Plan du cours de 2e année

Métabolisme des glucides et lipides :
suite du cours de 1e année
voies de synthèse (stockage d'énergie), lipoprotéines,
métab du cholestérol,
régulation en fonction de l'apport alimentaire

Métabolisme des amino-acides

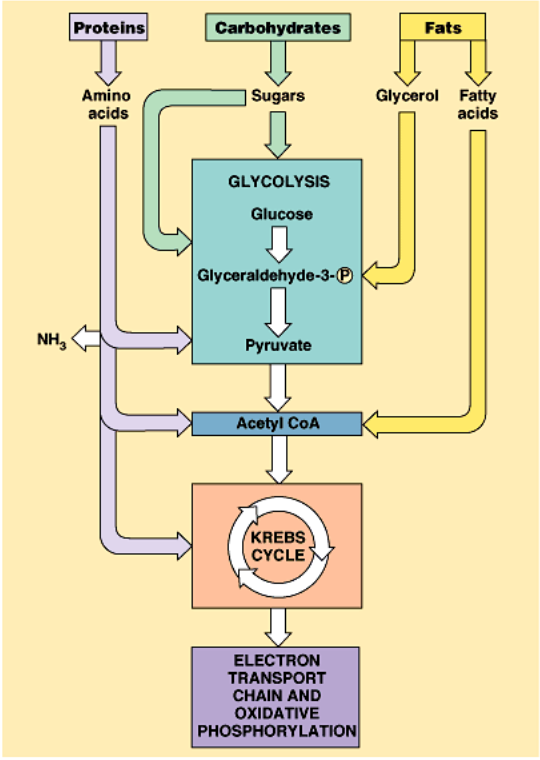
Troubles du métabolisme énergétique :
dyslipidémies, diabète, syndrome métabolique

Autres métabolismes :
hémoglobine, ac nucléiques, stéroïdes

En complément de cours :
www.chups.jussieu.fr/en-ligne/index.html#ressmed :
cours en ligne du CHU Pitié-Salpêtrière

www.diabsurf.com/ :
sur les diabètes

www.nsfa.asso.fr/ :
site de la Nouvelle Société Française d'Athérosclérose



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1ère partie : métabolisme des glucides et lipides, suite

1) Mise en réserve d'énergie :
glucose ---------> glycogène ------> glucose
glycogénogenèse glycogénolyse
lipogenèse : synthèse d'ac gras à partir d'acétyl CoA

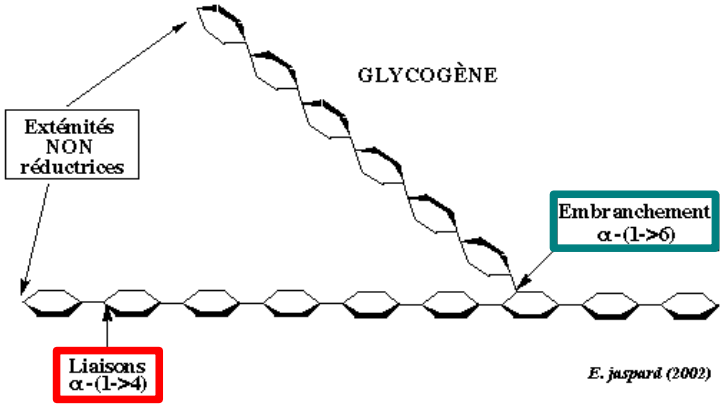
2) Métabolisme du cholestérol

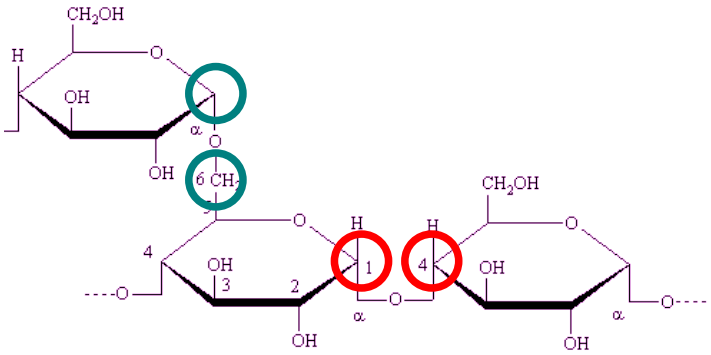
3) Métabolisme des lipoprotéines

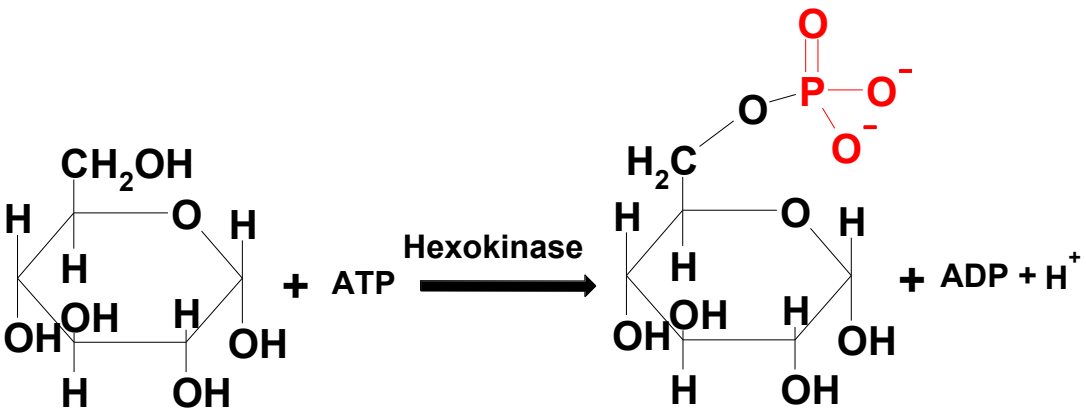
4) Voies annexes et régulations :
voie des pentoses (-> NADPH et pentoses-P) : cf 1e année
néoglucogenèse : synthèse de Glc à partir de pyruvate
cétogenèse (-> corps cétoniques)

