Metabolism in a Nutshell

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**Glycolysis**
2 ATP are used to add a phosphate to glucose
This 'phosphorylated' molecule is split in several reactions --> 4 ATP + 2 pyruvic acid
(net gain of 2 ATP)

Pyruvic acid from above converted into acetyl-CoA, a form of acetic acid.
Acetyl CoA enters Krebs/citric acid cycle --> 2 ATP + CO₂ and H⁺

Hydrogen ions above are further oxidized in an electron transfer process called oxidative phosphorylation.
1 glucose --> 32 ATP through oxidative phosphorylation.
If oxygen isn't available (as in high intensity work), lactic acid is formed.
The lactic acid diffuses into the blood until oxygen is available again.

**Fatty Acid and Glycerol Metabolism**
Glycerol can enter anaerobic glycolytic reactions --> pyruvic acid
Complete glycerol breakdown --> 22 ATP
Glycerol can also provide the carbon skeleton for glucose synthesis when
carbohydrate is restricted in the diet or during long-term exercise straining glycogen reserves.

Fatty acids oxidize into acetyl-CoA, which can enter Krebs if sufficient
oxaloacetic acid generated from carbohydrate metabolism is available.
Fatty acid breakdown is directly associated with oxygen uptake.
1 FA --> 147 ATP and 1 triglyceride contains 3 fatty acids, so...
One neutral fat molecule:
441 ATP from Krebs + 22 ATP from glycerol catabolism --> 465 total ATP

**Protein.**
Amino acids are first deaminated (nitrogen is removed)
and converted into a form that can readily enter the energy pathways.
These residues enter the Krebs cycle at various intermediate stages.

**Macronutrient usage as energy substrates depends upon:**

*Level of Activity*
Moderate to intense activity --> growth hormone secretion.
GH stimulates FFA release and protein synthesis --> FA's available for energy production, proteins not.

*Psychological and Health Status; Nutritional State; Endocrine Status* (influenced by previous factors)
Blood glucose levels control insulin and glucagon secretion:
High glucose -> insulin release -> inhibit fa release, enhance glucose usage
Low glucose -> glucagon release -> enhance glycogenolysis and gluconeogenesis, inhibit glucose use
Emotional or Physical Distress --> cortisol release --> ffa release --> fa usage increase