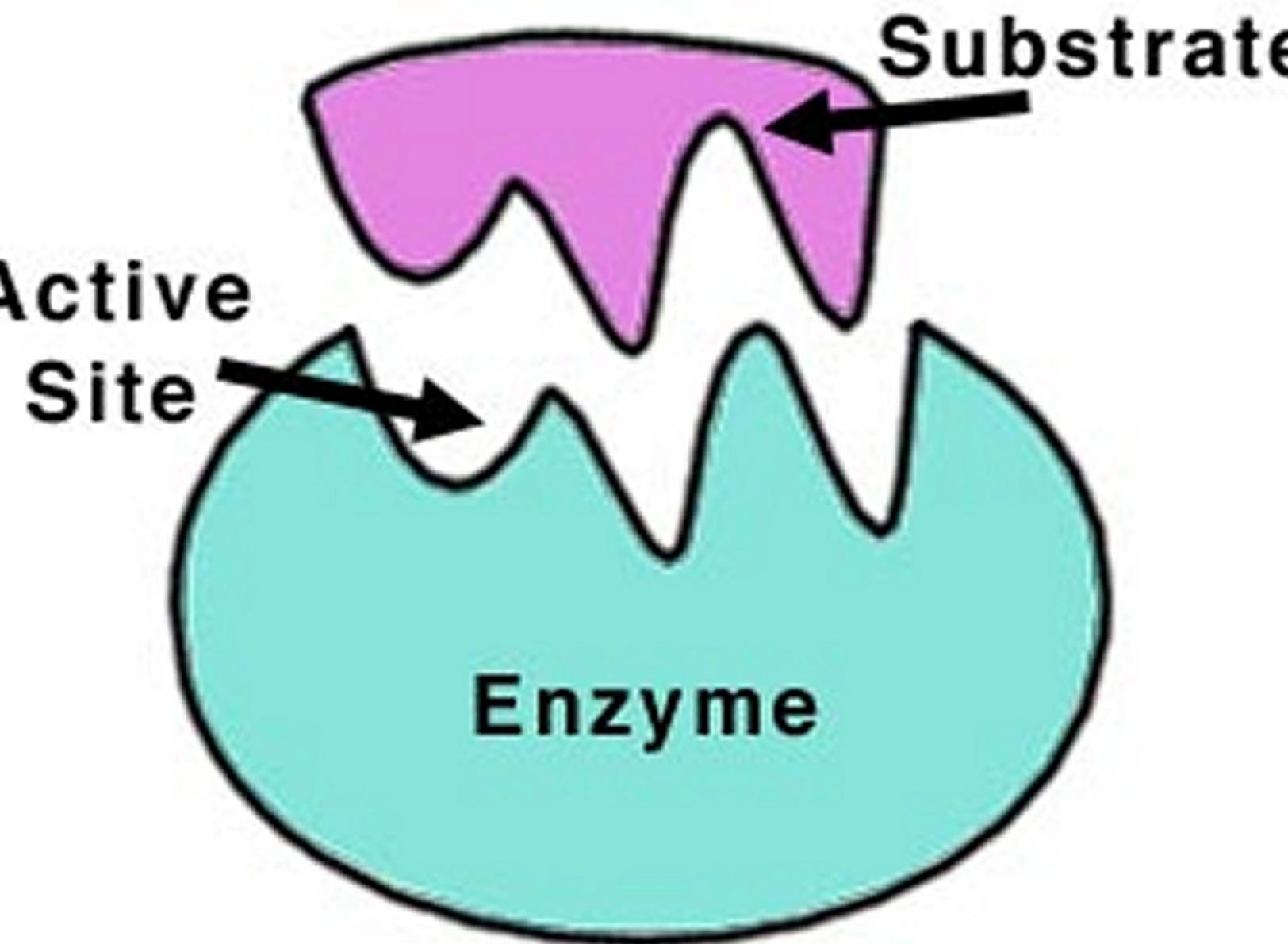


Enzymes



Enzymes

Vicki Leifer
Douglas Wilkin, Ph.D.
Jean Brainard, Ph.D.

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AUTHORS

Vicki Leifer
Douglas Wilkin, Ph.D.
Jean Brainard, Ph.D.

Contents

1 Enzymes

1

CONCEPT 1

Enzymes

- Define enzyme.
- Summarize the importance of enzymes to living organisms.

Enzymes Summary

- Enzymes are special proteins made within cells by the process of protein synthesis.
- Enzymes break down or build (synthesize) molecules within cells.
- Food molecules are broken down enzymes to provide energy and chemical constituents needed to synthesize other molecules within cells.
- Some enzymes enable the cell to store energy in special chemicals, such as ATP, that are needed to drive the many other chemical reactions in a cell.
- Enzymes are biological catalysts. They speed up biochemical reactions.
- Enzymes are involved in most of the chemical reactions that take place in organisms.



What is a biological catalyst?

This super fast train can obviously reach great speeds. And there's a lot of technology that helps this train go fast. Speaking of helping things go fast brings us to enzymes. Life could not exist without enzymes. Essentially, enzymes are special proteins that speed up biochemical reactions.

Enzymes

Importance of Enzymes

Enzymes are involved in most of the biochemical reactions that take place in organisms. About 4,000 such reactions are known to be catalyzed by enzymes, but the number may be even higher. Enzymes allow reactions to occur at the rate necessary for life.

In animals, an important function of enzymes is to help digest food. Digestive enzymes speed up reactions that break down large molecules of carbohydrates, proteins, and fats into smaller molecules the body can use. Without digestive enzymes, animals would not be able to break down food molecules quickly enough to provide the energy and nutrients they need to survive.

Enzymes are also important for synthesizing (building) new molecules in the cell as many different molecules are needed for proper cell structure and function. For example, glycogen synthase is an enzyme responsible for building chains of glucose molecules for energy storage called glycogen.

Enzymes and Biochemical Reactions

Most chemical reactions within organisms would be impossible under the conditions in cells. For example, the body temperature of most organisms is too low for reactions to occur quickly enough to carry out life processes. Reactants may also be present in such low concentrations that it is unlikely they will meet and collide. Therefore, the rate of most biochemical reactions must be increased by a catalyst. A **catalyst** is a chemical that speeds up chemical reactions. In organisms, catalysts are called **enzymes**. Essentially, enzymes are biological catalysts.

Like other catalysts, enzymes are not reactants in the reactions they control. They help the reactants interact but are not used up in the reactions. Instead, they may be used over and over again. Unlike other catalysts, enzymes are usually highly specific for particular chemical reactions. They generally catalyze only one or a few types of reactions.

Enzymes are extremely efficient in speeding up reactions. They can catalyze up to several million reactions per second. As a result, the difference in rates of biochemical reactions with and without enzymes may be enormous. A typical biochemical reaction might take hours or even days to occur under normal cellular conditions without an enzyme, but less than a second with an enzyme.

Enzymes, an overview of these proteins, can be viewed at <http://www.youtube.com/watch?v=E90D4BmaVJM> (9:43).



MEDIA

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As you view *Enzymes*, focus on these concepts:

1. the role of enzymes in nature,
2. other uses of enzymes.