



Metabolism of lipids IV:

Ketone bodies

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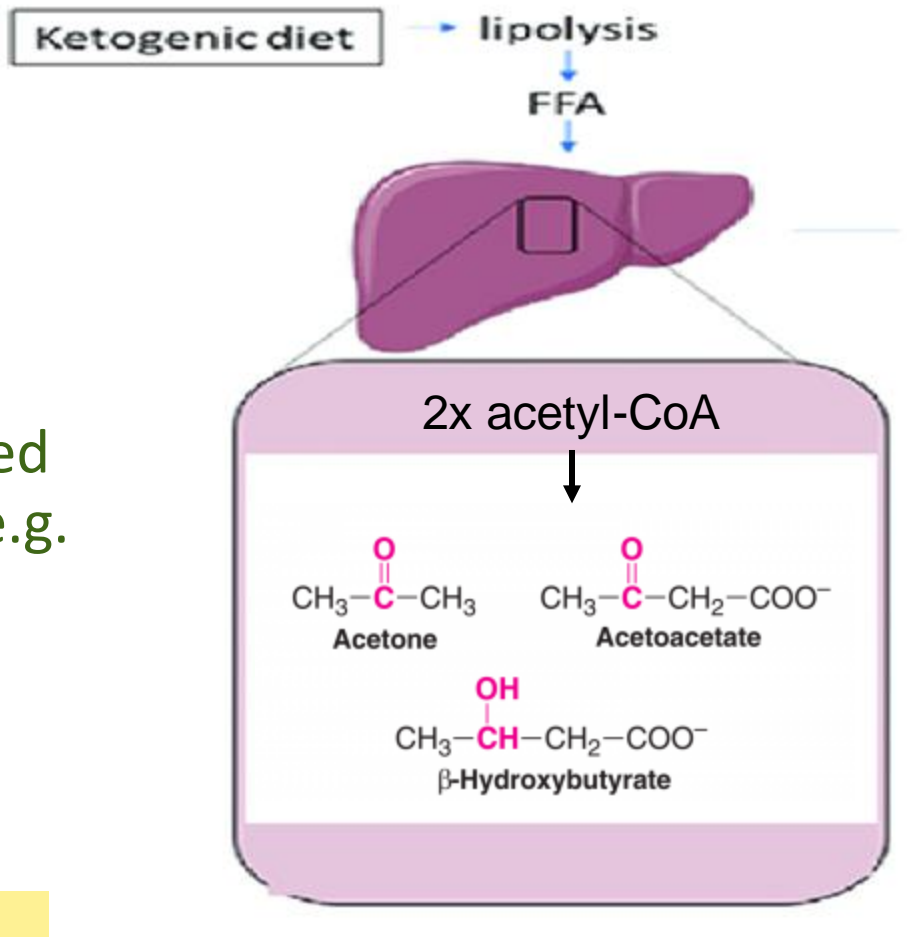
- This lecture
- Lippincott's Biochemistry, Ch. 16
- Diabetic, alcoholic and starvation ketoacidosis
 - <https://derangedphysiology.com/main/cicm-primary-exam/required-reading/acid-base-physiology/acid-base-disturbances/Chapter%20617/diabetic-alcoholic-and-starvation-ketoacidosis>

What are ketone bodies?