Régulation
en fonction de l'apport alimentaire
et de l'activité physique

Le Glycogène

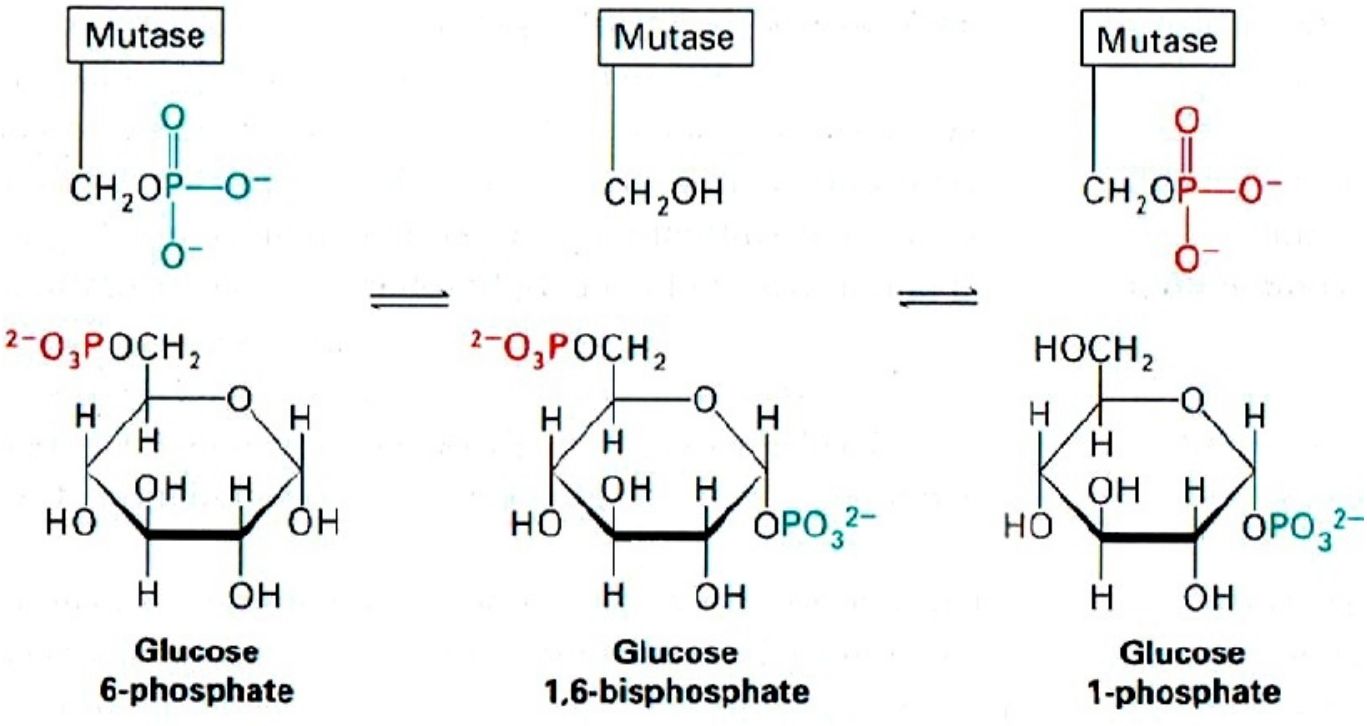


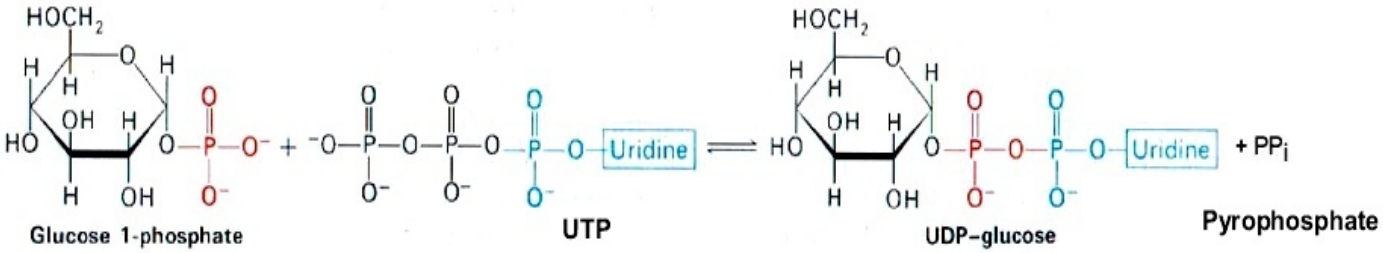


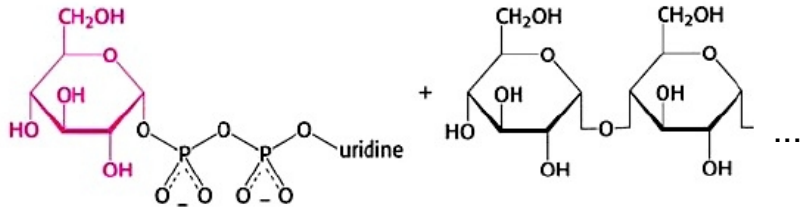


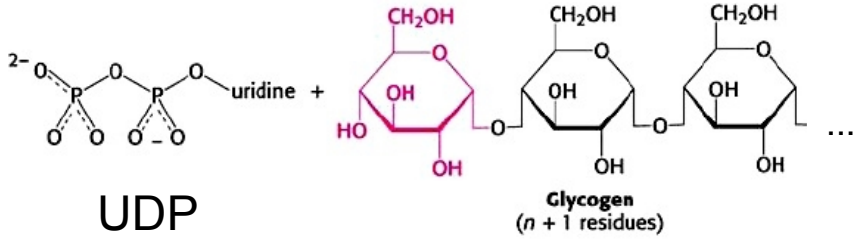
Glucose

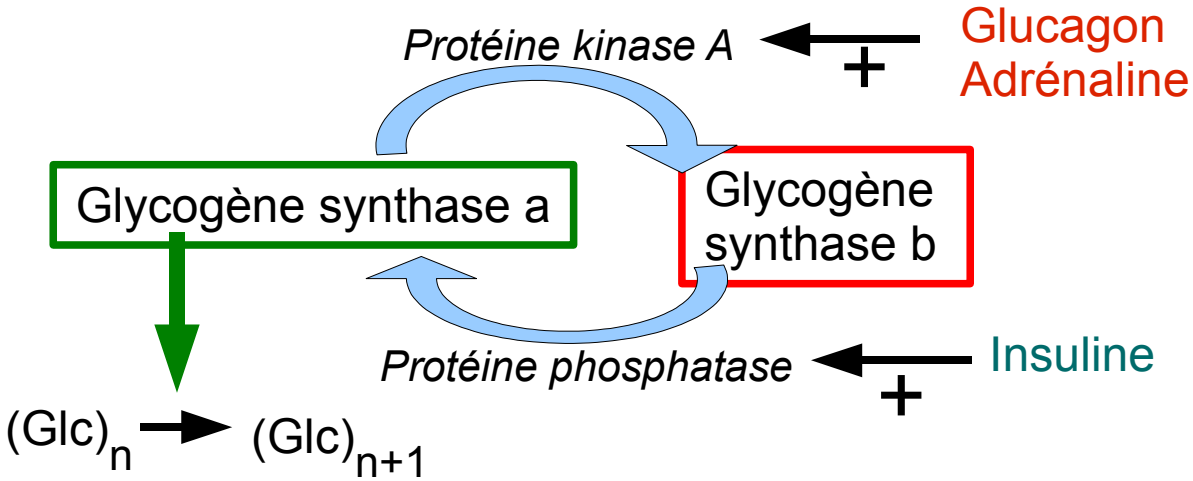
Glucose-6-P

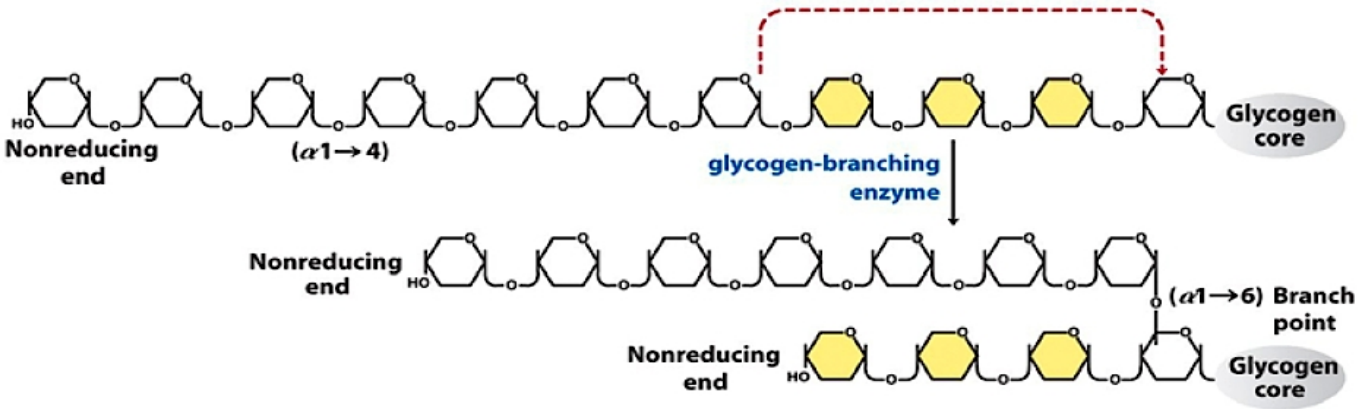



Glucose 1-phosphate
UTP
UDP-glucose
Pyrophosphate
+ PPi
Uridine

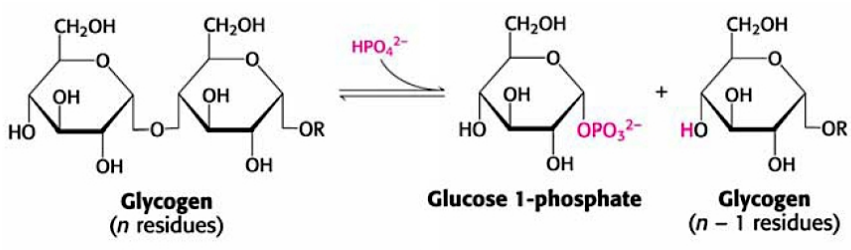

UDP-Glc
Glycogen
(n residues)
uridine

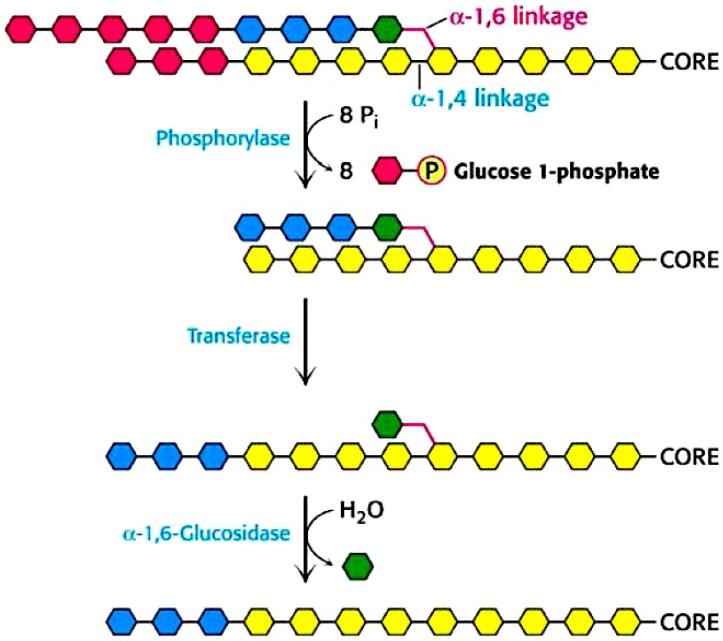

UDP
Glycogen
(n + 1 residues)
uridine


Protéine kinase A
Glucagon
Adrénaline
Glycogène synthase a
Glycogène synthase b
Protéine phosphatase
Insuline
(Glc)n → (Glc)n+1

