



A Case of Unintentional Overdose

Core Concepts:

- Acetaminophen is a pain medicine found in many over-the-counter medications and some prescription medications.
- Acetaminophen overdose can cause liver damage.
- Liver damage can lead to serious illness or death because the liver carries out many functions critical for maintaining homeostasis.
- Acetaminophen overdose can result from taking too much of one medicine.
- Acetaminophen overdose can result from taking two or more medicines that contain acetaminophen.

Class Time Required:

2-3 forty minute class periods

Teacher Provides:

For each student

- Copy of student handout entitled **A Case of an Unintentional Overdose**
- Copy of **General Safety Precautions**. See page vii. Each student only needs a half sheet.

For each team of students

- Color copies of the three medicine labels. See pages viii through x.
- **Laboratory Test Sheet**—printed on plastic transparency. Each team only needs a half sheet. See page xi. Alternatively, you can print it on paper and place the paper strip into a plastic sheet protector.
- **Color Charts for Laboratory Tests**—printed in color. Each team only needs a half sheet. See page xii.
- 3 labeled droppers:
 - **Luis Cordera Blood Plasma**
 - **Bilirubin Test Solution**
 - **Albumin Test Solution**
- Small tube labeled **Luis Cordera Blood Plasma** containing at least 2 ml of pH 10 buffer solution. Purchase pH 10 buffer from a science supplier such as Ward's Science.
https://www.wardsci.com/store/catalog/product.jsp?product_id=8868691

- Small tube labeled **Bilirubin Test Solution** containing at least 1 ml of 0.1% methyl red solution. Purchase methyl red from a science supplier such as Ward's Science. https://www.wardsci.com/store/catalog/product.jsp?product_id=8880637
- Small tube labeled **Albumin Test Solution** containing at least 1 ml of 0.1% bromothymol blue. Purchase bromothymol blue from science supplier such as Ward's Science. https://www.wardsci.com/store/catalog/product.jsp?product_id=8868613
- Small bag labeled **ALT Enzyme Test Paper** containing ½ strip of 1-12 pH paper. Purchase from Carolina Biological Supply. <http://www.carolina.com/ph-test-papers/hydrion-jumbo-ph-strips-wide-range-ph-1-12-100-strips-per-vial-pack-5-vials/895280.pr>

Teacher Resources:

- **Your Guide to Over-the-Counter Pain Relief** slideshow discusses what to consider when taking OTC pain relievers. <http://www.webmd.com/drug-medication/otc-pain-relief-10/slideshow-pain-relievers>
- **KnowYourDose.org** from the Acetaminophen Awareness Coalition provides a variety of resources including a report and an infographic on acetaminophen use. <http://www.knowyourdose.org/>
- **Acetaminophen-Savvy resource guide: tools for teen influencers** provides resources for teachers on the safe use of acetaminophen. <http://www.talkaboutrx.org/acetaminophen/teen-influencers-landing.jsp>
- **Taking Acetaminophen Safely** is a YouTube video (approximately 2 minutes). It provides background about acetaminophen, a common over-the-counter pain reliever and fever reducer, and the many different types of medications that might contain acetaminophen; the danger of taking more acetaminophen than directed; how to learn if acetaminophen is in a medicine by looking at the Drug Facts label; and how to take acetaminophen safely <https://www.youtube.com/watch?v=cBDOx85Ywck>
- **Ten Tips to Prevent an Accidental Overdose** provides information on the importance of using the appropriate dosing devices when taking liquid medicine. <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm253338.htm>

Suggested Class Procedure:

