



The Ins and Outs of the Mito Cocktail – Part 1

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What You Eat

- All food comes from cells
 - Whether animal or plant
- All cells are made up of 3 components
 - Proteins
 - Sugars
 - Fats
- All cells contain additional nutrients (vitamins, minerals)

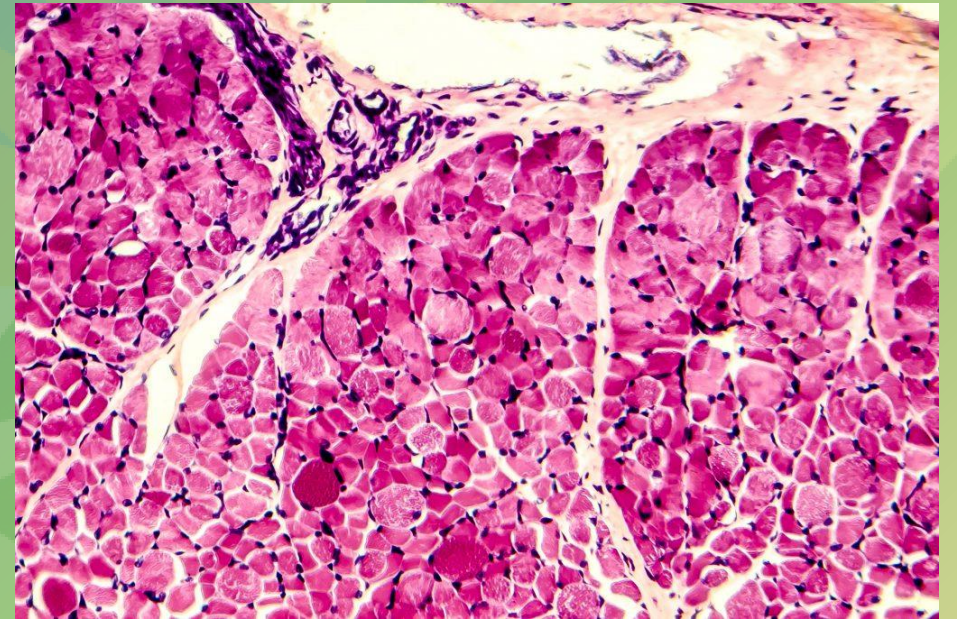
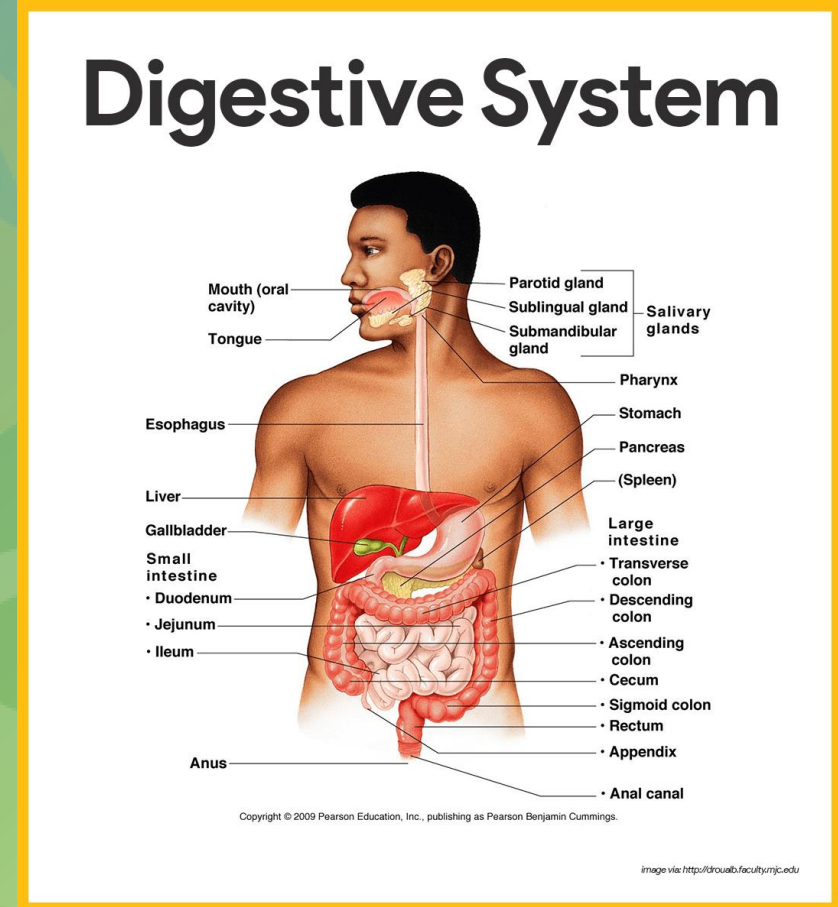


Image from: <https://autogen.com/product/tissue-cells/>

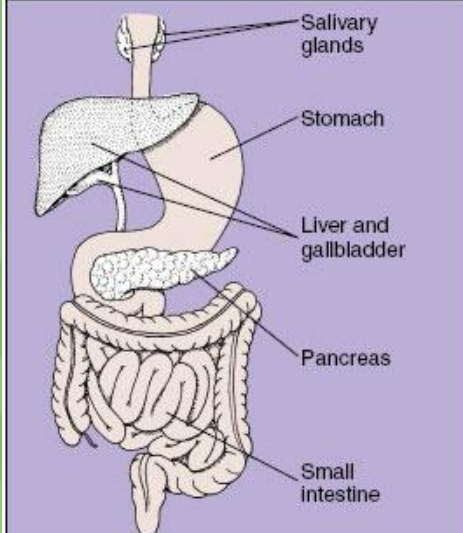
Digestion/Absorption

- Digestion and absorption start in the mouth
- Absorption stops near the end of the colon
- Different things are happening to food at different stages
- This is part 1 of the absorption of nutrients by the body



pH/Enzymes

- Nowhere in the GI tract does the same environment exist
- pH varies
 - This affects the shape of molecules and their absorbability
- Enzymes vary
 - These break down larger molecules into smaller



REGION	SECRETION	pH	COMPOSITION
Salivary glands	Saliva	6.5	Amylase Bicarbonate
Stomach	Gastric juice	1.5	Pepsin HCl Rennin in ruminant mammals
Liver and gallbladder	Bile	7-8	Bile salts and pigments Cholesterol
Pancreas	Pancreatic juice	7-8	Trypsin, Chymotrypsin, Carboxypeptidase, Lipase, Amylase, Nucleases Bicarbonate
Small intestine	Membrane enzymes	7-8	Aminopeptidase Maltase Lactase Sucrase Alkaline Phosphatase



