

Technological Advances in Treating Diabetes

Diabetes is becoming a more common medical condition in Canada as a result of increasingly sedentary lifestyles and an ageing population. **Figure 10.19** shows a steady increase in the number of Canadians with diabetes over a seven-year period. According to Statistics Canada, from the period 2001 through 2008, men were more likely than women to report that they had diabetes. In 2008, the incidence of diabetes ranged from 0.3% at ages 12 to 19 to 16.0% for seniors (65 or older). At ages 20 to 34, women were more likely than men to have diabetes (1.1% versus 0.6%), but by age 55 men were more likely than women to be diabetic.

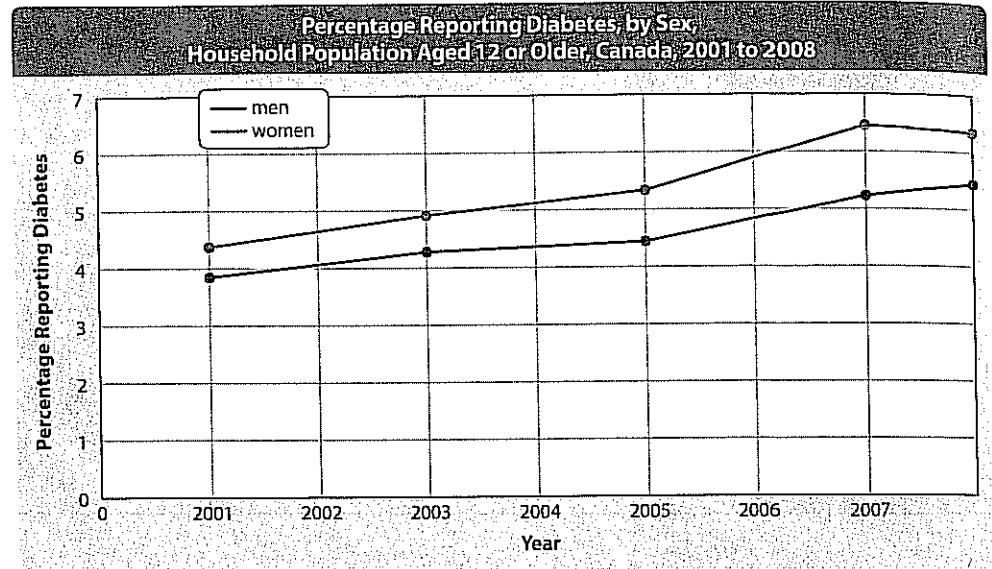


Figure 10.19 Survey respondents were asked to report diabetes that had been diagnosed by a doctor, so type 1, type 2, and gestational diabetes are all included in these percentages.



Figure 10.20 Human DNA with instructions for making insulin can be added into this bacterial plasmid, resulting in recombinant DNA. Once the recombinant DNA is inserted into bacteria, the bacteria begin to produce human insulin.

According to the Public Health Agency of Canada, the risk factors for diabetes also include being of advanced age, having a family history of the disease, and belonging to certain high-risk ethnic groups (Aboriginal peoples and people of African, Asian, Hispanic, and Pacific Island descent). To meet a growing demand for improved treatment for diabetes, scientists have developed several new technologies, described below.

Manufacturing Human Insulin

Until the early 1980s, insulin used to treat diabetes was extracted from pigs or cattle. However, the human body treats these kinds of insulin as a “foreign” contaminant, and injections of this type of insulin eventually trigger an immune response. The immune response is how the body recognizes and defends itself against bacteria and other harmful substances.

The development of genetic engineering during the 1990s allowed pharmaceutical companies to manufacture human insulin using bacteria and modified bacterial *plasmids*, as shown in **Figure 10.20**. A plasmid is a circular molecule of DNA that is commonly found in bacteria. Large vats of genetically engineered bacteria produce human insulin in the lab, and this is now the main source of insulin for people with diabetes in Canada.

QUIRKS & QUARKS

with BOB McDONALD



THIS WEEK ON QUIRKS & QUARKS

Do You Really Need Your Appendix?

Today, every known human body process is at least partly understood by doctors and scientists. Many of the mysteries of circulation, respiration, and digestion have been solved. One organ, however, still has biologists stumped: the appendix. Humans have this small pouch at the intersection of the small and large intestines. What is it for?

Dr. William Parker, a professor of surgery at Duke University in North Carolina, USA, and his colleagues think they have solved the mystery, and Bob McDonald interviewed him on Quirks and Quarks to hear their theory.

Is the Appendix a Safe Haven?

Dr. Parker admitted that he and his colleagues were not all that interested in the appendix when they began their research. They were trying to find out how the immune system interacts with the normal ("good") bacteria found in the intestines. The intestines contain more than 100 different species of bacteria, with numbers in the billions. The bacteria aid in digestion

and absorption of food. They also help keep out "bad" bacteria that make people sick.

If the bad bacteria are present in the intestines in large numbers, the immune system triggers a reaction that cleans out the intestines—taking out the lining and everything else in an effort to flush out the bad bacteria. (We call this diarrhea.) This approach is very effective, but once the bad bacteria are gone, how do we get the good bacteria back in there?

Dr. Parker and his colleagues found evidence of large populations of good bacteria around the appendix. They think that this little pouch is ideally situated—out of the way of intestinal clean-outs—to provide a place for good bacteria to stay until the bad bacteria have been cleaned out. Parker says when it is safe, the good bacteria can emerge from the appendix to re-populate the intestines.