1. Distribute a copy of **A Case of Unintentional Overdose** student instructions to each student.
2. Assign students to work in pairs to complete **Part 1: Completing a Patient Record for Luis Cordera**.
3. Several students read their answers to **Part 1**.
4. Distribute and review **General Safety Precautions**.
5. Assign students to work in pairs students to complete **Part 2: Laboratory Tests for Luis Cordera**.
6. Read the first two paragraphs of **Part 2** aloud to class.
7. Distribute laboratory materials for **Part 2** to each pair of students.
8. Students work with their partner and follow the instructions to complete **Part 2**.
9. Select students to read their answers to questions 19 and 20 in **Part 2**.
10. Distribute 3 medicine labels for **Part 3**.
11. Students work with their partner to complete **Part 3: What Caused Luis Cordera's Liver Damage?**
12. Select students to share their answers to question 7 in **Part 3**.
13. Students work with their partner or individually to complete **Part 4: Why is a Healthy Liver Important?** *Note that Part 4 may be done for homework.*
14. Several students share their answers to questions 1 and 2 in **Part 4**.
15. Display student labels created in **Part 4**. Consider having students use post it notes to "vote" for the poster was most effective. For the poster they chose, they should write one feature of the poster that made it effective.
16. Optional: The multiple choice questions on pages iv-vi may be used for homework or as a quiz.

Warning: It is essential that you maintain families' legal rights to privacy related to health and medicine use. Do not allow students to provide or discuss examples of medicines or dietary supplements used by their family members.

Note: The everyday use of the words "drugs", "medicines", and "dietary supplements" is different from the definitions used by the FDA (Food and Drug Administration). However, to help students relate the activity to their lives, we have used the words "drug" and "medicine" interchangeably.

Multiple Choice Questions – *A Case of Unintentional Overdose*

Base your answers to questions 1 through 4 on the information in the box below.

Acetaminophen is the most commonly used drug ingredient in America. It is found in over 600 over-the-counter (OTC) and prescription drugs. Many people don't realize that acetaminophen is found in a variety of their prescription and over-the-counter medicines, including pain relievers, fever reducers, and many cough and cold medicines.

When taken as directed, acetaminophen is safe and effective pain reliever and fever reducer. Like any medicine, however, there is a limit to how much should be taken in one day. The U.S. Food and Drug Administration (FDA) recommends a maximum daily dose of no more than 3,000 milligrams (mg) of acetaminophen.

Taking more acetaminophen than directed is an overdose and can lead to liver damage or death. An overdose occurs when a person takes too much acetaminophen at one time or takes a second dose before they are supposed to in an effort to help manage pain. Using multiple medications that contain acetaminophen can also result in an overdose. If a person takes an overdose of acetaminophen, they should seek prompt medical treatment by immediately contacting a doctor or a Poison Control Center.

1. Acetaminophen may be found in
 - A. Over-the-counter medicines only.
 - B. Prescription medicines only.
 - C. Both over-the-counter and prescription medicines.
2. Taking more than the recommended amount of acetaminophen may result in
 - A. Alcoholism.
 - B. Liver damage.
 - C. Fever and muscle aches.
3. An acetaminophen overdose may result when a person takes
 - A. More than one medicine that contains acetaminophen.
 - B. A medicine prescribed for another person.
 - C. 2000 mg of acetaminophen per day.
4. If you suspect that someone has taken an acetaminophen overdose,
 - A. It is a problem for children, but not for adults.
 - B. Contact a doctor or a Poison Control Center immediately.
 - C. Wait to see if you notice any unusual signs or symptoms.

Base your answers to questions 5 through 12 on the Adult Strength Acetaminophen Drug Facts label shown below.

