

Métabolisme des acides aminés

Plan du cours

Origine des amino-acides :

- Alimentation
- Transamination
- Conversion

Catabolisme des amino-acides : réactions générales

- Décarboxylation
- Désamination, Transamination
- Cycle de l'urée, Ammoniogenèse
- AAs céto-gènes et glucoformateurs

Transformations des amino-acides en produits spécialisés :

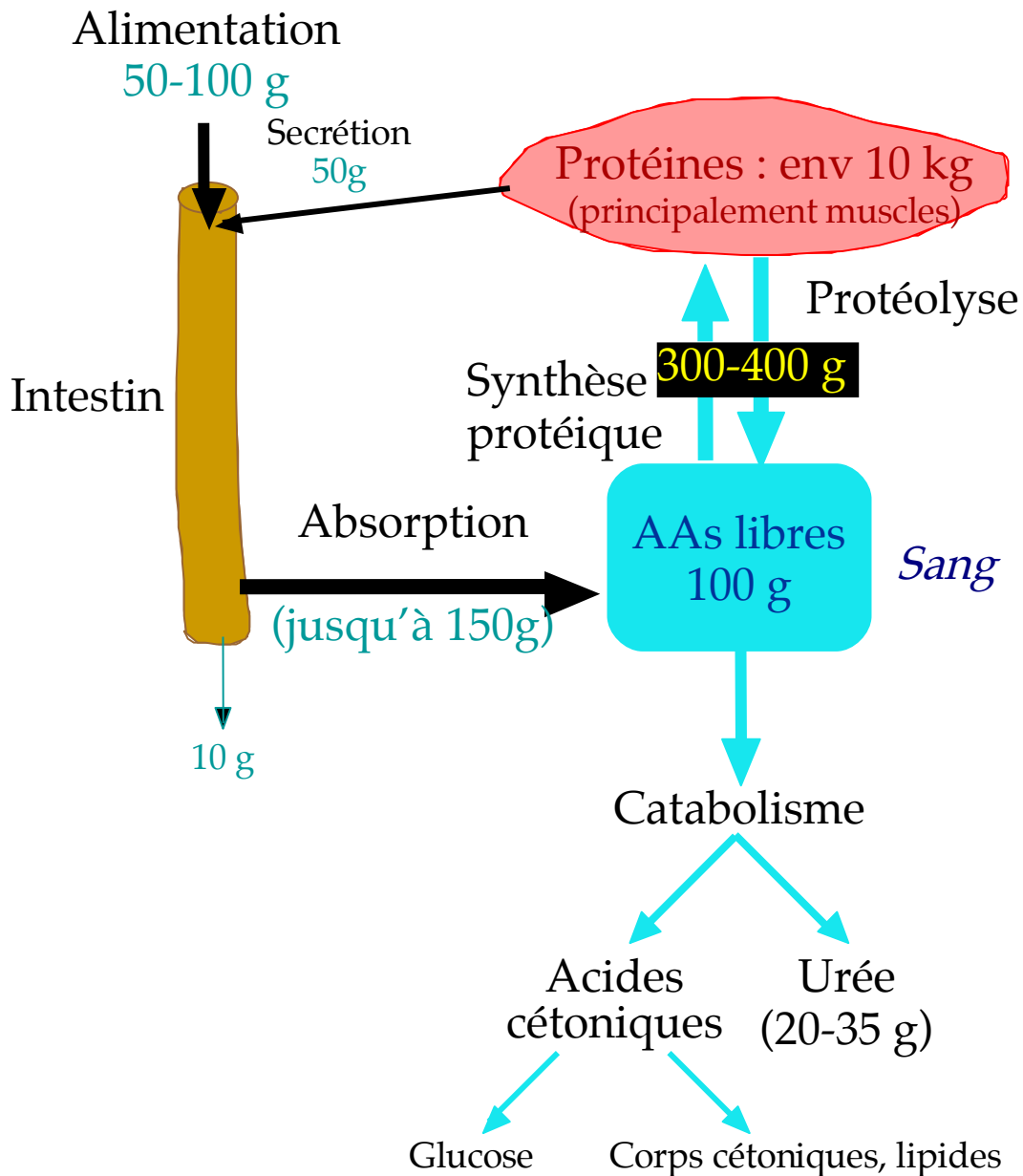
- Neuromédiateurs et autres amines biogènes
- Bases puriques et pyrimidiques, hème

(*métabolismes *vs* ultérieurement*)

- Glutathion
- Synthèse de la créatine

Métabolisme et dérivés particuliers de certains AAs :

- Glycine
- Arginine
- Met et Cys
- Phe et Tyr



Biosynthèse des AAs

Transamination

Conversion

réversible : Glycine ↔ Sérine

non réversibles :

Méthionine → Cystéine par transsulfuration d'homocystéine

Phénylalanine → Tyrosine par hydroxylation

Aspartate → Alanine par décarboxylation

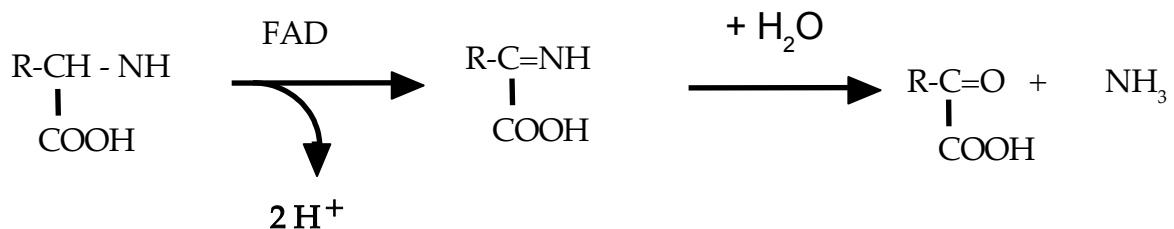
Glutamate → Proline par cyclisation

Autres :

Arginine : produite au cours du cycle de l'urée

<u>AA</u>	<u>AMINE</u>	<u>FONCTION</u>
Trp	Sérotonine	Neuromédiateur
Glu	γ -amino butyrate	Neuromédiateur
His	Histamine	Neuromédiateur, médiateur immunitaire
	Dopamine,	
Tyr	Noradrénaline, Adrénaline	Neuromédiateurs, hormone
Asp	β -alanine	Composant du coenzyme A
Cys	Cystéamine	Composant du coenzyme A
Ser	Ethanolamine	Composant des phospholipides
Thr	Amino-propanol	Composant de la vitamine B12

