

A Case of Unintentional Overdose

The Case

Two days ago, fourteen year-old Luis Cordera felt like he was coming down with the flu and had trouble sleeping. He took some over-the-counter medicines for his headache, cold symptoms, and insomnia (difficulty sleeping). Over-the-counter medicines are legal drugs that can be purchased without a prescription from a doctor. They can be purchased at pharmacies, grocery stores, or convenience stores.

Today at school, Luis began feeling nauseous and started vomiting. His stomach hurt, he was sweating excessively, and his heart felt like it was racing. Luis's science teacher noticed that the whites of his eyes and his skin were yellowish, and he insisted that Luis go to the school nurse. The nurse called Luis's parents and told them he should be taken immediately to the emergency room at a nearby hospital.

Part 1: Completing a Patient Record for Luis Cordera

1. Use **The Case** information above to complete a patient record for Luis Cordera. List at least 5 symptoms that Luis is experiencing at school.

<i>General Hospital - Patient Record</i>	
Date of Admission: 2/12/2017	Time of Admission: 2:50 pm
Patient Name: Luis Cordera	Gender: Male Age: 14 years
Height: 65 inches (165 cm)	Weight: 115 pounds (52.2 kilograms)
Temperature: 99 °F (37 °C)	Heart Rate: 100 beats per minute
Symptoms: 	

2. Do you think that Luis has the “stomach flu” or some other health problem? Support your answer with evidence from the patient record.

Part 2: Laboratory Tests for Luis Cordera

The emergency room doctor noticed that Luis had a medical condition called jaundice. Jaundice results when too much bilirubin (pronounced *BIL-ee-roo-bin*), a yellow pigment, accumulates in the body. This causes the skin and the whites of the eyes to turn yellow. Bilirubin is processed by the liver so that it can be eliminated from the body.

Jaundice can happen for many reasons, such as blood diseases, liver diseases, digestive diseases, infections, and medicines. The doctor ordered laboratory tests on Luis's blood to help determine what was causing Luis's jaundice.

1. What is the name of the yellow pigment that builds up in the blood when a person has jaundice?

2. List at least four things that can cause jaundice.

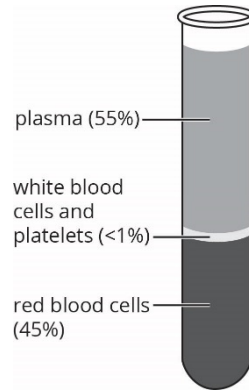
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3. Why might the doctor want to conduct laboratory tests on Luis Cordera's blood?

Follow the instructions on pages 3 and 4 to conduct each of the three laboratory tests that the doctor ordered. Record the results of the laboratory tests on the **Data Table: Laboratory Test Results** sheet on the last page of this handout. **Note: You may tear the Data Table page off to make it easier for you to record the results.**

Blood Plasma

Plasma is a pale yellow liquid that makes up 55% of the blood. It is composed of water with dissolved salts, proteins, and enzymes. The primary purpose of plasma is to transport nutrients, hormones, and proteins to the parts of the body that need them. Cells also deposit their waste products into the plasma, and the plasma in turn helps remove this waste from the body.



Plasma Bilirubin Test

- Place two drops of Luis Cordera's blood plasma sample onto the circle labeled "Plasma Bilirubin Test" on the **Laboratory Test Sheet**.
- Add 1 drop of Bilirubin Test Solution to the plasma in the circle.
- Use the **Plasma Bilirubin Test** color chart to determine the level of bilirubin in the plasma sample.
- Record the results of the bilirubin test on the **Data Table: Laboratory Test Results** sheet.
- What does the result of the plasma bilirubin test indicate about Luis Cordera's health? Record the answer to this question in the last column of the **Data Table: Laboratory Test Results** sheet.

Bilirubin testing checks for levels of bilirubin in blood plasma. Bilirubin, a yellow pigment, is a waste product of the normal breakdown of red blood cells. Higher than normal levels of bilirubin may indicate different types of liver problems. Occasionally, higher bilirubin levels may indicate an increased rate of red blood cell breakdown.

Plasma Albumin Test

- Place two drops of Luis Cordera's blood plasma sample onto the circle labeled "Plasma Albumin Test" on the **Laboratory Test Sheet**.
- Add 1 drop of Albumin Test Solution to the plasma in the circle.
- Use the **Plasma Albumin Test** color chart to determine the albumin level.
- Record the results of the albumin test on the **Data Table: Laboratory Test Results** sheet.
- What does the result of the plasma albumin test indicate about Luis Cordera's health? Record the answer to this question in the last column of the **Data Table: Laboratory Test Results** sheet.

