

snímek 1

**METABOLISMUS LIPIDŮ**

Lipasy - hydrolasy - karboxylesterasy

$\text{triacylglycerol} + \text{H}_2\text{O} \rightarrow \text{glycerol} + \text{mastné kyseliny}$

Lipasy  $\left\{ \begin{array}{l} \text{trávicí - potravní lipidy} \\ \text{organové - organové lipidy} \end{array} \right.$

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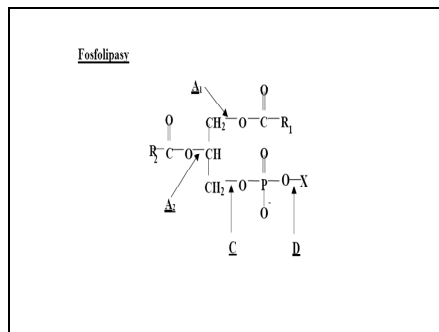
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snímek 2




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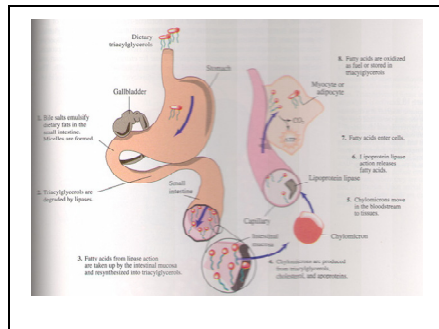
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snímek 3




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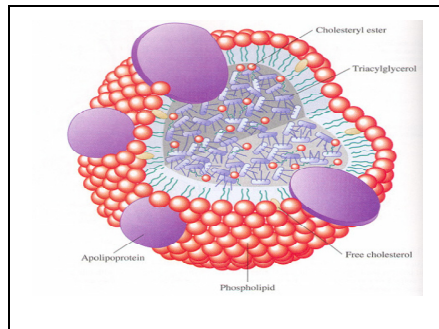
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snímek 4



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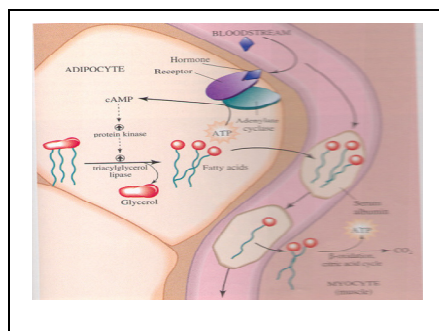
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snímek 5



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snímek 6

Odbourávání mastných kyselin  
β oxidace  
F.KNOOP 1909  
F.LYNEN 1951

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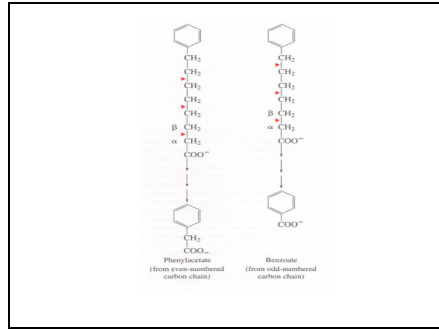
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snímek 7




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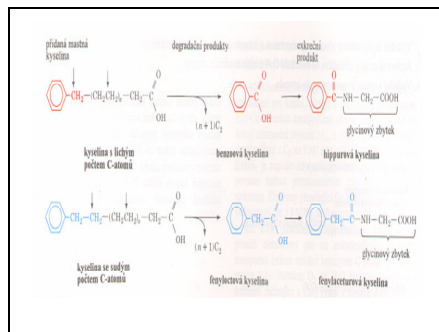
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snímek 8




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snímek 9

**Odbourávání mastných kyselin**

**β oxidace**

F.KNOOP 1909  
F.LYNEN 1951

*A. Aktivace mastných kyselin*

$\text{RCOO} + \text{ATP} \rightarrow \text{RCOO-AMP} + \text{P-P}$

$\text{RCOO-AMP} + \text{HSCoA} \rightarrow \text{RCOSCoA} + \text{AMP}$

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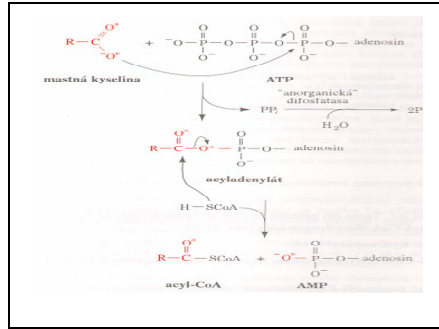
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snímek 10




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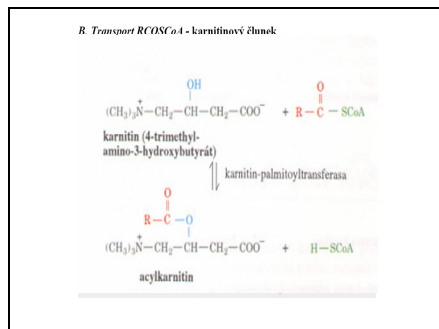
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snímek 11




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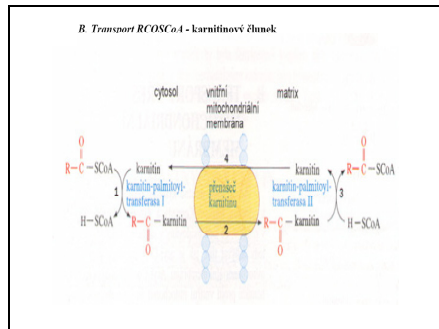
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snímek 12




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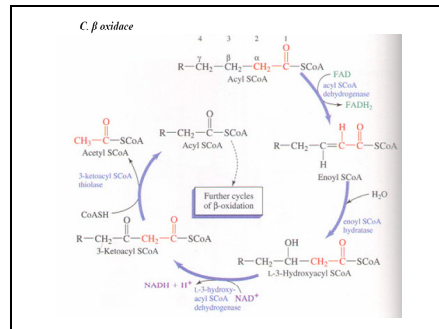
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snímek 13




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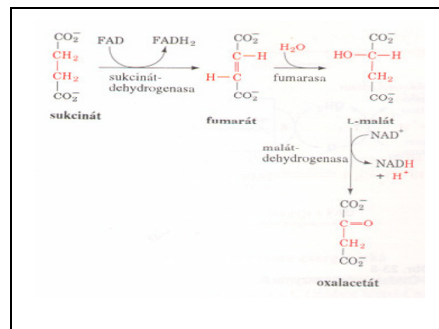
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snímek 14




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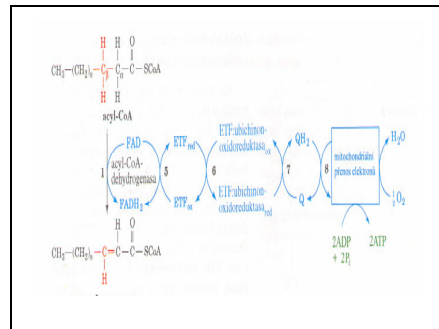
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snímek 15