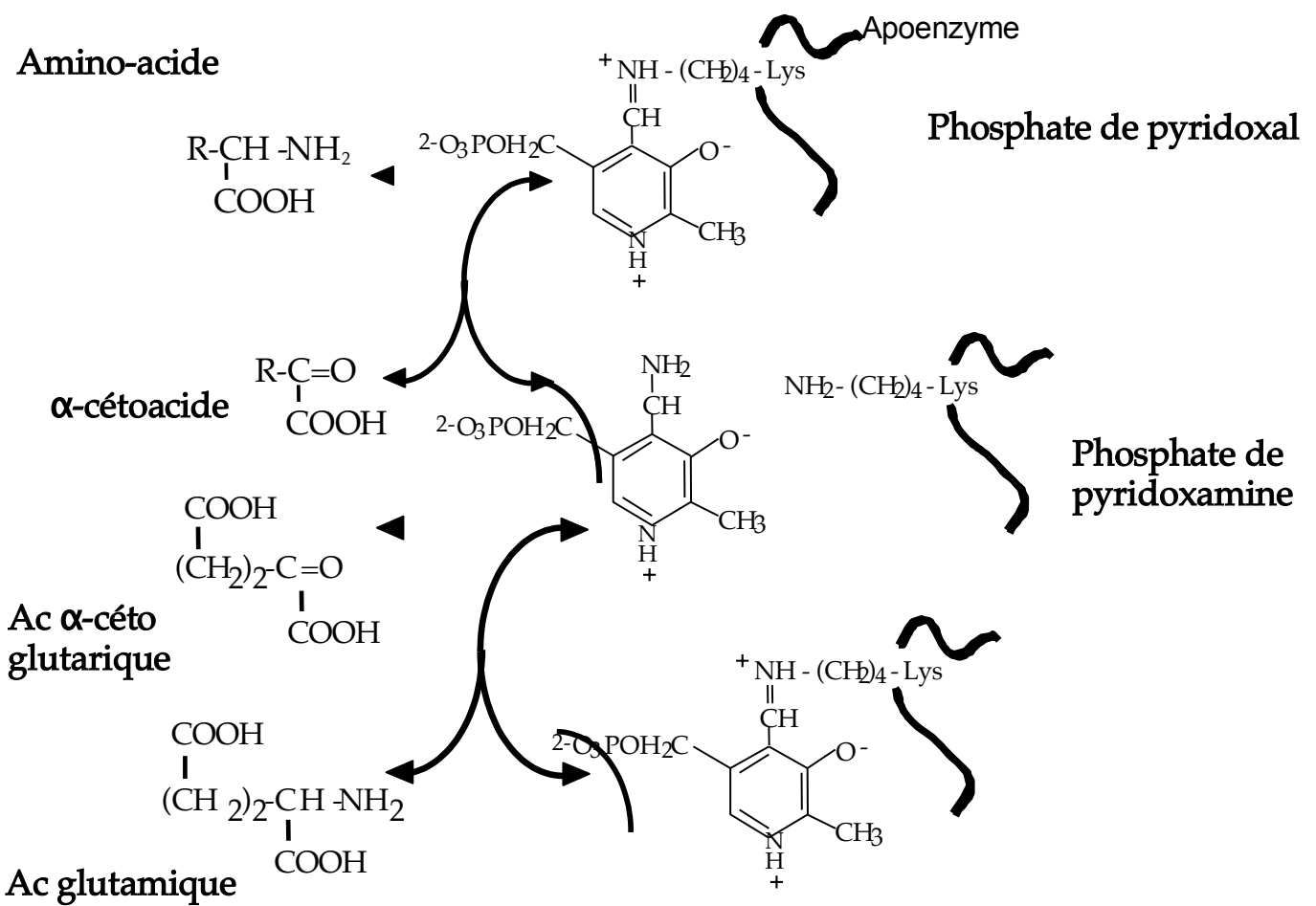
Désamination oxydative

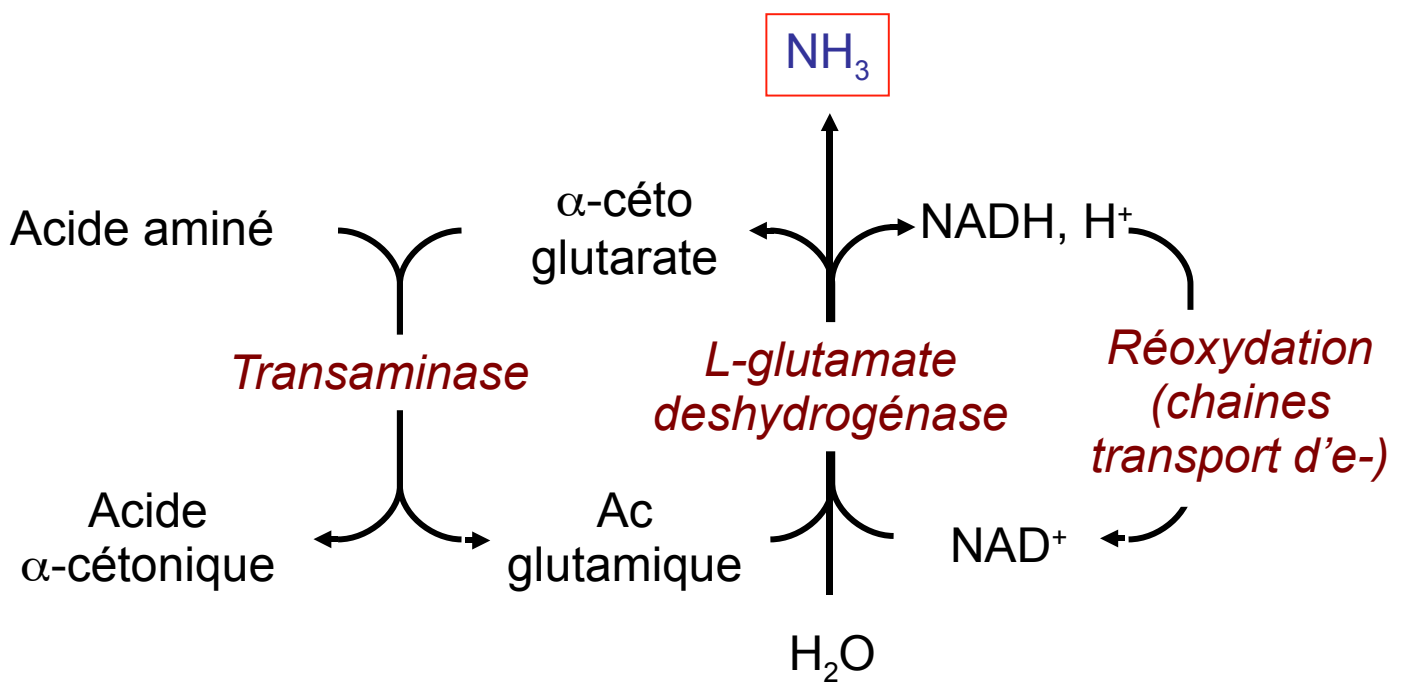
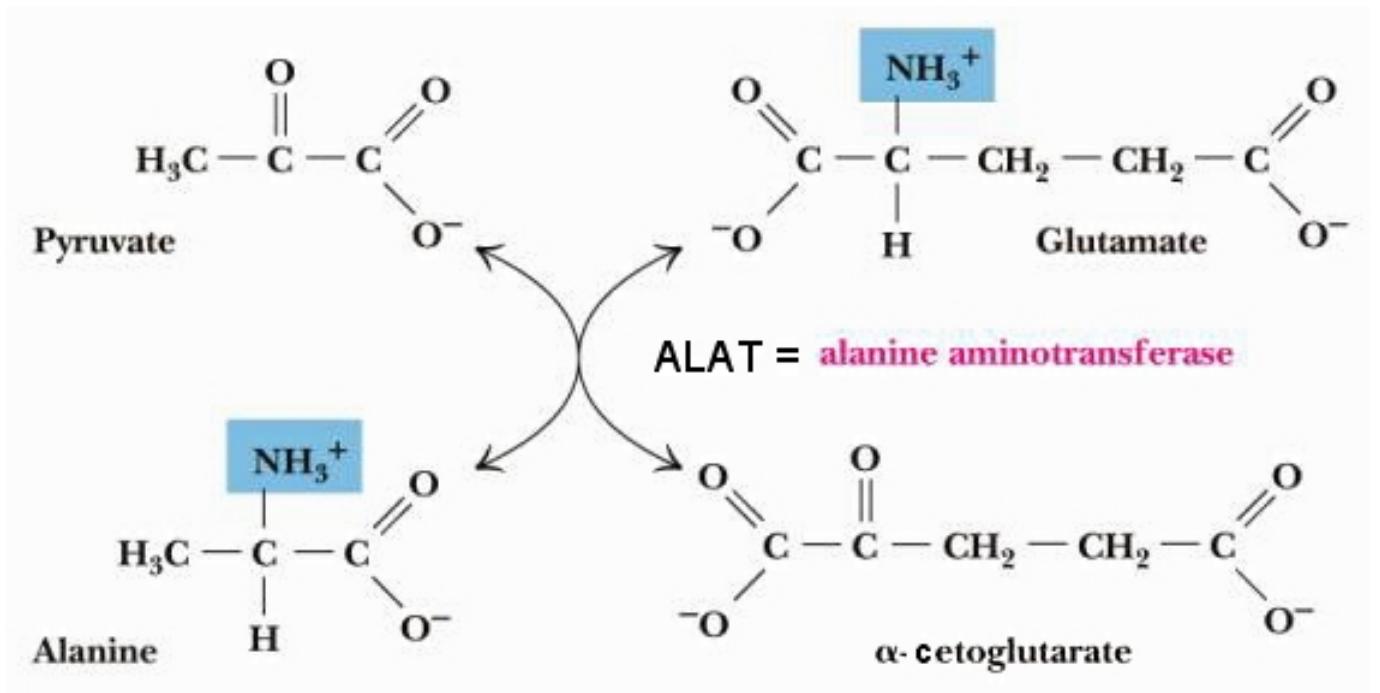