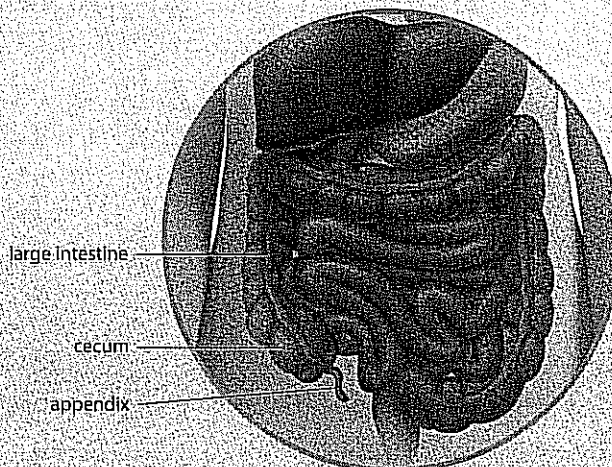
Related Career

Nutritional counsellors create personalized food, supplement, and lifestyle plans to help their clients achieve optimum health. Clients can range from children to seniors to professional athletes. Training to become a nutritional counsellor includes studies in anatomy, basic biochemistry, nutritional support of body systems, and environmental influences on health and disease.

Go to [scienceontario](http://scienceontario.com) to find out more



An Inflamed appendix will likely burst if it is not removed.



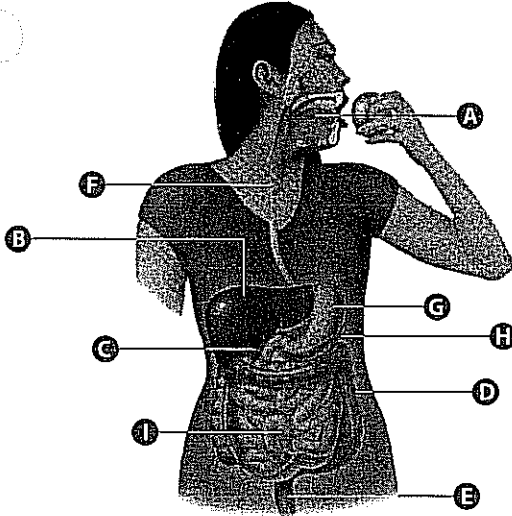
QUESTIONS

1. Why is the function of the appendix, as proposed by Dr. Parker and his colleagues, particularly important for people living in developing countries?
2. Use the Internet or print resources to research careers in the field of natural and holistic nutrition.

Section Summary

- Ulcers in the alimentary canal are primarily caused by the bacteria *Helicobacter pylori*.
- Inflammatory bowel disease is a group of chronic diseases that cause inflammation in the intestines.
- Technological advances such as medical imaging technology and endoscopy enable doctors to diagnose and treat many diseases of the alimentary canal without the need for invasive surgery.
- The pancreas secretes insulin that regulates the absorption of glucose from the small intestine; diabetes results when there is insufficient insulin to regulate blood glucose levels.
- Genetically engineered human insulin and computerized insulin pumps are some of the technological innovations used in the control and maintenance of blood glucose levels.

Review Questions

1. **(K/U)** What is a peptic ulcer?
 2. **(K/U)** Use the figure below to answer the following questions.
 - a. Identify the body part(s) where an ulcer can occur.
 - b. Identify where Crohn's disease occurs in the body.
 - c. Which body part(s) does colitis affect?
 - d. What organ does hepatitis target?
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3. **(C)** Create a table that compares the causes of, symptoms of, and treatments for the following digestive system disorders: ulcers, inflammatory bowel disease, cirrhosis, and gallstones.
 4. **(A)** Your friend may have a stomach virus and she vomits violently in class. She is concerned because she sees a green tint in her vomit. What do you suppose that is? Explain your answer.

(A) List five important questions that a gastroenterologist (a medical doctor who specializes in digestive disorders) should ask every new patient prior to diagnosis or treatment.
 5. **(V)** Diseases of the liver can be fatal. Why is the liver such an important organ?
 6. **(K/U)** Summarize the differences between a traditional endoscope and a capsule endoscope.
 7. **(K/U)** Why might an endoscope be used for retrieving foreign objects in the alimentary canal?
 8. **(C)** Create a Venn diagram that compares the costs and benefits of using capsule endoscopy as compared to traditional endoscopy for detecting gastrointestinal disorders.
 9. **(K/U)** What are the three types of hepatitis, and how is each type contracted?
 10. **(A)** For health reasons, particularly to fight cancer, certain organs of the digestive system may be removed or altered. Which organs are vital to digestion and, thus, could not be removed?
 11. **(C)** Make a table to compare and contrast the advantages and disadvantages of using self-delivery insulin injections compared with using a computerized insulin pump.
 12. **(A)** Occasional heartburn afflicts many people. What causes heartburn, and what can people do about it?
 13. **(V)** Your friend complains about having hard stools, infrequent bowel movements, and difficulty having bowel movements. What diagnosis would your friend's doctor probably make based on these symptoms? What advice would the doctor likely provide to relieve these symptoms?
 14. **(A)** An older friend of the family has just had her gall bladder removed. Describe the kind of diet you think she would be wise to follow.
 15. **(V)** Why do you think the incidence of diabetes is generally higher among elderly people than in younger people?