Complex Molecules

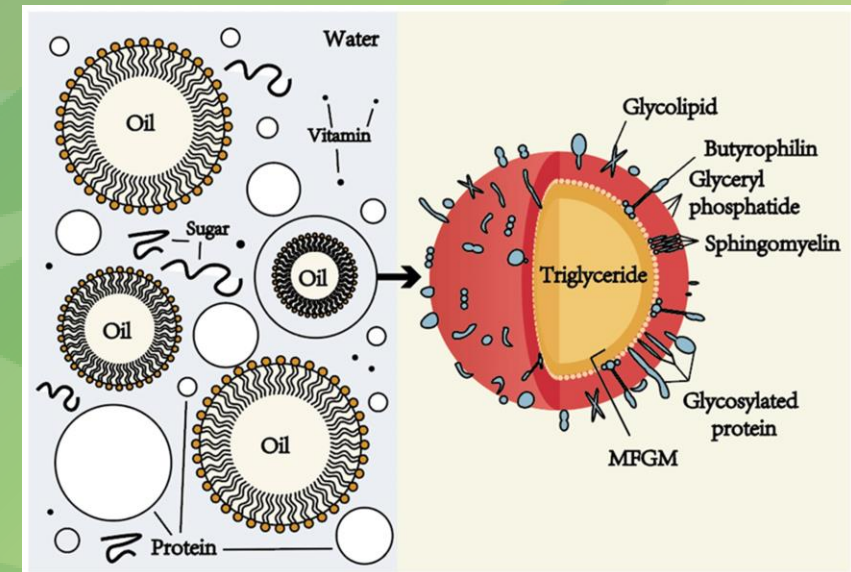
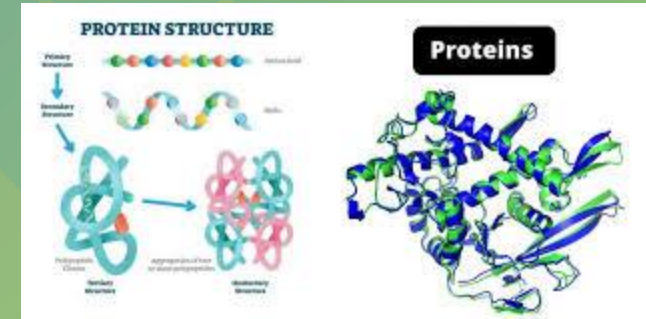
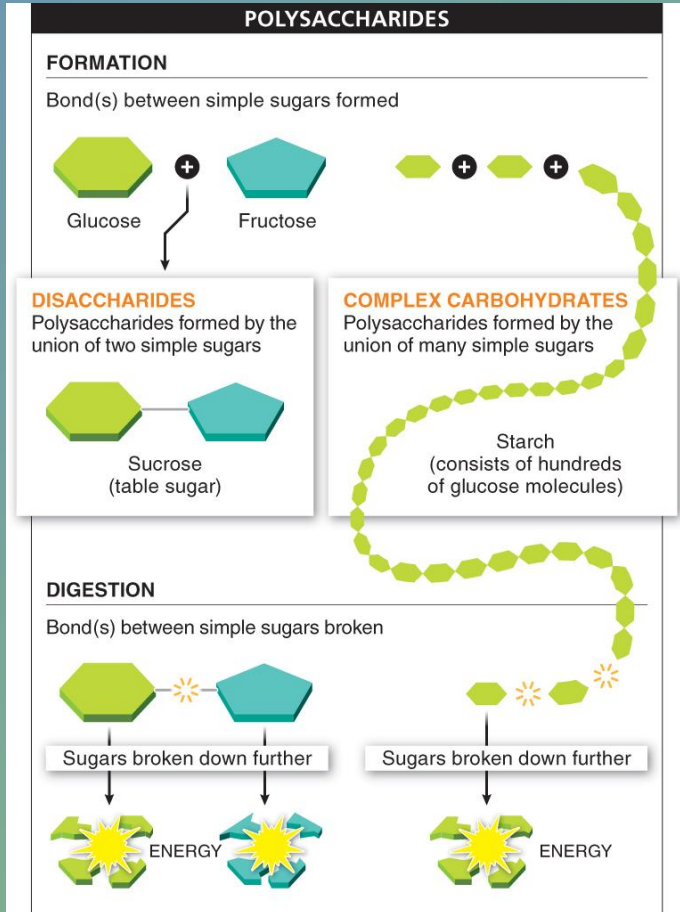


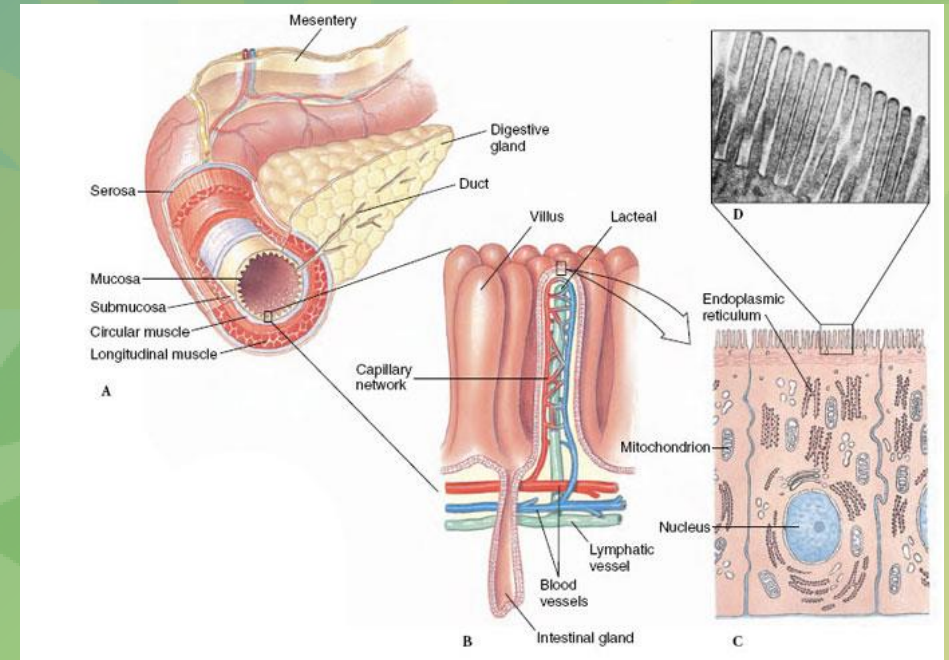
Image from: https://digfir-published.macmillanusa.com/phelanphys3e/phelanphys3e_ch2_12.html