La transamination

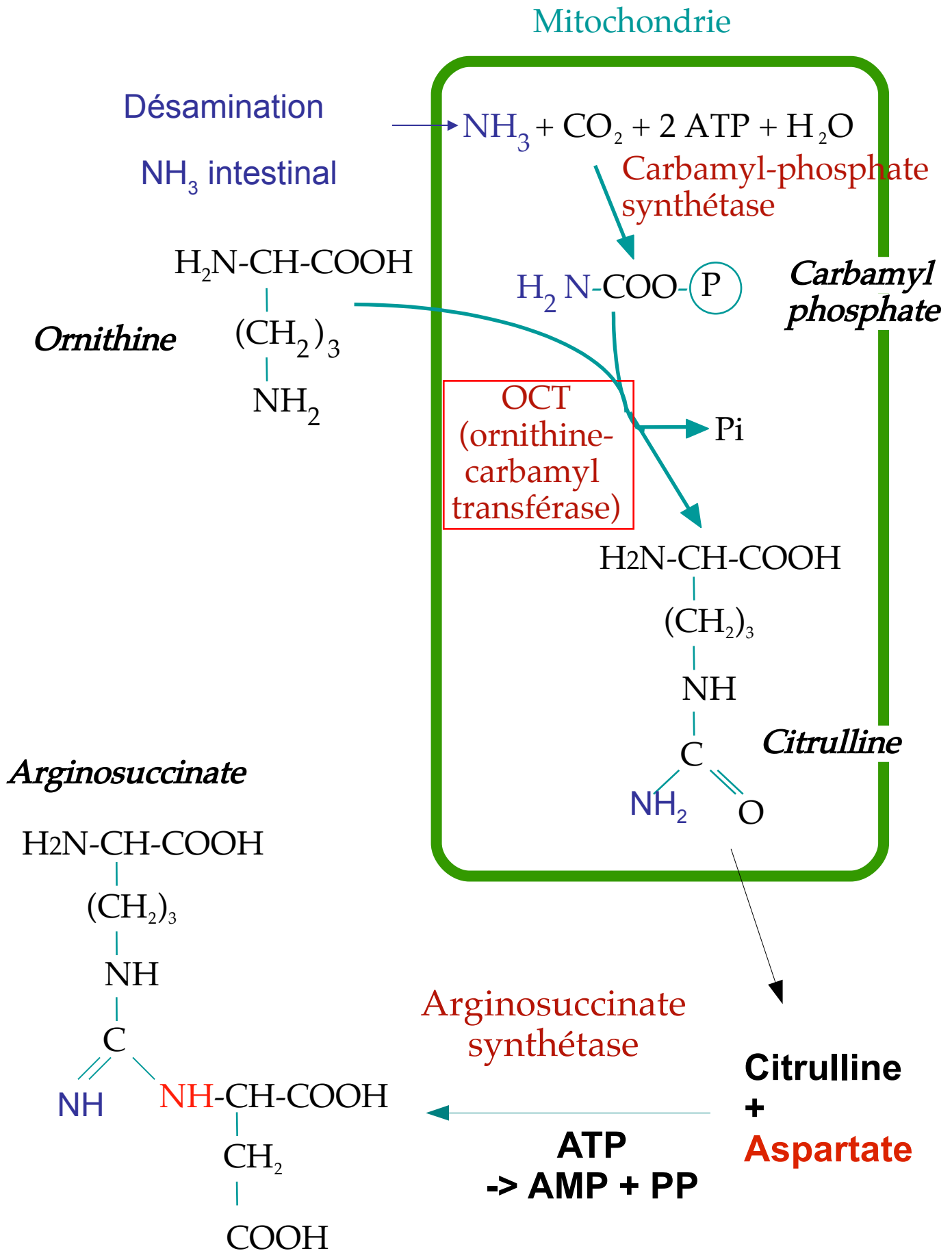


AA + ac α -cétoglutarique \longleftrightarrow α -cétacide + Ac Glutamique

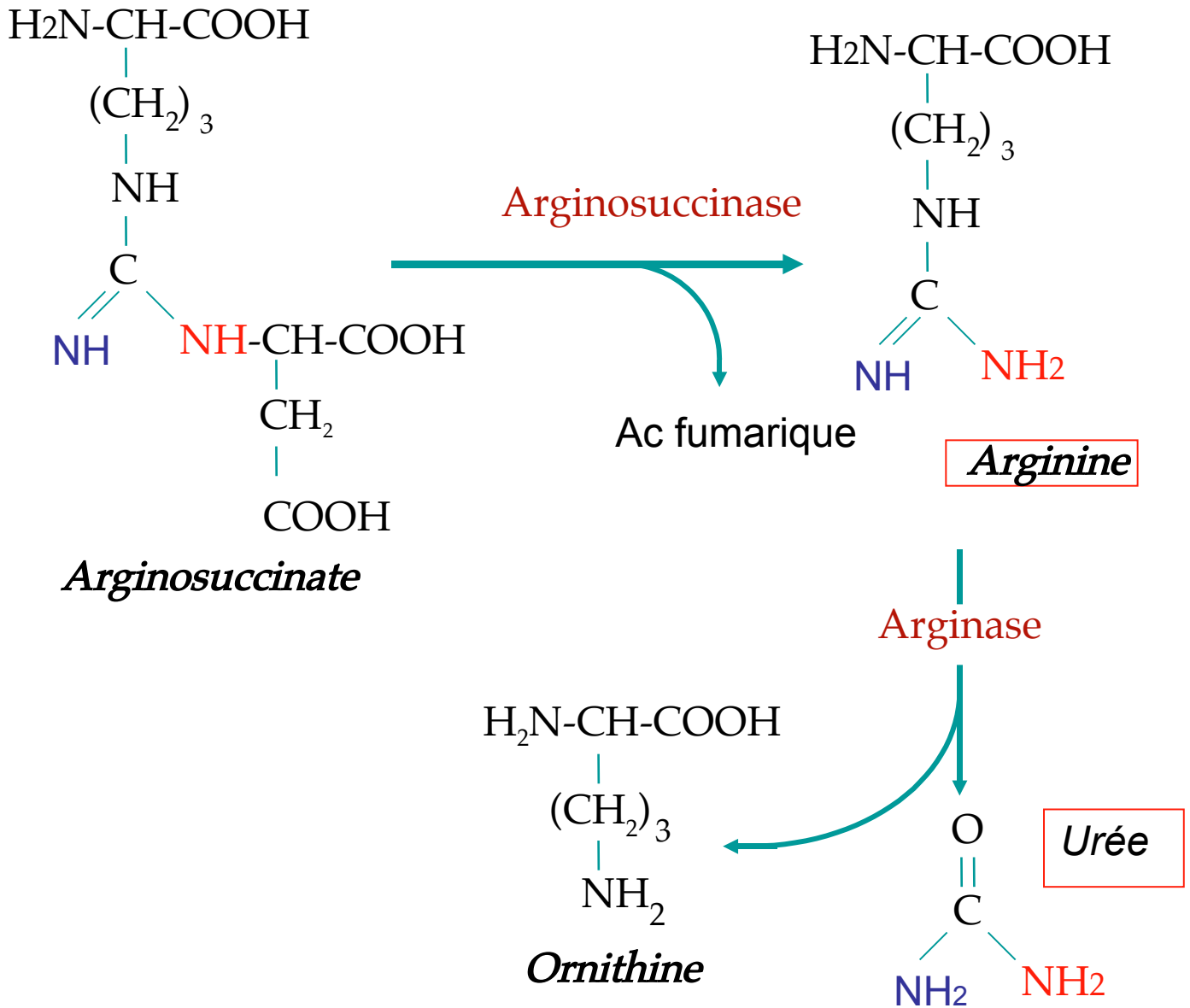




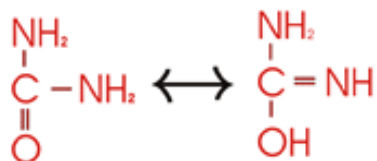
Le cycle de l'urée

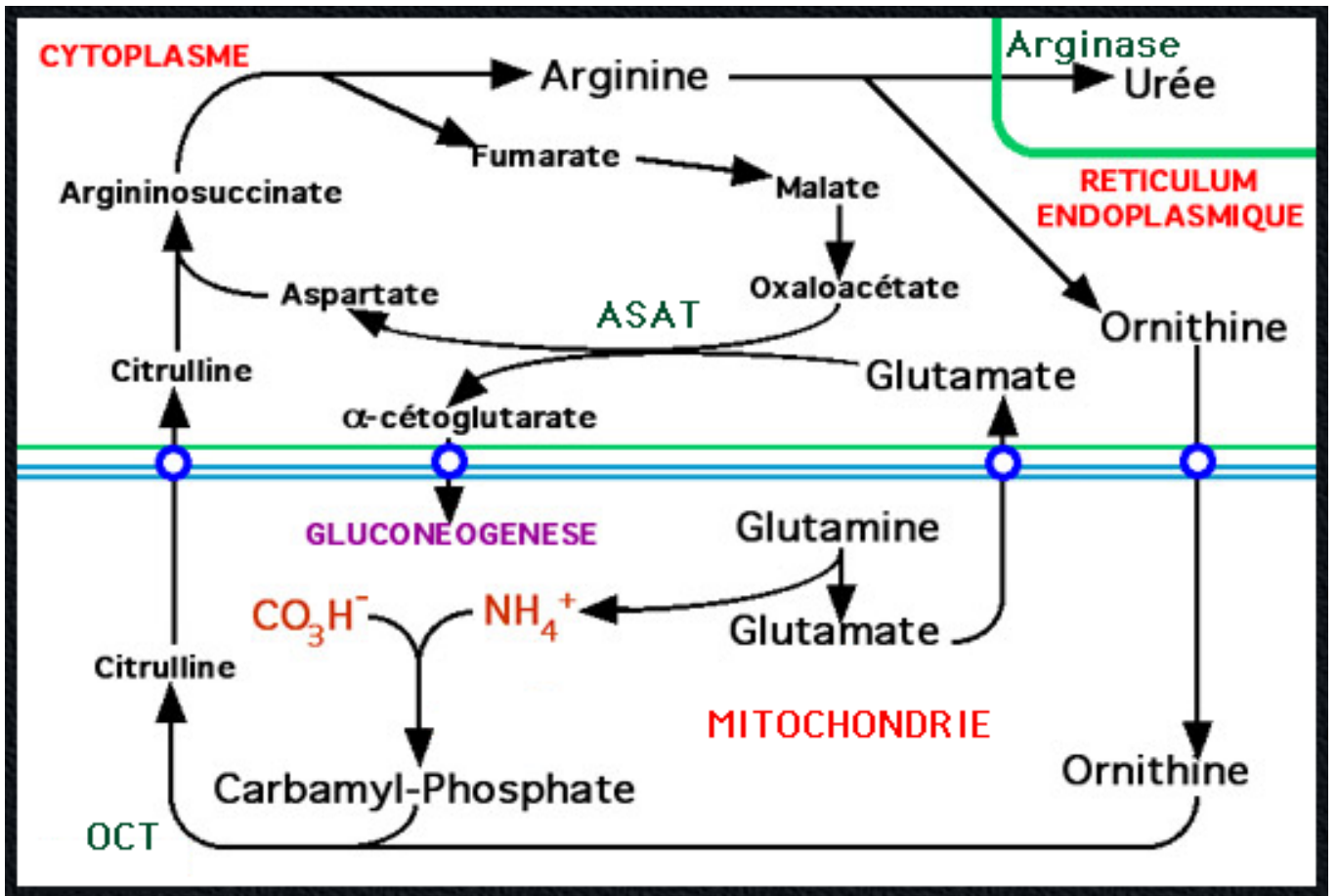


Cycle de l'urée (suite)