Adult Strength Acetaminophen DRUG FACTS LABEL					
Drug Facts					
Active ingredient (in each caplet)	Purpose				
Acetaminophen 500 mg.....	Pain reliever/fever reducer				
Uses					
<ul style="list-style-type: none"> ■ temporarily relieves minor aches and pains due to: <ul style="list-style-type: none"> ■ the common cold ■ headache ■ backache ■ minor pain of arthritis ■ muscular aches ■ toothache ■ premenstrual and menstrual cramps ■ temporarily reduces fever 					
Warnings					
<p>Liver warning: This product contains acetaminophen. Severe liver damage may occur if you take</p> <ul style="list-style-type: none"> ■ more than 8 caplets in 24 hours, which is the maximum daily amount ■ with other drugs containing acetaminophen ■ 3 or more alcoholic drinks every day while using this product <p>Do not use with any other drug containing acetaminophen (prescription or nonprescription). If you are not sure whether a drug contains acetaminophen, ask a doctor or pharmacist.</p> <p>Ask a doctor before use if you have liver disease</p> <p>Ask a doctor or pharmacist before use if you are taking the blood thinning drug warfarin</p> <p>Stop use and ask a doctor if</p> <ul style="list-style-type: none"> ■ pain gets worse or lasts more than 10 days ■ new symptoms occur ■ fever gets worse or lasts more than 3 days ■ redness or swelling is present <p>These could be signs of a serious condition.</p> <p>If pregnant or breast-feeding, ask a health professional before use.</p> <p>Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away. (1-800-222-1222) Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.</p>					
Directions					
<ul style="list-style-type: none"> ■ do not take more than directed (see Liver warning) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">adults and children 12 years and over</td> <td style="width: 50%; padding: 5px;"> <ul style="list-style-type: none"> ■ take 2 caplets every 6 hours while symptoms last ■ do not take more than 8 caplets in 24 hours </td> </tr> <tr> <td style="padding: 5px;">children under 12 years</td> <td style="padding: 5px;">do not use this adult product in children under 12 years of age; this will provide more than the recommended dose (overdose) and may cause liver damage</td> </tr> </table>		adults and children 12 years and over	<ul style="list-style-type: none"> ■ take 2 caplets every 6 hours while symptoms last ■ do not take more than 8 caplets in 24 hours 	children under 12 years	do not use this adult product in children under 12 years of age; this will provide more than the recommended dose (overdose) and may cause liver damage
adults and children 12 years and over	<ul style="list-style-type: none"> ■ take 2 caplets every 6 hours while symptoms last ■ do not take more than 8 caplets in 24 hours 				
children under 12 years	do not use this adult product in children under 12 years of age; this will provide more than the recommended dose (overdose) and may cause liver damage				
Other information ■ store at 20°-25°C (68°-77°F)					
Inactive ingredients carnauba wax*, croscarmellose sodium*, hypromellose, polyethylene glycol, povidone, sodium metabisulfite*, sodium starch glycolate*, starch, stearic acid *may contain one or more of these ingredients					
Questions or comments? 1-800-809-0469					

5. According to the information on the label, acetaminophen is
 - A. An antihistamine.
 - B. A muscle relaxant.
 - C. A pain reliever and fever reducer.

6. How much acetaminophen is in one Adult Strength Acetaminophen caplet?
 - A. 500 mg
 - B. 1000 mg
 - C. 5000 mg

7. What is considered a safe dose of Adult Strength Acetaminophen that an adult could safely take at one time?
 - A. 1 caplet
 - B. 2 caplets
 - C. 8 caplets

8. How long should an adult wait before taking additional Adult Strength Acetaminophen caplets?
 - A. 4 hours
 - B. 6 hours
 - C. 8 hours

9. What is the largest number of Adult Strength Acetaminophen caplets that an adult can safely take in a 24 hour period?
 - A. 4 caplets
 - B. 6 caplets
 - C. 8 caplets

10. A person should consult a doctor before taking Adult Strength Acetaminophen if they
 - A. Consume three or more alcoholic beverages every day.
 - B. Are 12 years old and over.
 - C. Have been diagnosed with kidney disease.

11. A person should not take Adult Strength Acetaminophen if they take
 - A. Dietary supplements
 - B. Herbal supplements
 - C. Other medicines that contain acetaminophen

12. A person should stop taking Adult Strength Acetaminophen and contact their doctor if they experience
 - A. A fever that gets worse or lasts for more than 3 days
 - B. Pain that lasts for more than twenty four hours.
 - C. Nervousness and excitability

13. When the liver stops functioning, it is a medical emergency that requires immediate treatment because
 - A. Treatment with albumin and alcohol can prevent liver damage.
 - B. A healthy liver is essential for maintaining homeostasis.
 - C. Patients with liver damage can only survive if they get an immediate liver transplant.

14. Liver damage caused by acetaminophen is usually diagnosed by
 - A. Treating the patient with a medicine that destroys acetaminophen.
 - B. Taking X-rays of the patient's liver.
 - C. Testing a patient's blood plasma for high levels of bilirubin and liver enzymes.

