FUELS AND METABOLISM

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LEARNING OBJECTIVES

- Learn major classes of dietary fuels
- Know different forms of body fuel stores
- Define metabolism
- Distinguish between anabolism and catabolism

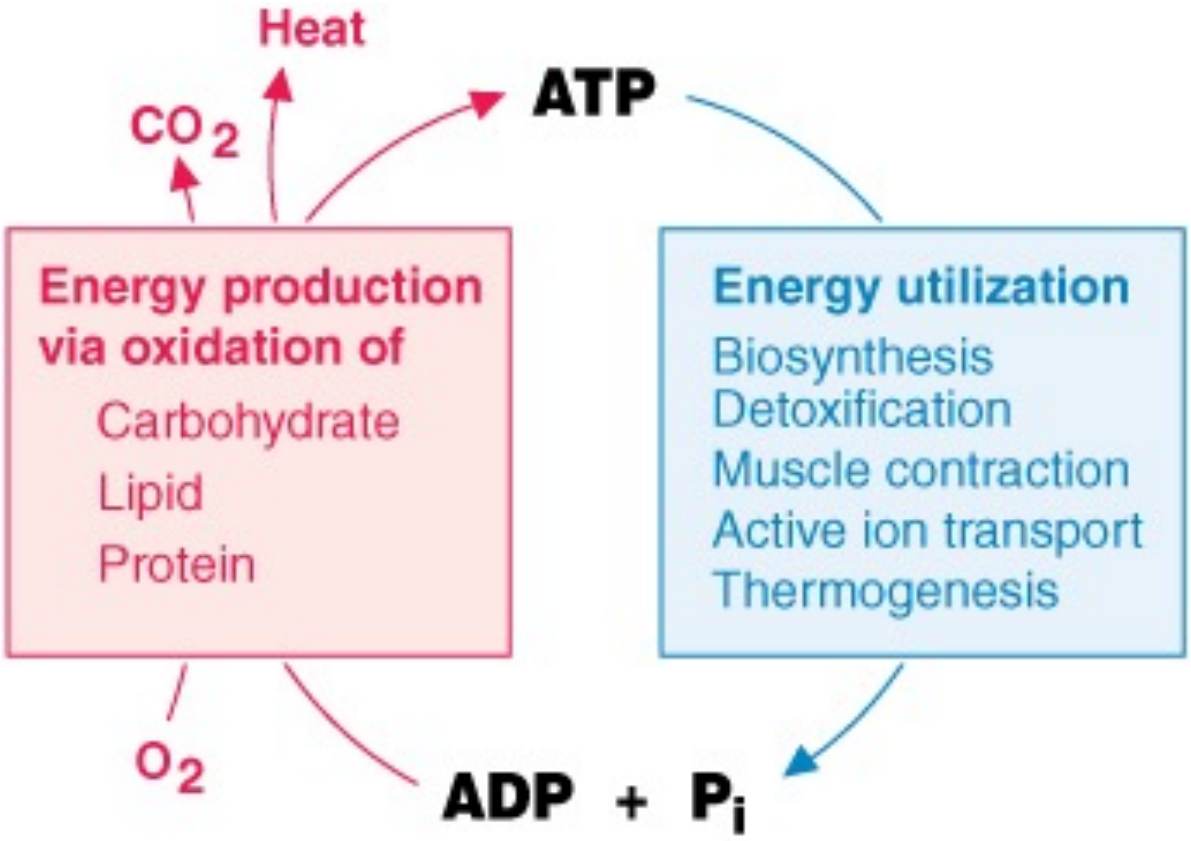
DIETARY FUELS

- Major fuels from food are
  - Carbohydrates
  - Proteins
  - Fats
- Energy is released by oxidation of these fuels to CO_2 and H_2O
- Such released energy generate
  - Heat
  - ATP (adenosine triphosphate)

CELLULAR FUEL IS ATP

$$ATP \rightleftharpoons ADP + PI$$

- What does ATP do?
  - Provide energy that is needed to drive such as
    - Biosynthetic reactions
    - Muscle contractions
    - Active transport across membranes
- Where does ATP end up?
  - Converts to ADP (adenosine diphosphate) and Pi (inorganic phosphate)
  - ADP regenerates ATP



