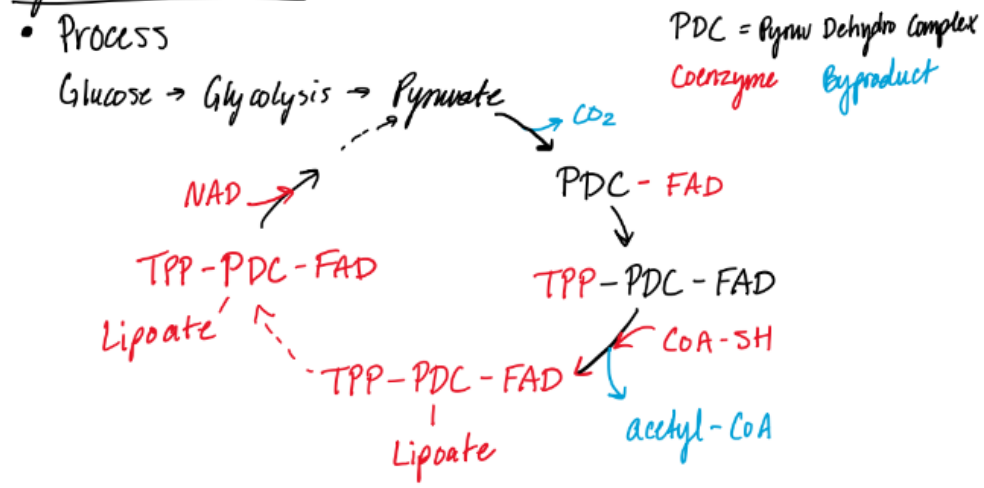
Exam III Review

Tricarboxylic Acid Cycle

Pyruvate Oxidation

- Process



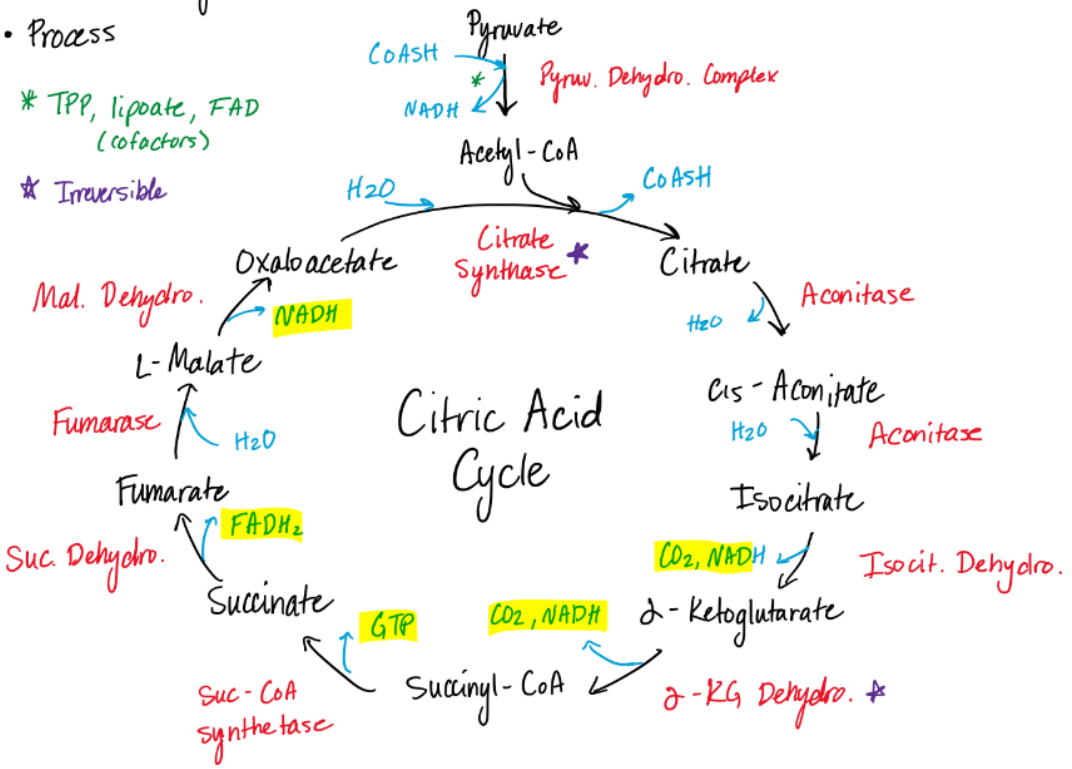
- Enzyme Regulation (PDC)
  - Activ: dephos - can't fit into active site with (P)
    Inactiv: phos
  - Activ ↑reg: Pyruv, CoASH, NAD^+
    ↓reg: NADH, Acetyl-CoA