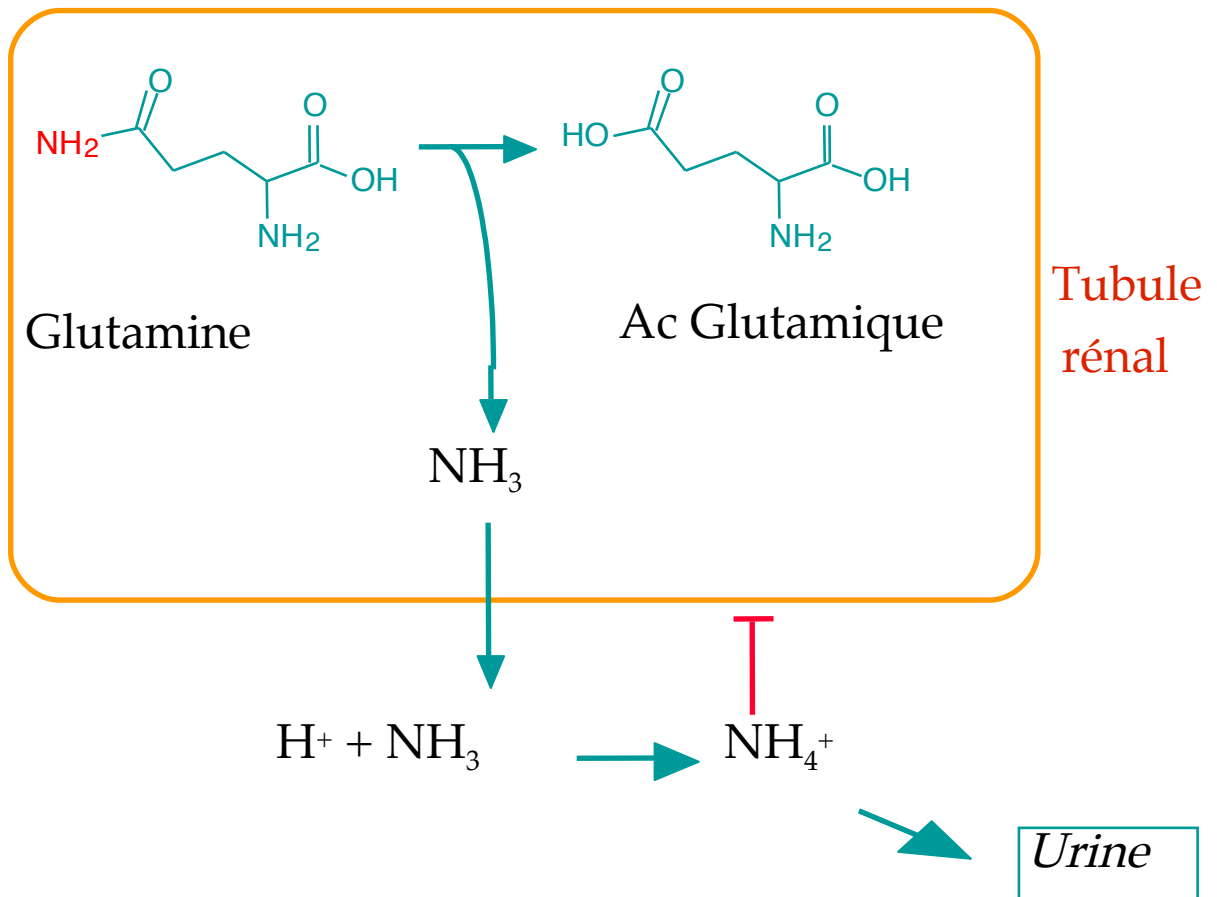


Urée

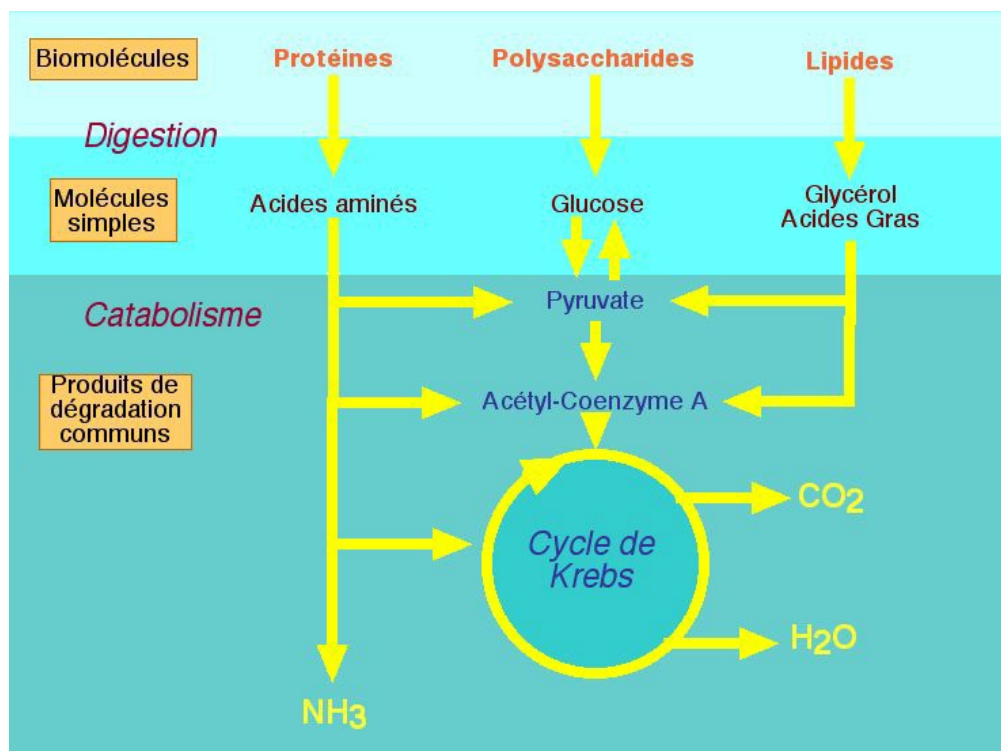
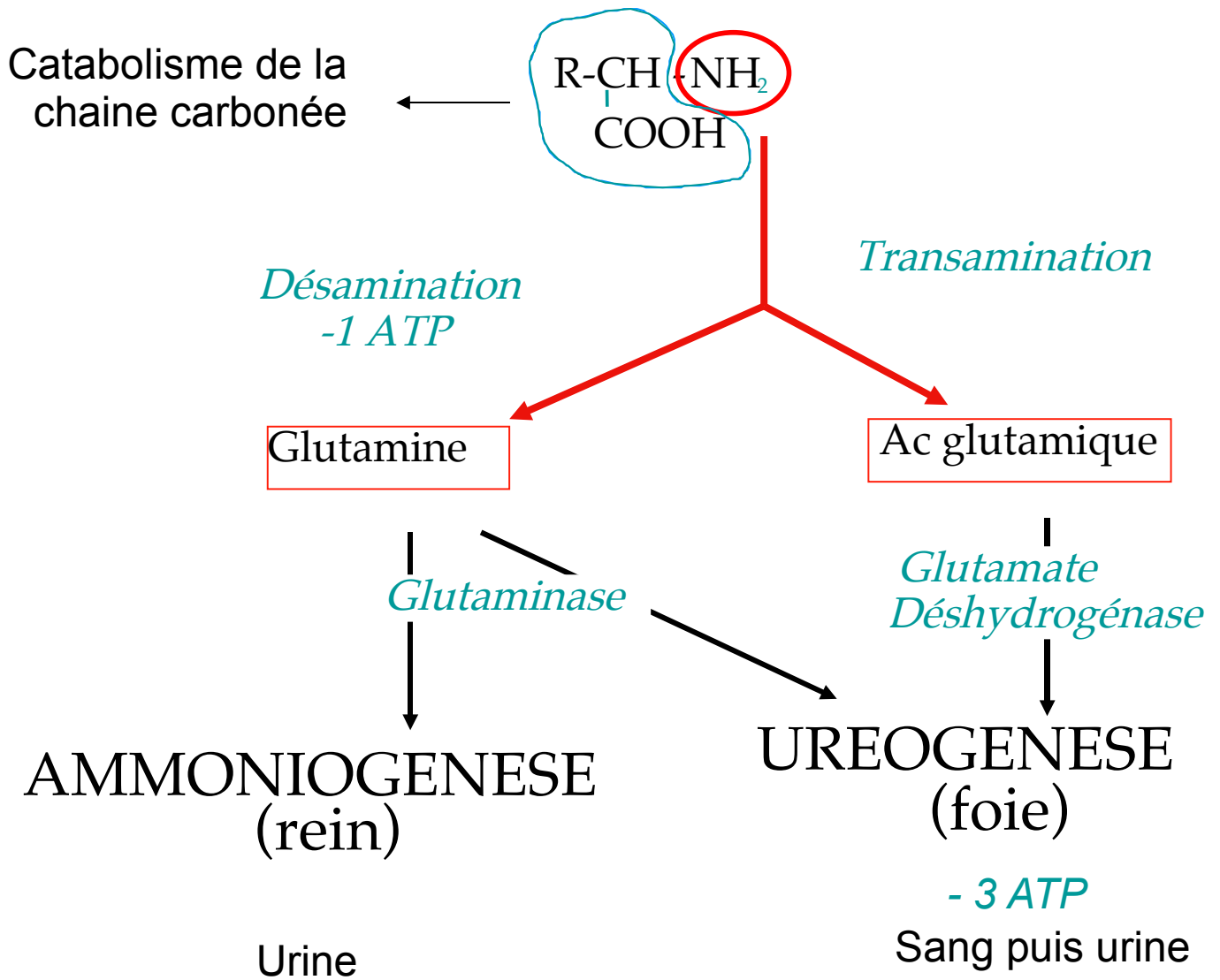