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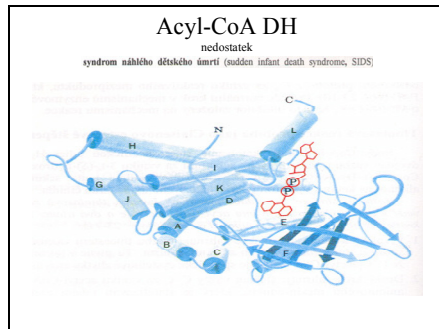
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snímek 16




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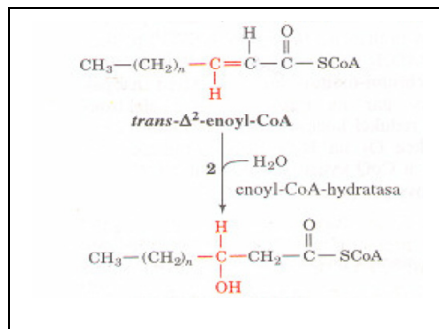
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snímek 17




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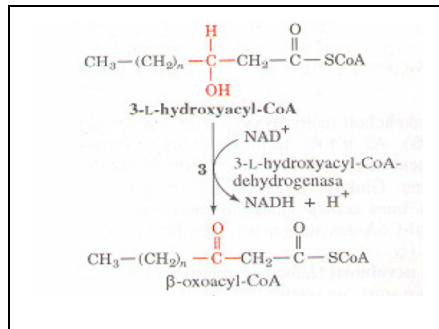
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snímek 18




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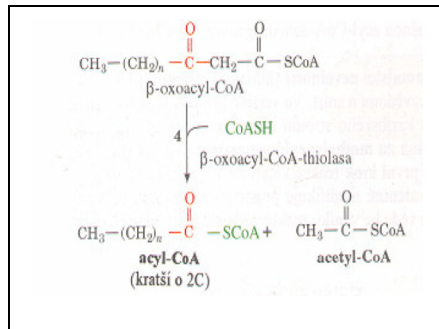
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snímek 19




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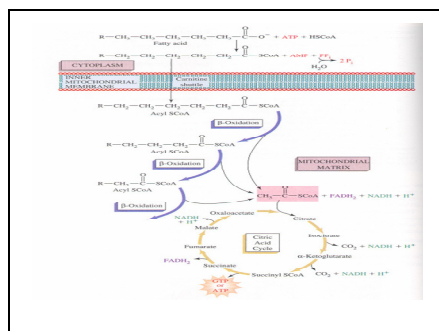
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snímek 20




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snímek 21

**Bilance  $\beta$  oxidace :**

1. cyklus - 1 FADH<sub>2</sub> (2 ATP) + 1 NADH (3 ATP) - 5 ATP  
 acetylCoA (citrátový cyklus) - 12 ATP

na C<sub>16</sub> - 7 x  $\beta$  oxidace + 8 x citrátový cyklus - aktivace  
 (7 x 5) + (8 x 12) - 2 ATP = 129 ATP

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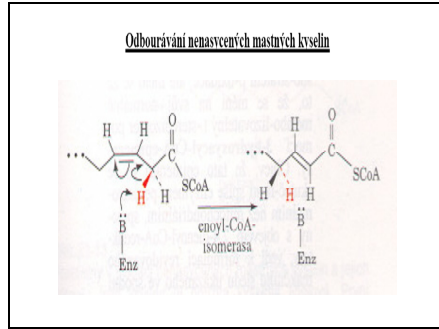
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snímek 22




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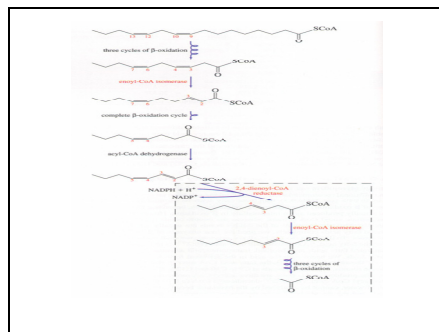
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snímek 23




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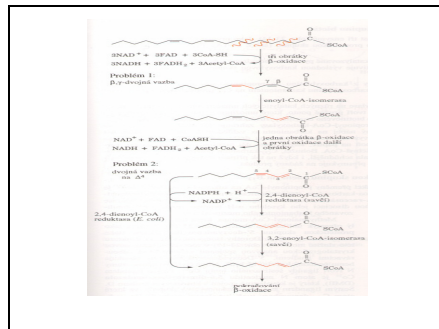
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snímek 24




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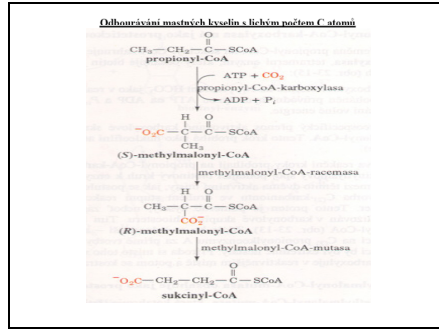
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snímek 25




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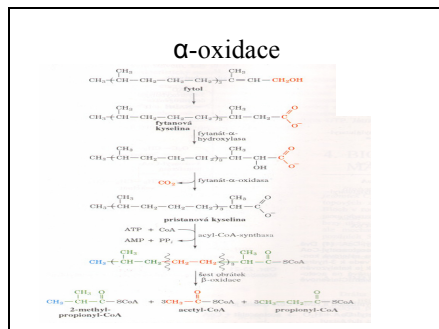
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snímek 26




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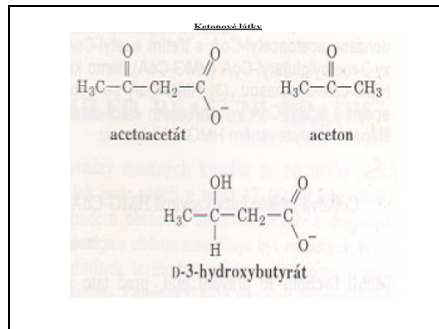
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snímek 27




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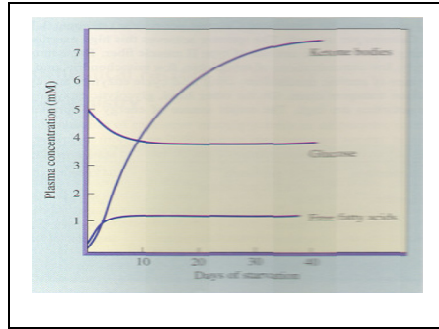
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snímek 28