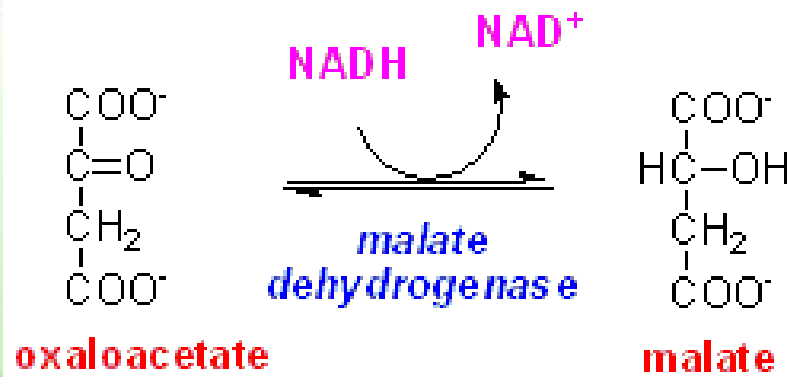
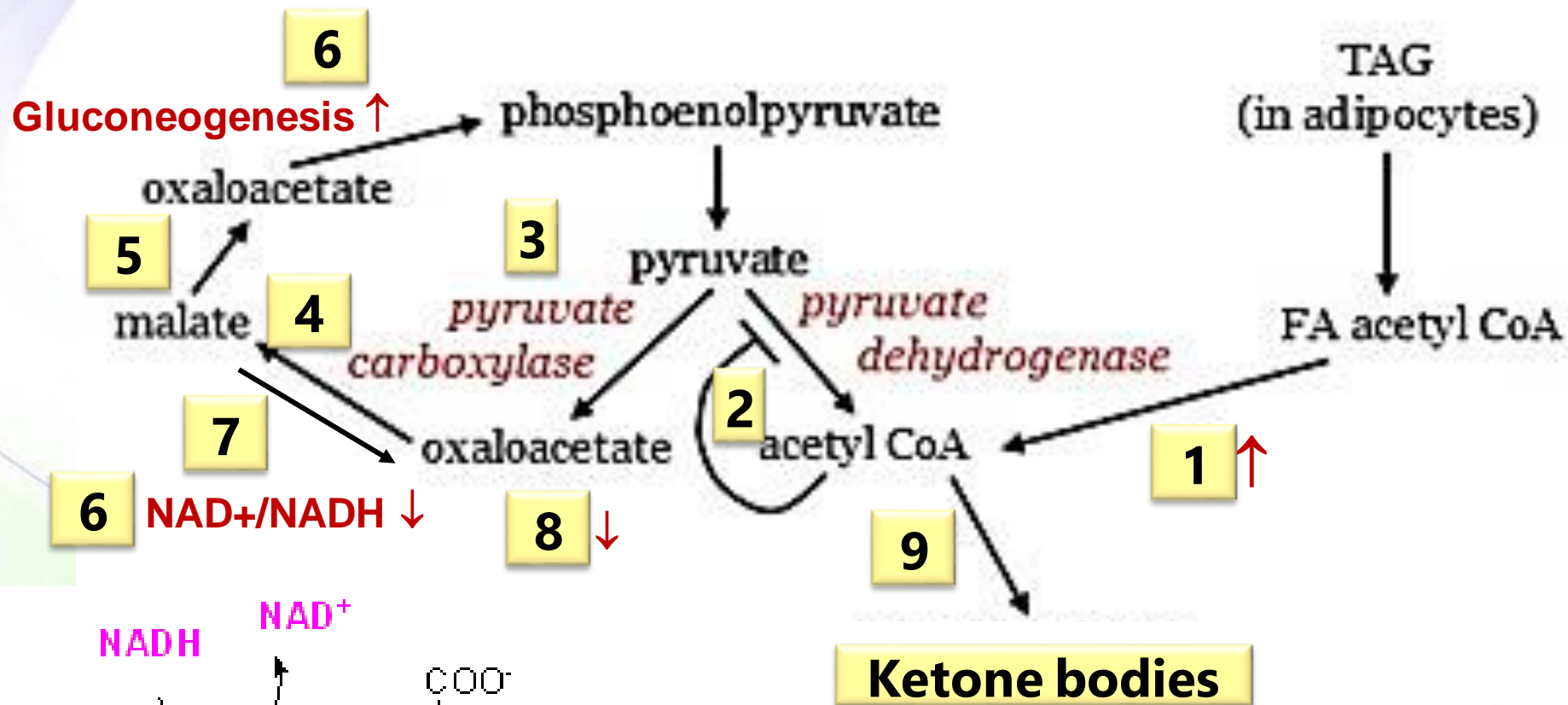
- From 2x acetyl-CoA, the liver produces ketone bodies:

- Acetoacetate
- 3-Hydroxybutyrate (AKA β -hydroxybutyrate)
- Acetone (volatile)
- The organic acids are transported to and re-converted to acetyl-CoA in, and utilized by peripheral tissues (e.g. muscle, heart, brain, ...etc., **but not RBC and liver**)
- Advantages:
 - Soluble (no carrier is needed)
 - Fast
 - Spare glucose