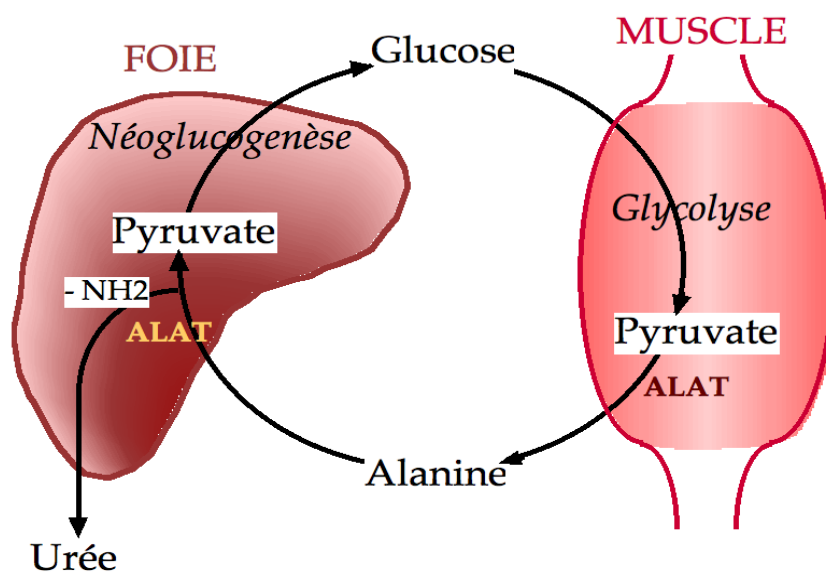
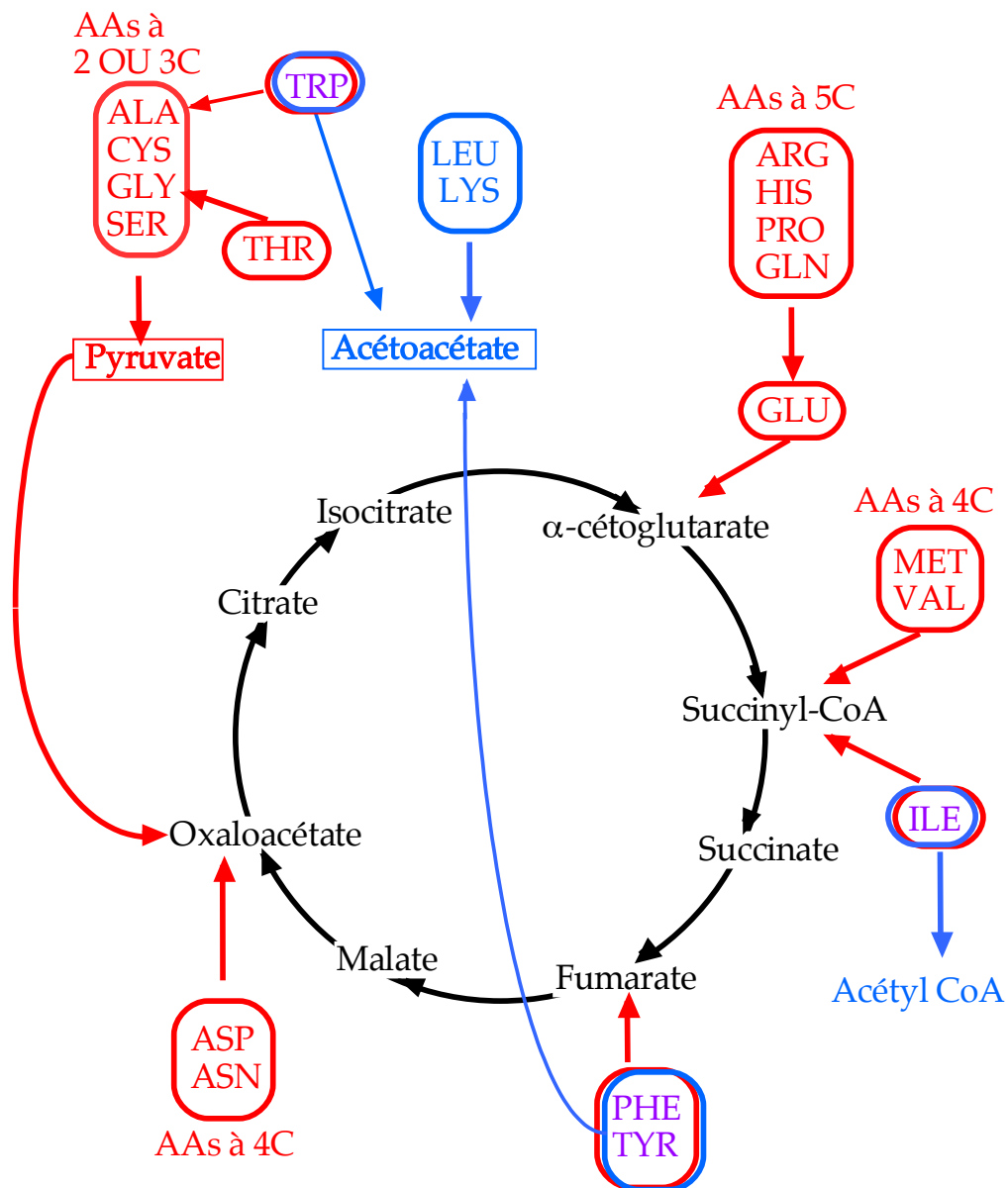
Ammoniogénèse



Elimination du groupement aminé : bilan



AAs cétoogènes et AAs glucoformateurs



Dérivés biologiquement actifs des AAs

AMINES BIOGENES

Produits de décarboxylation ± autres réactions

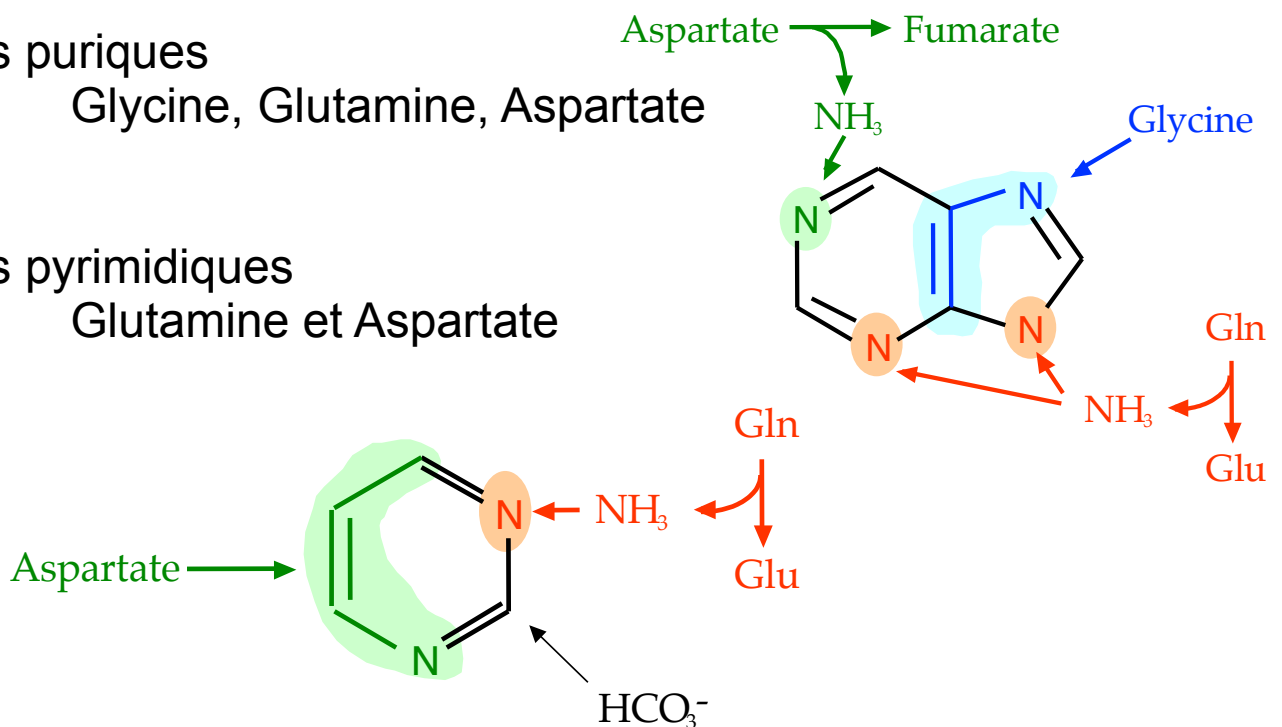
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Phe, Tyr	Dopamine Noradrénaline, Adrénaline	Neuromédiateurs, hormone
Asp	β -alanine	Composant du coenzyme A
Cys	Cystéamine	Composant du coenzyme A
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Thr	Amino-propanol	Composant de la vitamine B12

Bases puriques

Glycine, Glutamine, Aspartate

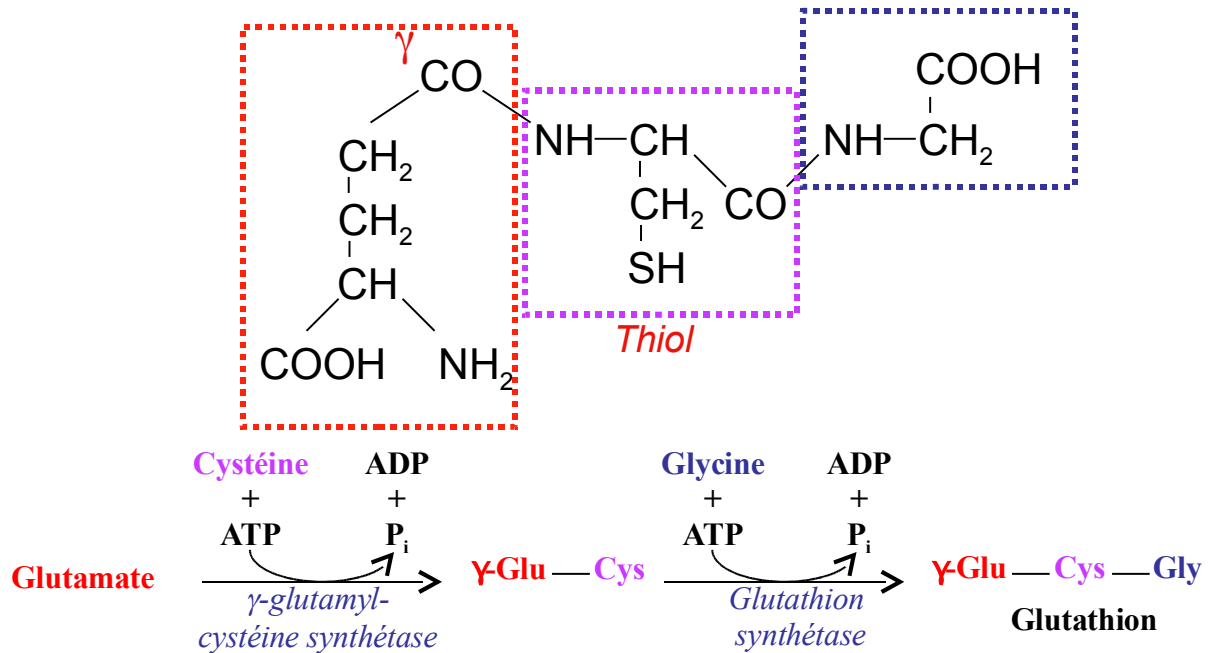
Bases pyrimidiques

Glutamine et Aspartate



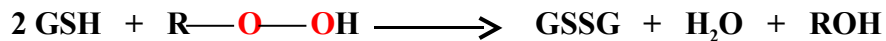
Le glutathion

Synthèse du glutathion : $\text{Glu} + \text{Cys} + \text{Gly} + 2 \text{ATP} \rightarrow \text{Glutathion} + 2 (\text{ADP} + \text{P}_i)$:



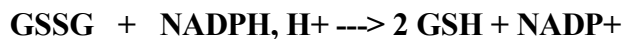
Réactions impliquant la fonction thiol :

Détoxication des peroxydes par le glutathion :



Glutathion-peroxydase
Sélénium

Régénération du glutathion réduit par la glutathion-réductase :



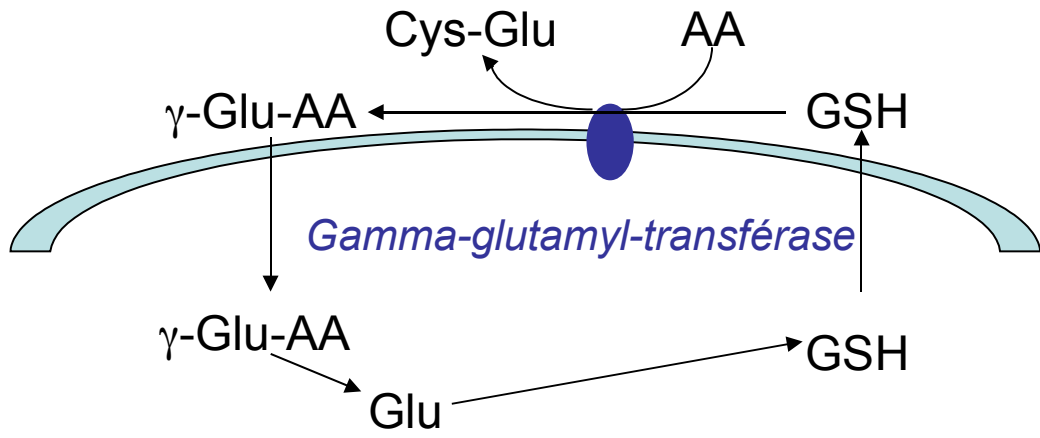
Glutathion-réductase

Conjugaison du glutathion aux xénobiotiques électrophiles :

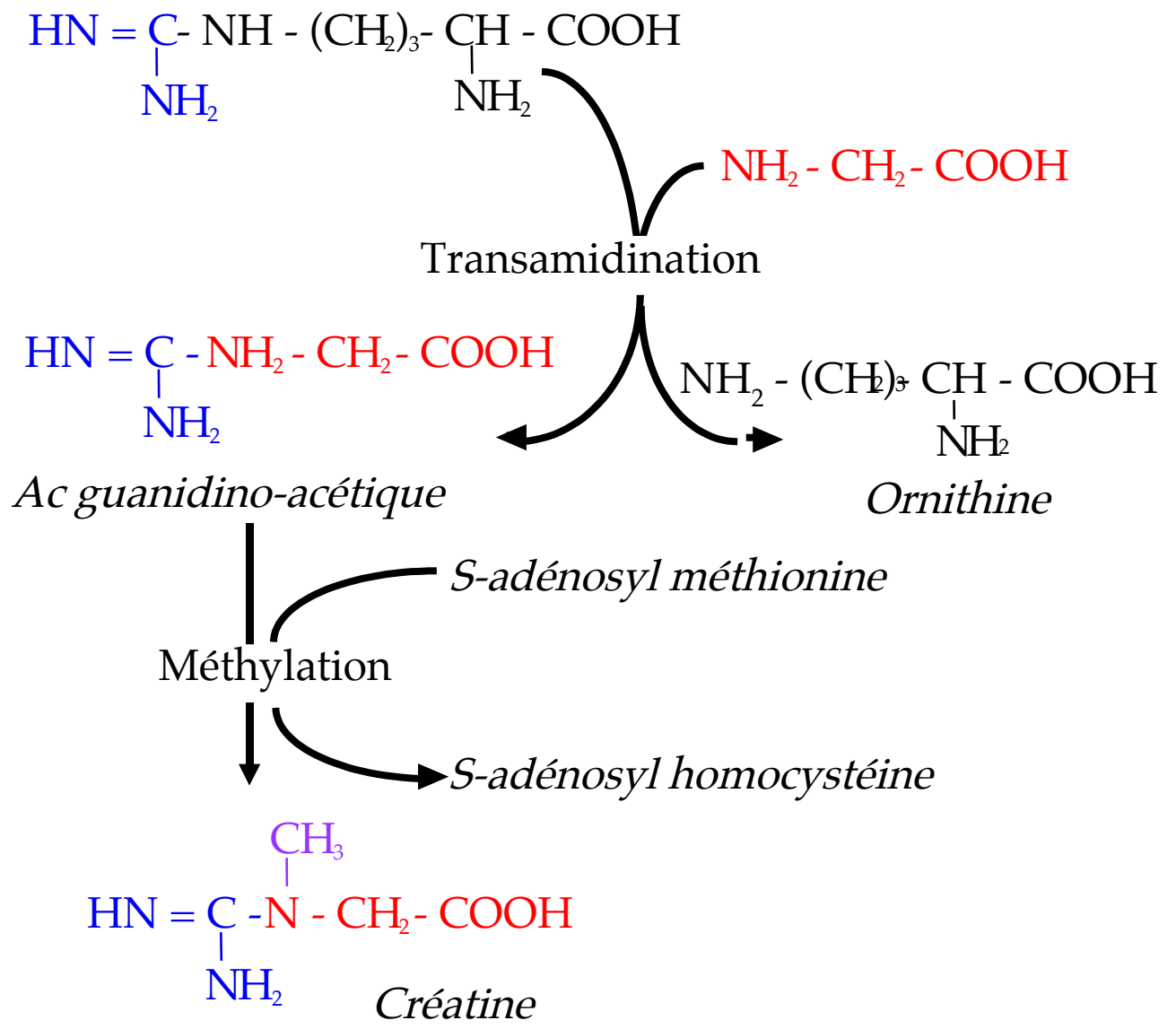


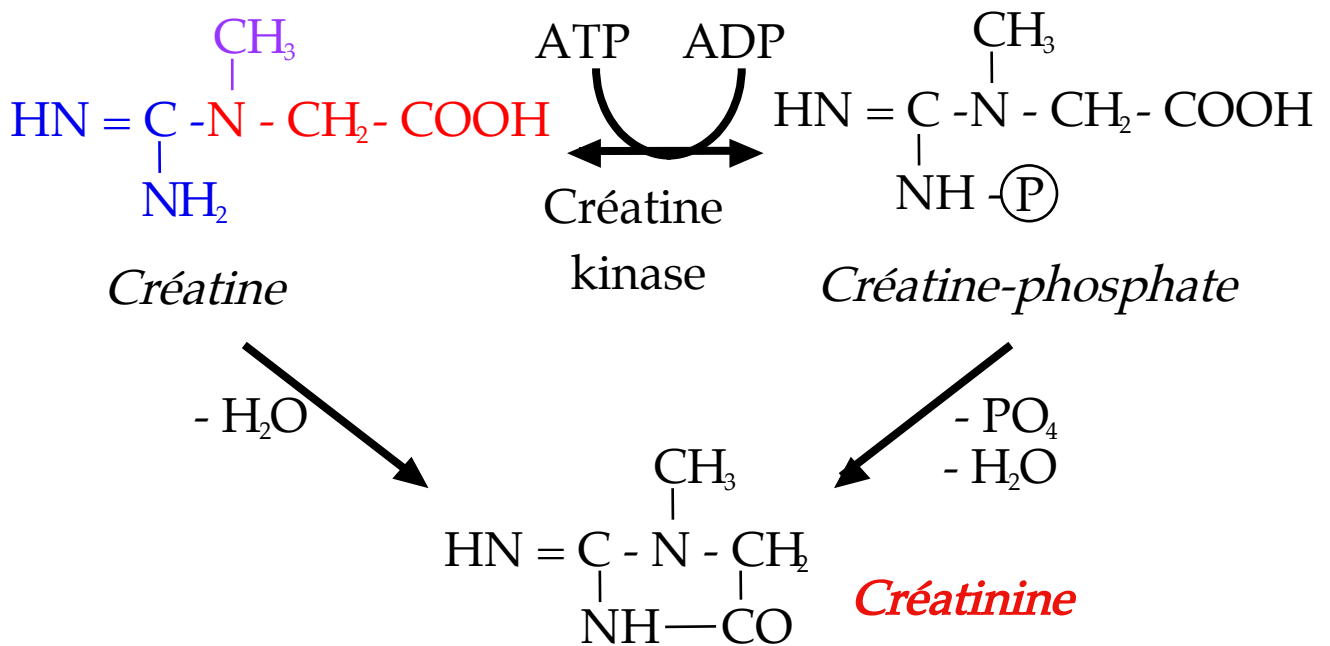
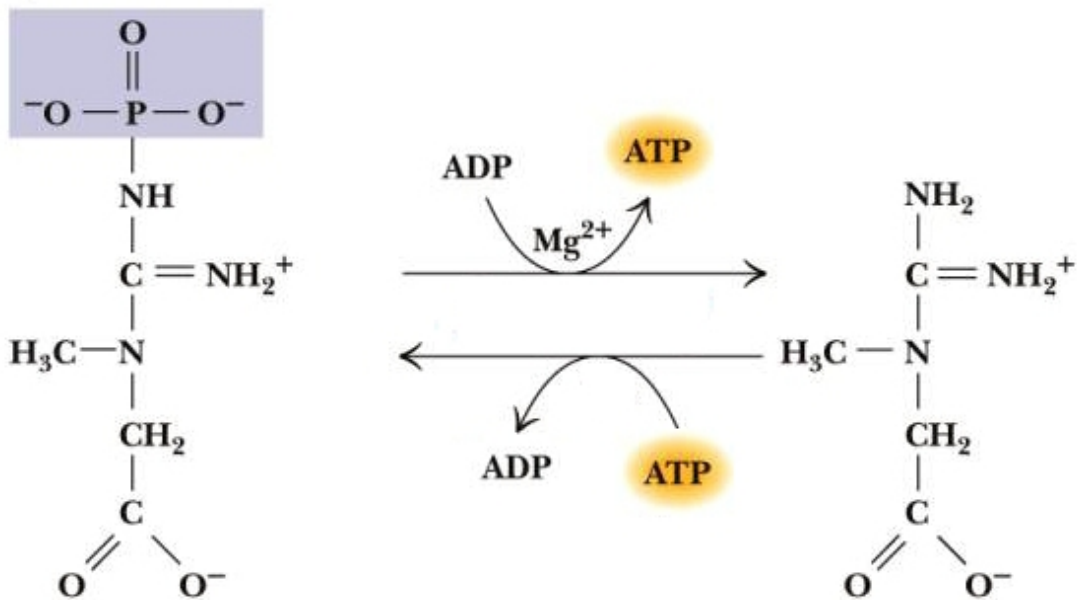
Catabolisme hépatique de l'insuline (réduction des ponts S-S)