Albumin is a plasma protein made by the liver. Albumin is a protein needed to keep the correct amount of water in the blood and body tissues. Albumin testing measures the amount of this protein in the plasma. Low levels of plasma albumin may be a sign of kidney disease or liver disease. High levels of plasma albumin may be a sign of dehydration or a high protein diet.

ALT Enzyme Test

- 14. Place two drops of Luis Cordera’s blood plasma sample onto the circle labeled “**ALT Enzyme Test**” on the **Laboratory Test Sheet**.
- 15. Add 1 strip of ALT Enzyme Test Paper to the plasma in the circle.
- 16. Use the **ALT Enzyme Test** color chart to determine the ALT enzyme level.
- 17. Record the results of the ALT enzyme test on **Data Table: Laboratory Test Results** sheet.
- 18. What does the result of the ALT enzyme test indicate about Luis Cordera’s health? Record the answer to this question in the last column of the **Data Table: Laboratory Test Results** sheet.

The ALT enzyme test measures the level of ALT enzyme in blood plasma. ALT is an enzyme that helps the liver break down proteins that can be used as a source of energy. ALT is normally found inside liver cells. If liver cells are damaged, they may release ALT enzyme into blood plasma. Therefore, ALT enzyme in blood plasma indicates liver damage.

Conclusions

- 19. Based on all of the test results, what can you conclude is causing Luis Cordera’s jaundice? Support your conclusions with at least three pieces of evidence from the **Data Table: Laboratory Test Results** sheet.

- 20. Which of the three tests provides the best evidence that Luis has liver damage? Support your answer with information provided from the test.

Part 3: What Caused Luis Cordera’s Liver Damage?

The doctor explained that knowing what caused Luis’s liver damage would help him select the best treatment for Luis. The doctor asked Luis and his parents whether Luis had used alcohol, prescription medicines, over-the-counter medicines or illegal drugs during the last few days. Luis explained that he had only used over-the-counter medicines that were in his family’s medicine cabinet. All he had taken in the last few days were medicines for his headache, fever, flu symptoms, and some medicine to help him sleep. Luis also explained that he had been careful to read the directions and take only the dose that the label indicated.

Extra Strength Pain Reliever

Luis said that he took two ***Extra Strength Pain Reliever*** caplets when he woke up, two caplets at lunch time, two caplets at dinner time, and two caplets at bedtime.

1. Look at the ***Extra Strength Pain Reliever*** label. How many mg (milligrams) of acetaminophen were in all of the ***Extra Strength Pain Reliever*** caplets that Luis took? _____

Show your calculations in the space below.

2. Did Luis follow the dosage instructions on the ***Extra Strength Pain Reliever*** label? _____

Support your answer with information from the label.

Adult Cold and Flu Formula

Luis said he took two ***Adult Cold and Flu Formula*** capsules when he woke up, two capsules at lunch time, two capsules at dinner time, and two capsules at bedtime.

3. Look at the ***Adult Cold and Flu Formula*** label. How many mg (milligrams) of acetaminophen were in all of the ***Adult Cold and Flu Formula*** capsules that Luis took? _____

Show your calculations in the space below.

4. Did Luis follow the dosage instructions on the ***Adult Cold and Flu Formula*** label? _____

Support your answer with information from the label.

Nighttime Relief

Luis said he had been having trouble getting to sleep so he took 2 tablespoons (30 mL) of **Nighttime Relief** at 10:00 pm. When he was still awake at 11:00 pm, he took another 2 tablespoons.

5. Look at the **Nighttime Relief** label. How many mg (milligrams) of acetaminophen were in all of the **Nighttime Relief** liquid that Luis took? _____ milligrams

Show your calculations in the space below.

6. Did Luis follow the instructions on the **Nighttime Relief** label? _____

Support your answer with information from the label.

The doctor explained that many people don't realize that acetaminophen is found in many over-the-counter medicines, including pain relievers, fever reducers, and cough and cold medicines. While acetaminophen is safe and effective when used as directed, there is a limit to how much you should take in one day. Adults weighing over 50 kg (110 pounds) can take a maximum dose of 4,000 milligrams per day. Taking more acetaminophen than directed is an overdose that can lead to liver damage.

7. Luis weighs 115 pounds. Did Luis take an overdose of acetaminophen? _____

Support your answer by calculating the total amount of acetaminophen Luis took. Show your work in the space below.

- Extra Strength Pain Reliever

- Adult Cold and Flu Formula

- Nighttime Relief

- TOTAL =

Some people do not realize that prescription medicines may also contain acetaminophen. Before taking over-the-counter pain medicines, it is important to read prescription labels or ask a doctor or a pharmacist to be sure the prescription medicine you are taking does not contain acetaminophen. On prescription medicine labels, acetaminophen is often listed as APAP.