Citric Acid Cycle

- Process

* TPP, lipoate, FAD (cofactors)

☆ Irreversible



Yield: 1 GTP, 3 NADH, 1 $FADH_2$, 2 CO_2
(2.5 ATP per) (1.5 ATP per)

- Mneumonic:
  - Products: **C**itric **A**cid **I**s **K**rebs **S**tarting **S**ubstrate **F**or **M**aking **O**xaloacetate
  - Enzymes: **S**ome **A**pples **A**re **D**elightfully **D**elicious, **S**o **D**on't **F**ind **D**onuts

- Enzyme Regulation

Enzyme	PDC	Iso Dehydro	α-KG Dehydro	Cit. Synthase
Activated By	AMP, CoA, NAD, Ca^{2+}	Ca^{2+}, ADP	Ca^{2+}, ADP	ADP
Inhibited By	ATP, acetyl-CoA NADH, fatty acids	ATP	Succinyl-CoA, NADH	succinyl-CoA, ATP citrate, NADH

- Anabolism
  1) Citrate → fatty acids, sterols
  2) α-Keto → glutamate → purines; Gln, Arg, Pro
  3) Succinyl-CoA → porphyrins, heme

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4) Oxaloacetate ⇄ (PEP carboxykinase / PEP Carboxylase) PEP → Glucose; Ser, Gly, Cys, Phe, Tyr, Trp

Carboxylase: anabolism in liver/kidney (req biotin)
Carboxykinase: anabolism in heart/skeletal muscle

Nitrogen and AA Metabolism

AA Anabolism (NH_3 form)

- Process: Glutamate $\xrightarrow[\text{Gln Syn}]{NH_3}$ Glutamine → AA
- Transport: Glutamate (α amino) $\xrightarrow[\text{Alanine Aminotransferase}]{\text{Alanine}}$ Pyruv → Liver
- AA from Diet: secretory Pathway
  1) Gastrin stim HCl/Pepsinogen
  2) Pepsinogen activ to be pepsin

3) stomach → small intest.

4) secretin secreted, pancreas stim

5) Pancreas stim bicarbonate to neutralize HCl

6) Duodenum releases cholecystokinin

8) Chymo/trypsin prod peptides

9) Peptides degrad by proaminopeptidase and carboxypeptidase A and B

10) Free AA sent to liver

AA Catabolism

1) AA + α Keto $\xrightarrow[\text{PLP coenzyme}]{\text{Aminotransferase}}$ Glutamate (+ α keto Acid) Cytosol

2) Glutamate + Alanine $\xrightarrow{\text{Glu Dehydro}}$ NH_4 $\xrightarrow[HCO_3, 2ATP]{CSPI}$ Carbomoyl Phosphate Mito

and

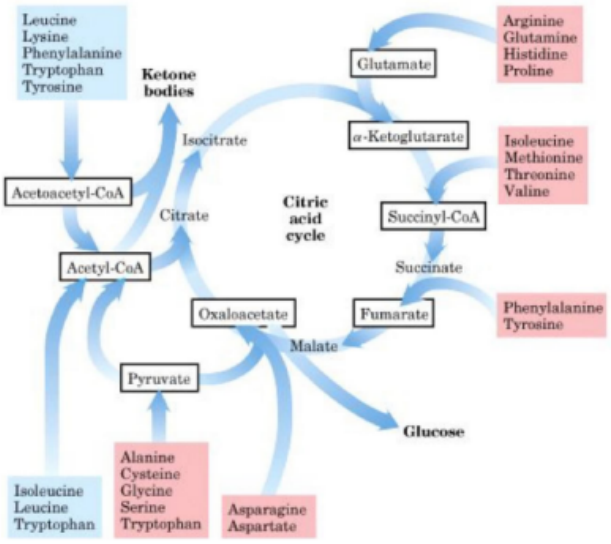
Glutamine $\xrightarrow{\text{Glutaminase}}$ Liver

CSP = Carbomoyl Phosphate Synthase I

Urea Cycle

3) Carbomoyl Phosphate → Citrulline —ATP→ Arginino-Succinate → Fumarate → Arginine → Urea (leaves) —H_2O→ Ornithine → Citrulline