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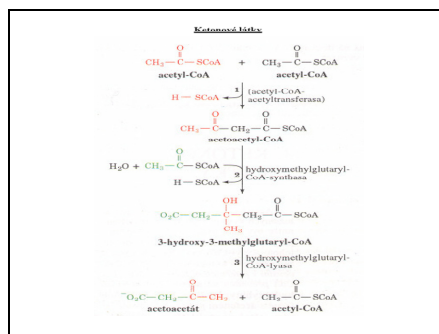
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snímek 29




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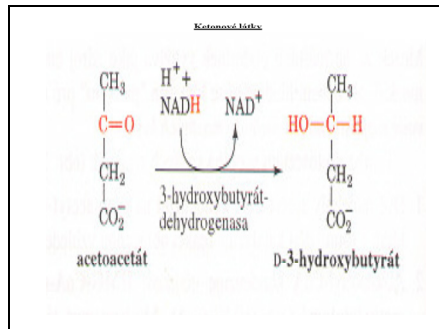
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snímek 30




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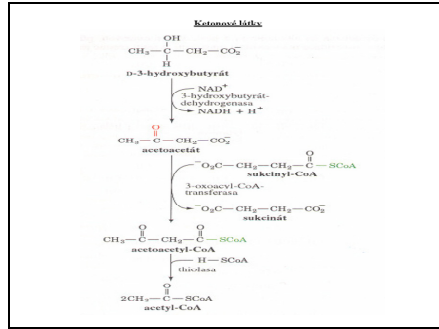
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snímek 31




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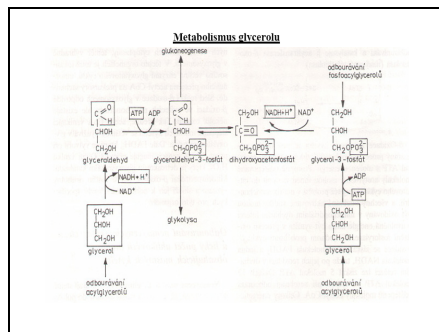
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snímek 32




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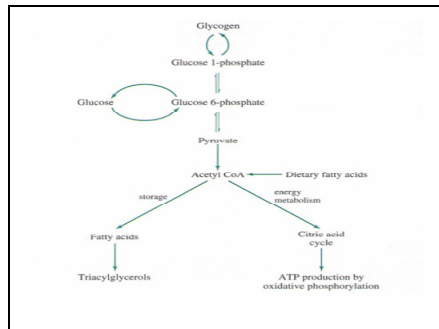
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snímek 33




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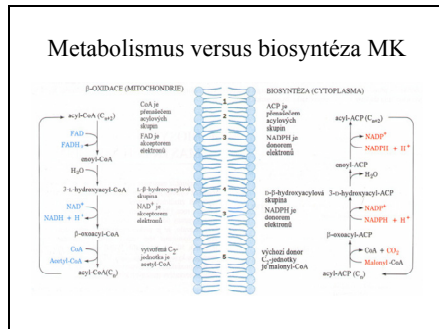
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snímek 34




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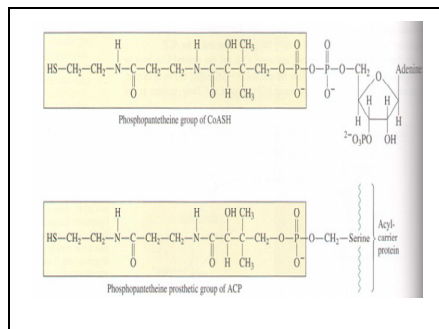
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snímek 35




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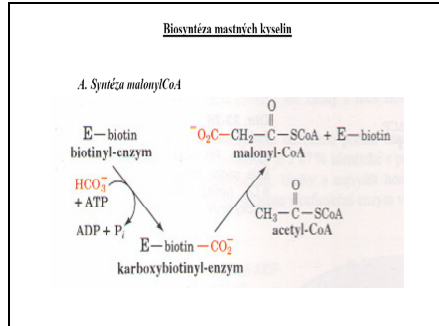
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snímek 36




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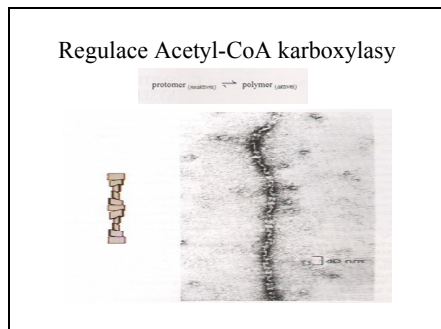
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snímek 37




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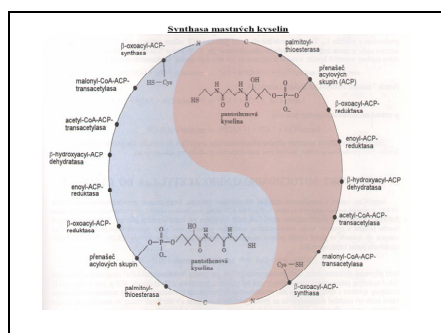


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snímek 38




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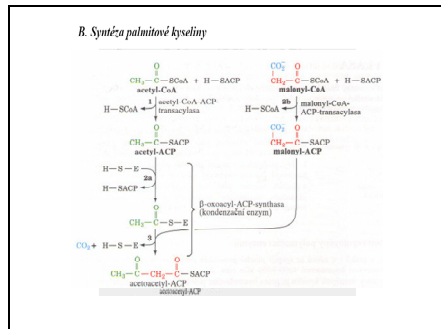


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snímek 39




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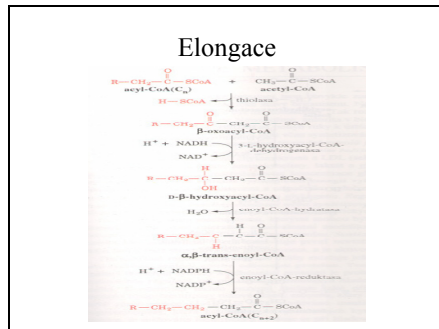
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snímek 43




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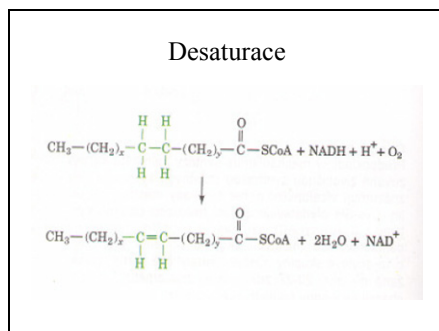
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snímek 44




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snímek 45

Bilance biosyntéz mastných kyselin :

1. cyklus	syntéza malonylCoA	1 ATP
	2 NADPH na redukcii	6 ATP
na C <sub>16</sub>	7 x (16/2 - 1)	49 ATP

