STEROIDOGENESIS

1. We are going to study a metabolic pathway involved in catabolism. For that, we are assembling a puzzle, which works like this: there will be available some clues about the metabolic pathway that we are studying and about the chemical structure of some compounds of that pathway. The goal of each group is to analyze and assemble all compounds in a logic sequence. For that, the group needs to schematize the pathway in the metabolic map, including all products and informations about reversibility of the reactions. You can use the "Study Mode" of the App ARMET Pathways to help you.

2. After assembling the pathway, indicate all involved enzymes.

3. After determining every enzyme and reaction, answer the questions in the App. For that, use the "Game Mode". Finally, with the assistance of the textbook and your friends, discuss this study guide.

Clues:

- ✓ The biosynthesis of steroid hormones is necessary to maintain the reproductive function and homeostasis in general. This process is performed in the steroidogenic tissues (adrenals, gonads and placenta).
- ✓ The steroid hormones are classified as sex steroids (androgens, estrogens and progesterone), glucocorticoids (cortisol) and mineralocorticoid (aldosterone).
- ✓ Cholesterol is derived from acetyl-CoA.
- ✓ The precursor of all steroid hormones is cholesterol, which is formed intracellularly or is absorbed by the cells and is used in the mitochondria.
- ✓ Cytochrome P450 are a group of enzymes that catalyze many reactions involved in drug metabolism and synthesis of cholesterol, steroids and other lipids.
- ✓ The synthesis of steroid hormones is accomplished by different enzymes among which are the different types of cytochrome P450 steroid dehydrogenases and reductases.
- ✓ The synthesis of steroid hormones begins with the conversion of cholesterol to pregnenolone by cytochrome P450scc / CYP11A1 located in the inner mitochondrial membrane.

Some enzyme types

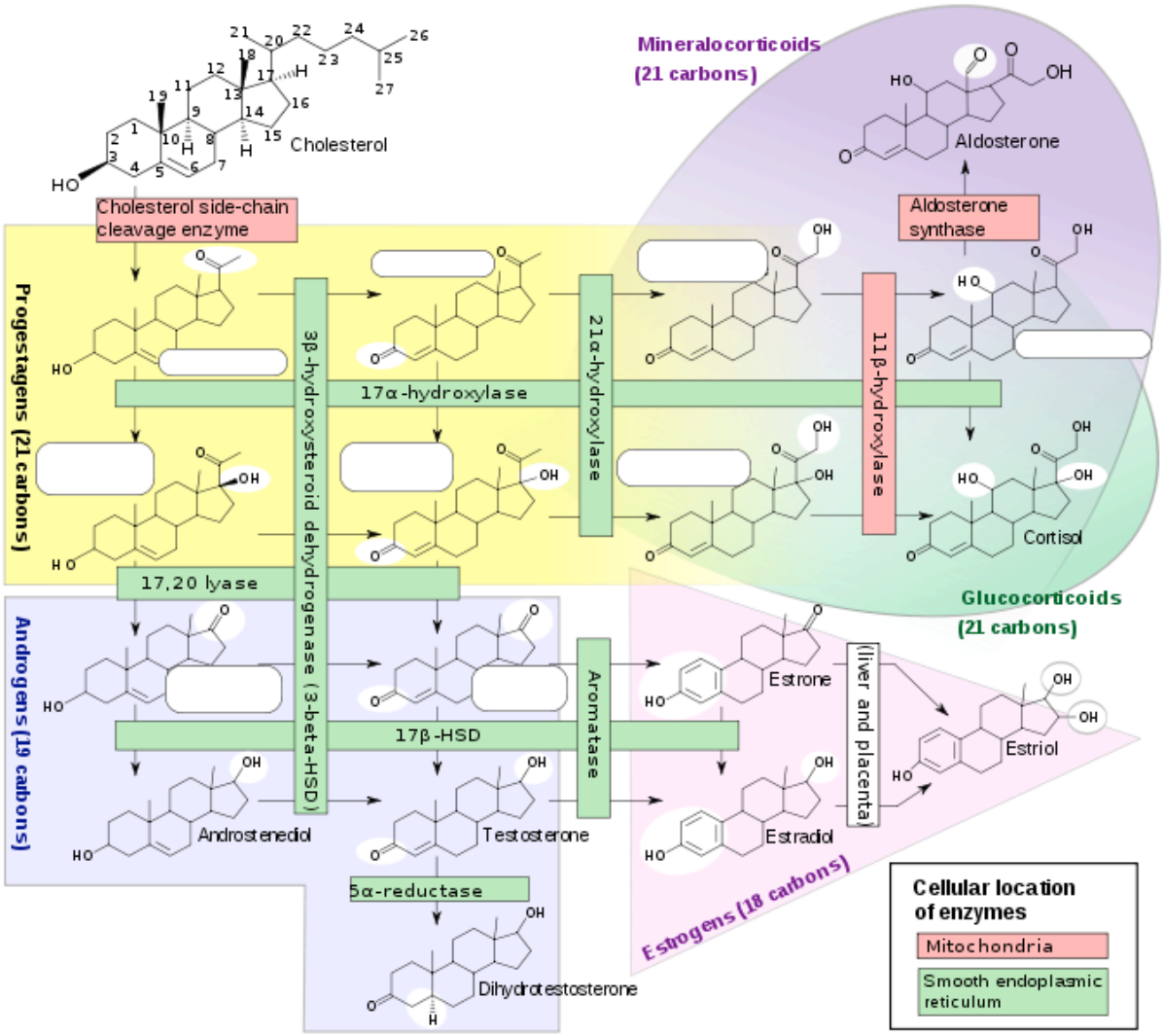
Isomerases: Enzymes that catalyze isomerization reactions (change of chemical groups).
Dehydrogenases: Enzymes that catalyze hydrogen transfer reactions, i.e., oxi-reduction reactions, usually NAD or FAD. In mostly cases these reactions are reversible.
Hydroxylases: Inserts a hydroxyl group (OH) into an organic molecule.
Desmolase: Enzyme that catalyzes the formation or destruction of carbon-carbon bonds within a molecule.
Aromatase: Enzyme that catalyzes the conversion of testosterone (androgen) to estradiol (estrogen).

* The enzyme's name is related to the reaction that this enzyme catalyze. In many cases it is the name of the substrate or product of the reaction.

Questions

1. What is the main mineralocorticoid, where is produced (organs and cells) and what is its function?
2. What is the main glucocorticoid, where is produced (organs and cells) and what is its function?
3. What is the main androgen, where is produced (organs and cells) and what is its function?
4. What is the main estrogen, where is produced (organs and cells) and what is its function?
5. What is progesterone, where is produced (organs and cells) and what is its function?
6. Why is important to study the aromatase?
7. What is an isoenzyme and why is important in steroidogenesis?
8. In the steroidogenesis; what are delta 4 and delta 5 pathways, why are important?

METABOLIC MAP (Assemble your pathway here)



«Steroidogenesis» de David Richfield (User:Slashme) and Mikael Häggström. Derived from previous version by Hoffmeier and Settersr.In external use, this diagram may be cited as:Häggström M, Richfield D (2014). "Diagram of the pathways of human steroidogenesis". Wikiversity Journal of Medicine 1 (1). DOI:10.15347/wjm/2014.005. ISSN 20018762. - Self-made using bkchem and inkscape. http://commons.wikimedia.org/wiki/File:Steroidogenesis.svg#mediaviewer/File:Steroidogenesis.svg