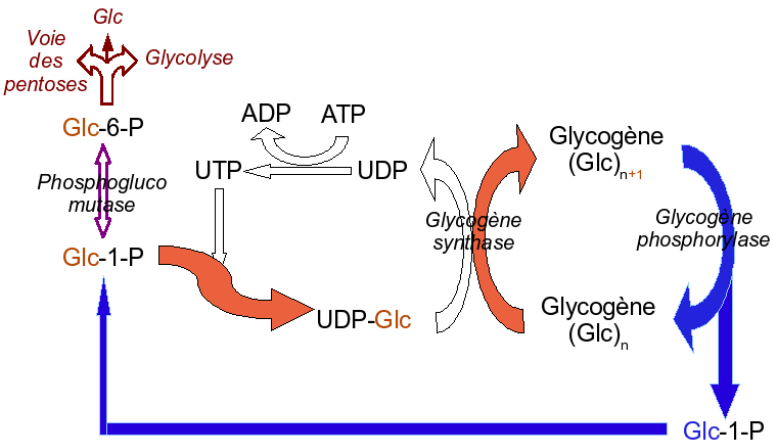

Nonreducing end
(α1→4)
glycogen-branching enzyme
Glycogen core
Nonreducing end
(α1→6) Branch point
Nonreducing end
Glycogen core