15. 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. Liver damage would result in
 - A. An increase in protein in the diet.
 - B. A decrease in albumin in the blood.
 - C. Dehydration due to high albumin levels.

General Safety Precautions

1. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
 2. Read and follow all instructions carefully.
 3. Pay particular attention to following the specific safety precautions included in the instructions.
 4. Wear safety goggles while performing experiments using chemicals.
 5. Do not use droppers as “squirt guns”.
 6. Never taste or ingest any chemicals used for this activity - they may be toxic.
 7. Do not eat, drink, or apply make-up or contact lenses while performing experiments.
 8. Wash your hands before and after performing experiments.
 9. Chemicals used in experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
 10. Follow your teacher’s instructions for end-of-experiment clean-up.
-

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Medicine Labels for “A Case of Unintentional Overdose”

<p>Drug Facts</p>	<p><i>Adult</i> Extra Strength</p>	<p>Overdose warning: Taking more than the recommended dose (overdose) could cause serious health problems. In case of overdose, get medical help or contact a Poison Control Center right away. Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.</p>				
<table border="0"> <tr> <td>Active Ingredients (in each caplet)</td> <td>Purpose</td> </tr> <tr> <td>Acetaminophen 500 mg.....</td> <td>Pain reliever/ fever reducer</td> </tr> </table>	Active Ingredients (in each caplet)	Purpose	Acetaminophen 500 mg.....	Pain reliever/ fever reducer	<p>Pain Reliever and Fever Reducer</p>	<p>Directions.</p> <ul style="list-style-type: none"> do not take more than directed (see overdose warning) take 2 caplets every 4 to 6 hours as needed do not take more than 8 caplets in 24 hours
Active Ingredients (in each caplet)	Purpose					
Acetaminophen 500 mg.....	Pain reliever/ fever reducer					
<p>Uses: temporarily relieves minor aches and pains due to:</p> <ul style="list-style-type: none"> headaches backache menstrual cramps muscle aches arthritis toothache the common cold 	<p>Contains Acetaminophen</p>	<p>Children under 12 years: do not use this adult Extra Strength product in children under 12 years of age; this will provide more than the recommended dose (overdose) of acetaminophen and could cause serious health problems.</p>				
<p>Warnings</p> <p>Alcohol warning: If you consume 3 or more alcoholic beverages every day, ask your doctor whether you should take acetaminophen or other pain relievers/fever reducers. Acetaminophen may cause liver damage.</p>	<p>Caplets </p>	<p>Other Information</p> <ul style="list-style-type: none"> do not use if neck wrap or foil inner seal is broken or missing store at room temperature 				
<p>Do not use with any other products containing acetaminophen</p>	<p>100 CAPLETS—500 mg each</p>	<p>Questions or comments? Call toll free 1-800-XXX-XXXX</p>				
<p>Stop use and ask your doctor if</p> <ul style="list-style-type: none"> new symptoms occur redness or swelling is present pain gets worse or lasts for more than 10 days fever gets worse or lasts for more than three days 						
<p>If pregnant or breast-feeding, ask a health professional before use.</p>						
<p>Keep out of reach of children.</p>						

Drug Facts

Active Ingredients (in each liquid-filled capsule) Purposes

Acetaminophen, 325 mg..... fever reducer/pain reliever
 Dextromethorphan HBr, 15 mg.....cough suppressant
 Doxylamine Succinate, 625 mg.....antihistamine

Uses: temporarily relieves these symptoms occurring with a cold, flu, hay fever, or other upper respiratory allergies:

- headaches
- sore throat
- itchy, watery eyes
- itchy nose or throat
- minor aches and pains
- cough
- runny nose

Warnings

Liver warning: This product contains acetaminophen. Severe liver damage may occur if you take:

- more than 8 capsules in any 24-hour period, which is the maximum daily amount
- with other drugs containing acetaminophen
- 3 or more alcoholic drinks every day while using this product.

