

Hepatitis A & B

Case #8

Jon and Laura Green are siblings sharing similar symptoms. Both have a yellow tinge to their skin and the whites of their eyes. Both have flu-like symptoms. Jon, however, has been living in Brazil while Laura has been in San Francisco. Is this a weird sibling connection? Find out what's causing their unusual symptoms in Case #5.

Case Objectives

- 1) Review [liver structure and function](#). (Use your anatomy and physiology text as well as this internet site to help with your review). Include in the review the following functional aspects:
 - a. Define the function of hepatocytes.
 - b. List the important enzymes produced by the liver and their primary function.
 - c. Define the role of the liver in bilirubin (bile) metabolism.
 - d. List the key substances produced by the liver.
 - e. Define immunoglobulin.
- 2) Review the basic nature of a [virus](#) and provide:
 - a. Definition of a virus
 - b. Description of viral replication
 - c. Mode of viral pathogenicity (i.e. how does it destroy cells and subsequently tissue).
- 3) Briefly describe the following components of viral hepatitis:
 - a. target organ/cells
 - b. modes of acquiring type A, B and C
 - c. at-risk populations, behaviors contributing to acquiring viral hepatitis
 - d. general symptoms
- 4) Define the following terms:
 - a. Jaundice
 - b. Endemic
 - c. Infectious Disease
 - d. Dehydration
- 5) Describe the roles of the following healthcare practitioners in the diagnosis and treatment of viral hepatitis.
 - a. physician (internist)
 - b. physician (infectious disease specialist)
 - c. registered nurse
 - d. clinical laboratory personnel
- 6) Discuss the options for prevention of A, B and C viral hepatitis.
- 7) Discuss the options for treatment of A, B and C viral hepatitis.
- 8) Define the following as they relate to viral hepatitis.
 - a. Jaundice
 - b. the liver enzymes ALT and AST
 - c. bilirubin levels in the blood
 - d. Anti-HAV IgM serum immunoglobulin
 - e. Anti-HAV IgG serum immunoglobulin

- f. Anti-HBsAb surface antibody
 - g. HbsAg surface antigen
 - h. Hepatitis vaccine(s)
 - i. Hepatitis B immunoglobulin (HBIG)
- 9) Define the precautions health care personnel must use to protect themselves, and prevent the spread of viral hepatitis. Review the [essentials of universal precautions](#) and patient confidentiality since these are applicable to all health care professionals.
- 10) Define the key diagnostic testing parameters used in the diagnosis of viral hepatitis and how these tests differentiate viral hepatitis from other forms of liver disease.

Instructor's Note for Hepatitis Case

This case is actually two separate cases that address viral hepatitis. This format was selected because many of the clinical, diagnostic and therapeutic parameters are very similar. The probability that two members of the same household acquired two separate forms of viral hepatitis is very small, but it does serve to illustrate the key medical issues surrounding these prevalent and infectious liver diseases. Click here to review the basic nature of a [virus](#)

- 1) *What is a virus?*
- 2) *How is viral replication different than other living organisms?*
- 3) *How does a virus destroy the cells it inhabits?*
- 4) *What type of cells is the hepatitis virus specific for?*

The Cases

For the past several months, 22 year old Jon Green had been serving a church mission in an area close to San Paulo, Brazil when he began to exhibit several symptoms. Among them were increasing fatigue, nausea with vomiting, and increasing [jaundice](#). Jon also had intermittent periods of fever and chills. Additionally, he complained of abdominal pain.

- 5) *Define jaundice.*
- 6) *Where does bilirubin come from?*
- 7) *Why are individuals infected with the hepatitis virus jaundiced?*
- 8) *What are Jon's symptoms?*

At his parents request, the decision was made to send Jon back to his home near Houston, TX. In the meantime, Jon's sister, 20 year old Laura Green had visited with relatives in late May near the San Francisco, CA area where she and some friends attended a musical concert. After the concert, and on a whim, Laura decided to have her navel pierced. Although the pierced area was slightly inflamed and sore for several days, it seemed to heal well and she returned home. Now, nearly four months later during the last part of September, Laura, usually active and full of energy, began to feel increasingly tired and ate very little. As a result, she began to lose weight and experienced intermittent episodes of vague aching in the abdominal area.

- 9) *What are Laura's symptoms?*
- 10) *How do these symptoms differ from Jon's?*

When Jon arrived home, Jon and Laura's father arranged for both of his children to see Dr. Lyon, a medical doctor specializing in internal medicine. These specialists are commonly referred to as internists.