Dégradation du glycogène

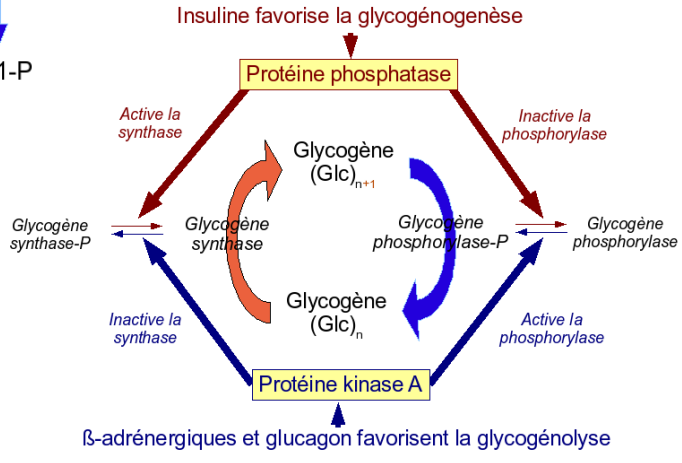




Résumé du métabolisme du glycogéne

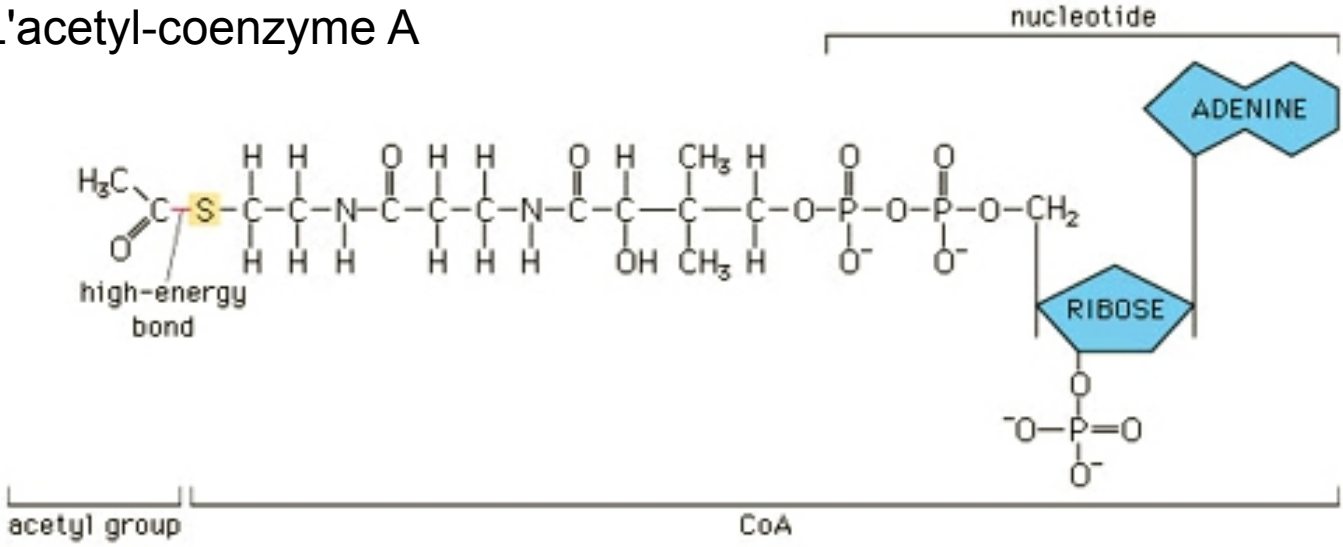


Régulation du métabolisme du glycogéne



Biosynthèse des acides gras

L'acetyl-coenzyme A



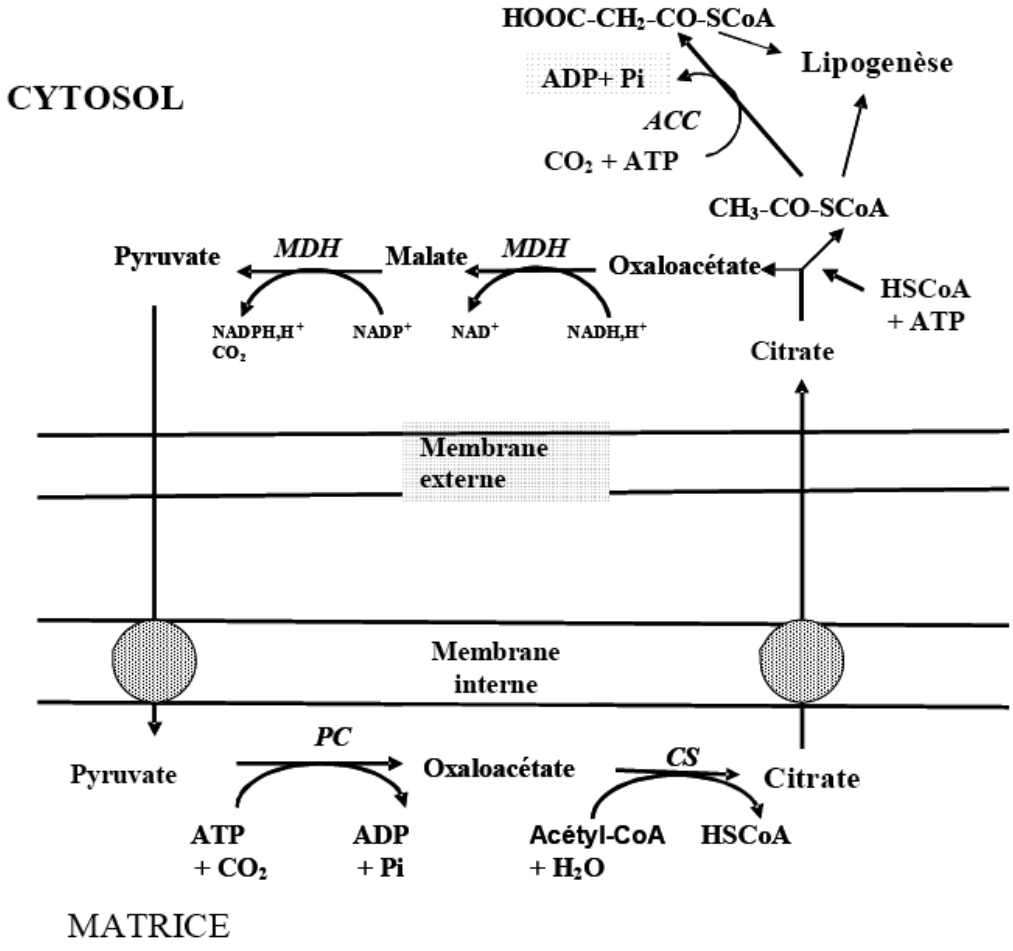
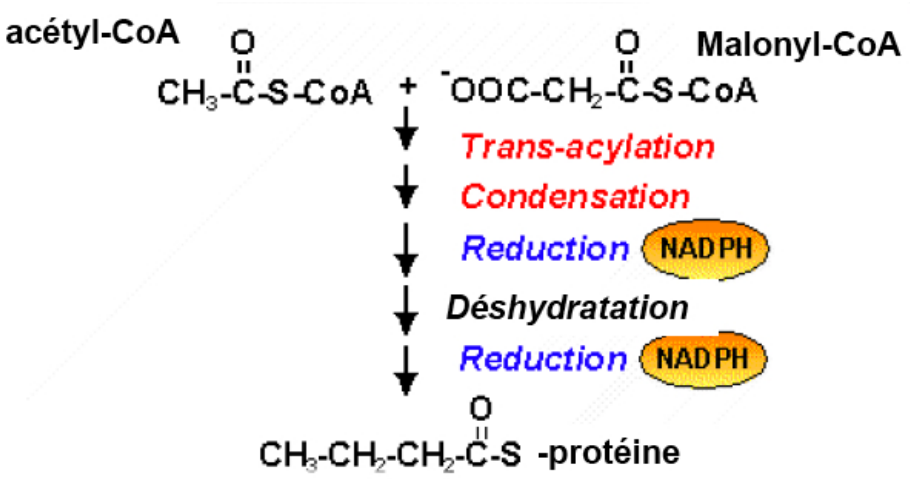
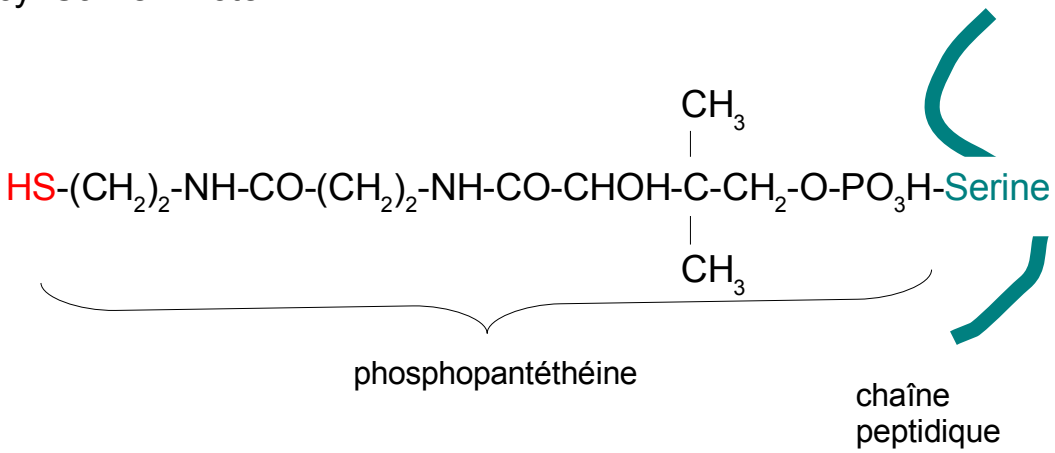
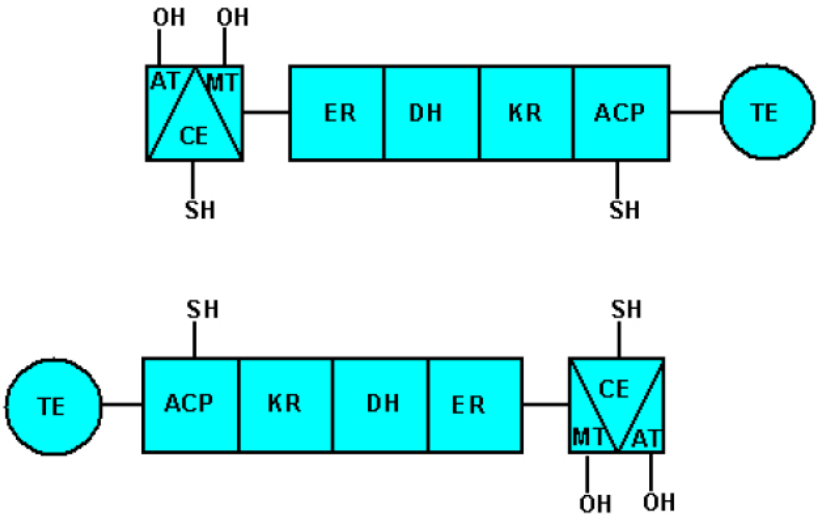


Figure 1 : Transport du radical Acétyle de la matrice dans le cytosol par le citrate. ***ACC*** = Acétyl-CoA Carboxylase, ***CS*** = Citrate synthase, ***MDH*** = Malate déshydrogénase, PC = Pyruvate carboxylase.



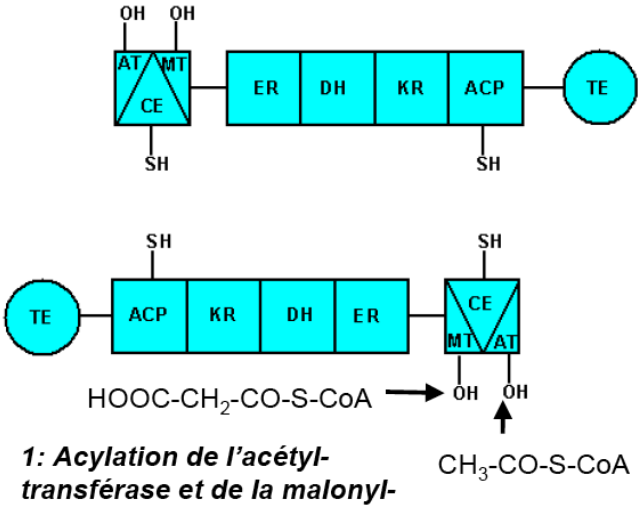
Acyl Carrier Protein



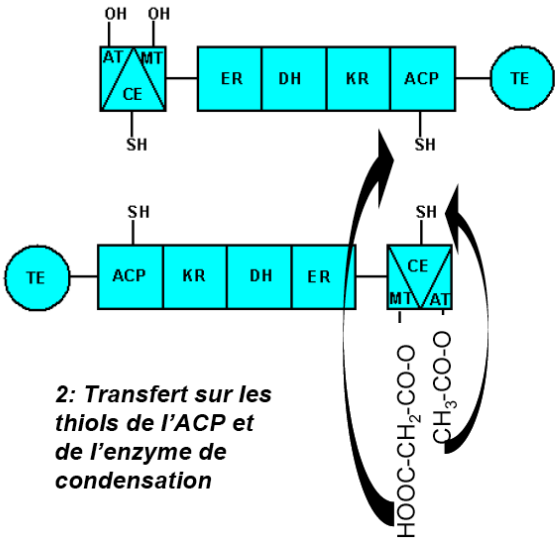


AT: Acetyl transacylase
MT: Malonyl transacylase
CE : Condensing enzyme
ACP: Acyl Carrier Protein

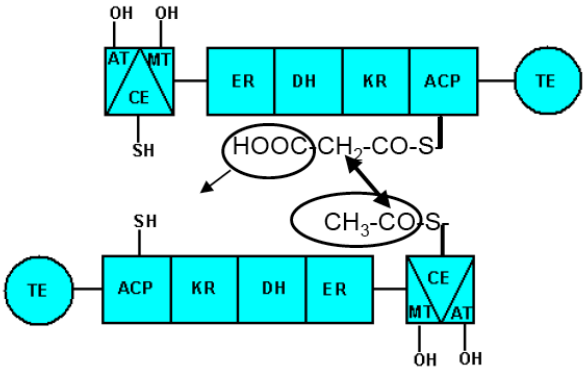
KR : 3-Ketoacyl reductase
DH : 3-Hydroxyacyl dehydratase
ER : Enoyl reductase
TE : Thioesterase



