Metabolism

(Greek: *meltable*, change) The biochemical processes by which all living organisms sustain life. Metabolism is the sum of all chemical processes occurring within living cells and organisms. Although most living organisms on earth share common pathways to sustain life they do so with the use of different sources of energy and carbon.

Introduction

Metabolism consists of two main types of reactions, catabolic and anabolic. Catabolic processes are ones in which biomolecules are being degraded or oxidized. Anabolic processes are ones in which biomolecules are built via biosynthesis and reduction. Below is a diagram of CO₂ being reduced completely. Oxidation of methane can be seen by following the process in reverse.

Catabolism

(Greek *ketabole*, throwing down) The biochemical processes of metabolism by which molecules are broken down. Often catabolism is an oxidative process in which carbons have hydrogen atoms removed. CO₂ is the most reduced form of carbon. NADH is the primary electron acceptor for catabolic reactions.
Anabolism

(Greek, *ana*, up, + *bolein*, to throw) The biochemical processes of metabolism by which molecules are synthesized or built up. Often anabolism is a reductive process in which carbons have hydrogen atoms added. Fully saturated fatty acids are the most reduced form of carbon. NADPH is the primary electron donor for anabolic reactions.

### Organism Classifications

<table>
<thead>
<tr>
<th>Classification</th>
<th>Carbon source</th>
<th>Energy source</th>
<th>Electron donor</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photoautotroph</td>
<td>CO₂</td>
<td>Light</td>
<td>H₂O, H₂S, S, inorganic compounds</td>
<td>Green plants, photosynthetic</td>
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<td></td>
<td></td>
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<td></td>
<td>bacteria</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Photoheterotrophs</th>
<th>Organic compounds</th>
<th>Light</th>
<th>Organic compounds</th>
<th>Nonsulfur purple bacteria</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Chemoautotrophs</td>
<td>CO₂</td>
<td>Redox reactions</td>
<td>Inorganic compounds: H₂, H₂S, NH₄⁺, Fe²⁺</td>
<td>Hydrogen, sulfur and iron bacteria</td>
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</tr>
<tr>
<td>Chemoheterotrophs</td>
<td>Organic compounds</td>
<td>Redox reactions</td>
<td>Organic compounds (e.g. glucose)</td>
<td>All animals, most microorganisms</td>
</tr>
</tbody>
</table>

References

Outside links
- [http://www.mikeblaber.org/oldwine/BCH4053/bch4053.htm](http://www.mikeblaber.org/oldwine/BCH4053/bch4053.htm)

Problems
1. Photoheterotrophs use this as their primary source of carbon.
2. Is ATP usually synthesized or degraded during oxidative processes?
3. True or False Methanol is more reduced than methane.
4. Name the primary electron acceptor for catabolic reactions.
5. Is Glycolysis a catabolic or anabolic process?

Contributors
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