-year-old son). Actually, she was upset about the discussion she had afterward with her husband, who was adamantly opposed to having their son vaccinated against hepatitis B virus (HBV). Pam called you because the doctor had convinced her that it was necessary, and indeed routine, to vaccinate young children. Her husband believes that hepatitis B is mostly acquired through sexual contact and drug use and that it's ridiculous to vaccinate a 3-year-old. Pam wants your advice before continuing this discussion with her husband.

- 1. First of all, is Pam's husband correct about transmission of the virus? Elaborate.
- 2. How severe is this infection for young children?
- 3. Pam says she'll also remind him that in the last year the newspapers have reported at least three hepatitis outbreaks traced back to restaurants. Respond to her statement.
- 4. While you're on the phone with Pam, her husband comes home from work. He hears your conversation, and says in a loud voice, "That vaccine is not safe! It's one of those genetically engineered things!" What can you tell Pam about how the vaccine is made, and whether it is safe or not?

Case 5.4

One summer in the late 1990s, a, group of tourists from the United Kingdom became ill after they all stayed at the same hotel in Greece. Epidemiologists conducted surveys among all the people who had stayed at that hotel during the two-and-a-half week period in which people were reporting their illnesses. They did this in an attempt to determine the cause of the symptoms, which were primarily diarrhea and nausea. They surveyed 23 people; 224 of them reported ill while they were still on vacation or shortly after their return. Their diarrheal symptoms lasted 10-15 days.

Seventy of the 224 people who reported illness were classified as having definite cases of gastrointestinal disease. A case was called "definite" when a pathogen could actually be recovered from their stool. Of these, the vast majority tested positive for one particular microorganism.

- 1. Microscopic analysis of the stool samples revealed the presence of small oval-shaped structures, with defined outer walls and two to four nuclei inside that looked like seeds. What is your diagnosis?
- 2. What organisms should be included in the differential diagnosis of this infection?
- 3. What feature of the symptoms suggests that the causative organism is not likely to be *Staphylococcus aureus*?
- 4. Epidemiologists interviewed the patients about their vacation activities and food intake to try to identify the environmental source of the infection. There was no relationship between illness and a person's attending one of the scheduled children's activities at the hotel. Only two types of food available in the dining room seemed to be associated with the illness: raw vegetables and salads. There was also a statistically significant relationship between illness and having consumed orange juice made from a mix (with hotel water). So what was the likely source?
- 5. Why would an epidemiologist even ask about a person's attendance at children's activities?
- 6. Are there any symptoms that would help to distinguish this kind of diarrheal illness from others?

Case 5.5.

On Christmas Eve a few years ago, the Ohio State Health Department announced that two elderly people had died during the previous six weeks, apparently after ingesting tainted meat. Ten additional nonfatal cases were reported in the state during this period.

The state epidemiologist was aware of a national outbreak of a disease with the symptoms seen in these cases. The symptoms included fever and muscle aches and often diarrhea and nausea. Occasionally, the central nervous system was affected, resulting in confusion, stiff neck, headache, and convulsion.

The nationwide outbreak affected approximately 40 people, with a particularly high infection rate in pregnant women and a significant number of deaths among fetuses. The Centers for Disease Control and Prevention (CDC) issued a list of people who were at particular risk for the disease. These included pregnant women, newborns, people with weakened immune systems, and the elderly.

The CDC and the U.S. Department of Agriculture suspected prepackaged meats, such as hot dogs and cold cuts, as the source of the outbreak. A recall of meat processed at a particular plant in Michigan was instituted.

- 1. What is the most likely causative microorganism in this outbreak?
- 2. Why is this infection associated with processed meats, but usually not with hamburger or cuts of meat including pork, beef, or chicken?
- 3. Epidemiologists describe a microorganism! **Pathogenicity** as the proportion of people who become ill after being exposed to the microorganism. (An infection that is **sub clinical** in most people who acquire it is considered to have low pathogenicity.) After considering the types of people at high risk for the disease, would you suppose that this organism has high or low pathogenicity? Explain your answer.

Case 5.6

You are working as a receptionist at the only family practice in a small town in northern Arizona while you are studying to become a physician's assistant. On a Saturday morning you are the only office worker there when a call comes in from a local church. The congregation is hosting a family that moved to the United States from Peru six weeks ago and is helping them find housing and work, In the mean time, the family is staying at a church-owned house and relying heavily on church members for help negotiating this new country and for translation while their English is still sketchy.

The woman on the phone identifies herself as Leslie, a church member. She seems distraught. She says that the mother of the young family became ill yesterday and seems extremely ill now. Her symptoms started out as stomach cramps and quickly progressed to a very watery diarrhea. You hear moaning in the background and Leslie tells you that the patient is pointing to her calves and crying. You ask Leslie how many stools the sick woman has had in the last 12 hours. She replies that it is almost constant and that the woman can no longer leave her bed at all

When asked, Leslie says there is no blood in the excreta. It is very clear with lots of little white flecks in it. You put her on hold and run down the hall to the examining room where a physician is doing a well-baby check.

- 1. When the doctor opens the door you whisper that you think there's a case of on the phone.
- 2. The doctor's eyes widen and she asks you how you came to that conclusion. What is your reply?
- 3. Why was the doctor initially dubious about your diagnosis and why does the patient's recent immigrant status convince her that your diagnosis was correct?
- 4. The doctor asks you to tell Leslie to call 911. The sick woman should be transported to an emergency room right away and the doctor will call ahead and meet her there. What is the first intervention likely to be performed when the patient arrives?
- 5. The incubation period for this disease is one to four days. Can you think of any way that the young mother could have been infected so recently even though she has been in this country for six weeks?
- 6. The next day you ask the doctor about the patient's status. She says that currently the patient is receiving a course of the antibiotic ciprofloxacin, though it won't help her. Why won't it help her and why was it prescribed if it won't?

You went to get a haircut yesterday and your stylist was having a conversation with another stylist in the shop. The second stylist said that her live-in boyfriend of three years got a blood test and discovered he has hepatitis C. Then she shrugged her shoulders and said her boyfriend has never had any symptoms so she wasn't going to worry about it.

- 1. After the second stylist walks away, your stylist asks you about hepatitis C. Her first question is, "is it serious?" Answer this question as thoroughly as you can.
- 2. How is it transmitted?
- 3. Can she be vaccinated against it?
- 4. Your stylist has heard of hepatitis A and hepatitis B, but never hepatitis C. Is it new? Explain,

Case 5.8

When you arrived at work in the intensive care unit this morning. You learned that a patient with Guillain-Barre syndrome had been admitted. He is a 45-year-old poultry farmer. He is on a respirator and has **bilateral** paralysis of his legs. You remember that Guillain-Barre syndrome is a result of the immune system attacking the peripheral nervous system.

- 1. What leads to Guillain-Barre? What would you look for in the patient's history?
- 2. Considering this patient's profession, what type of condition do you suspect as the **precipitating** event?
- 3. Is Guilllain-Barre often fatal?
- 4. What about the original infection, which you identified in question 2? Is it common or uncommon?