1: Acylation de l'acétyl-transférase et de la malonyl-transférase

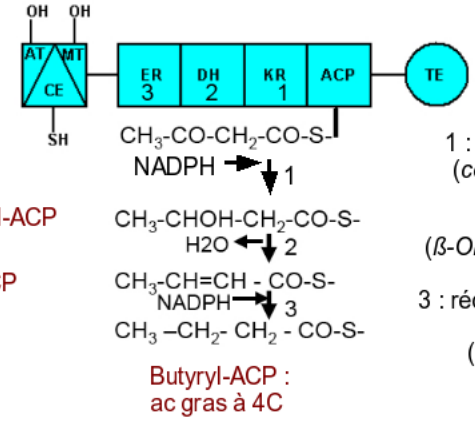


2: Transfert sur les thiols de l'ACP et de l'enzyme de condensation



3: Décarboxylation de la malonyl-ACP et condensation en acétoacétyl-ACP

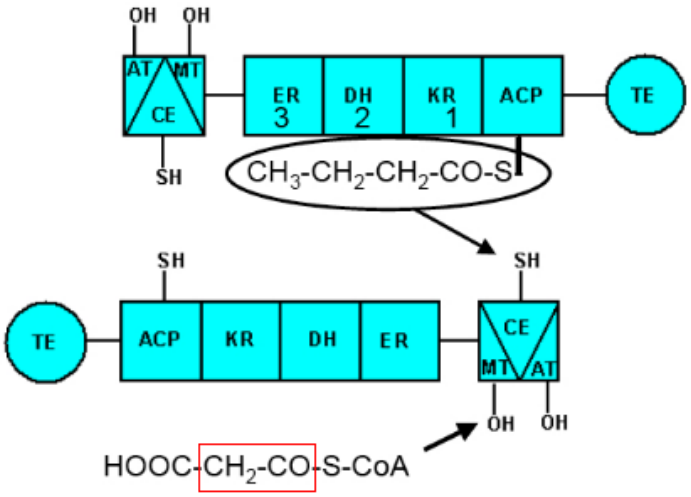
Intervention successive des 3 enzymes

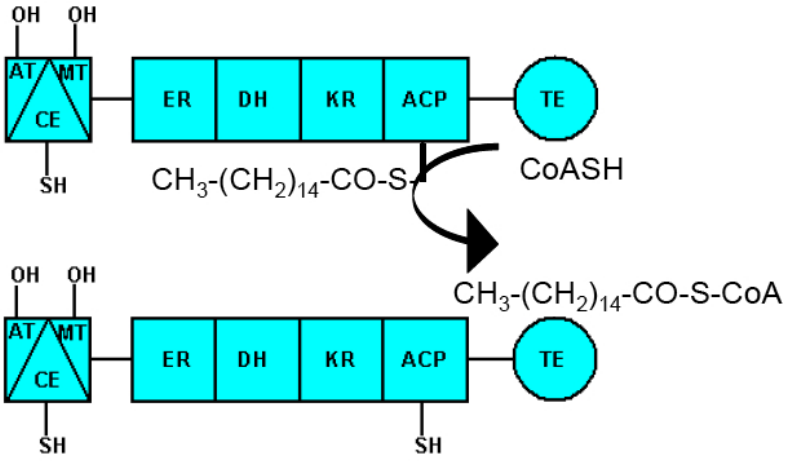


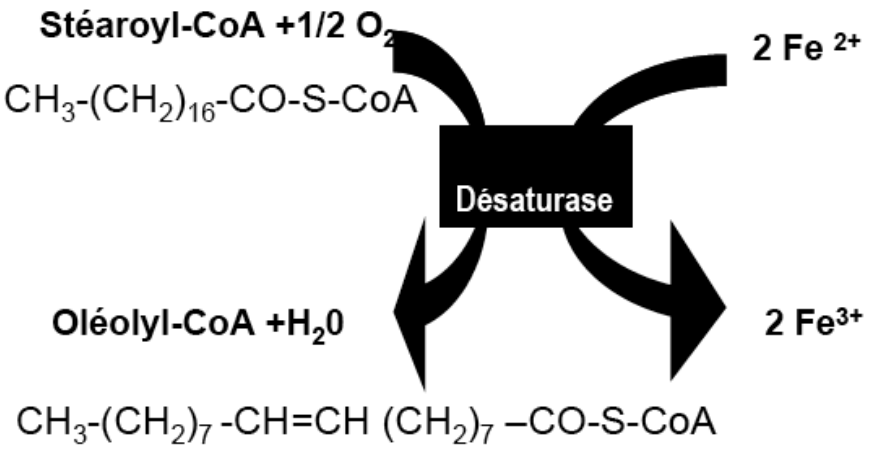
1 : réduction par le NADPH
(*cétoacyl-ACP réductase*)

2 : deshydratation
(*ß-OH acyl-ACP deshydratase*)

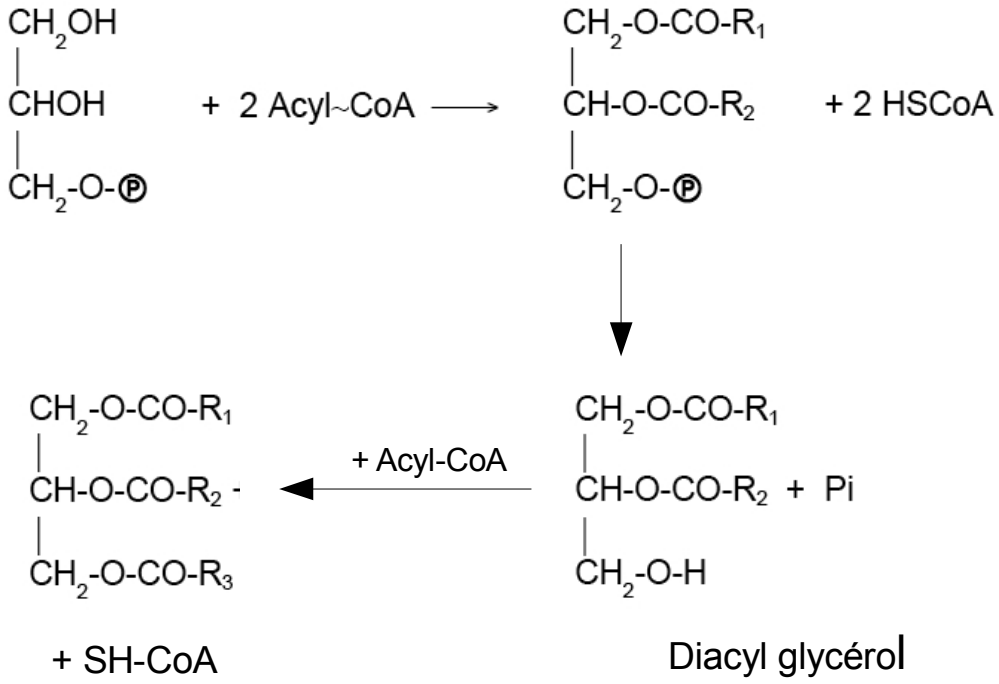
3 : réduction de la double liaison
par le NADPH
(*enoyl-ACP reductase*)


OH OH
AT MT
CE
SH
ER 3
DH 2
KR 1
ACP
TE
CH3-CH2-CH2-CO-S
SH
SH
TE
ACP
KR
DH
ER
CE
MT AT
OH OH
HOOC-CH2-CO-S-CoA

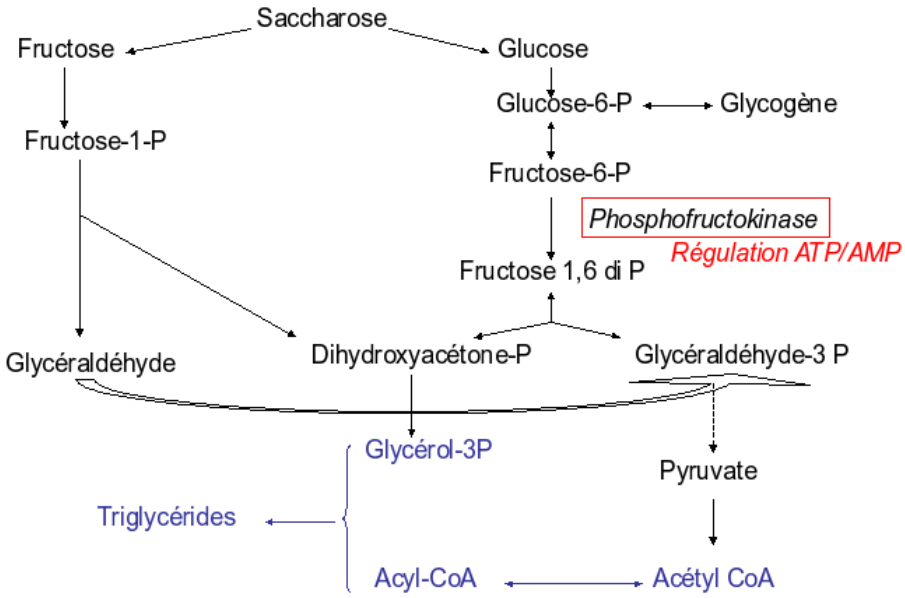

OH OH
AT MT
CE
SH
ER
DH
KR
ACP
TE
CH3-(CH2)14-CO-S
CoASH
CH3-(CH2)14-CO-S-CoA
OH OH
AT MT
CE
SH
ER
DH
KR
ACP
TE
SH


Stéaroyl-CoA +1/2 O2
2 Fe 2+
CH3-(CH2)16-CO-S-CoA
Désaturase
Oléolyl-CoA +H20
2 Fe3+
CH3-(CH2)7 -CH=CH (CH2)7 –CO-S-CoA

