

# Lecture 16: Enzymes & Kinetics IV

## Regulation and Allostery

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Fall 2004

### GENERAL THOUGHTS ON REGULATION

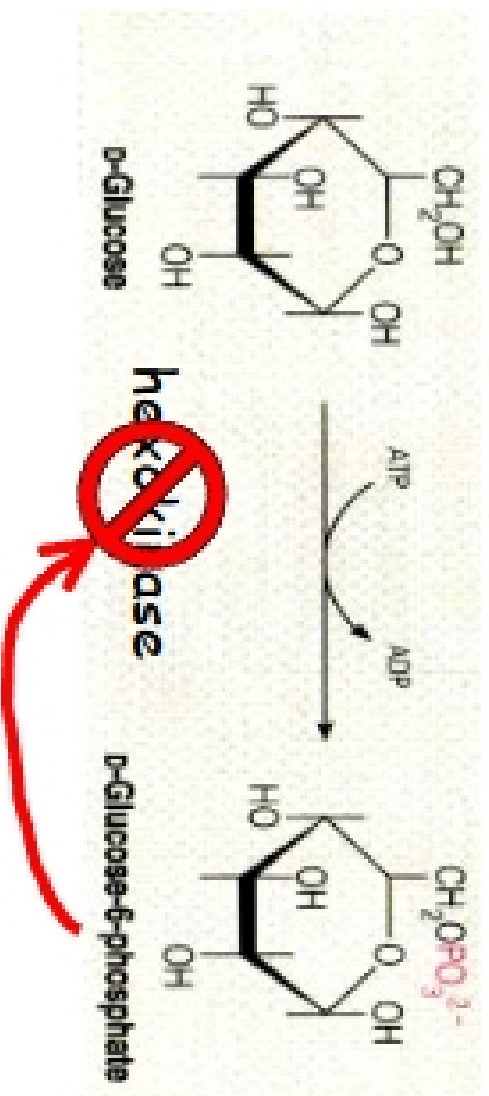
- 1). Enzymes slow down as product accumulates
- 2). Availability of substrates determines reaction rate
- 3). Enzymes are controlled at the level of DNA
- 4). Many enzymes are regulated via reversible covalent modification
- 5). Many enzymes regulated via non-covalent interactions with small molecules

**REGULATION IS KEY TO VIABILITY**

## REGULATION OF ENZYME ACTIVITY?

How does the cell know when "enough is enough"?

First step in glycolysis:

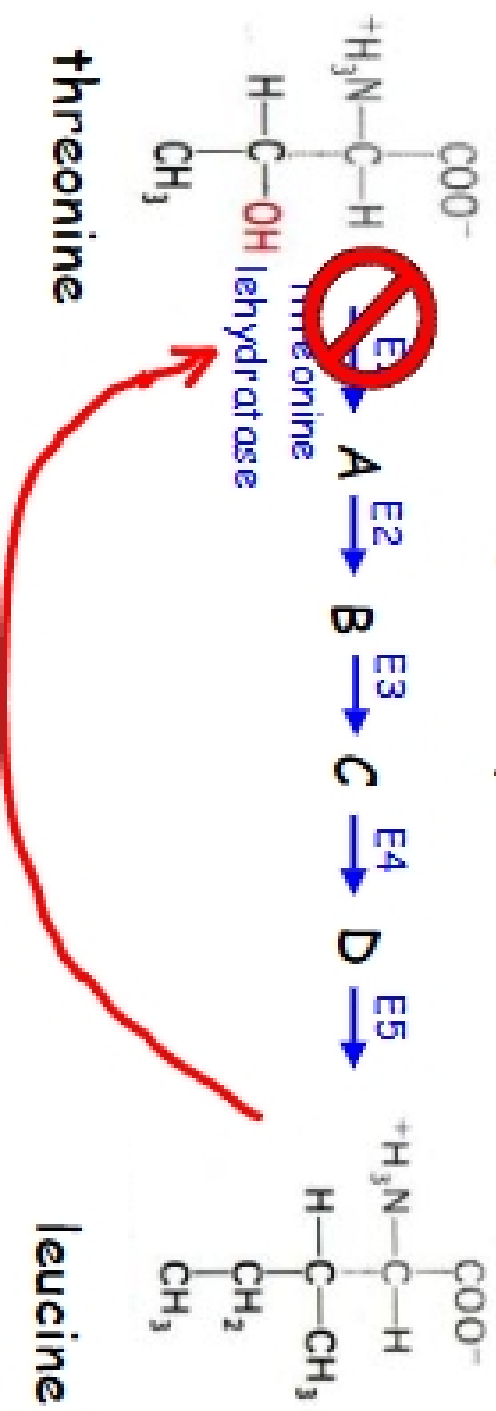


*Substrate-level control*

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## REGULATION OF ENZYME ACTIVITY?

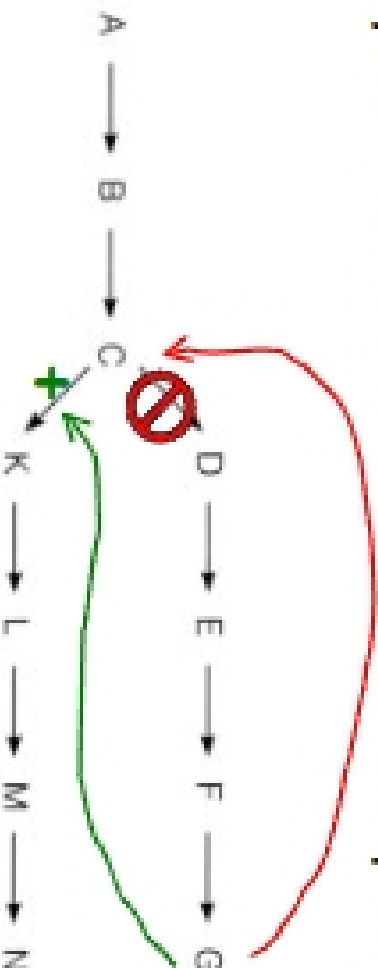
Problem: Most metabolic pathways involve many enzymes that act sequentially



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## FEEDBACK CONTROL: INHIBITION & ACTIVATION

The same substrate can act as an inhibitor of one pathway, and an activator of a second pathway.



Increase in G can inhibit formation of D, activate formation of K.

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## REGULATORY ENZYMES: THREE GENERAL CLASSES

**Regulatory enzymes:** enzymes that control key metabolic points in a pathway. Usually located at the first committed step to a pathway.

- 1). Enzymes regulated via reversible covalent modification;
- 2). Enzymes regulated via proteolytic cleavage.
- 3). "Other" types: isozymes, modulator proteins
- 4). Allosteric enzymes

(1) (3) and (4) tend to be multi-subunit proteins; Regulatory site and active sites usually on separate subunits

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