

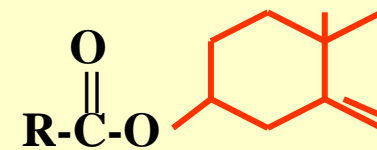
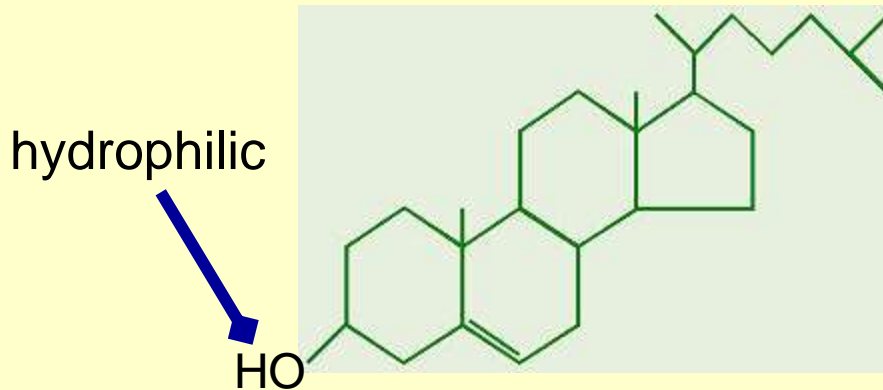
CHOLESTEROL

OBJECTIVES:

1. For **cholesterol**:
 - a) list its physiological functions
 - b) describe its synthesis
 - c) list groups of hormones produced from it
2. For **bile acids (salts)**:
 - a) list their physiological functions
 - b) describe their synthesis

CHOLESTEROL FACTS

- synthesized from acetyl CoA and eliminated as bile acids
- precursor of all other steroids in the body
- - in foods of animal origin
- amphipathic lipid (hydrophobic and hydrophilic portions)
- storage form is cholesterol ester found in most tissues.



Cholesterol ester (1st ring only)
R = fatty acid hydrocarbon chain

CHOLESTEROL FACTS

- **essential structural component of membranes**
- **transported in the circulation in lipoproteins**

ROLES OF CHOLESTEROL AND BILE ACIDS (SALTS)

The physiological roles of cholesterol include:

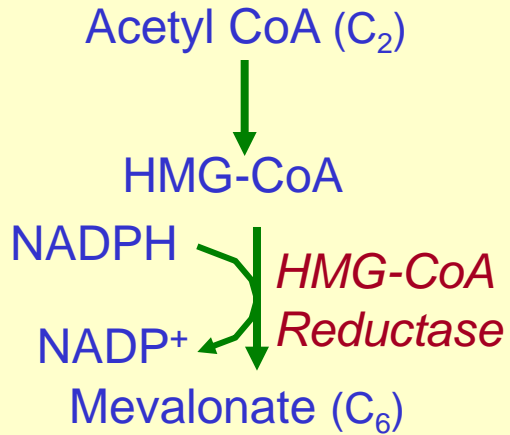
- a) an important lipid component of biological membranes,**
- b) precursor of steroid hormones and**
- c) source of bile acids.**

Bile acids are polar derivatives of cholesterol and aid in:

- a) lipid digestion**
- b) lipid absorption**
- c) cholesterol excretion**

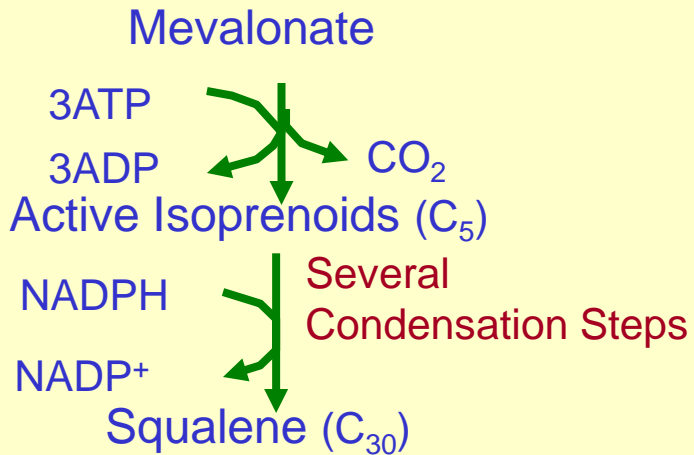
Cholesterol synthesis pathway

Stage 1

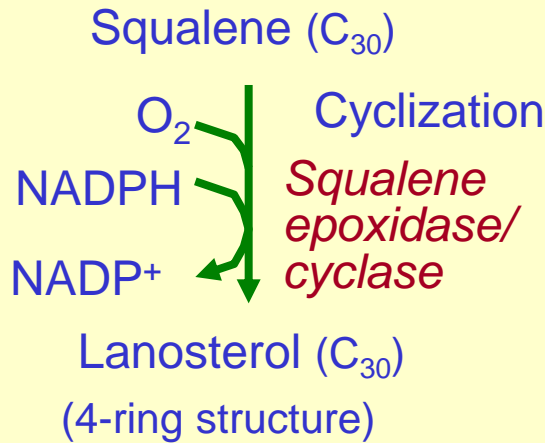


- ◆ rate-determining step
- ◆ cholesterol is feedback inhibitor
- ◆ mevalonate is feedback inhibitor
- ◆ target site for statin drugs

Stage 2



Stage 3



Stage 4

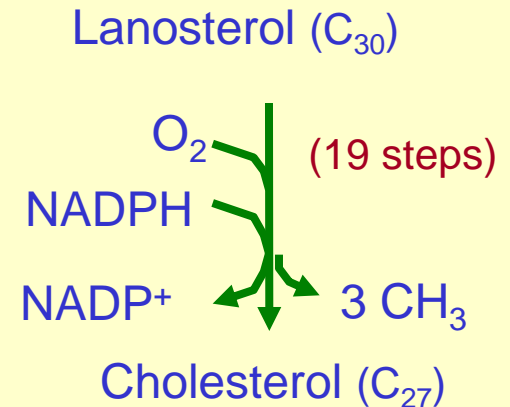
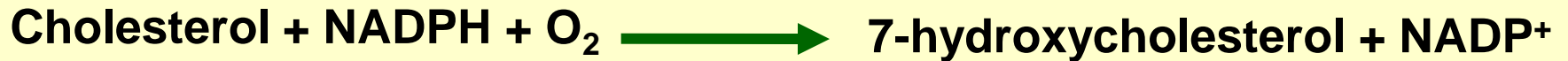


Figure 2. The four stages of cholesterol biosynthesis

HMG-CoA reductase is the regulatory enzyme of cholesterol pathway synthesis. It is inhibited by antihyperlipidaemic drug; statin and dietary cholesterol, but stimulated by Insulin through decreasing c AMP.

Bile acids synthesis

7 α -hydroxylase



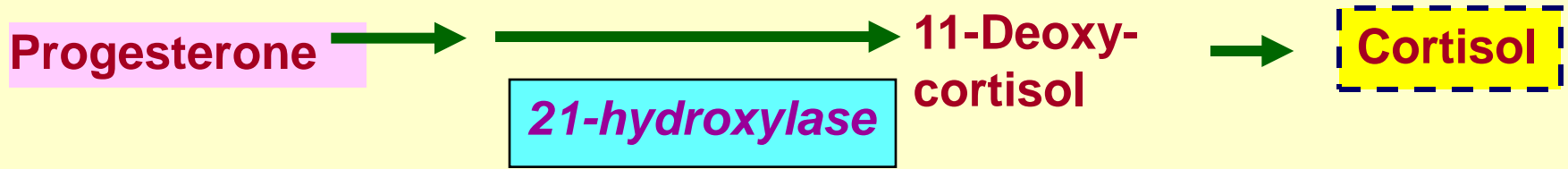
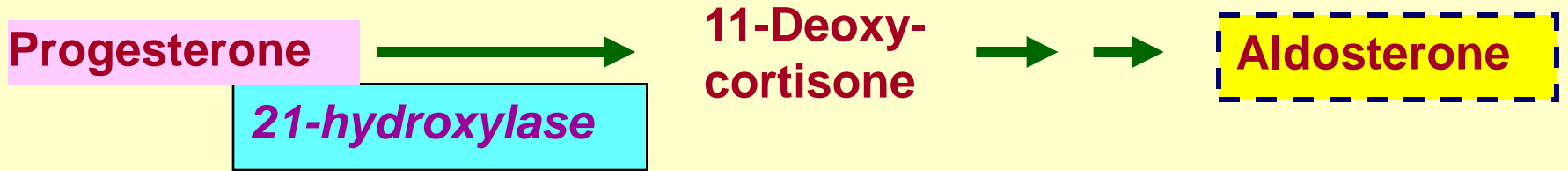
The initial reaction, 7 α -hydroxylase, in the conversion of cholesterol to bile acids.