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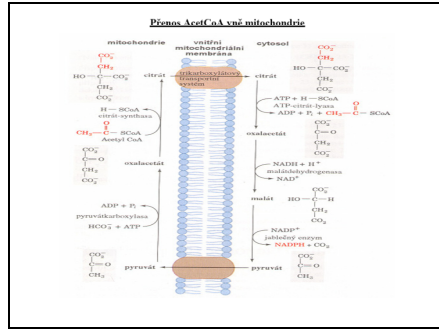
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snímek 46



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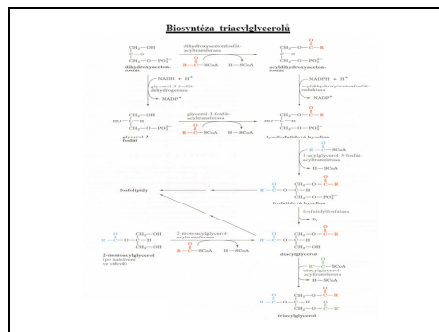
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snímek 47



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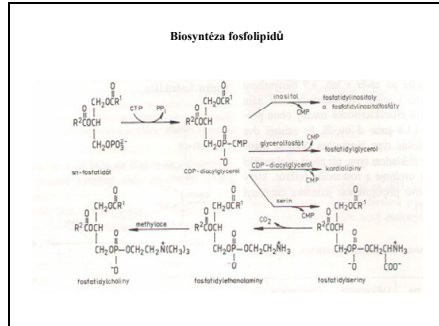
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snímek 48



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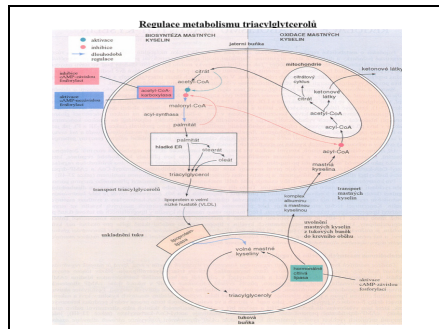
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snímek 49




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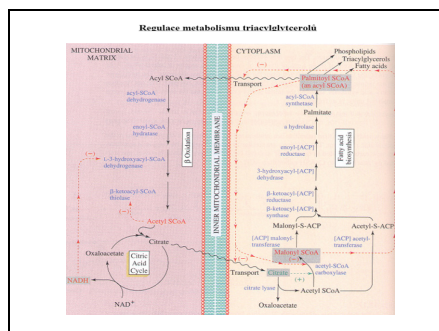
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snímek 50




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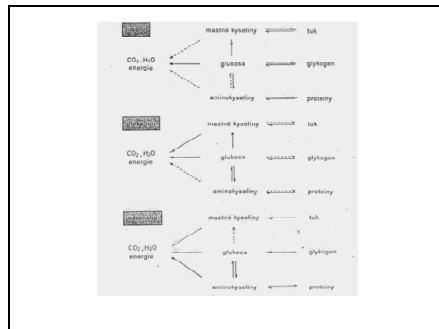
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snímek 51




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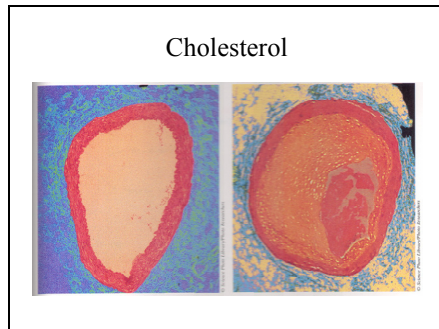
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snímek 52



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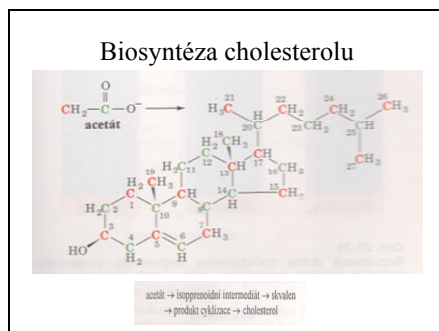
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snímek 53



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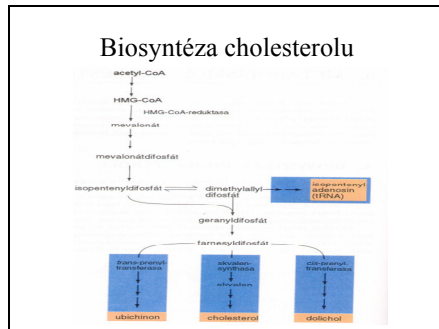
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snímek 54



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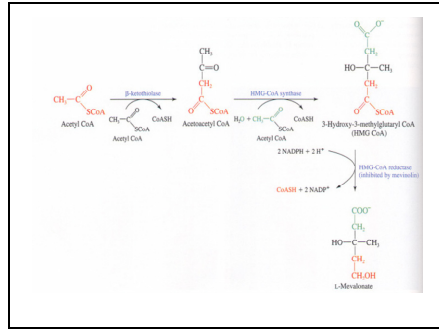
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snímek 55



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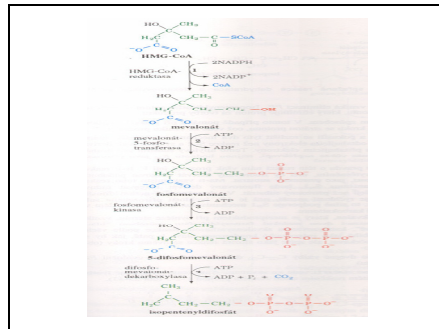
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snímek 56



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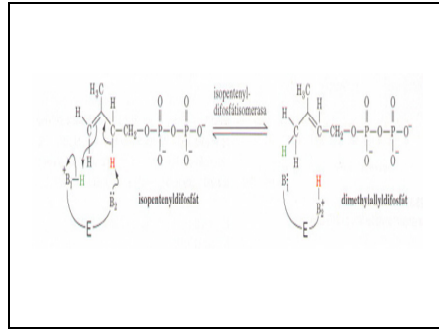
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snímek 57



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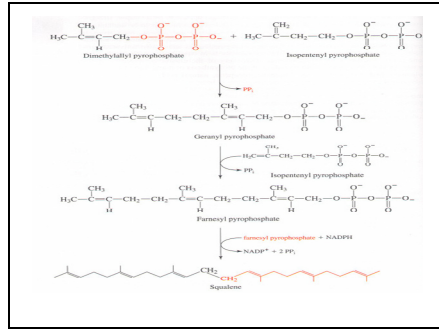
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snímek 58



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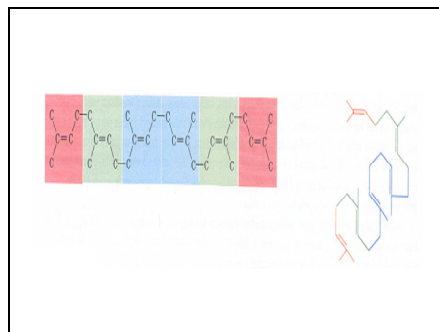
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snímek 59