8. Would it be safe for Luis to take **Adult Cold and Flu Formula** and the prescription medicine shown on the right? Explain why or why not.

<p>Town Pharmacy 1 Main Street, Townsville, NY 12345 Phone: 555-123-4567</p> <p>Dr. Haus Rx # 18475030</p> <p>LUIS CORDERA 8 East Avenue, Townsville, NY 12345</p> <p>TAKE 1-2 TABLETS BY MOUTH EVERY 4 TO 6 HOURS AS NEEDED FOR PAIN</p> <p>Hydrocodone 5 MG / APAP 325 MG</p> <p>Qty: 30 Refill: Doctor authorization required</p>	<p>APAP = acetaminophen</p>
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9. A new report from the Acetaminophen Awareness Coalition highlights common mistakes that patients often make when using acetaminophen:

- **Taking more than the recommended dose for any of the medicines at a single time.**
Did Luis do this for any of the medicines? Support your answer with specific information.

- **Taking the next dose too soon.**
Did Luis do this? Support your answer with specific information.

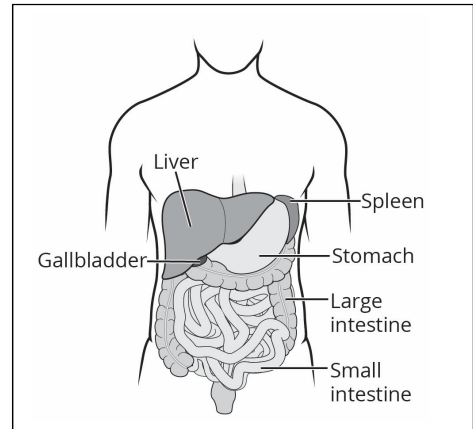
- **Using multiple products with acetaminophen at the same time.**
Did Luis do this? Support your answer with specific information.

Part 4: Why is a Healthy Liver Important?

The doctor told Luis's parents that Luis's condition was extremely serious. The results of Luis's laboratory tests indicated that his liver was severely damaged. The doctor explained that when the liver stops functioning, it is a medical emergency that requires immediate treatment.

The liver is a large reddish brown organ that sits on the right side of the belly. A healthy liver is essential for maintaining homeostasis because it:

- Removes excess sugar and amino acids from the blood.
- Releases sugar into the blood when blood sugar levels are low.
- Removes waste products such as bilirubin, ammonia, and other toxins from the blood.
- Absorbs and stores fat, sugars, vitamins, iron, and other minerals.
- Produces cholesterol that is important for cell membrane structure.
- Produces important proteins such as albumin and blood clotting enzymes.
- Breaks down (metabolizes) alcohol and many drugs.



Homeostasis is a healthy state that is maintained by the constant adjustment of biochemical and physiological processes needed to keep the body stable enough to function properly. Failure to maintain homeostasis may result in illness or death.

1. List at least five ways in which liver damage result in a lack of homeostasis for Luis.

- _____

- _____

- _____

- _____

- _____

2. Do you think that Luis can survive if his liver does not begin functioning again? Explain why or why not.

A person who took an overdose of acetaminophen usually shows no symptoms until two days after the overdose. By then it may be too late for medical treatment to be effective, and liver damage could lead to death. Luis is very lucky because he received medical treatment within one day of his acetaminophen overdose.

Luis is responding well to treatment with Acetadote, a medicine used to treat acetaminophen overdoses. Luis has been in the hospital's intensive care unit for four days. Recent tests indicate that Luis's liver function is gradually returning to normal. He is expected to return home in a week or two.

For more information on acetaminophen overdose see:

- **MedlinePlus:** Acetaminophen Overdose
<https://www.nlm.nih.gov/medlineplus/ency/article/002598.htm>
- **eMedicine Health:** Acetaminophen (Tylenol) Poisoning
http://www.emedicinehealth.com/acetaminophen_tylenol_poisoning/article_em.htm

3. Some products have safety warning labels to be certain that people understand the risks of using these products. On a separate sheet of paper, design an acetaminophen warning label that could be used on any medicine that contains acetaminophen. This label should:

- Be easily understood by someone with limited ability to read English.
- Make people aware that serious liver damage may result from an acetaminophen overdose.

Data Table: Laboratory Test Results

Laboratory Tests	Results (low, normal, or high)	Interpretation of Results: What do the results indicate about Luis Cordera's liver function? <i>Hint: Refer to the information about each test under the test title.</i>
Plasma Bilirubin Test		
Plasma Albumin Test		
ALT Enzyme Test		