- ✚ Rate-determining step
- ✚ Repressed (decreased synthesis) by bile salts
- ✚ Induced (increased synthesis) by cholesterol

Primary bile acids are : cholic acid and chenodeoxycholic acid(synthesized from cholesterol in the liver)

Secondary bile acids are: deoxycholic acid and lithocholic acid(from primary in S.I by intestinal flora).

*activated to turn
on pathways*



General pathways for the synthesis of aldosterone and cortisol in the adrenal cortex

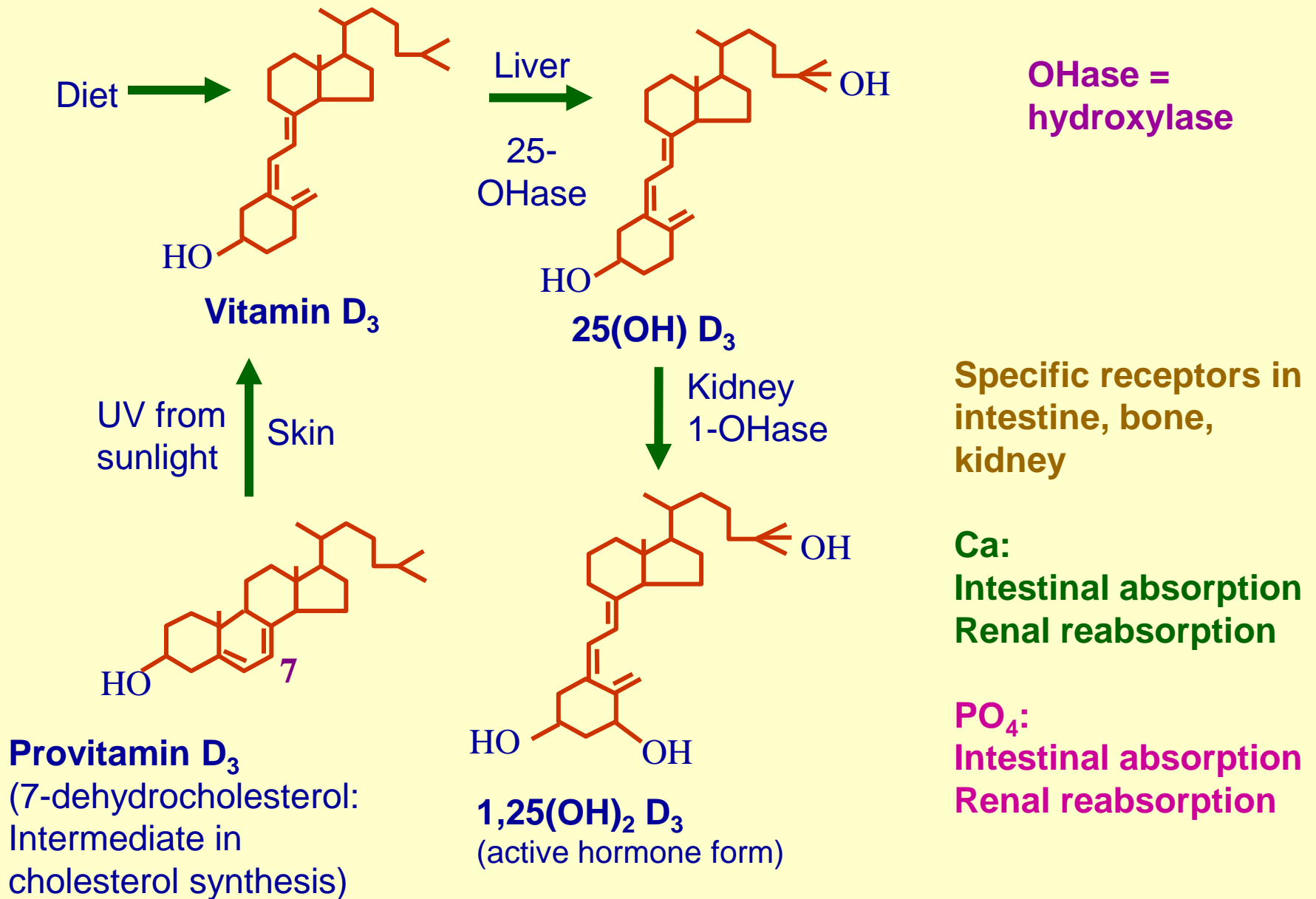


Figure 7. Photobiosynthesis of vitamin D₃ and its metabolism