Bile acids and Bile salts

Bile acids are synthesized in the liver from cholesterol through a series of steps:

Cholesterol catabolism

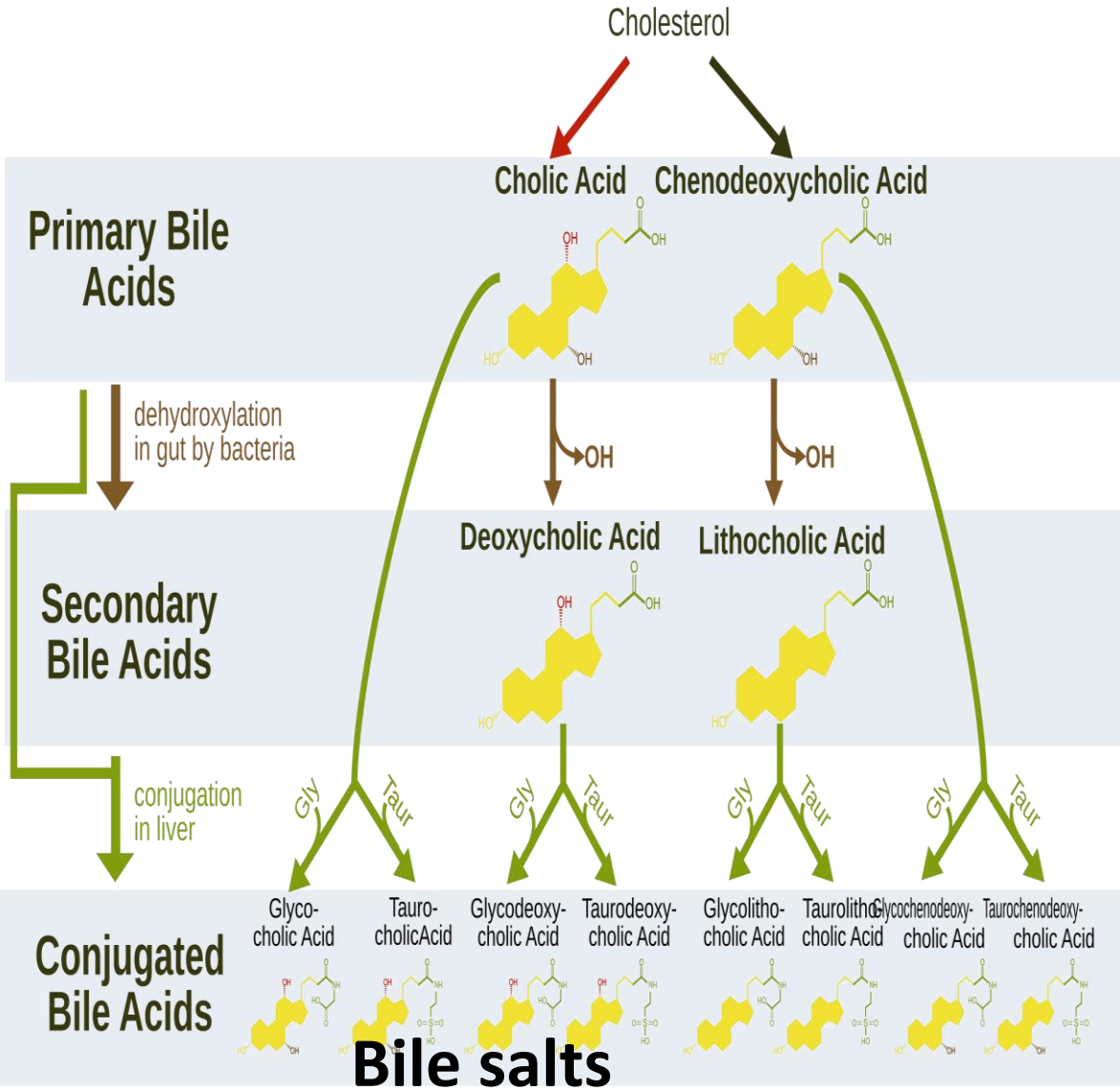
The liver's hepatocytes break down cholesterol to produce the primary bile acids cholic acid and chenodeoxycholic acid.

Conjugation

The liver conjugates the primary bile acids with the amino acids glycine or taurine to create bile salts.