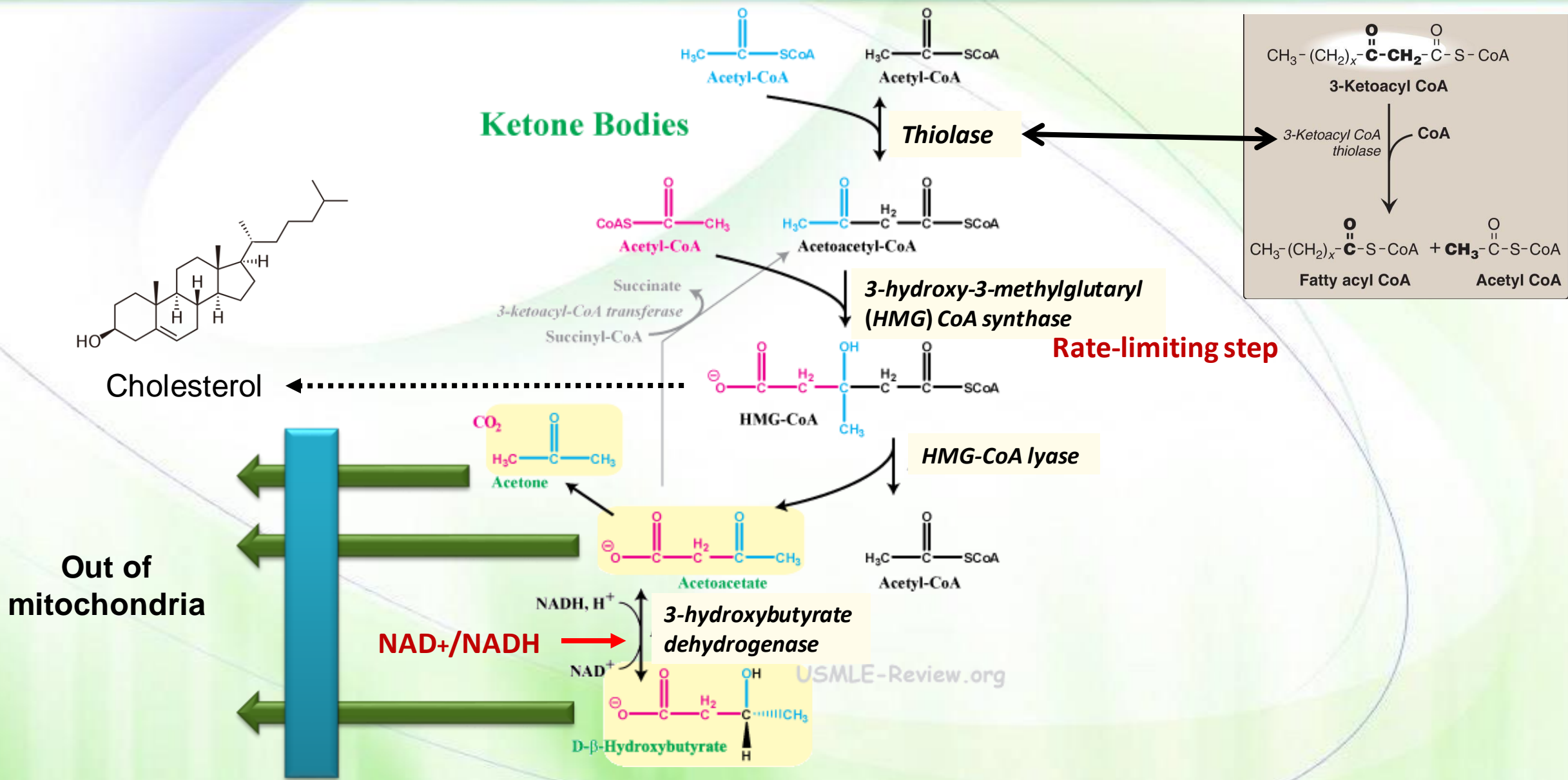


- At wake-up time: 3-4% of energy