Dr. Lyon suspected immediately both Jon and Laura had acquired [viral hepatitis](#). His suspicions were based on their physical examination and recent histories. John had lived in an area of the world where viral hepatitis is [endemic](#), whereas Laura had been exposed to the risk of hepatitis through having her navel pierced under unknown conditions. Dr. Lyon then consulted with his colleague Dr. Smith, also an internist but with a specialty in diagnosing and treating [infectious diseases](#). Dr. Smith also suspected both the Green siblings had acquired viral hepatitis. Jon was quite ill and his skin and whites of his eyes appeared more jaundiced.

- 11) *Define Hepatitis*
- 12) *List 4 functions of the liver*
- 13) *Which type of hepatitis causes an acute disease but not a chronic?*
- 14) *Which type of Hepatitis is spread through blood transfusion, sexual contact, and needles?*
- 15) *Which type of Hepatitis is spread through feces via contaminated food and water?*
- 16) *Approximately 90% of transfusion-associated hepatitis is spread through what type?*
- 17) *Why is Hepatitis A considered endemic to the region where Jon contacted it?*
- 18) *What is a carrier?*
- 19) *When does Hepatitis become an infectious disease?*

Dr. Lyon ordered the following laboratory tests on both Jon and Laura Green:

CBC

Urinalysis

Chemistry panel to include [Liver enzymes and bilirubin](#).

- 20) *Which of the liver enzymes is the most specific for hepatocyte damage?*
- 21) *Which hepatitis symptom is directly linked to an elevated bilirubin level?*
- 22) *Why is bilirubin elevated in hepatitis?*

At the same time, he admitted both Jon and Laura to the hospital for observation. Jon, in particular, needed treatment for [dehydration](#) due to a prolonged period of vomiting and diarrhea.

- 23) *Define dehydration.*
- 24) *What organs can be affected by dehydration?*
- 25) *How is dehydration treated?*

[Jon's Chemistry Panel](#)

[Laura's Chemistry Panel](#)

- 26) *Compare Jon and Laura's chemistry panels. How are they similar. How are they different? Why?*

[Jon's Hepatitis Screening Panel](#)
[Laura's Hepatitis Screening Panel](#)

- 27) *What is the test of choice for diagnosing Hepatitis A? Is this test looking for an antigen or antibody?*
28) *Which 2 tests are ordered to confirm an acute infection with Hepatitis B? Are these tests looking for antigens or antibodies?*

Treatment

Since Jon's diagnosis was confirmed by his immune response to the presence of the virus, the physicians agreed that treatment for dehydration was the most appropriate course of action. Jon was given intravenous fluids for one day and released from the hospital. He was prescribed bed rest. Follow-up laboratory tests showed a steady and eventual full recovery.

Laura, on the other hand had acquired [hepatitis B](#), and with it the potential of more serious side effects. In some patients with underlying medical problems, there is the ability to reduce the possibility of long term effects by administering [alpha interferon](#), (click on interferon) a relatively new substance available for reducing the tendency to become a carrier of hepatitis B. Since she was essentially a healthy young person, she was released, prescribed bed rest and good nutritional habits were recommended. Follow-up liver tests showed a steady improvement in Laura's liver function. Unfortunately, as with other post hepatitis B patients, the possibility of transmission to others remains present.

- 29) *What are some of the possible long term consequences from chronic hepatitis?*
30) *How is Hepatitis A treated differently than Hepatitis B? How are the treatments similar?*

Case Summary

[Review Viral Hepatitis](#)

- 1) Viral hepatitis was seen in two siblings. Jon acquired hepatitis type A in an endemic area from ingesting food or water containing contaminated human fecal matter. Laura contracted type B hepatitis from a navel piercing from unsanitary conditions. Either the equipment was contaminated or the person(s) involved in the piercing procedure were carriers of the virus, or possibly both.
- 2) The symptoms of the various forms of hepatitis are very similar. They include nausea, vomiting, weight loss, jaundice and tiredness among others.
- 3) The diagnosis of the disease was made by two medical doctors specializing in internal medicine. One had a sub-specialty in infectious diseases. The elevated liver enzymes indicated damaged hepatocytes and subsequent diminished liver function. Both patients showed some jaundice due to a build-up of bilirubin in the skin. Tests showed the presence of the virus because the immune system reacted to the virus's presence by forming antibodies, or by demonstrating viral particles circulating in the patient's serum. As you recall, the IgM immunoglobulin class of antibodies appear early in the course of the disease then gradually decline. On the other hand, IgG antibodies rise later and are those responsible for lasting immunity.

