

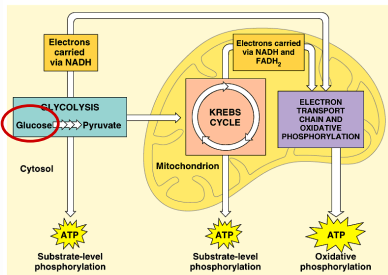


Cellular Respiration

Other Metabolites &
Control of Respiration

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Cellular Respiration



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Beyond Glucose: Other Carbohydrates

- Glycolysis accepts a wide range of carbohydrates fuels

polysaccharides → → → glucose
hydrolysis

- ex. starch, glycogen

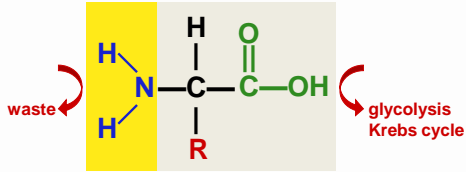
other 6C sugars → → → glucose
modified

- ex. galactose, fructose

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Beyond glucose: Proteins

proteins → → → → amino acids
hydrolysis



amino group = waste product excreted as ammonia, urea, or uric acid

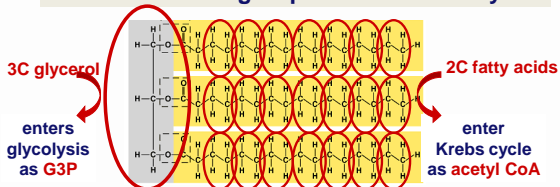
2C sugar = carbon skeleton = enters glycolysis or Krebs cycle at different stages

Beyond glucose: Fats

fats → → → → glycerol + fatty acids
hydrolysis

glycerol (3C) → → G3P → → glycolysis

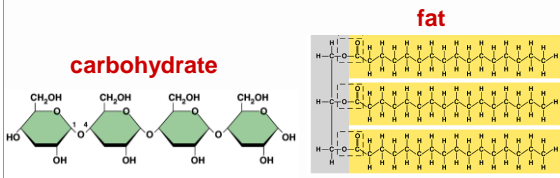
fatty acids → 2C acetyl → acetyl → Krebs cycle
groups coA



Carbohydrates vs. Fats

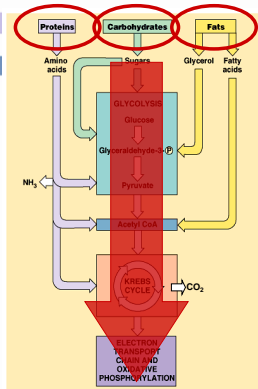
- Fat generates 2x ATP vs. carbohydrate
 - more C in gram of fat
 - more energy releasing bonds

That's why it takes so much to lose a pound a fat!



Metabolism

- digestion of carbohydrates, fats & proteins
 - all catabolized through same pathways
 - enter at different points
- cell extracts energy from every source

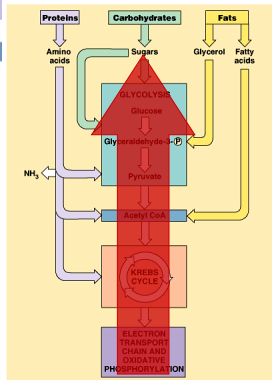


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Metabolism

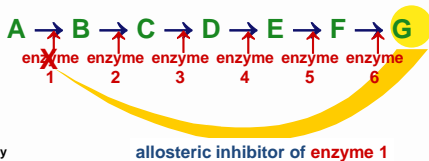
- Synthesis**
 - enough energy? **build stuff!**
 - cell uses points in glycolysis & Krebs cycle as links to pathways for synthesis
 - run pathways "backwards"
 - have extra fuel, build fat!

- pyruvate → → glucose
- Krebs cycle intermediaries → → amino acids
- acetyl CoA → → fatty acids



Feedback Inhibition

- Regulation & coordination of production
 - final product is inhibitor of earlier step
 - allosteric inhibitor of earlier enzyme
 - no unnecessary accumulation of product
 - production is self-limiting



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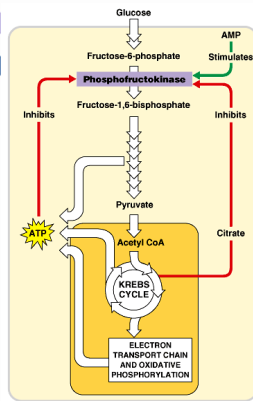
allosteric inhibitor of enzyme 1

Respond to cell's needs

- Key point of control
 - phosphofruktokinase**
 - allosteric regulation of enzyme
 - why here?
 - "can't turn back" step before splitting glucose
 - AMP & ADP stimulate
 - ATP inhibits
 - citrate inhibits

Why is this regulation important?

Balancing act:
 availability of **raw materials** vs. **energy demands** vs. **synthesis**



A Metabolic economy

- Basic principles of supply & demand regulate metabolic economy
 - balance the supply of raw materials with the products produced
 - these molecules become feedback regulators
 - they control enzymes at strategic points in glycolysis & Krebs cycle
 - levels of AMP, ADP, ATP
 - regulation by final products & raw materials
 - levels of intermediates compounds in pathways
 - regulation of earlier steps in pathways
 - levels of other biomolecules in body
 - regulates rate of siphoning off to synthesis pathways

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It's a Balancing Act

- Balancing synthesis with availability of both energy & raw materials is essential for survival!
 - do it well & you survive longer
 - you survive longer & you have more offspring
 - you have more offspring & you get to "take over the world"

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