- Prolonged fasting: 30-40%

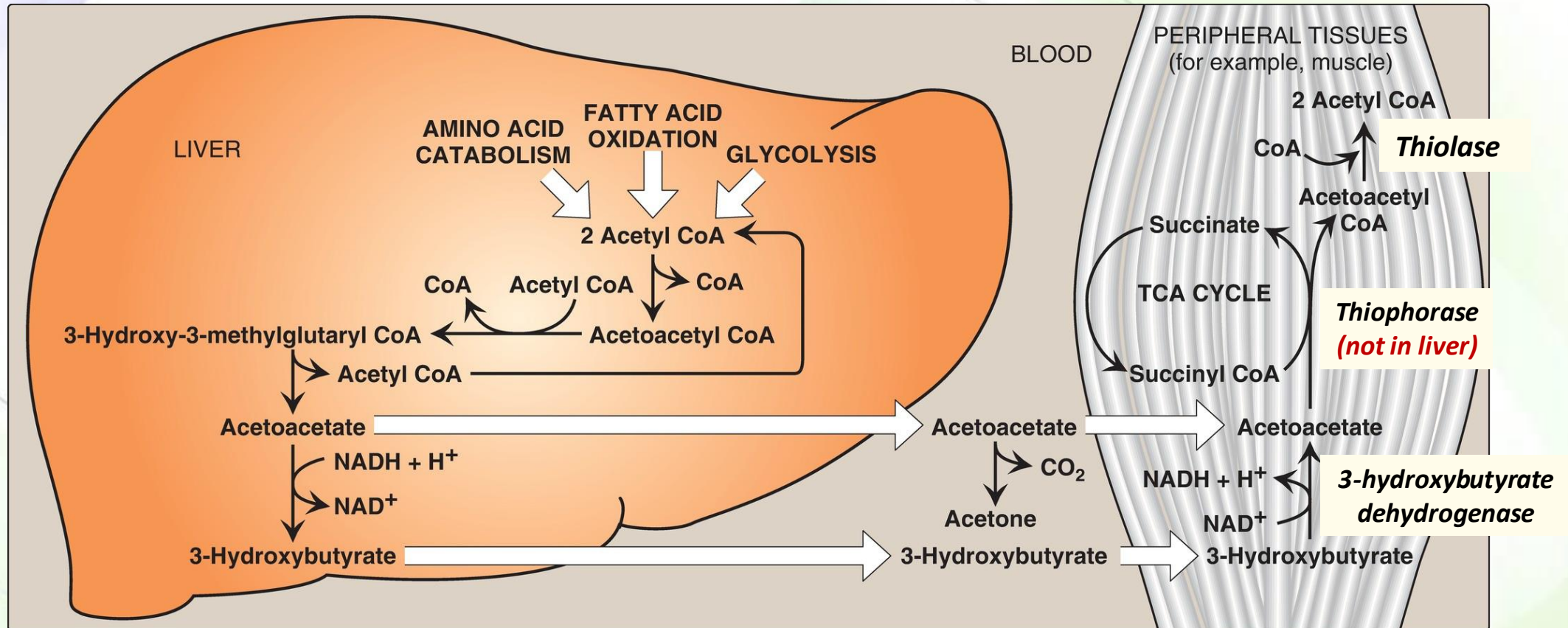
During a fast and diabetes...