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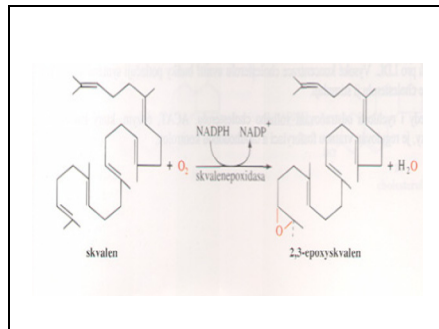
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snímek 60



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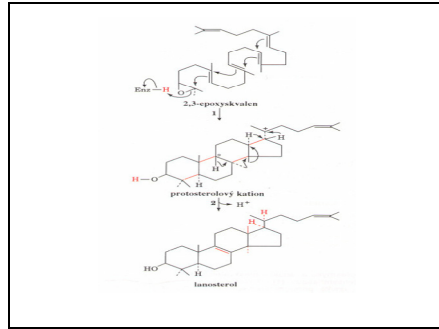
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snímek 61



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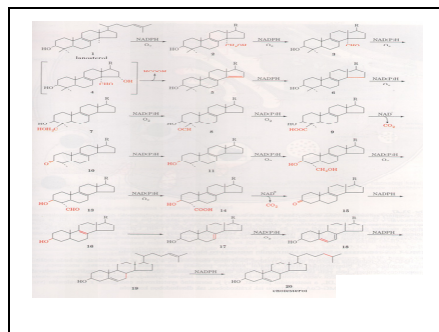
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snímek 62



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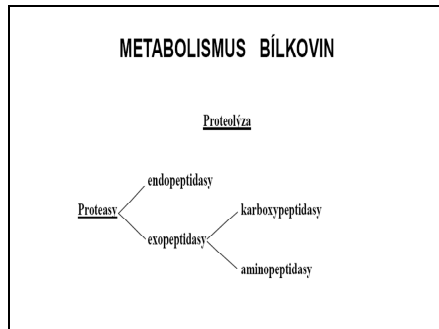
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snímek 63



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snímek 64

Proteasy - serinové  
cysteinové  
metaloproteasy  
kyselé - aspartátové

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snímek 65

1. Žaludeční proteasy

- pepsin
- chymosin (renin, syřídlo)

2. Pankreatické proteasy

- trypsin
- chymotrypsin
- elastasa
- karboxypeptidasa A,B

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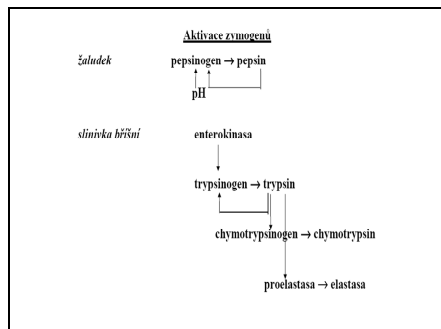
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snímek 66



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## snímek 67

### 3. Proteasy střevní šťávy

- aminopeptidasy
- dipeptidasy

### 4. Buněčné proteasy

- živočišné - kathepsiny B, D, L, H, M, S a T
- rostliny - papain
- bakterie - subtilisin, pronasa

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## snímek 68

### • Proteasy s jinou funkcí

- enterokinasa - aktivace zymogenů
- trombin - srážení krve

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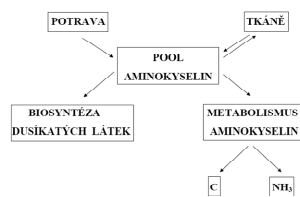
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## snímek 69

### Hotovost - pool aminokyselin



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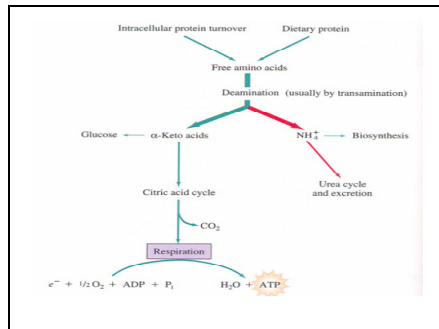
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snímek 70




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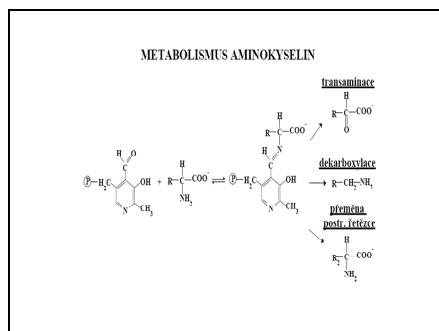
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snímek 71




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snímek 72

Transaminace

aminokyselina<sub>1</sub> + α-oxokyselina<sub>2</sub> ↔ aminokyselina<sub>2</sub> + α-oxokyselina<sub>1</sub>

Oxidací deaminace

*savci*  
glutamát + NAD<sup>+</sup> + H<sub>2</sub>O ↔ 2-oxoglutarát + NH<sub>3</sub> + NADH + H<sup>+</sup>

*vejšcorodí*  
aminokyselina + FAD + H<sub>2</sub>O ↔ α-oxokyselina + NH<sub>3</sub> + FADH<sub>2</sub>  
FADH<sub>2</sub> + O<sub>2</sub> ↔ FAD + H<sub>2</sub>O<sub>2</sub>

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### snímek 73

**Dekarboxylace**  
aminokyselina ↔ amin + CO<sub>2</sub>

**Biogenní aminy**

cystein	cystamin	CoA
k asparagová	β alanin	..
tyrosin	tyramin	šláňový hormon
DOPA	dopsamin	..
histidin	histamin	..
hydroxytryptofan	serotozin	..
k glutamová	k-γ-aminomáselná	neuromodulátor
serin	ethanolamin	fosfolipidy
methionin	spermin, spermidin	sperma

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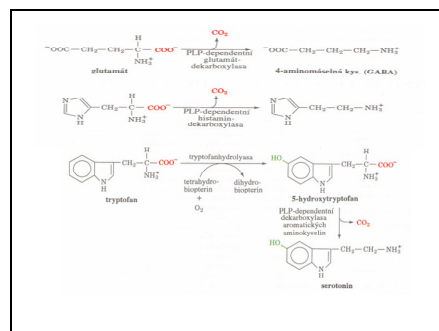
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### snímek 74




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### snímek 75

**Dependence uhličkových koster aminokyselin**

**1. Glukogenní aminokyseliny - prekurzory sacharidů**

pyruvát - Ser, Ala, Cys, Gly, Thr, Met, Trp  
 2-oxoglutarát - Glu, Gln, Arg, Pro, His  
 oxalacetát - Asp, Asn  
 fumarát - Phe, Tyr  
 sukcinyl-CoA - Val, Ile, Met, Thr