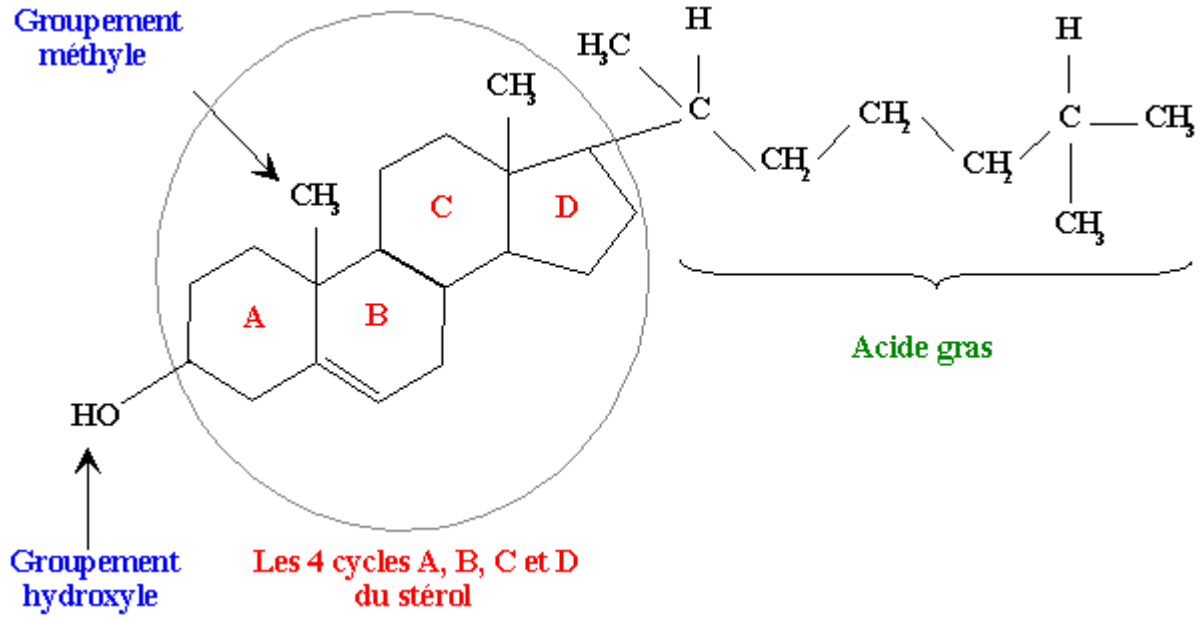
Biosynthèse des triglycérides

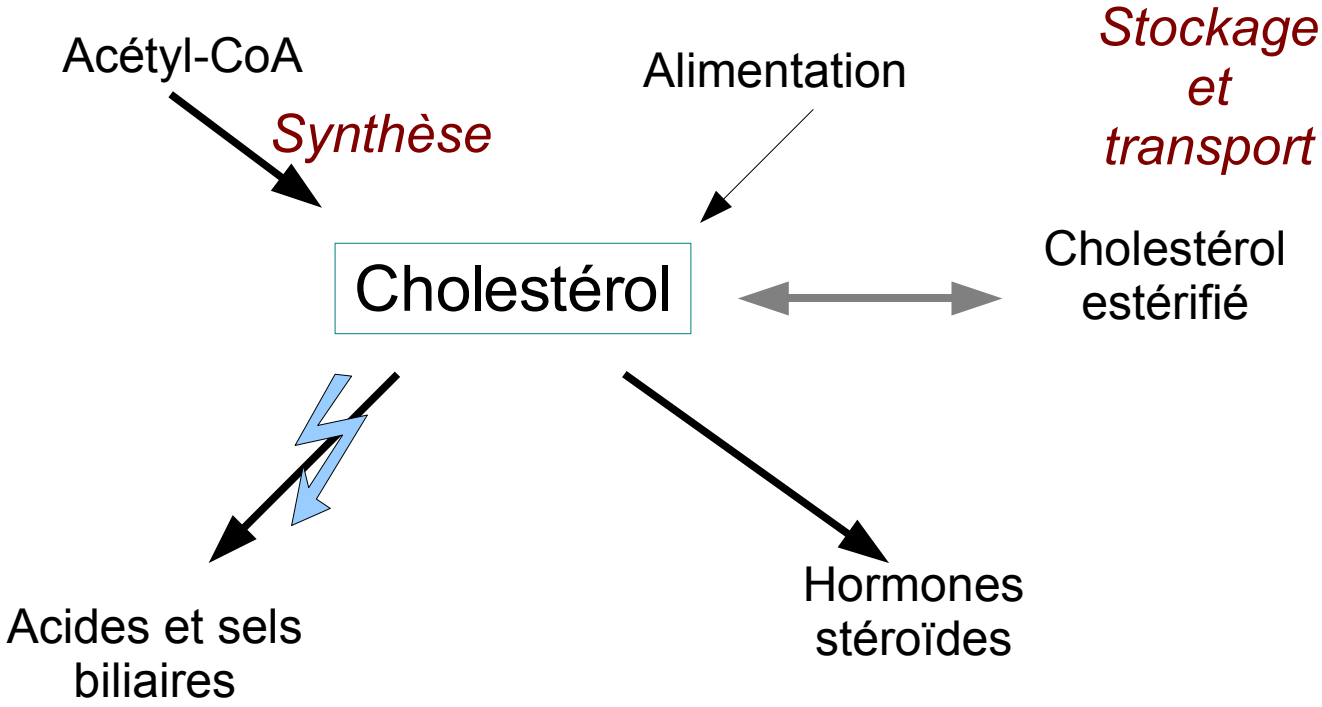


Cas du fructose

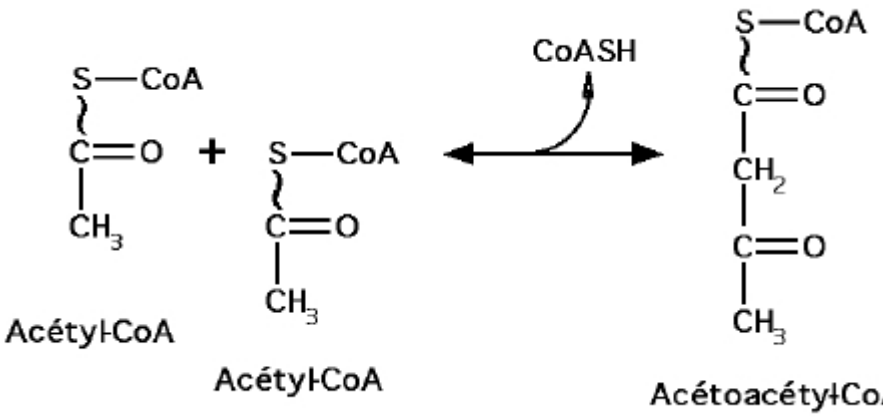


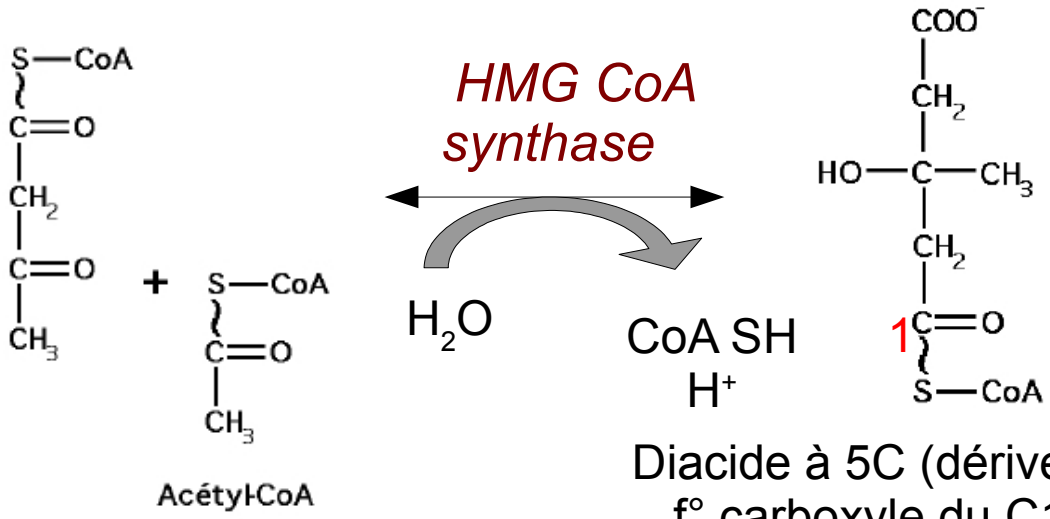
Métabolisme du cholestérol



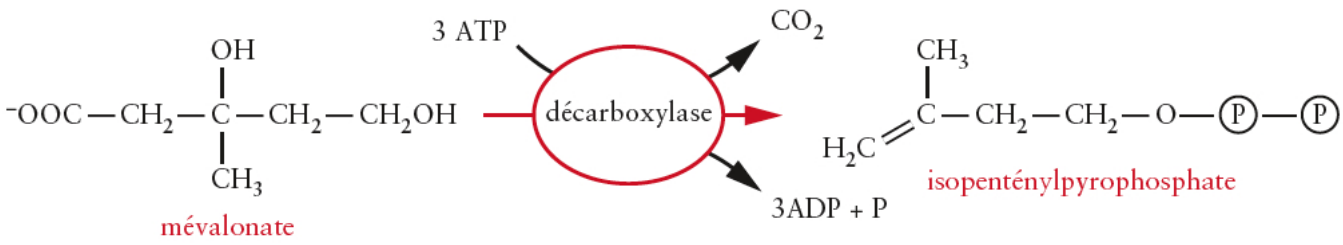


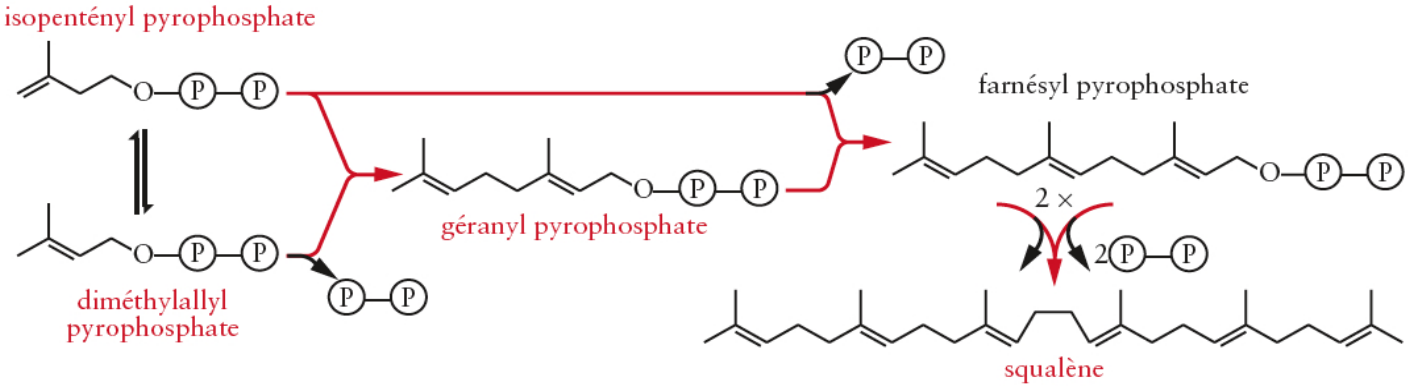
Synthèse du cholestérol





Diacide à 5C (dérivé ac glutarique)
f° carboxyle du C1 liée au CoA