The reactions



Use of ketone bodies

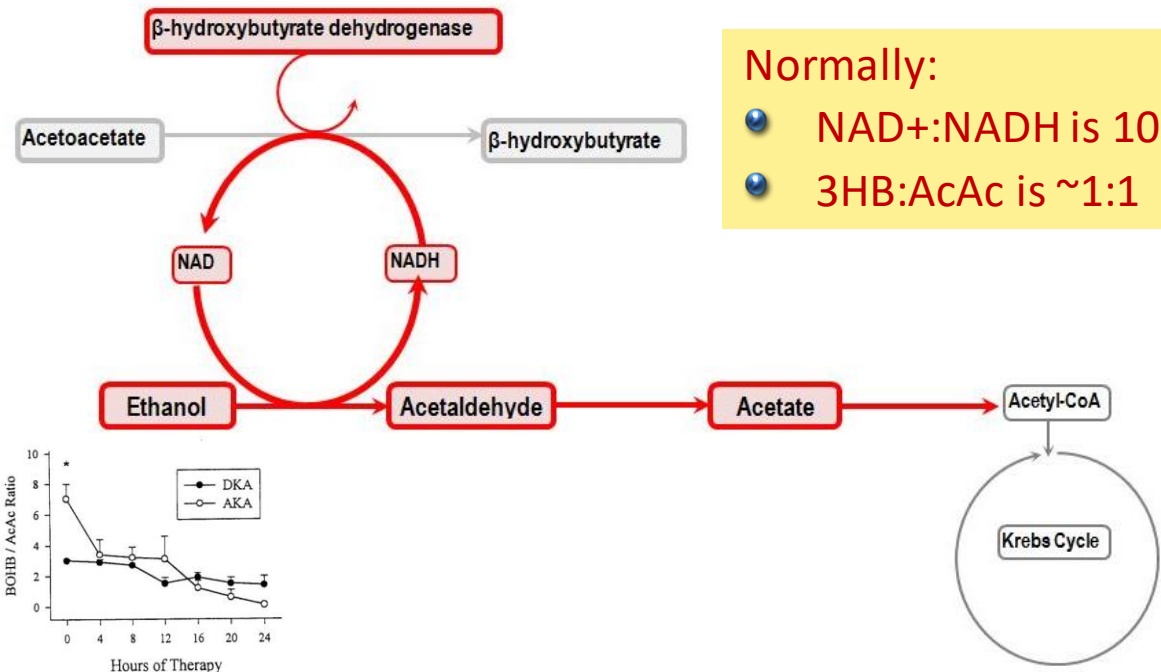
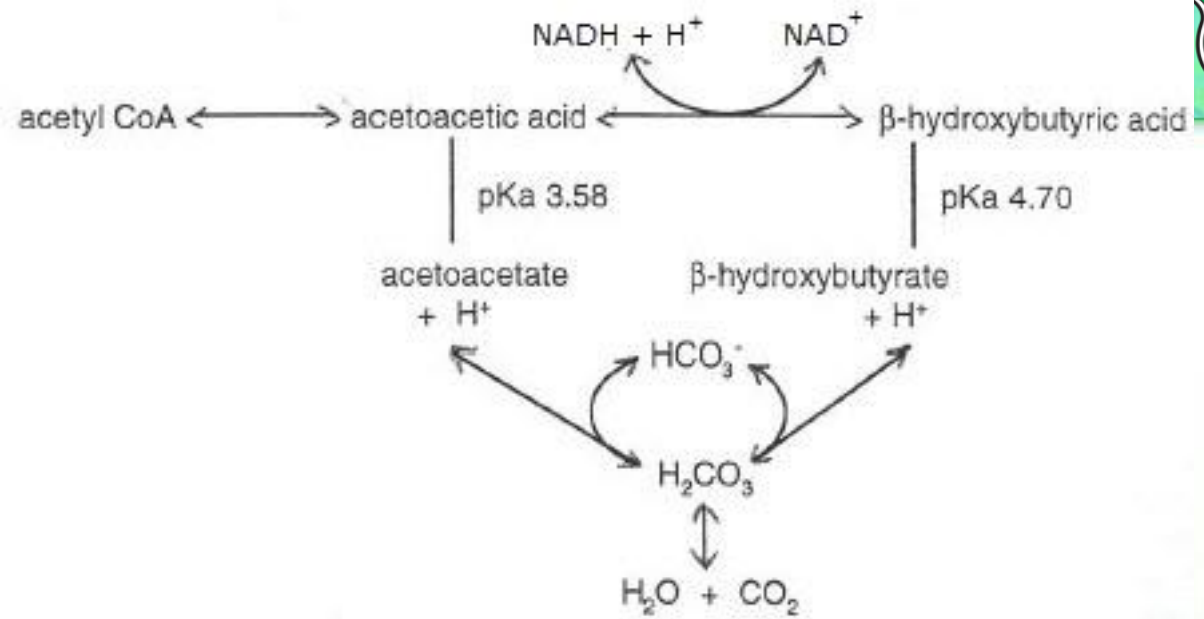


Ketoacidosis



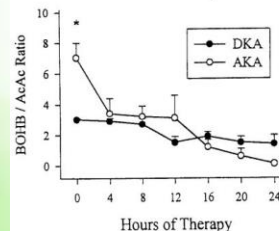
- Remember pKa!!!
- Normally, levels of ketone bodies: <3 mg/dl
- People with excessive production: 90 mg/dl and urinary excretion of ketone bodies may be 5,000 mg/24 hour.
- The end-results:
 - Dehydration
 - Acidemia (ketoacidosis)
 - Diabetic ketoacidosis, prolonged fasting, alcoholism
 - Fruity odor of breath

In alcoholic ketoacidosis: 3HB>AcAc
 The ratio gets back to 1:1 after a few hours



Normally:

- NAD⁺:NADH is 10:1
- 3HB:AcAc is ~1:1



Hormonal regulation