Do not use

- if you are taking a prescription monoamine oxidase inhibitor (MAOI)(certain drugs for depression, psychiatric or emotional conditions, or Parkinson's disease), or for two weeks after stopping these drugs. If you do not know if your prescription drug contains an MAOI, ask a doctor or a pharmacist before taking this drug.
- with any prescription or nonprescription drug containing acetaminophen

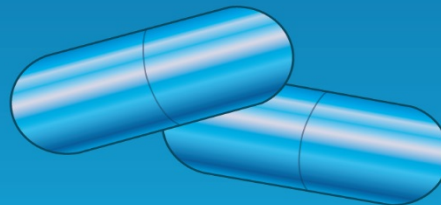
Ask a doctor before use if you have:

- liver disease
- glaucoma
- trouble urinating due to enlarged prostate gland
- coughing that occurs with too much phlegm (mucus)
- a breathing problem or chronic cough that lasts or occurs with smoking, asthma, chronic bronchitis, or emphysema

Ask a doctor or pharmacist before use if you are taking

- the blood thinning drug warfarin
- any other pain reliever/fever reducer
- sedatives or tranquilizers

Adult Cold and Flu Formula



20 Liquid-Filled Capsules

Relieves:

- Cough
- Sore Throat
- Fever
- Sneezing
- Body Aches
- Runny Nose

When using this product:

- marked drowsiness may occur
- avoid alcoholic drinks
- alcohol and sedatives may increase drowsiness
- be careful when driving a motor vehicle or operating machinery
- excitability may occur, especially in children

Stop use and ask a doctor if

- pain or cough gets worse or lasts for more than 7 days
- fever gets worse or lasts more than 3 days
- redness or swelling is present
- cough comes back or occurs with a rash or headache that lasts. These could be signs of a serious condition.
- new symptoms occur

If pregnant or breast-feeding, ask a health professional before use.

Keep out of reach of children

In case of overdose, get medical help or contact a Poison Control Center right away. Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.

Directions.

- Do not take more than 8 capsules in any 24 hour period
- Do not exceed recommended dosage (Taking more than the recommended dose can cause serious liver damage.)

age	dose
•adults and children 12 years and over	2 capsules every 6 hours
•children under 12 years	do not use

Other Information

- do not use if neck wrap or foil inner seal is broken or missing
- store at room temperature

Inactive ingredients FD&C blue no. 1, gelatin, glycerin, pharmaceutical ink, polyethylene glycol, povidone, propylene glycol, purified water, sorbitol sorbitan solution

Questions or comments?

Call toll free 1-800-XXX-XXXX

Drug Facts

Active Ingredients (in 15 ml TBSP)

Purposes

Acetaminophen, 325 mg..... Fever reducer/pain reliever
Dextromethorphan HBr, 15 mg.....Cough suppressant
Doxylamine Succinate, 625 mg.....Antihistamine

Uses: temporarily relieves common cold/flu symptoms
•cough due to minor throat and bronchial irritation
•sore throat •headache •fever
•minor aches and pains •runny nose and sneezing

Warnings

Liver warning: This product contains acetaminophen. Severe liver damage may occur if you take:
•more than 4 doses in any 24-hour period, which is the maximum daily amount
•other drugs containing acetaminophen
•3 or more alcoholic drinks every day while using this product.

Sore throat warning: If sore throat is severe, lasts for more than 2 days, occurs with or is followed by fever, headache, rash, nausea, or vomiting, see a doctor promptly.

Do not use

•to make a child sleep
•with any prescription or nonprescription drug containing acetaminophen
•if you are taking a prescription monoamine oxidase inhibitor (MAOI)(certain drugs for depression, psychiatric or emotional conditions, or Parkinson's disease), or for two weeks after stopping these drugs. If you do not know if your prescription drug contains an MAOI, ask a doctor or a pharmacist before taking this drug.