OH et CH_3 sur le C3 (ou Cβ)
= 3 hydroxyl 3 méthyl glutaryl CoA
= β hydroxyl β méthyl glutaryl CoA





GGPP

↓ Phytoene synthase (PSY)

Phytoène

↓ Phytoene désaturase (PDS)

ζ-carotène

↓ Zeta-carotène désaturase (ZDS)

Lycopène

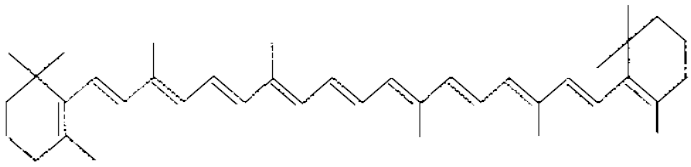
↓ Lycopène cyclase (LYC)

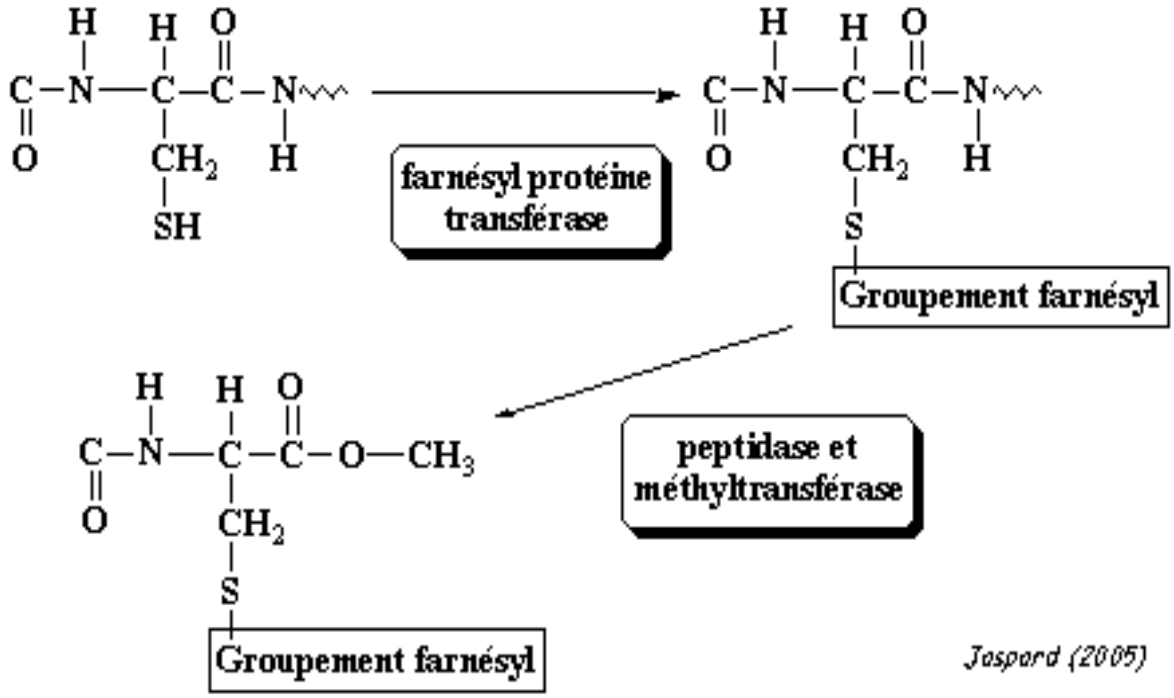
β-carotène

↓

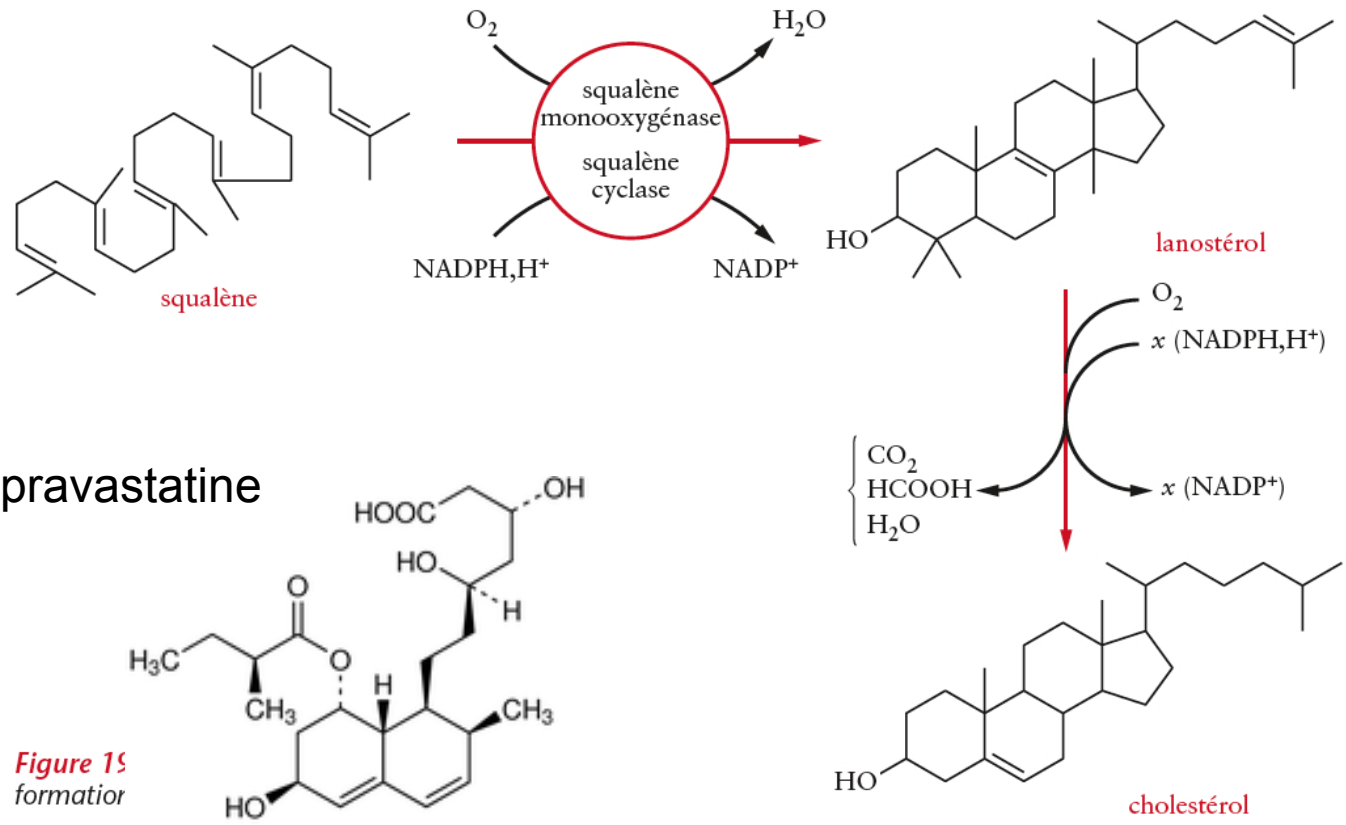
↓

Violaxanthine, Luteine etc.