AA Synopsis in Cycle



Essential: A N D C G E Q P S T

Nonessential: R H I L K M F T Y V

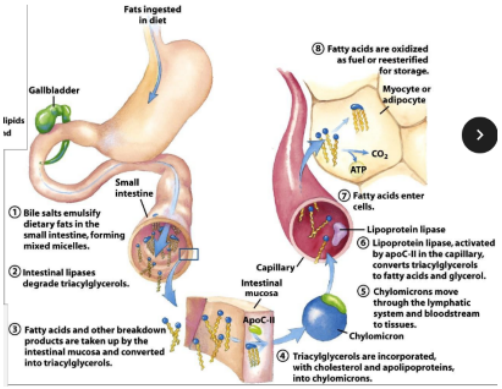
Molec from AA

- Creatine: buffer in skeletal muscle From Gly/Ser
- Glutathione: redox buffer for Fe in heme From Gly, Gln, Lys
- Polyamines: DNA packaging From Met / Orthinine
- GABA, Hist, Nor/Epi, Dop, Ser, Cimetidine
- T_3/T_4 for thyroid
- Nitric oxide From Arg

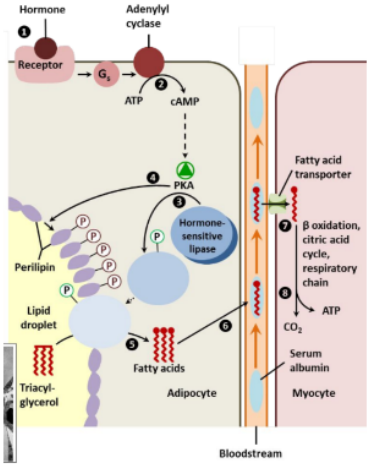
Lipid Metabolism

Fat Transport

- Exogenous Source



- Endogenous Source



Adipose Tissue Pathway

1) Epi / glucagon activ adenylate cyclase → cAMP (P) → triglycerol lipase activ → triglyceral hydrolyzed

2) Perilipin on fat molec (P) → CGI-58 released → lipolysis initiated → bind to albumin

3) Fatty acyl-CoA (FAS) synthetase adds ATP to fat → FAS adds CoASH to make fatty acyl CoA (Converted bc it can't cross mito mem)

4) Fatty acyl-CoA esters form @ mem → attach to carnitine via carnitine acyltransferase I (CAT) → Transporter pushes it into inner mito matrix → Transf from carnitine to intermito CoA via CAT II

Fatty Acid Oxidation

1) β Oxidation (of saturated fatty acid) C = CoA

Palmitoyl C —FAD (acyl C dehydro)→ Enoyl C —H2C (enoyl C hydratase)→ L-β-hydroxy acyl C —NAD (β-hydroxy acyl C dehydro)→ β-Ketoacyl C —CoASH (thiolase)→ Acetyl C

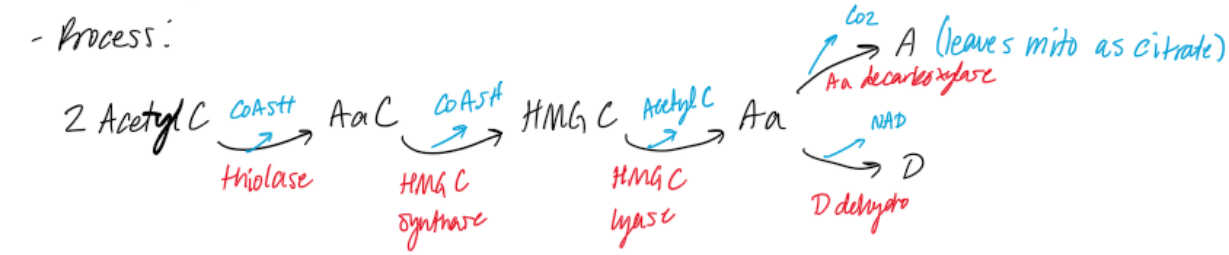
7 runs of β-ox per molec of palm C
Yields 8 Acetyl C, 7 $FADH_2$, 7 NADH

2) CAC (alternative is Ketone body)

3) ETC

Ketone Formation

- Products: acetone (A), acetoacetate (Aa), D-β-hydroxybutyrate (D)
- Aa/D go to skeletal/cardiac muscle, brain (starv), never liver
- Process:



Fatty Acid Synthesis