Case Study: Peptic Ulcer Disorder (PUD)

1. In which of the following occupations, low stress or high stress, do you expect the highest incidence of PUD? Explain.

High Stress Occupations

- Inner city high school teacher
- Police officer
- Miner
- Air traffic controller
- Medical intern

Low Stress Occupations

- Forester
- Toolmaker
- Repairperson
- Natural scientist

2. Spiral-shaped bacteria were first observed in excised stomachs in the 1940's. This observation generated little attention until 1975 when, using fiber optic technology, these bacteria were also observed in living stomachs. This bacterium has been identified as *Helicobacter pylori*. Hypothesis: PUD is caused by *H. pylori* infection, not stress. Do the following data support this hypothesis? Explain. To help support your conclusion, calculate the attack rate - in other words, calculate the percent of patients that develop ulcers in the presence and absence of *H. pylori*.

	Patients with Ulcers	Patients Without Ulcers	Attack rate
H. pylori present in stomach	27	2	
H. pylori absent in stomach	4	29	

3. Calculate the relative risk of developing an ulcer (PUD) when infected with *Helicobacter pylori*. *Relative Risk* = attack rate when *H. pylori* is present divided by the attack rate when *H. pylori* is absent. Relative Risk = _____. What does this value tell you?

4. Hypothesis: Since ulcers are associated with bacterial infection, antibiotic treatment should cure the symptoms. Individuals treated with an acid suppressor should experience little improvement. Examine the data below. Calculate the relapse rate (*i.e.*, what percent of the patients had a relapse after each treatment. What do you conclude about your hypothesis?

Treatment	Relapse after 3 months	Healthy after 3 months	Relapse rate
Acid suppressor	16	5	
Antibiotics	1	16	

5. Koch's postulates are the classic method to demonstrate that an organism is the suspected causal agent of a disease. According to Koch, to prove that an organism is a pathogen: (1) there must be a consistent association of the organism with the occurrence of the disease; (2) the organism must be isolated from a diseased individual; (3) re-introducing the suspected pathogen to a healthy individual should cause the disease; and (4) it should be possible to re-isolate the suspected pathogen from an inoculated individual. Describe how *H. pylori* could be proved to be the causative agent of PUD according to Koch's postulates.

6. What treatment do you recommend for PUD?
      a. an antacid   c. an acid suppressor
      b. a bland diet   d. an antibiotic

7. Which group would you expect to have the highest incidence of PUD? Explain.
      a. US population before 1950   b. US population after 1950

8. *H. pylori* has been implicated as a cause of stomach cancer. Which group do you expect to have the highest incidence of stomach cancer?
      a. adults in developing countries   b. adults in developed countries

9. *H. pylori* produces the enzyme urease that converts urea to ammonia. Of what value is ammonia to the bacterium?

Reference:
      This exercise was largely adapted from an article by Christine Case, "Myth Provides Problem-Solving Opportunity," pp 4 – 5, in a newsletter by Benjamin Cummings Publishers. Unfortunately, I ripped the article out of the newsletter and neglected to write down the specific citation. If anyone knows the full citation, please let me know.