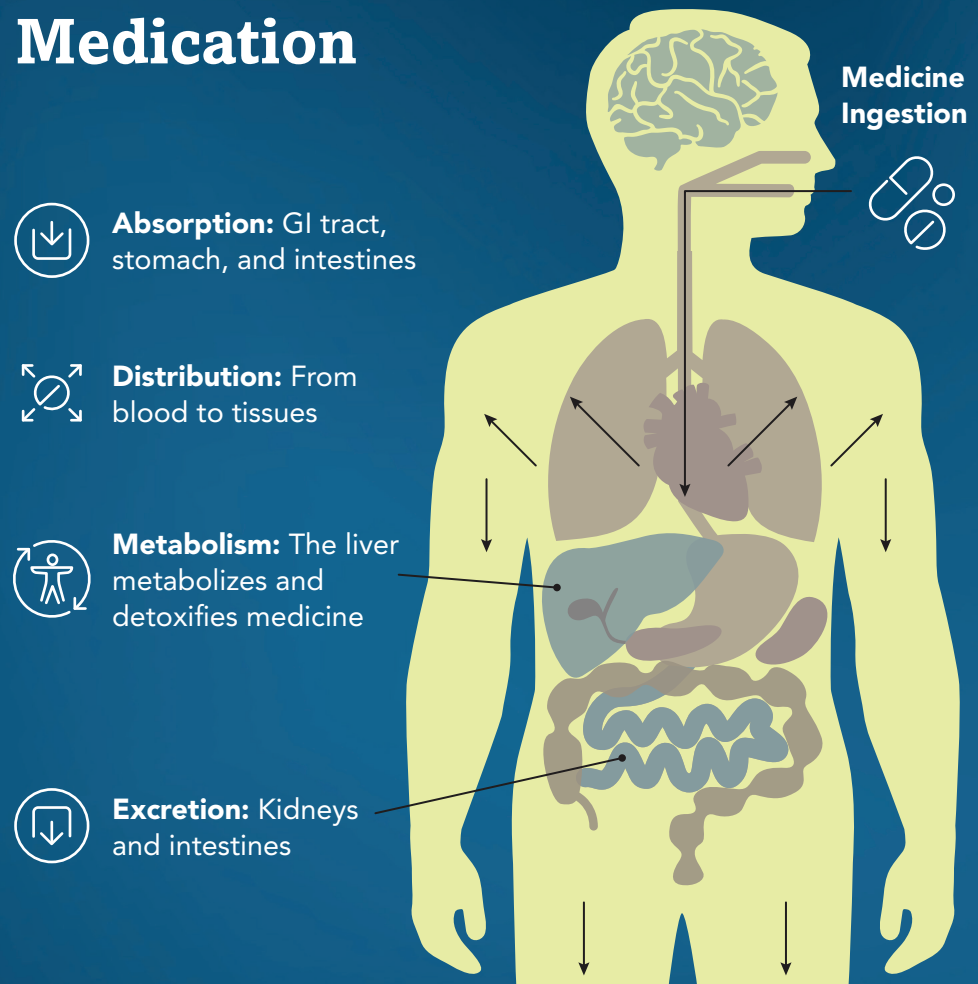
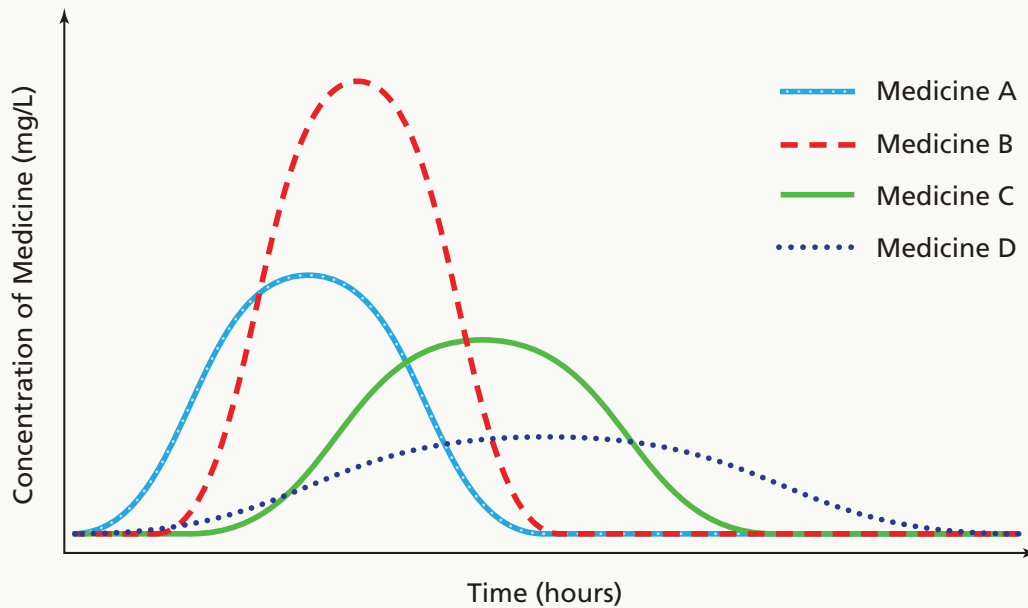