Image from: <https://biologynotesonline.com/proteins/>

Image from: <https://www.mdpi.com/2310-2861/10/10/671>

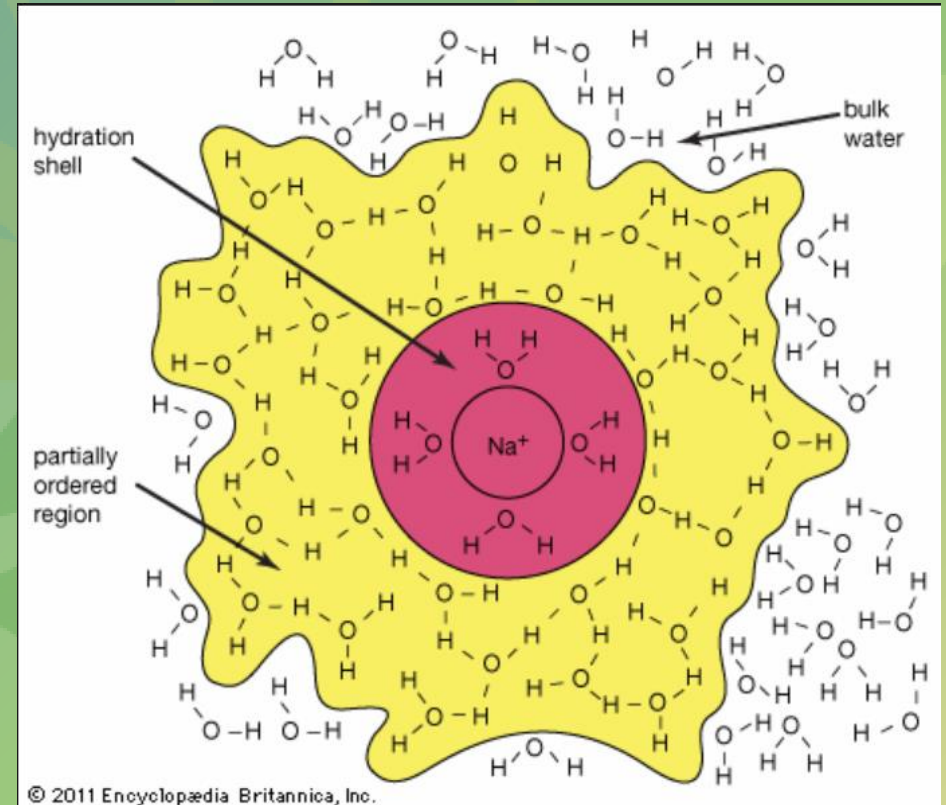
Small Intestine

- Most absorption of nutrients happens here
- Cells in the small intestine absorb water, minerals, vitamins, sugars, fats and amino acids
- Health of the GI tract affects absorption



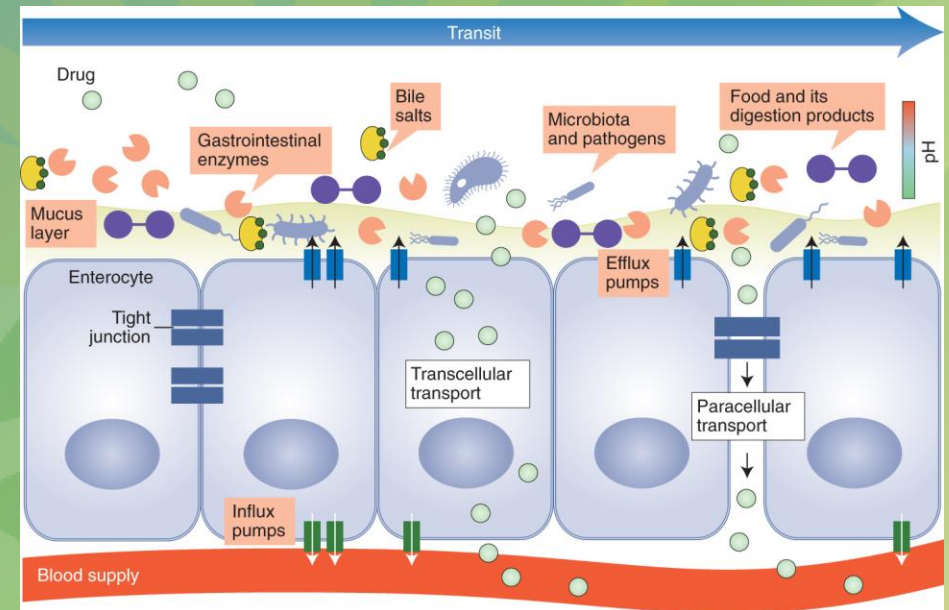
Intestinal Absorption

- Barriers exist to keep us safe from environment – also keeps us from potentially benefitting from oral therapy of medications/nutrition



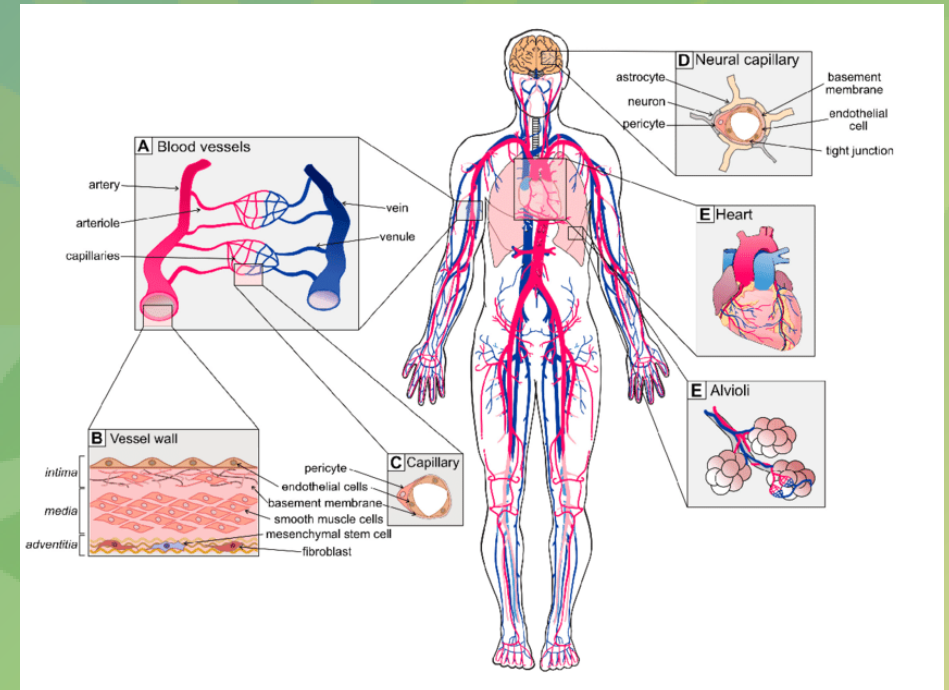
Intestinal Absorption

- Summarized picture of what is happening at the intestinal wall junction
- Multiple modalities to bypass barrier of GI tract from blood supply