Le glutathion
Réactions impliquant le résidu γ -glutamyl :

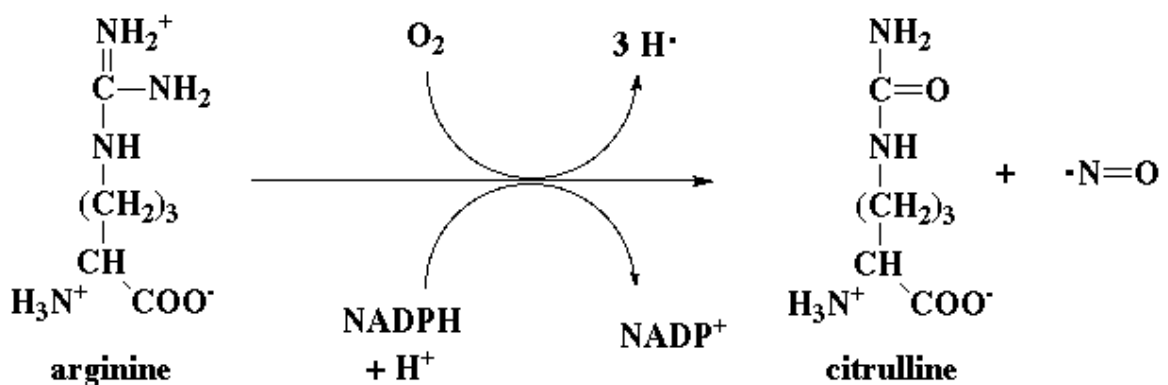


La créatine

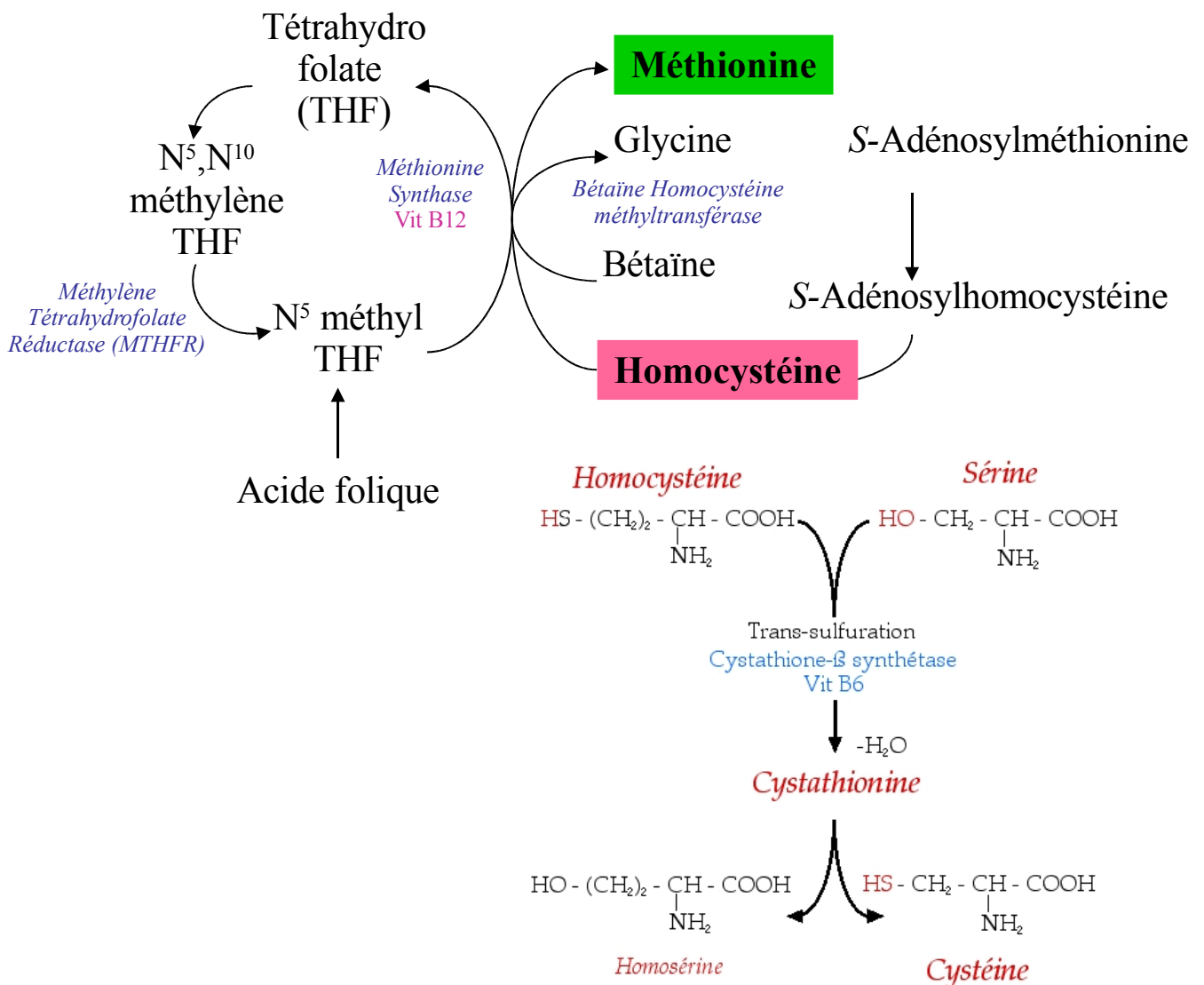
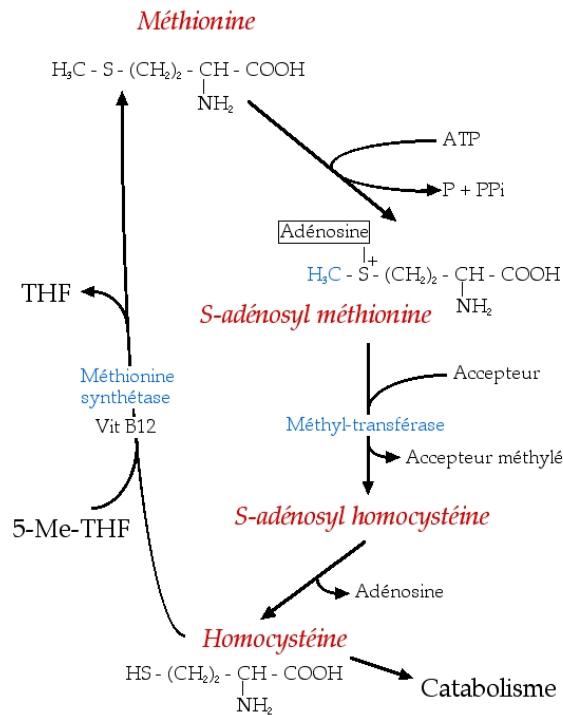