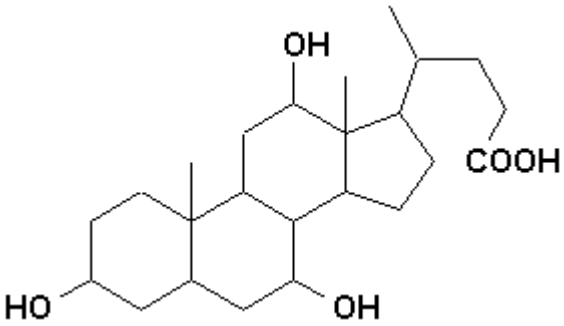
Jaspard (2005)



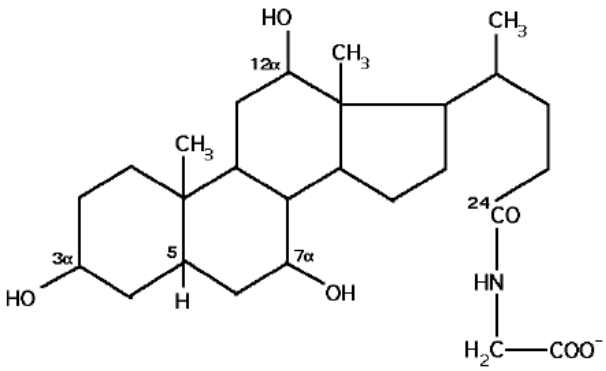
pravastatine

Figure 19
formation

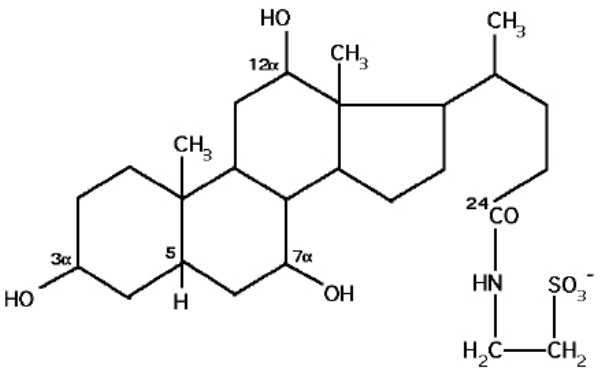
Les acides biliaires



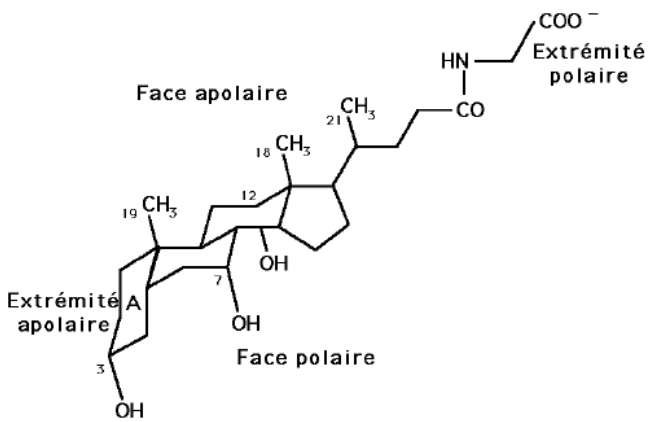
Ac cholique

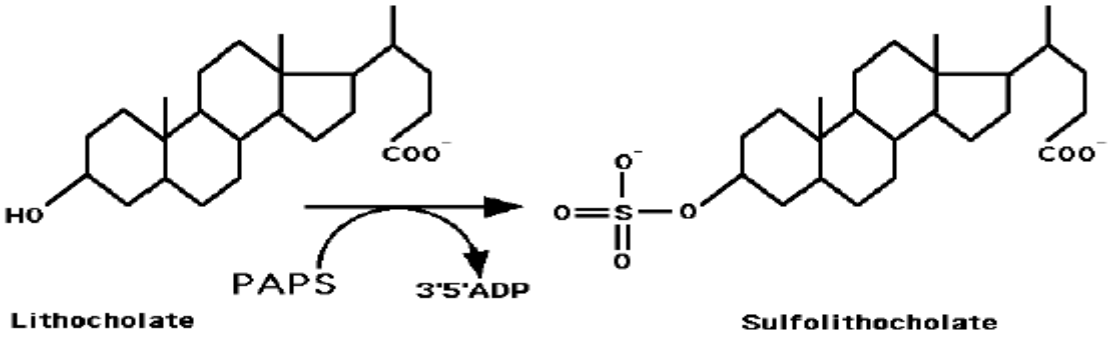


Ac glycocholique



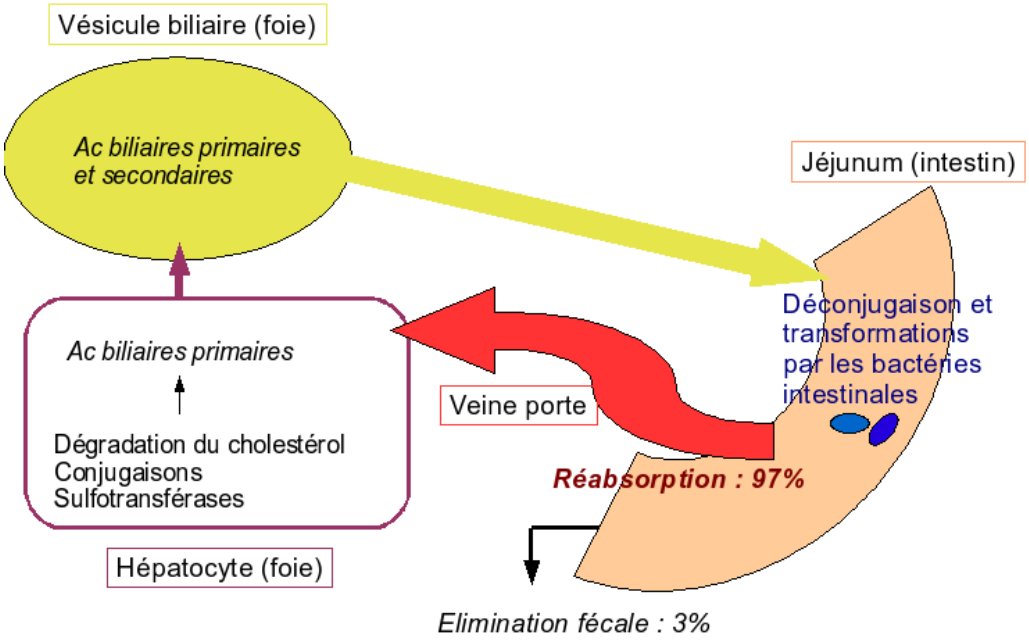
Ac taurocholique





Lithocholate — Sulfolithocholate

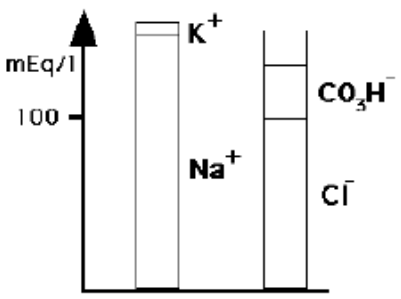
Cycle entéro-hépatique des sels biliaires



Bile hépatique

Débit 0,7 l/24 h

Composition 97 % d'eau



Glucides = **Mucopolysaccharides**

Lipides = **Cholestérol**
Phospholipides

Protéines et enzymes – 1,8 g/l
Estérases
Phospholipases
Urée, Acides aminés

Sels biliaires = 3,6 g/l

Glycocholate	1,2 g/l
Glycochénate	1,0 g/l
Taurocholate	0,4 g/l
Taurochénate	0,3 g/l
Glycodésoxycholate	0,6 g/l
Taurodésoxycholate	0,2 g/l
Sulfolithocholate	