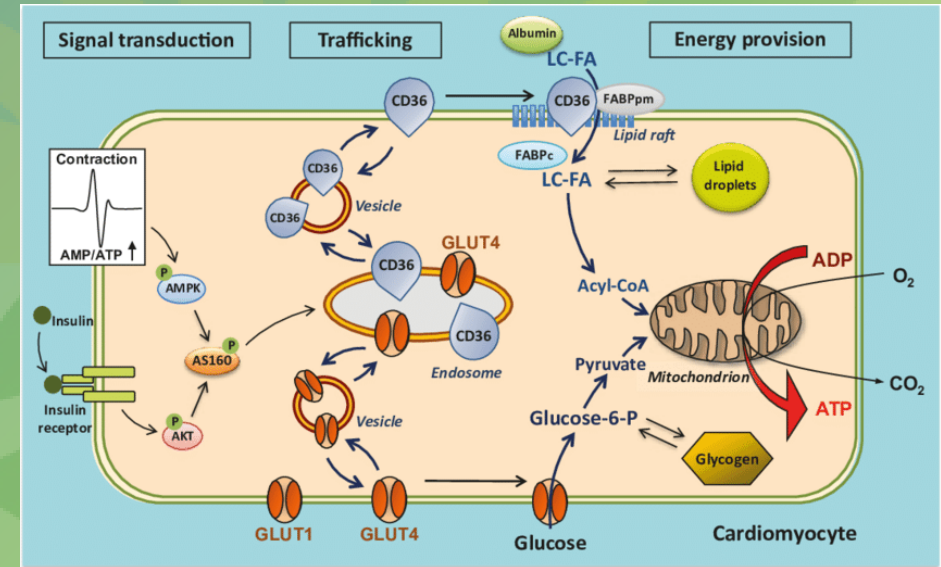
Vasculature

- The highway for nutrition, oxygen, and many other things in the body
- Intestinal absorption blood flow goes to liver first
 - Detox
- Then carries into the body



Cellular Absorption

- From the blood, now nutrients need to make it into all the cells in the body
- Example of 1 modality for 1 nutrient only used in fatty acid oxidation
- Complex process



Mitochondria Structure

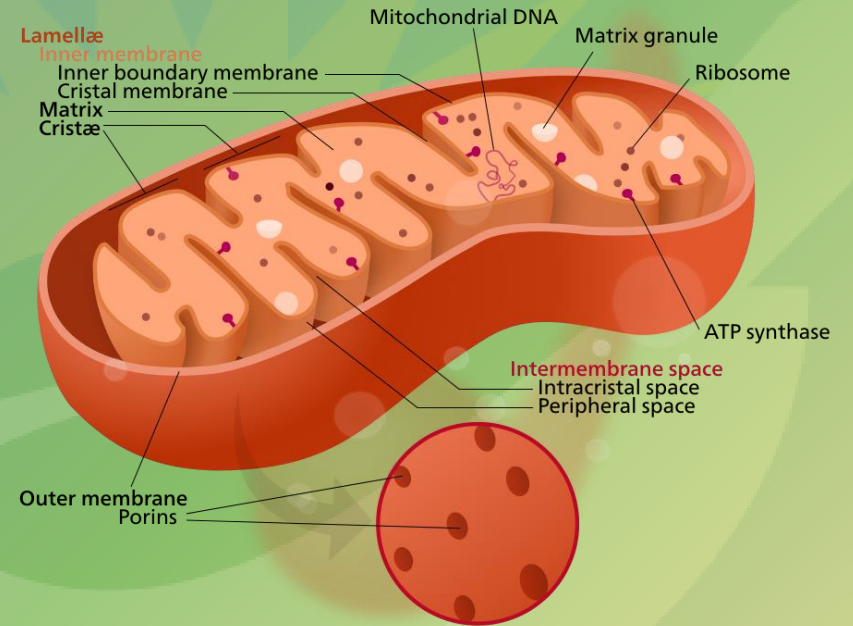
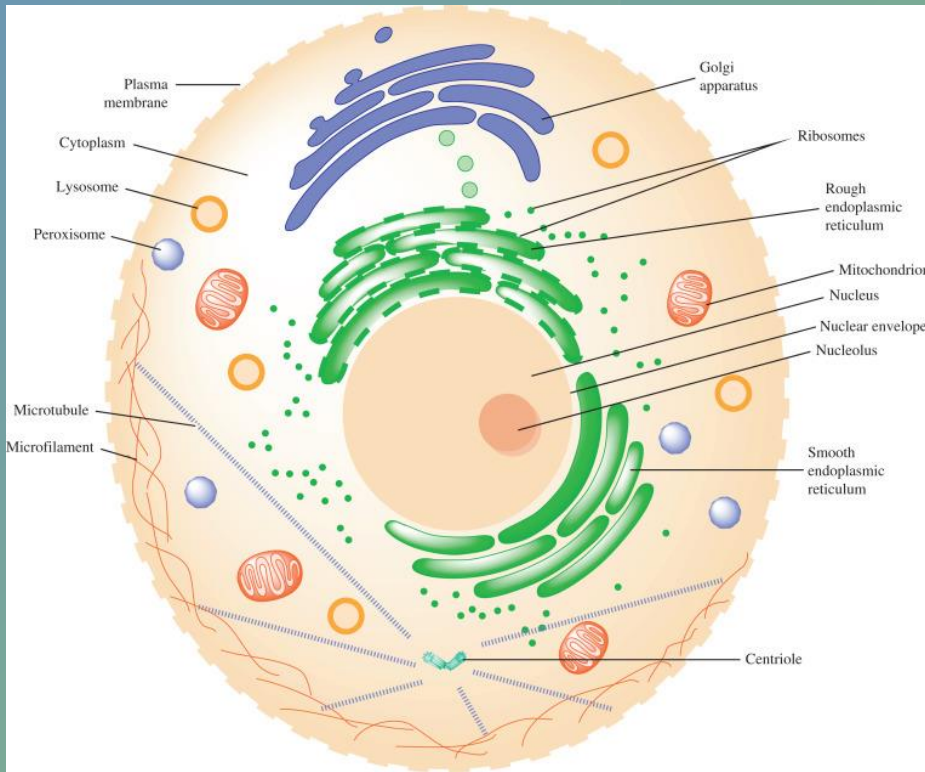


Image from: <https://images.app.goo.gl/pUraHLZ3Gt2S7AbL9>

Image from: <https://www.peirsoncenter.com/articles/mitochondria-why-theyre-important-and-what-they-need-to-function>