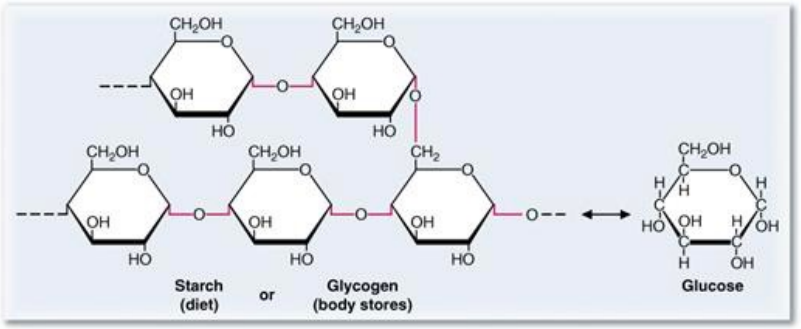
THE ATP–ADP CYCLE.

The energy-generating pathways are shown in *red*; the energy-utilizing pathways in *blue*.

TWO PROCESSES OF METABOLISM:

- Catabolism
  - To break down molecules
- Anabolism
  - To build up molecules from building blocks

FOR EXAMPLE



- Structure of starch and glycogen.
- Starch, our major dietary carbohydrate, and glycogen, the body's storage form of glucose, have similar structures. They are polysaccharides (many sugar units) composed of glucose, which is a monosaccharide (one sugar unit).

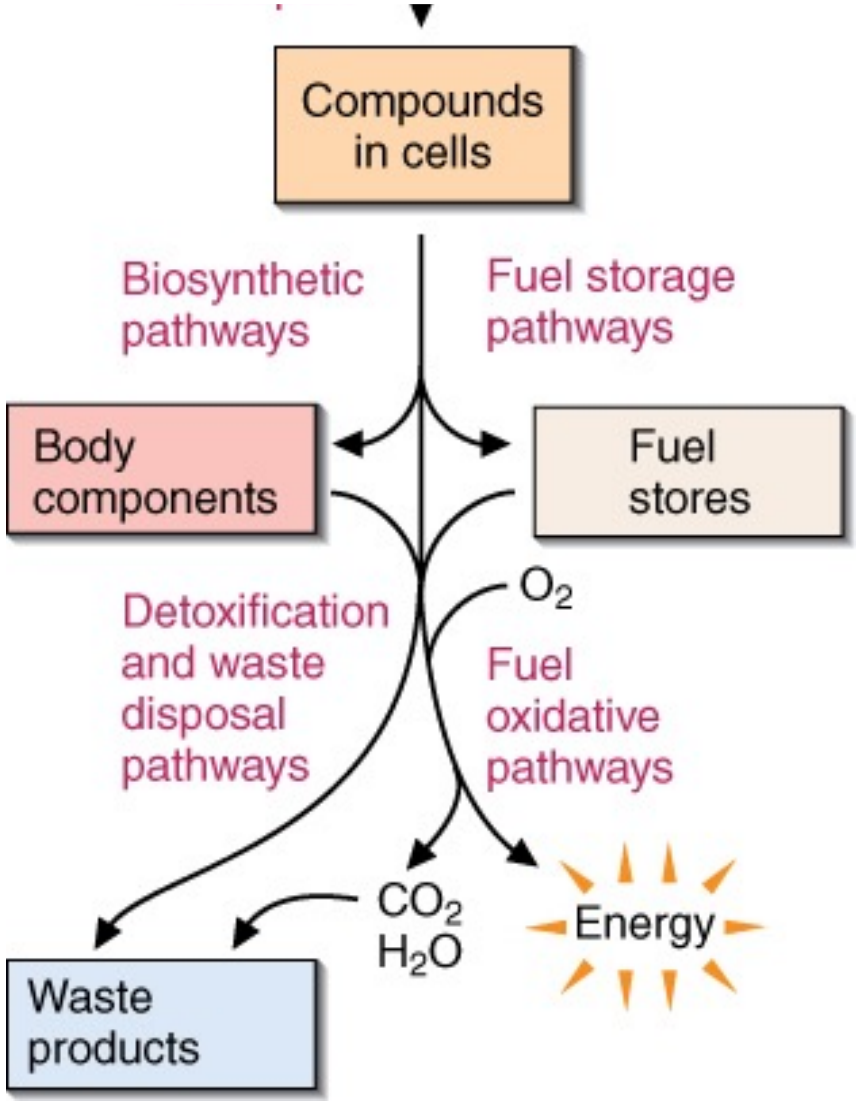
FATE OF EXCESS DIETARY FUEL IN FED AND FASTING STATES.