- 4) Treatment consisted of replacing fluids lost through dehydration from vomiting and diarrhea. Rest and nourishment eventually restored both patients to a healthy state. In some patients, the administration of the substance alpha-interferon may improve the course of the disease, particularly with hepatitis B and C.
- 5) The prognosis for recovery from hepatitis is very good, especially in otherwise healthy individuals such as Jon and Laura.
- 6) Prevention is based on avoidance of risk factors. Hepatitis B protection can be acquired through a vaccine. In most states, it is required for all health care professionals. Additionally, a vaccine for hepatitis type A is available. Unvaccinated individuals should exercise caution when in endemic areas by avoiding possibly contaminated food and drink from unreliable sources.
- 7) Two physicians collaborated in this case to form a diagnosis. Both had specialties in internal medicine, but one of the physicians also had a specialty in infectious disease. Nurses were responsible for treating many of the symptoms including administering medications and intravenous fluids. Clinical laboratory scientists were responsible for the liver function tests as well as the diagnostic hepatitis antigen and antibody tests.

Answers to Case Questions

Question 1

A small capsule that encloses proteins.

Question 2

A virus needs a host to reproduce.

Question 3

Replicates until the cell bursts.

Question 4

Liver (hepatic) cells.

Question 5

Yellowish staining of the skin and sclerae (the whites of the eyes) by abnormally blood high levels of the bile [pigment bilirubin](#).

Question 6

When red blood cells are broken down by the body, hemoglobin, the oxygen carrying portion of the red blood cell, is broken down to a protein, bilirubin. The liver processes the bilirubin.

Question 7

The hepatitis virus infects the liver cells, damaging them. The liver is unable to efficiently breakdown bilirubin which is elevated in the bloodstream causing jaundice.

Question 8

Fatigue, nausea with vomiting, jaundice, fever and chills, and abdominal pain.

Question 9

Fatigue, decreased appetite, weight loss, aching in abdominal area.

Question 10

Laura's symptoms are much more vague than Jon's.

Question 11

Hepatitis is an inflammation of the liver.

Question 12

The liver:

- a) Manufactures essential proteins
- b) Acts as a storage unit for sugars, vitamins and fats.
- c) Transforms smaller compounds into larger ones such as cholesterol.
- d) Purifies the blood.

Question 13

Hepatitis A

Question 14

Hepatitis B

Question 15

Hepatitis A

Question 16

Hepatitis C

Question 17

Because of poor sanitation, water and food may be contaminated with human feces. People that eat or drink in this region have a high risk of becoming a carrier of Hepatitis A or becoming symptomatic.

Question 18

A carrier is asymptomatic but "carries" an infectious organism such as hepatitis. A carrier is often not aware that they are carrying an infectious organism because they are not symptomatic. The disease is spread through poor hand washing or poor sanitation. This is why people who work with food must be so careful to wash their hands.

Question 19

When the organism produces sufficient tissue damage through many different mechanisms, the definition of infectious disease applies.

Question 20

ALT

Question 21

Jaundice.

Question 22

When the liver cells are damaged, they cannot properly break down bilirubin.

Question 23

Dehydration is a loss of water and important salts like potassium (K⁺) and sodium (Na⁺).

Question 24

Kidney, Brain, and Heart.

Question 25

Treat the underlying cause of the dehydration and replace fluids.

Question 26

Jon and Laura both have elevated liver enzymes, bilirubin, and a slightly decreased albumin level indicating liver damage. The differences in their enzyme and bilirubin levels are due to individual differences in their reactions to the disease. The key point is that the abnormal results of the combined tests point to liver damage and hepatitis.

Question 27

Anti HAV IgM. Looking for an IgM antibody.

Question 28

HbsAg and anti HBcIgM. This is a combination of an antigen and an antibody test. HbsAg is looking for an antigen on the Hepatitis B virus. HBcIgM is looking for an IgM antibody against the Hepatitis B virus.

Question 29

Chronic infections can lead to scarring of the liver, liver cancer, liver failure, and death.

Question 30

Acute symptoms are treated in both forms of hepatitis. This would be treating symptoms such as nausea, discomfort, and dehydration. Intravenous fluids may be administered to relieve dehydration. Hepatitis B may lead to a chronic infection and may be treated with an interferon drug which helps boost the patients immune system to fight the virus.

Health Professionals Introduced in this Case

[Physician \(Internal Medicine\)](#)

[Physician \(Infectious Disease\)](#)

[Physician](#)

[Nursing](#)

[Clinical Laboratory Scientist](#)

Additional links of Interest

Instructor's Note:

Listed below are several additional links to web sites applicable to the case. In some instances the information is the same or similar to what you have already seen, but may be presented in a different style or format. Students often appreciate and learn from these additional resources.

[CDC hepatitis page](#). This is from the Centers for Disease Control, the U.S. governmental agency overseeing much of the nation's health care policies and practices. It has links to other relevant sites as well. Worth a look.

[HepNet](#). This web site is produced by the Hepatitis Information Network. It is a fairly sophisticated site, but provides many useful and interesting bits of information about all forms of viral hepatitis. Some parts were used within this case study.

[Hepatitis Central](#). This site is a little higher level than most, but it provides some well written informative links on all aspects of hepatitis. Especially good with diagnostic testing, treatment and general information.