DNA

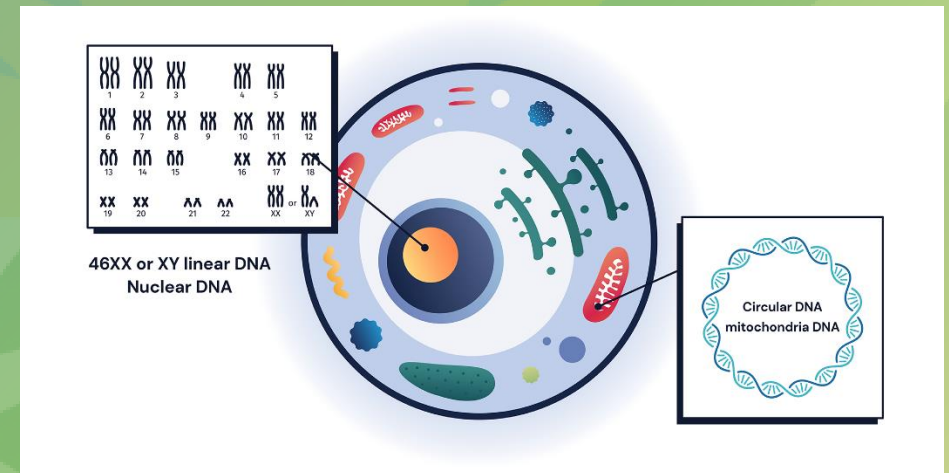
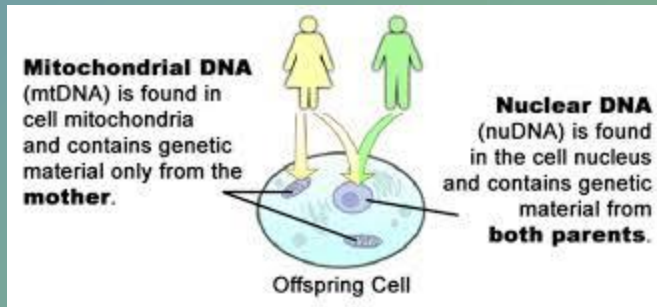


Image from: <https://thenaturalhistorian.com/2013/02/26/kinds-baramins-creationism-mtdna-genomes-compared/>

Image from: <https://3billion.io/blog/diagnose-mitochondrial-disease-using-wes-and-wgs>



Glycolysis

- The first step in energy creation
- 1 glucose molecule is broken down into 2 *pyruvate* molecules that then will enter the Krebs Cycle
- Quickest way to make energy

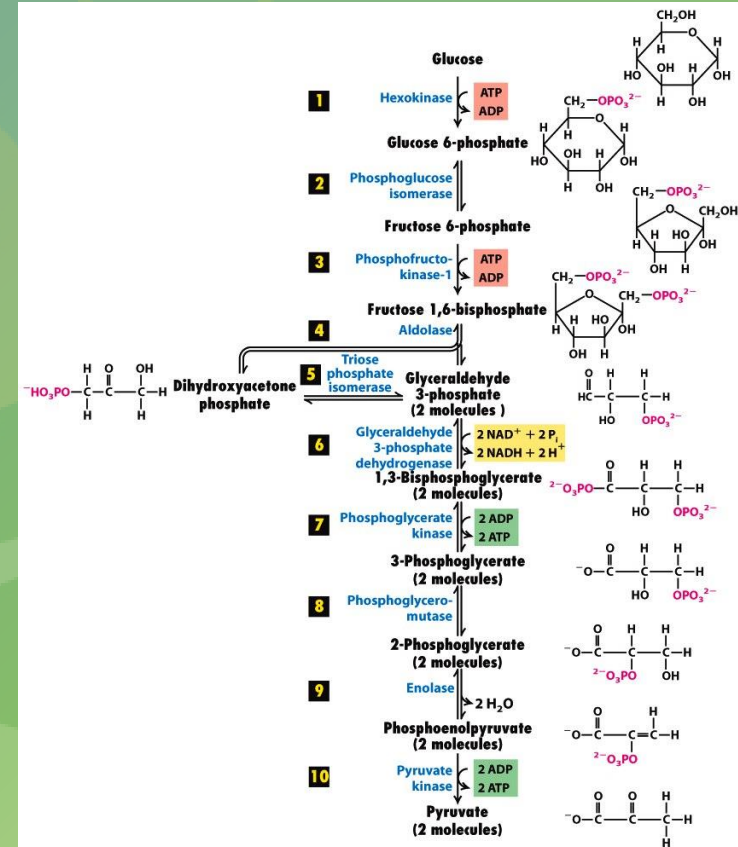
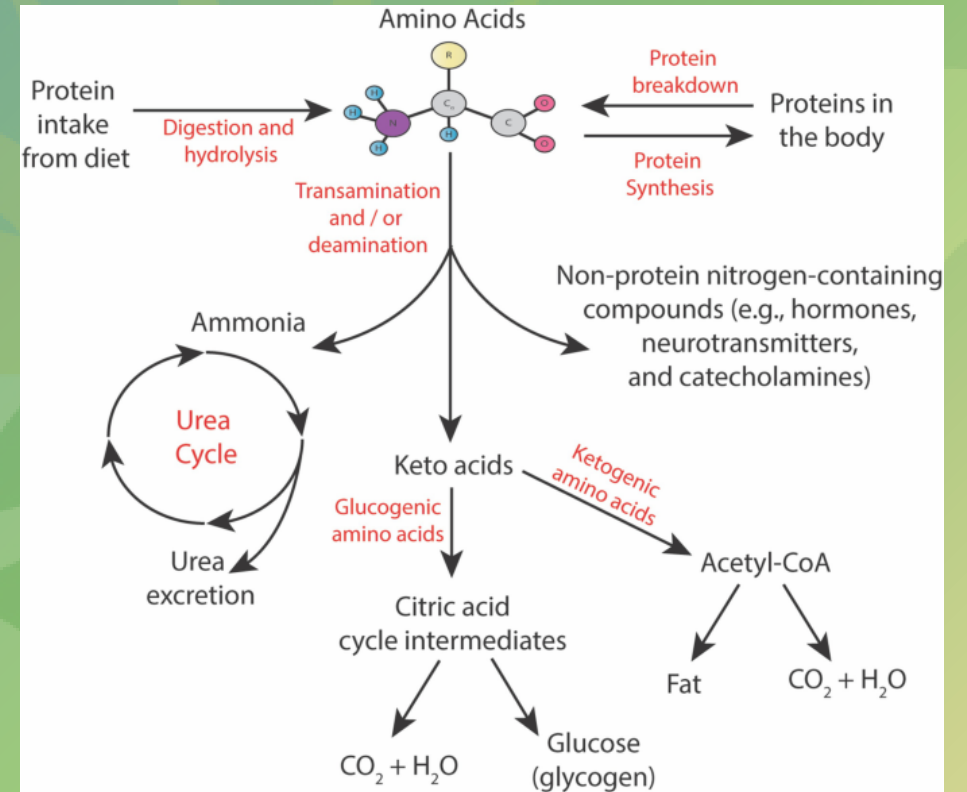


Figure 12-3
Molecular Cell Biology, Sixth Edition
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Protein Metabolism