Dehydroxylation

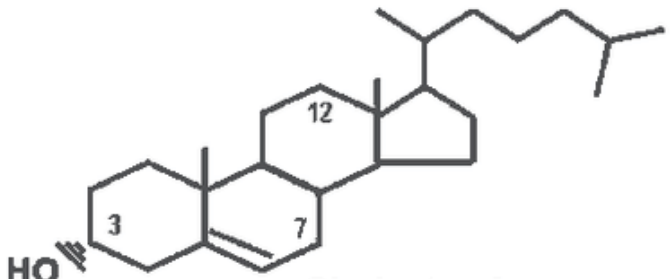
Bacteria in the small intestine dehydroxylate the primary bile acids to produce the secondary bile acids deoxycholic acid and lithocholic acid.



Classification of bile acids

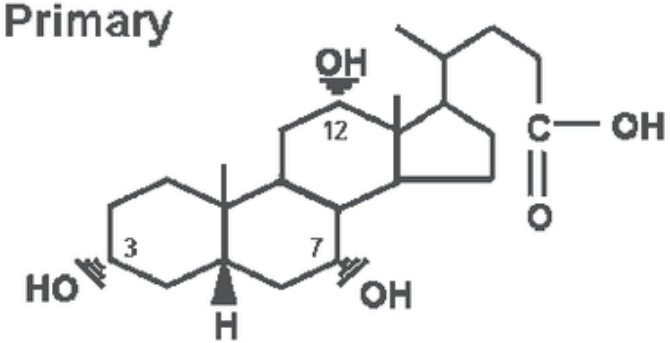
Classification	Free bile acids	Conjugated bile acids	
Primary bile acids	Cholic acid	Glycocholic acid	Taurocholic acid
	Chenodeoxy-cholic acid	Glycocheno-deoxycholic acid	Taurocheno-deoxycholic acid
Secondary bile acids	Deoxycholic acid	Glycodeoxy-cholic acid	Taurodeoxy-cholic acid
	Lithocholic acid	Glycolitho-cholic acid	Taurolitho-cholic acid

Structures

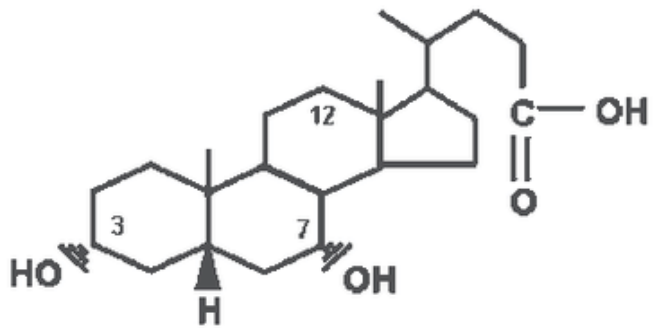


Cholesterol

Primary

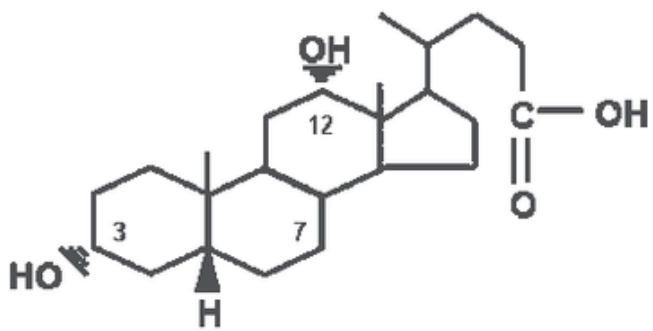


Cholic acid (CA)

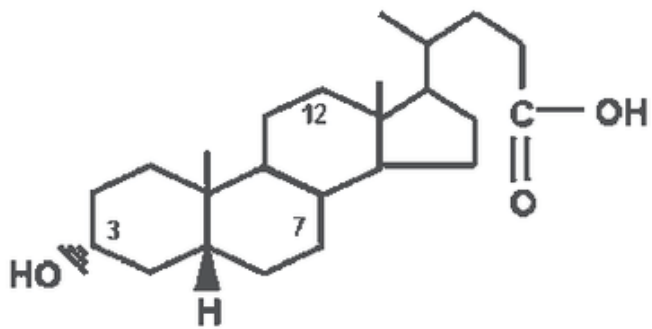


Chenodeoxycholic acid (CDCA)