BODY FUEL STORES

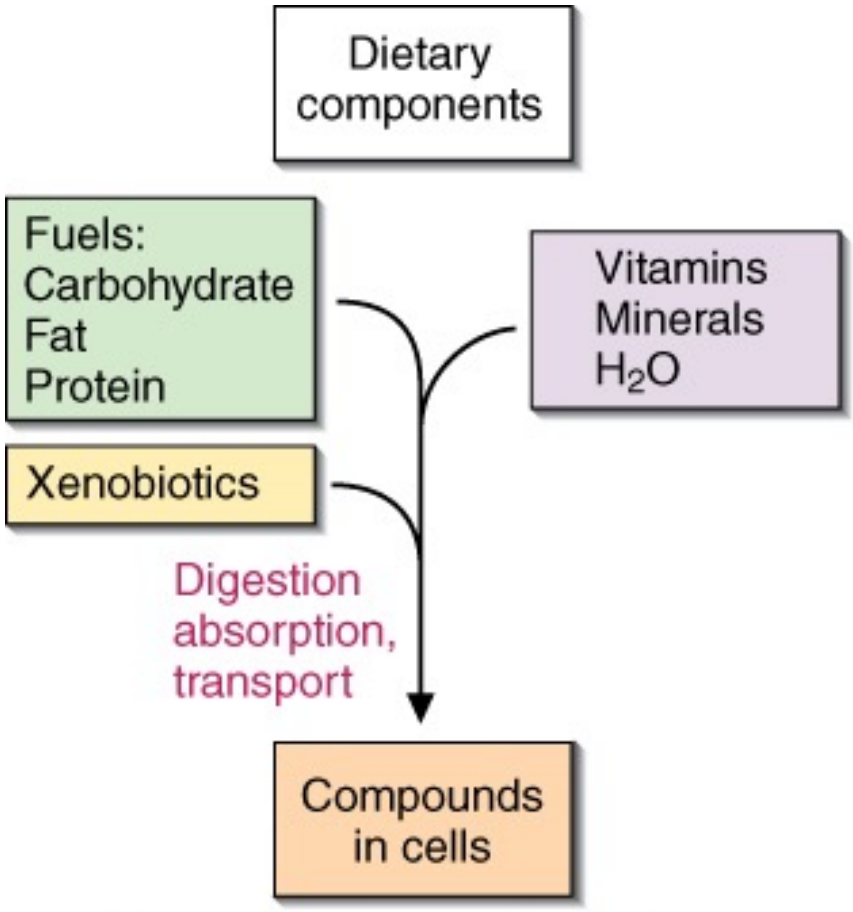
- Fats
  - Major fuel store!
  - In adipose tissues, which is found throughout our bodies
  - May accumulate more in hips, thighs and abdomens
- Carbohydrates
  - Smaller fuel stores
  - As glycogen
  - Mainly in liver and muscles
- Proteins
  - From large muscle masses in particular
  - Used when we fast

Fuel composition of the Average 70-kg Man after an Overnight Fast

Fuel	Amount (kg)	% of total stored calaries
Glycogen		
- Muscle	0.15	0.4
- Liver	0.08	0.2
Protein	8.0	14.4
Fats	15.0	85.0



AN OVERVIEW OF THE GENERAL METABOLIC ROUTES FOR DIETARY COMPONENTS IN THE BODY.



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