- Another pathway for energy production
 - Amino acids are broken down into *Acetyl-CoA* which enters the Krebs cycle or Fatty Acid Oxidation
 - Other *Keto Acids* can enter the Krebs Cycle as intermediates
- 1 molecule of an amino acid produces about the same amount of energy as 1 molecule of glucose
- More complex process



Fatty Acid Oxidation

- The most energy-rich process
 - Multiple *Acetyl-CoA* molecules are created per 1 fatty acid molecule
 - Those enter the Krebs Cycle

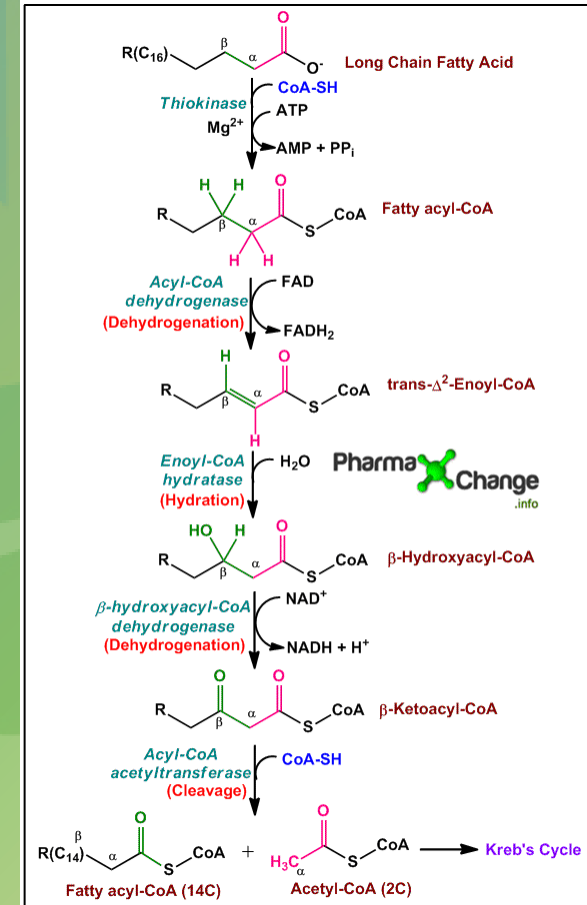


Image from: <https://pharmaxchange.info/2013/10/oxidation-of-fatty-acids/>

Krebs/Citric Acid/TCA Cycle

- Role of B-vitamins in the cycle

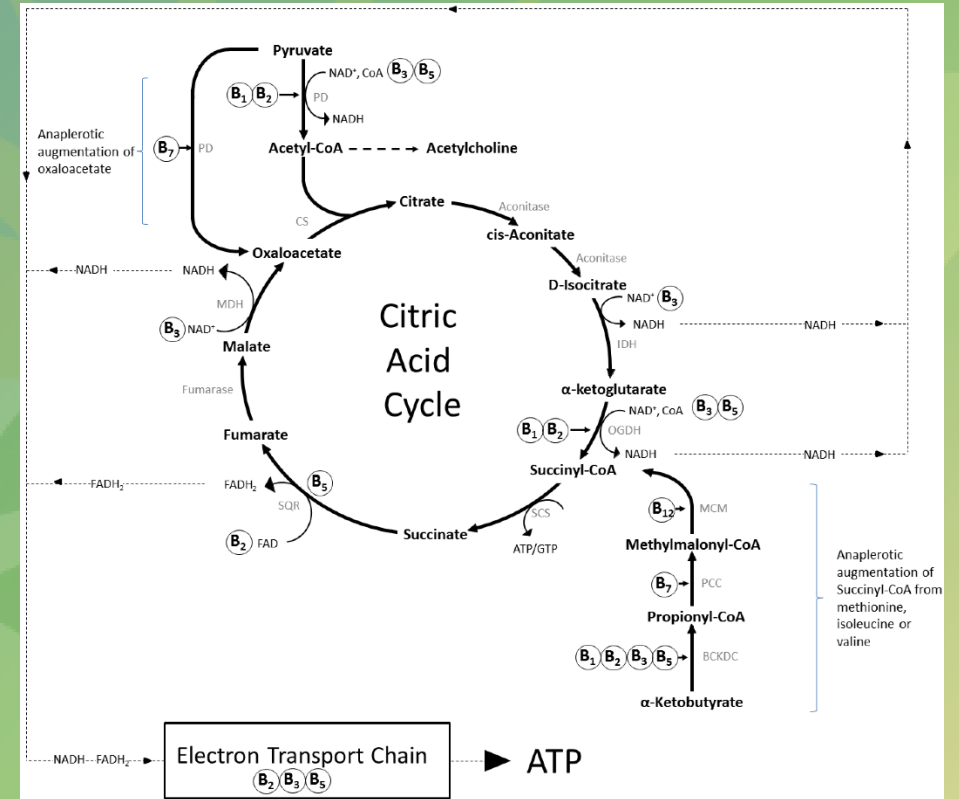
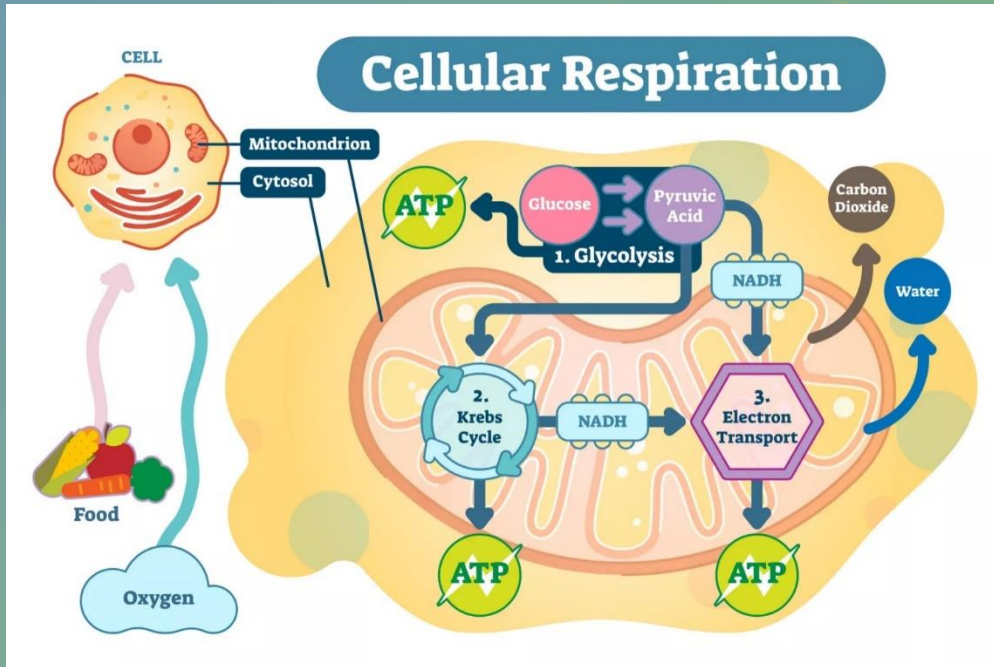