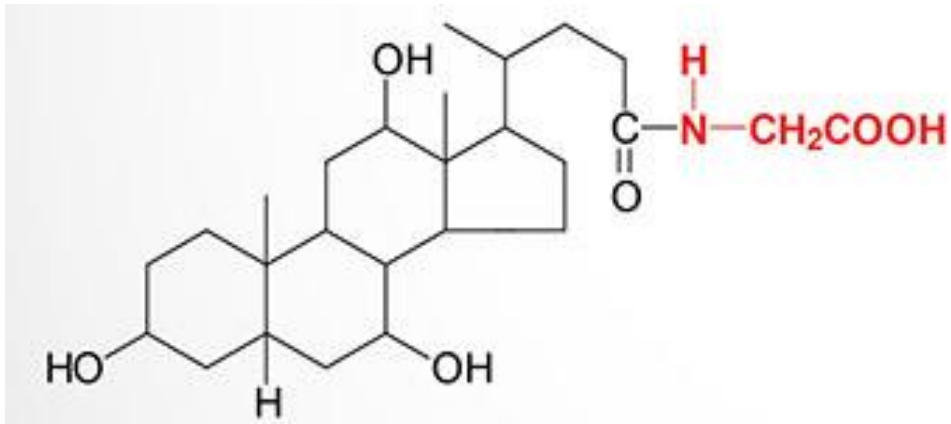
Secondary



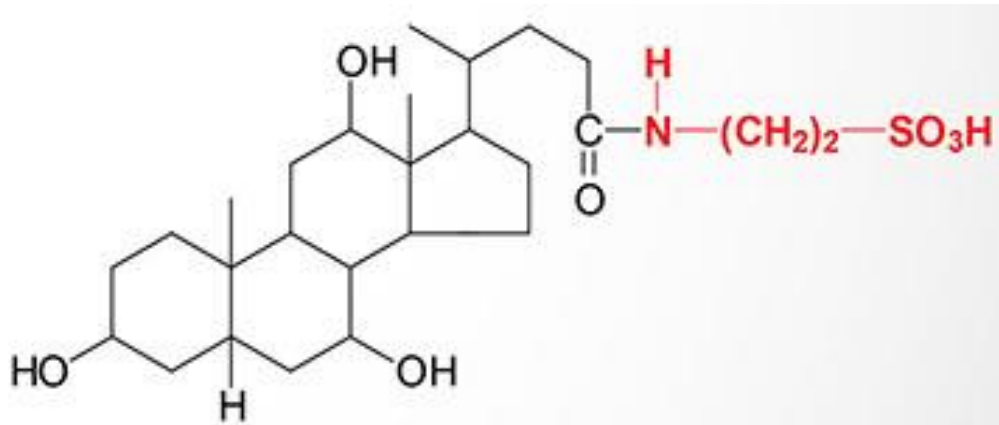
Deoxycholic acid (DCA)



Lithocholic acid (LCA)