**2. Ketoenní aminokyseliny - prekurzory mastných kyselin**

acetoacetát - Leu, Phe, Tyr, Lys, Trp  
 acetyl-CoA - Leu, Ile, Trp

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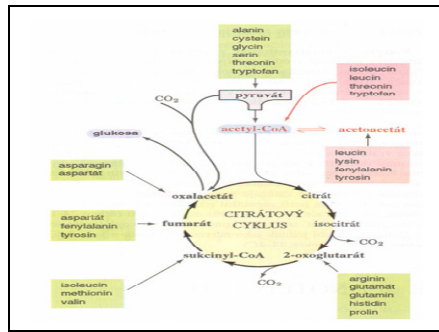
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snímek 76




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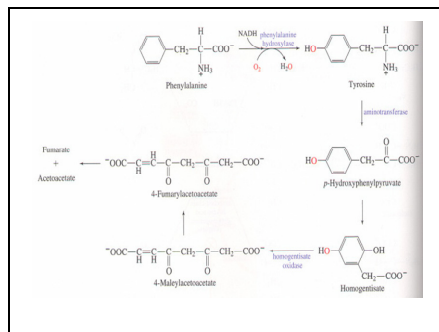
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snímek 77




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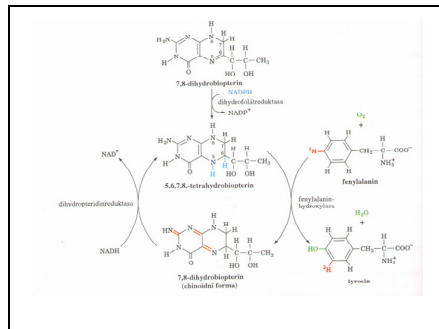
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snímek 78




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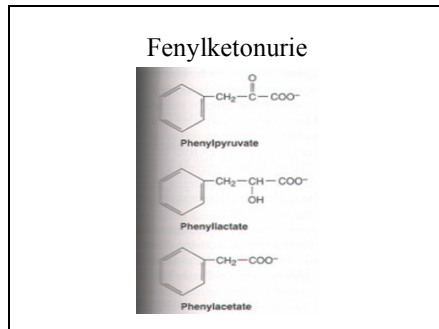
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snímek 79




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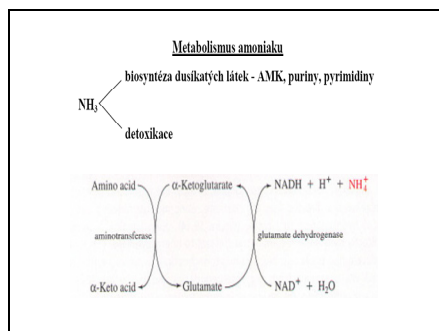
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snímek 80




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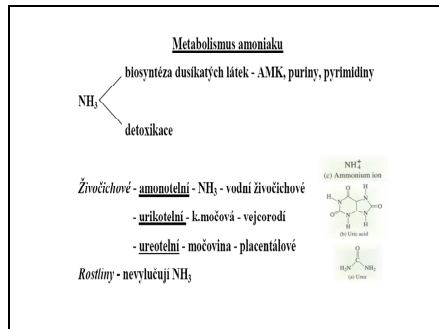
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snímek 81




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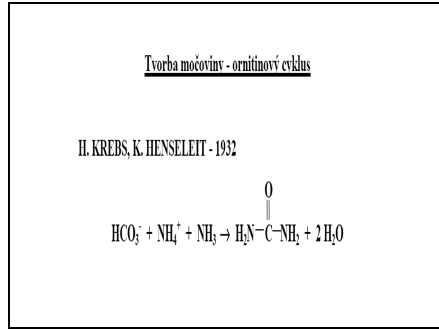
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snímek 82




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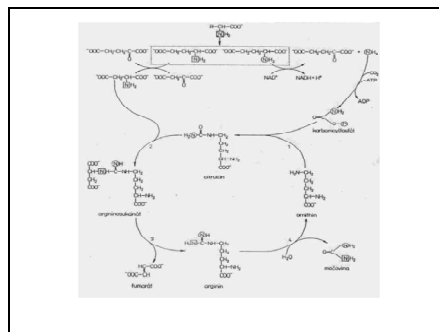
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snímek 83




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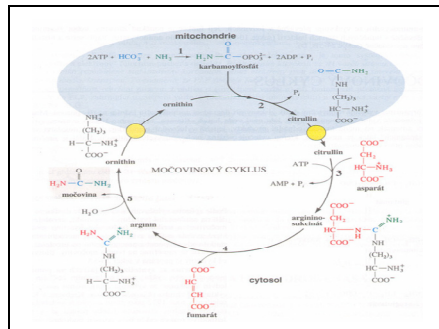
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snímek 84




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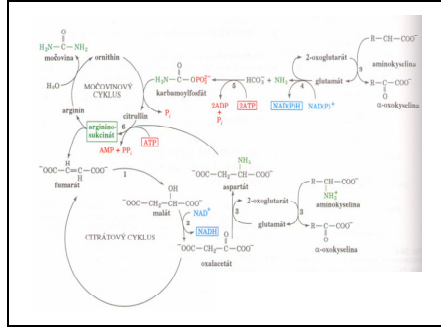
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snímek 85




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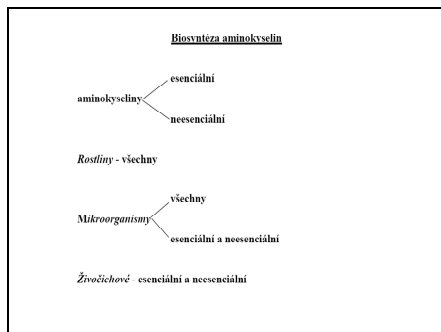
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snímek 86




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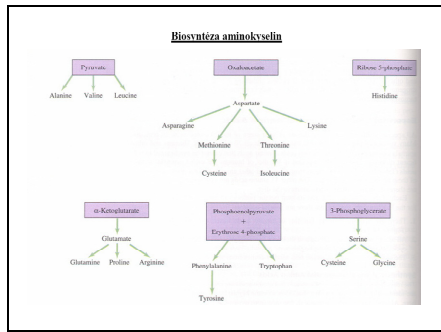
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snímek 87




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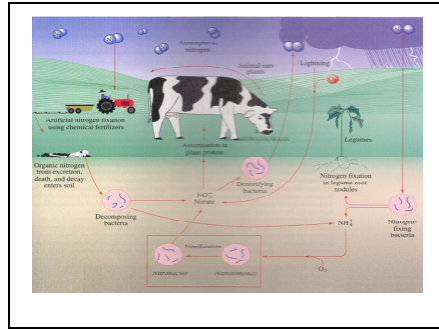
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snímek 88