Ask a doctor before use if you have:

•liver disease •glaucoma •a sodium restricted diet
•trouble urinating due to enlarged prostate gland
•cough that occurs with too much phlegm (mucus)
•a breathing problem or chronic cough that lasts or as occurs with smoking, asthma, chronic bronchitis, or emphysema

Ask a doctor or pharmacist before use if you are taking

•the blood thinning drug warfarin
•sedatives or tranquilizers

Nighttime Relief

Helps you sleep when you have a cold or the flu

- Aches, Fever, Sore Throat
- Sneezing, Runny Nose
- Cough

10 fluid ounces (295 ml)

10% alcohol

When using this product:

- do not use more than directed
- excitability may occur, especially in children
- marked drowsiness may occur
- avoid alcoholic drinks
- alcohol and sedatives may increase drowsiness
- be careful when driving a motor vehicle or operating machinery

Stop use and ask a doctor if

- pain or cough gets worse or lasts for more than 7 days
- fever gets worse or lasts more than 3 days
- redness or swelling is present
- cough comes back or occurs with a rash or headache that lasts. These could be signs of a serious condition.
- new symptoms occur

If pregnant or breast-feeding, ask a health professional before use.

Keep out of reach of children

Overdose Warning In case of overdose, get medical help or contact a Poison Control Center right away. Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.

Directions.

- take only as directed
- use dose cup or tablespoon (TBSP)
- do not exceed 4 doses per 24 hours

•12 years and over	30 ml (2TBSP) every 6 hours
•children 4 to under 12 years	ask a doctor
•children under 4 years	do not use

Other Information

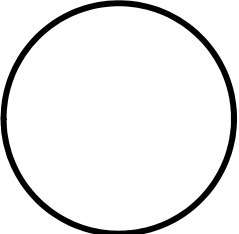
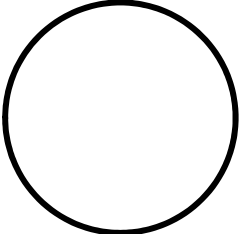
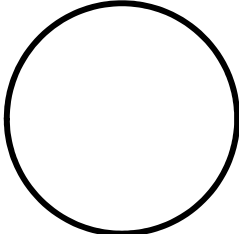
- each tablespoon contains potassium 5 mg, sodium 18 mg
- store at room temperature

Inactive ingredients acesulfame potassium, alcohol, citric acid, D&C yellow no. 10, FD&C green no. 3, flavor, high fructose corn syrup, polyethylene glycol, propylene glycol, purified water, saccharin sodium, and sodium citrate

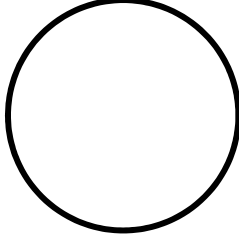
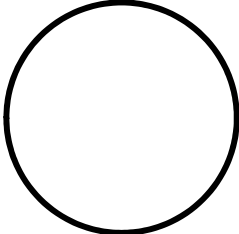
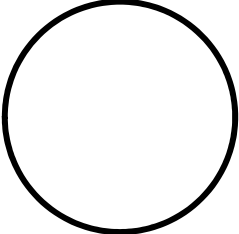
Questions or comments?

Call toll free 1-800-XXX-XXXX

Laboratory Test Sheet

Laboratory Tests	Add 2 drops of Luis Cordera Blood Plasma to each circle.
<p>Plasma Bilirubin Test</p> <p>Add 1 drop of Bilirubin Test Solution to this circle.</p>	
<p>Plasma Albumin Test</p> <p>Add 1 drop of Albumin Test Solution to this circle.</p>	
<p>ALT Enzyme Test</p> <p>Add one strip of ALT Test Paper to this circle.</p>	

Laboratory Test Sheet

Laboratory Tests	Add 2 drops of Luis Cordera Blood Plasma to each circle.
<p>Plasma Bilirubin Test</p> <p>Add 1 drop of Bilirubin Test Solution to this circle.</p>	
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<p>ALT Enzyme Test</p> <p>Add one strip of ALT Test Paper to this circle.</p>	

Color Charts for Laboratory Tests

Plasma Bilirubin Test

Low	Normal	High
Blue	Green	Yellow

Plasma Albumin Test

Low	Normal	High
Dark Blue	Purple	Red

ALT Enzyme Test

Low	Normal	High
Orange	Yellow	Teal

Color Charts for Laboratory Tests

Plasma Bilirubin Test

Low	Normal	High
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Plasma Albumin Test

Low	Normal	High
Dark Blue	Purple	Red

ALT Enzyme Test

Low	Normal	High
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