Image from: <https://www.biologyonline.com/dictionary/cellular-respiration>

Image from: <https://www.mdpi.com/2072-6643/8/2/68#>

Electron Transport Chain (ETC)

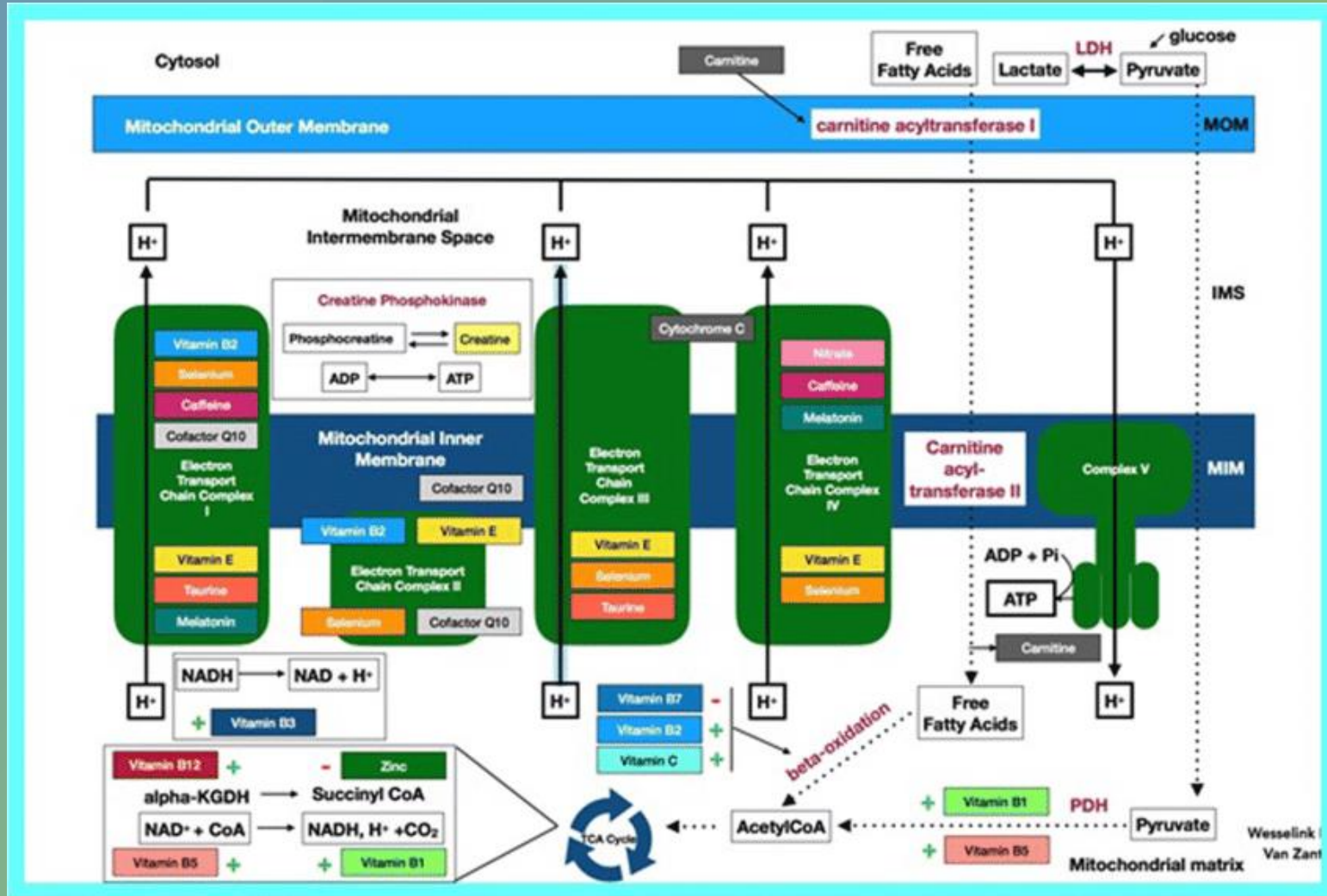
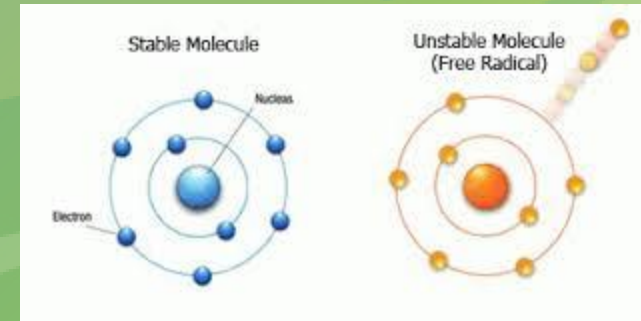


Image from: https://www.researchgate.net/figure/Role-of-micronutrients-in-the-function-of-the-electron-transport-chain-Reprinted-from_fig2_337197476

What are Reactive Oxygen Species (ROS)?

- Every molecule has a stable amount of electrons
 - Some like to be ionized (Na^+ , Cl^-)
 - Some like to be bonded (O_2 , N_2)



Reactive Oxygen Species (ROS)