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snímek 89

**Fixace  $N_2$**

**Chemická syntéza** - Haber Bosch (500 °C, 300 atm, kat - Fe)

$$N_2 + 3 H_2 \rightarrow 2 NH_3$$

**Biosyntéza** - sinice, bakterie - *Rhizobium*, *Azotobacter*

$$N_2 + 8 H^+ + 8 e^- + 16 ATP \rightarrow 2 NH_3 + H_2 + 16 ADP + 16 P_i$$

**Nitrogenasa:** 1. protein Fe  
2. protein MoFe

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snímek 90



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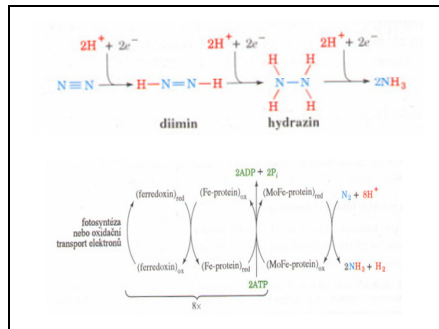
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snímek 91




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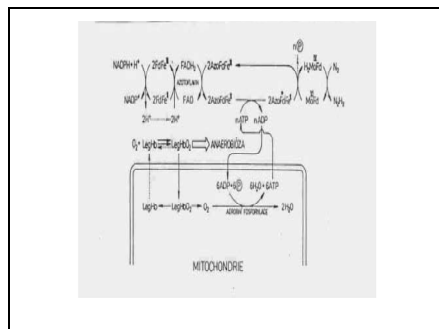
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snímek 92




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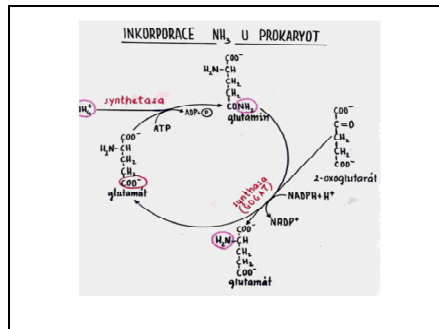
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snímek 93




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snímek 94

### AMK jako prekurzory

Bioactive Product	Biological Function	Amino Acid Precursor(s)
Alkaloids	Nitrogen bases in plants	Ornithine, Asp, Lys, Tyr, Trp, Phe, His
$\gamma$ -Aminobutyric acid (GABA)	Inhibitory neurotransmitter	Glu
Auxin	Plant growth hormone	Trp
Catecholamines	Neurotransmitters, hormones	Tyr, Phe
Glutathione	Redox tripeptide	Gly, Glu, Cys
Histamine	Allergic response, stomach acid secretion	His
Melanin	Skin pigments	Tyr, Phe
Melatonin	Regulates sleep cycles	Trp
Nitric oxide	Cell messenger	Arg
Phosphocreatine	Energy molecule in muscle	Gly, Arg, Met
Porphyrin	Heme and chlorophyll	Gly
Purine bases	RNA, DNA cofactors	Asp, Gly, Glu
Pyrimidine bases	RNA, DNA, cofactors	Asp
Serotonin	Neurotransmitter (hormone)	Trp
Spermine, spermidine	DNA packaging	Met, ornithine
Thyroxine	Hormone	Tyr

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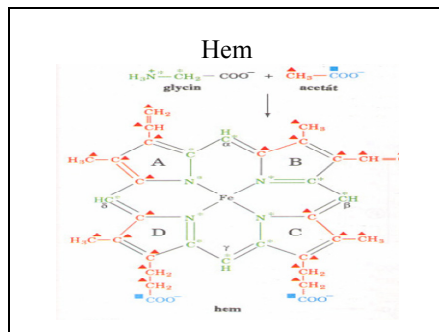
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snímek 95




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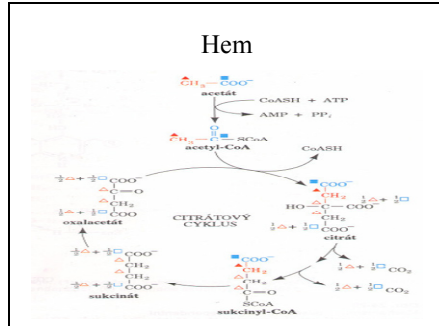
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snímek 96




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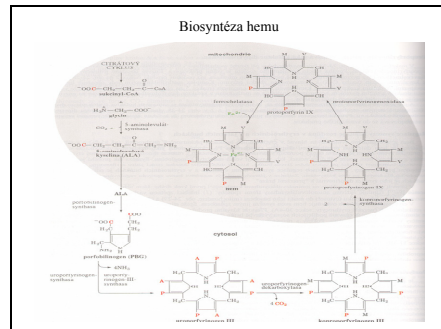
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snímek 97




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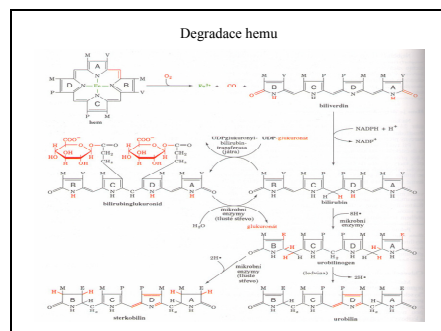
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snímek 98




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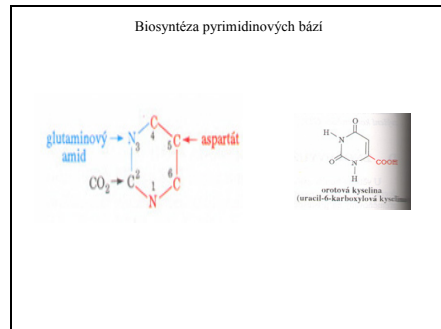
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snímek 99




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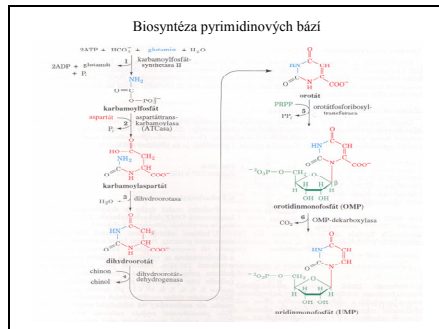
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snímek 100



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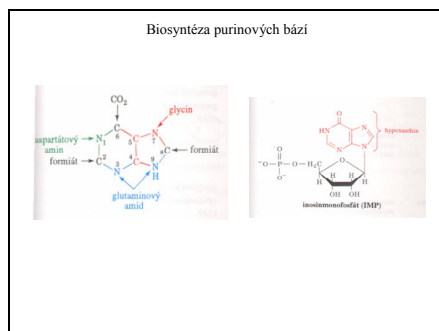
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snímek 101