# How the Body Processes Medication



Medicines interact with the body in complex ways. As painkillers move through the bloodstream, enzymes break them down, and the body gradually removes the medicine over time. For medicines to work effectively, their concentration must be just right—too low, and they won't have an effect; too high, and they could be harmful.

### Comparison of Medicine Concentrations in Bloodstream Over Time



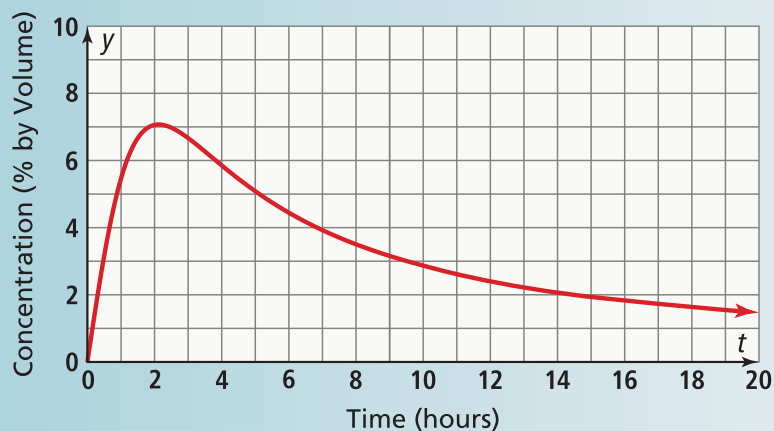
**What do you notice?**

**What do you wonder?**

**If you make a claim based on your observations, where can you find the evidence to support it?**

## MEDICINES MUST REACH THE RIGHT CONCENTRATION IN THE BODY TO BE EFFECTIVE.

A certain medicine is effective if its concentration is at least 5% but not above 7.5%, which can cause side effects. The concentration of the medicine can be modeled with the rational function  $f(t) = \frac{30t}{t^2 + 4.5}$ , when  $t \geq 0$ .



- 1 When is the medicine most effective?
- 2 Does the change in concentration happen at a constant rate? How do you know?
- 3 Describe the end behavior of the function. Explain what this means in context.
- 4 When is the concentration of medicine increasing? When is it decreasing? When might another dose need to be administered?



## DRIVE YOUR INVESTIGATION

Investigate the concentration of a different medicine in blood over time. To drive your investigation, search for this data on official websites.

1. **Make Sense of the World** How does the concentration of the medicine change over time? What kind of function could model this change?
2. **Predict** How does food affect the medicine's concentration in blood over time? What other factors might influence the dosage a patient receives?
3. **Make An Impact** How can using data and mathematical models help doctors create more personalized treatments for their patients?

## REFLECT ON MATH PRACTICES AND PROCESSES

Choose two of the following questions to reflect on how you engaged the math practices and processes during the investigation.

1. **Model with Mathematics** How did you use mathematical models to represent the data?
2. **Reason** How did you interpret the results of the model in terms of the context?
3. **Look for Relationships** What relationships did you notice in the behavior of the concentration over time? How did you use these relationships to make predictions?
4. **Construct Arguments** What evidence could you use to show that your model is accurate?



## EXTENSION

### Investigate how artificial intelligence (AI) helps doctors to advance treatment.

- Investigate how artificial intelligence can improve the accuracy and safety of medication dosages for patients.
- Based on your investigation, design a simple prototype or create a concept for an AI-based tool or app. This tool should help doctors, pharmacists, or patients ensure accurate and safe medication dosages.
- Explain how your product could make an impact on healthcare and improve patient outcomes.