- Where ROS are generated in all living things

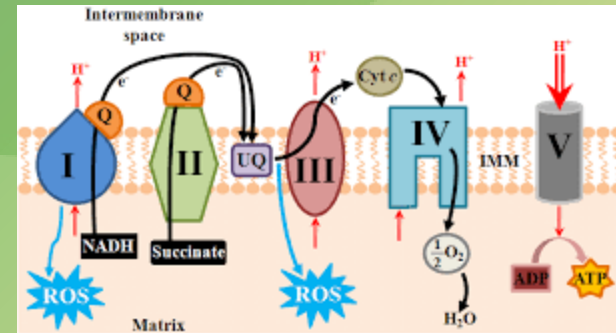
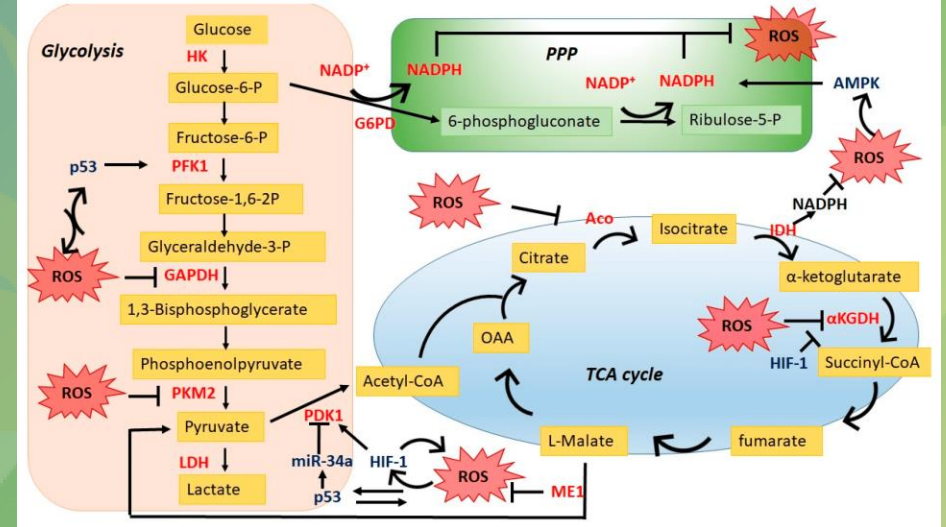
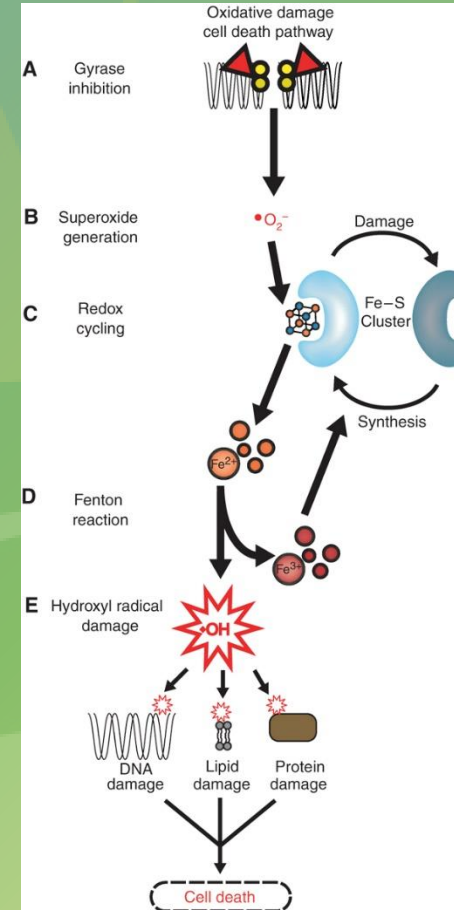


Image from: <https://www.mdpi.com/1422-0067/21/10/3412>

Image from: https://www.researchgate.net/figure/A-simplified-model-of-the-mitochondrial-ETC-and-ROS-production-Electrons-e-enter-the_fig26_266010551

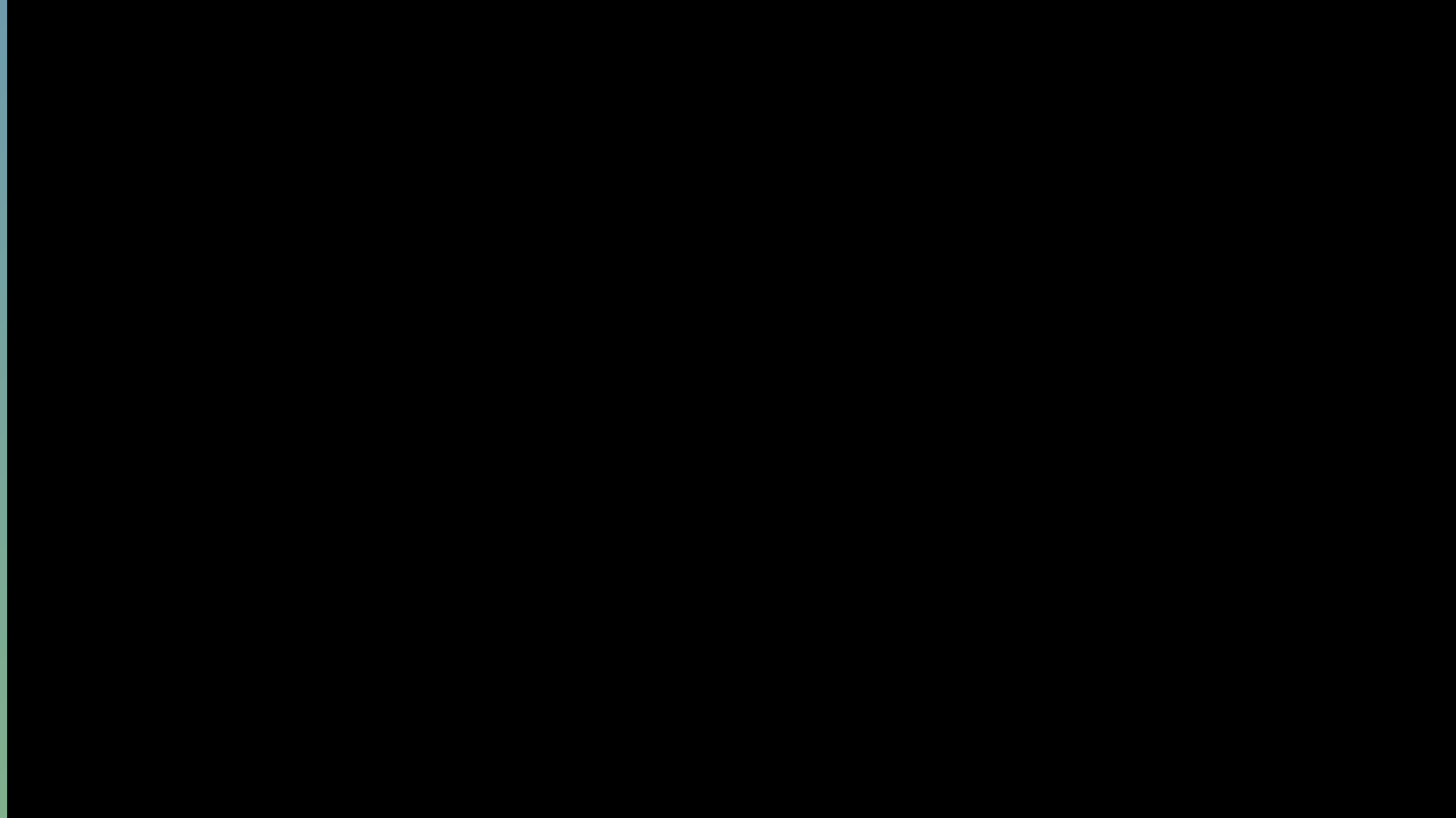
ROS Damage

- Happens in every cell of the body
- Cellular functions work to quench ROS
- Some damage does happen





What Most People Think



Video from: https://www.youtube.com/watch?v=P7fi4hP_y80



What Really Happens



Video from: <https://www.youtube.com/watch?v=AnHiAWlrYQc>





Questions?





Citations