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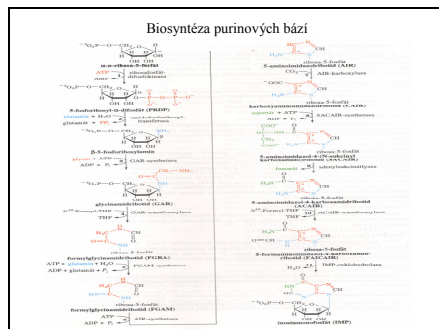
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snímek 102



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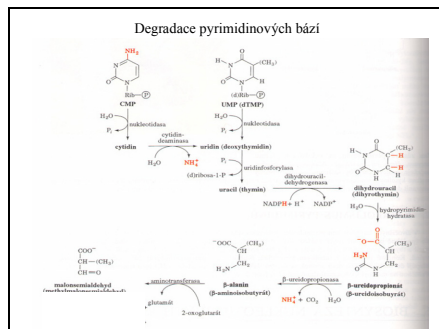
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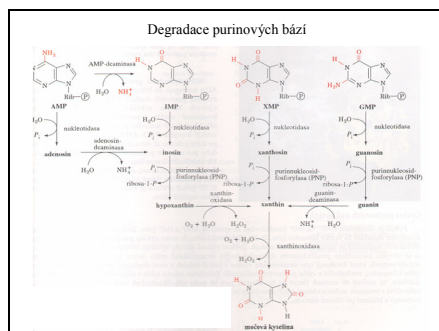
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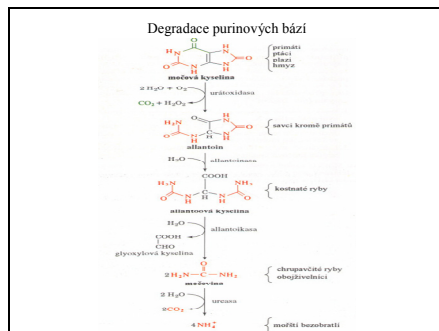
# snímek 103



# snímek 104



# snímek 105



snímek 106

### Metabolismus NK

- Žaludek – odštěpení proteinů pomocí HCl
- Nukleasa (fosfodiesterasa) – štěpení na oligo- a mononukletidy
- Mononukleotidasa – nukleosid + H<sub>3</sub>PO<sub>4</sub>
- Nukleosidasa – cukr + basa

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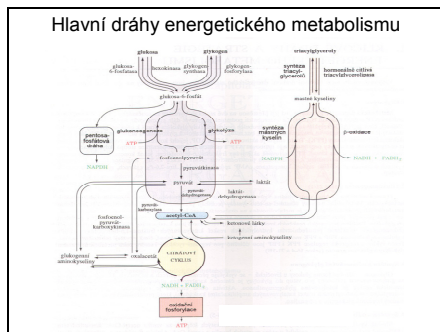
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snímek 107



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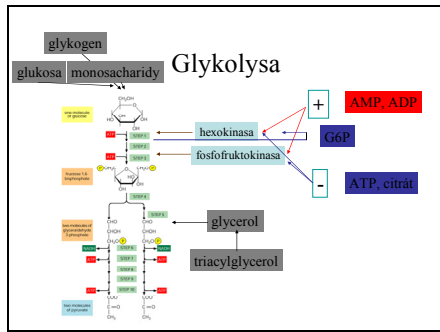
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snímek 108



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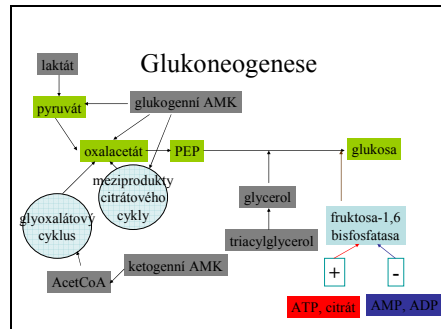
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snímek 109



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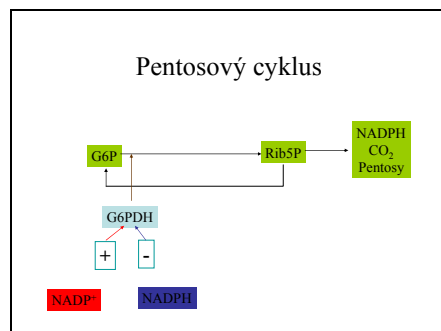
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snímek 110



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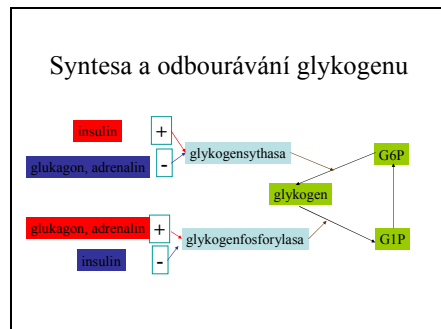
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snímek 111



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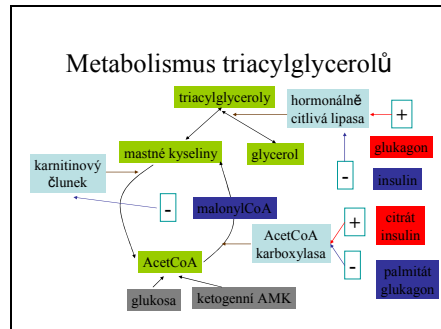
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snímek 112




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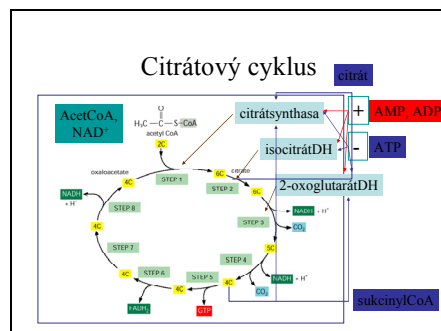
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snímek 113




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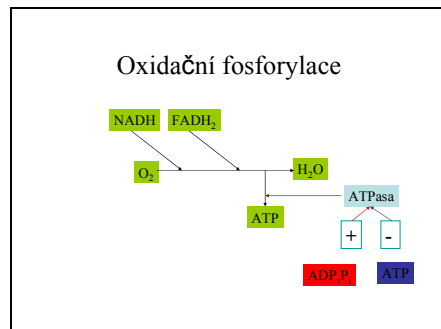
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snímek 114




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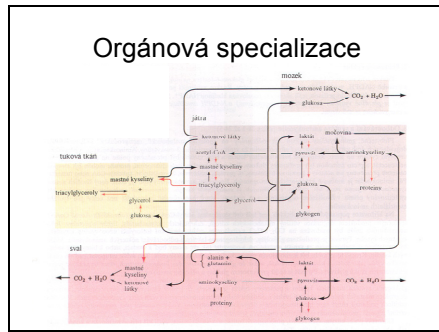
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snímek 115



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