Glycocholic acid



Taurocholic acid

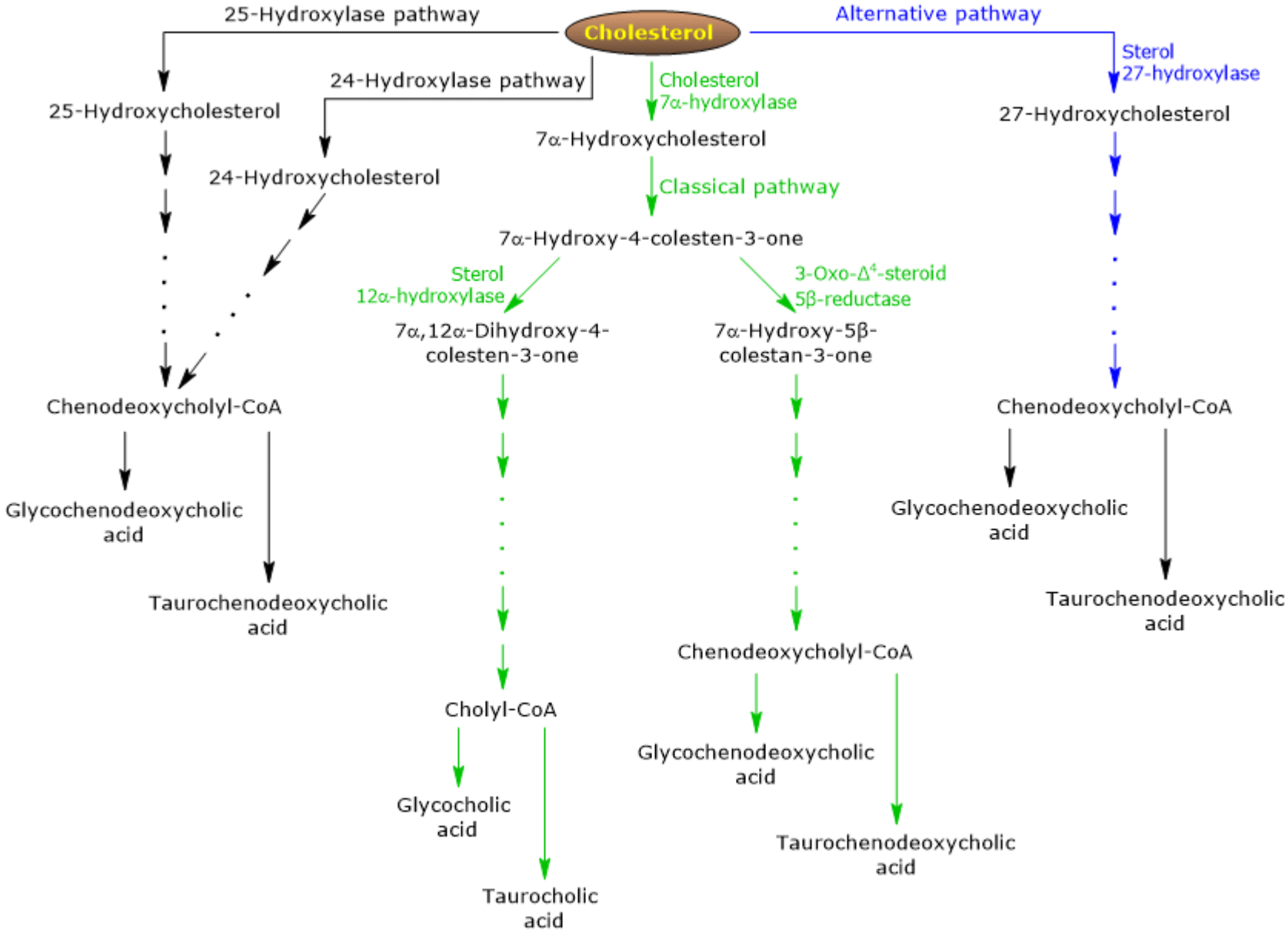
The main difference between bile acids and bile salts is that **bile salts are bile acids that have been conjugated with amino acids**, such as glycine or taurine:

	Bile acid	**Bile salt**
Composition	Steroid acid	Bile acid conjugated with an amino acid
Function	Emulsify fat, excrete cholesterol, antimicrobial effect	Help digest fats, absorb fat-soluble vitamins

The liver produces bile acids, which are then conjugated with amino acids to form bile salts. The amino acid portion of bile salts is hydrophilic, meaning it loves water. This makes bile salts more soluble in water and better able to emulsify fats than bile acids.

The liver produces about 800 to 1,000 ml of bile each day. Bile also contains cholesterol, water, and the pigment bilirubin.

Pathways for Bile acid and bile salt production



Functions of Bile acids/ bile salt

Bile salts, also known as bile acids, have several functions in the body, including:

Digestion

Bile salts break down large fat droplets into smaller particles, called micelles, which are easier for digestive enzymes to break down. This process is called emulsification. Bile salts also help the body absorb fat-soluble vitamins like A, D, E, and K.

Excretion

Bile salts help the body excrete cholesterol and bilirubin, a waste product from the breakdown of red blood cells.

Alkalization

Bile salts neutralize the acidic pH of chyme from the stomach by providing an alkaline fluid in the duodenum.

Signaling

Bile salts act as signaling molecules in the liver and intestine, regulating metabolic and cellular functions.

Homeostasis

Bile salts play a key role in maintaining homeostasis in the liver and intestines.

The liver produces bile salts from cholesterol. A lack of bile salts can lead to a buildup of toxins in the body, as well as problems with hormone formation. Other complications include diarrhea, gas, stomach cramps, and weight loss.