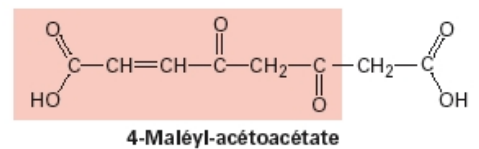
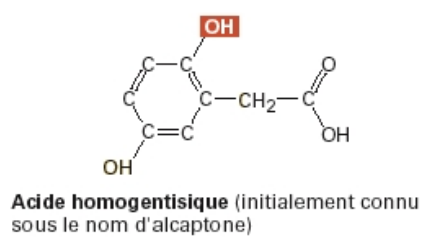
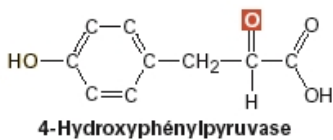
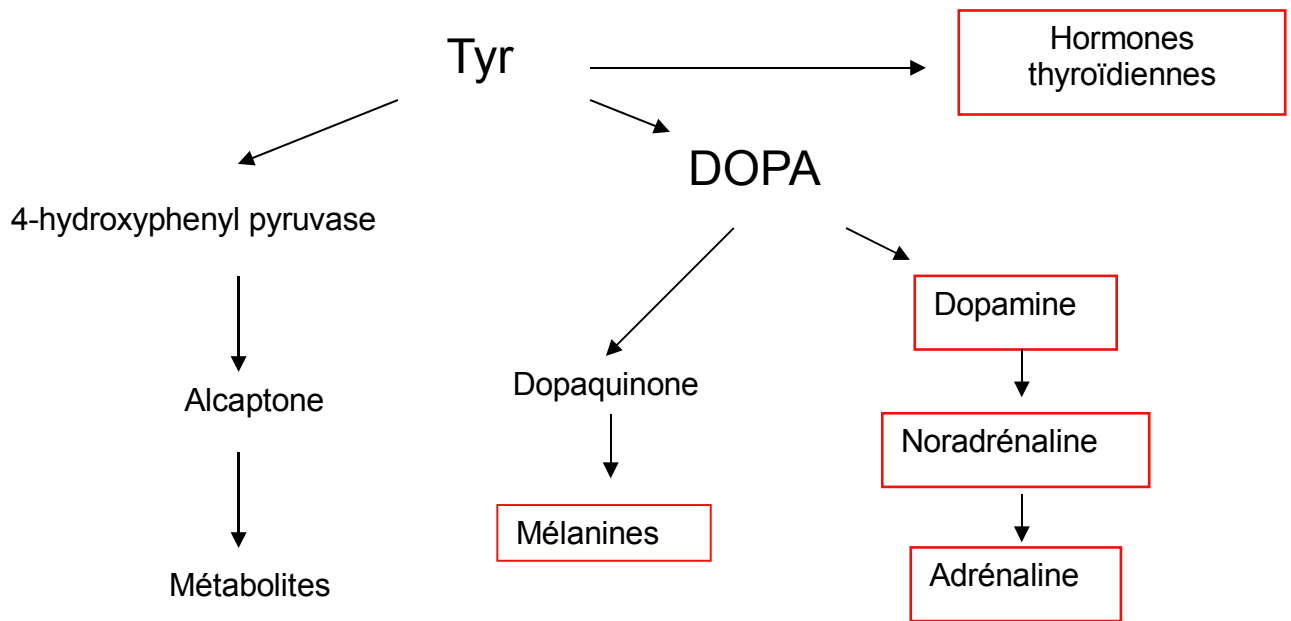
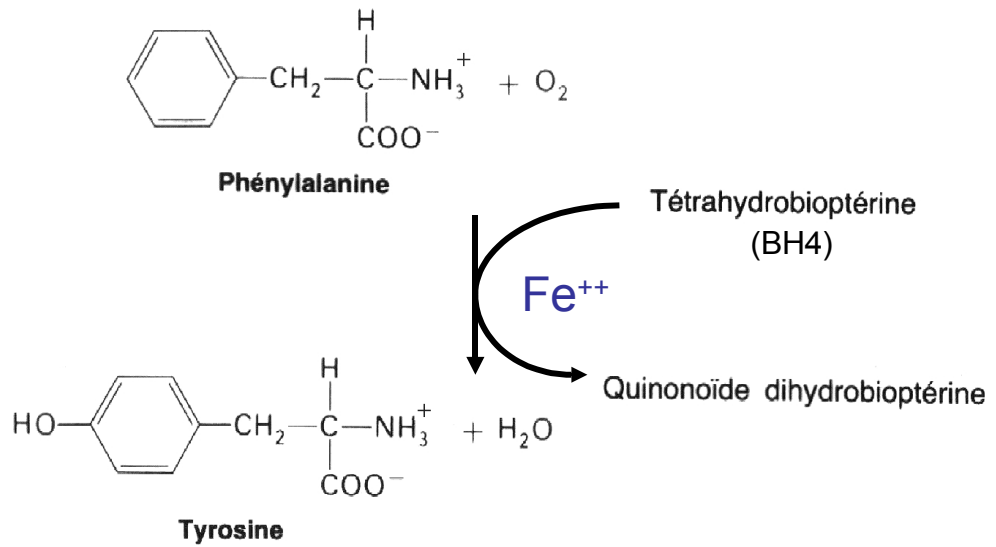
Arginine : synthèse de NO



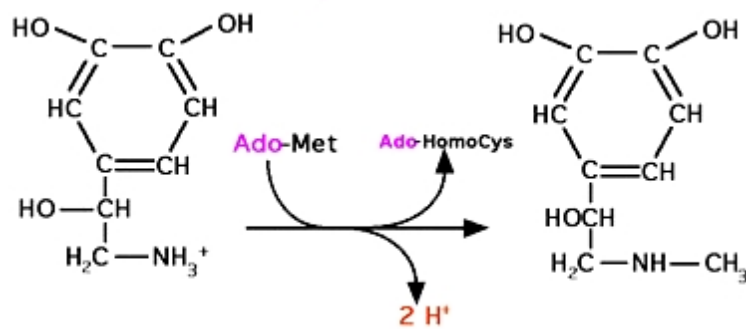
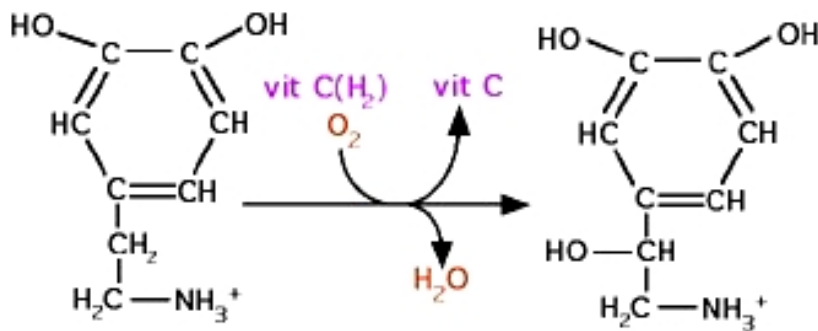
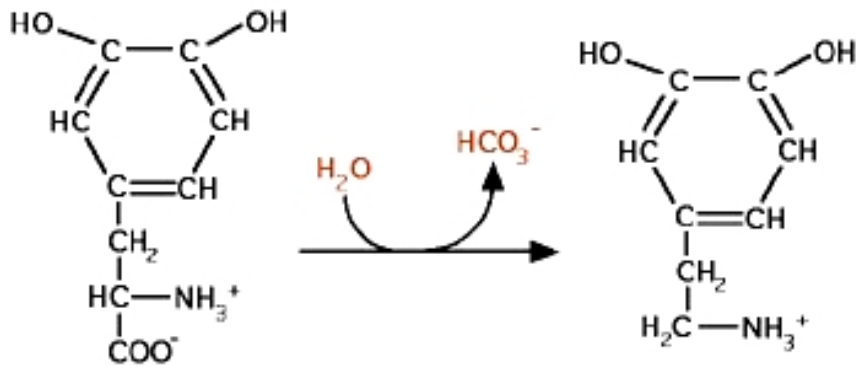
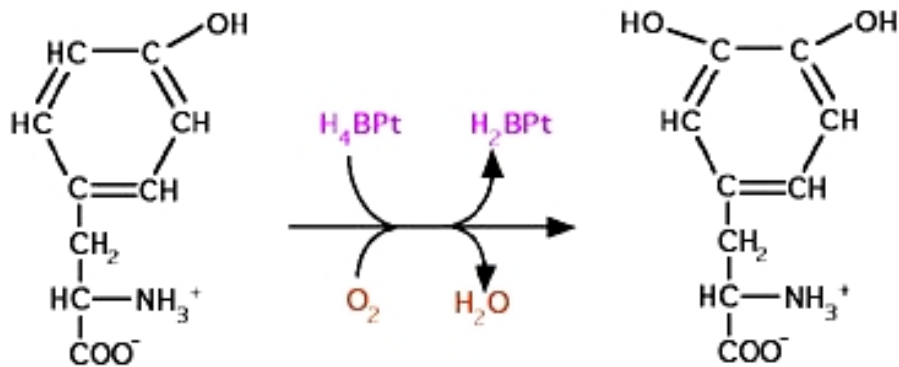
Cycle des méthyle activés



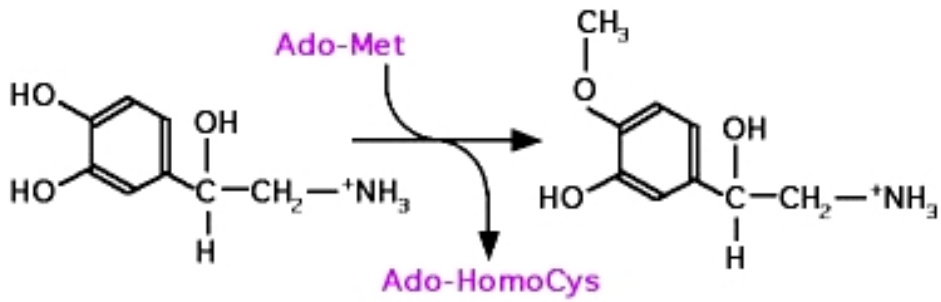
Métabolisme de Phe et Tyr



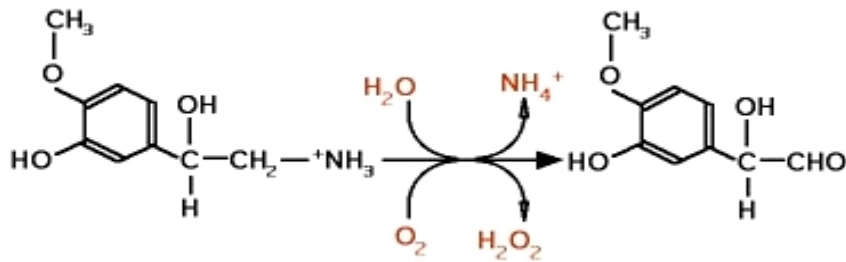
Synthèse des catécholamines



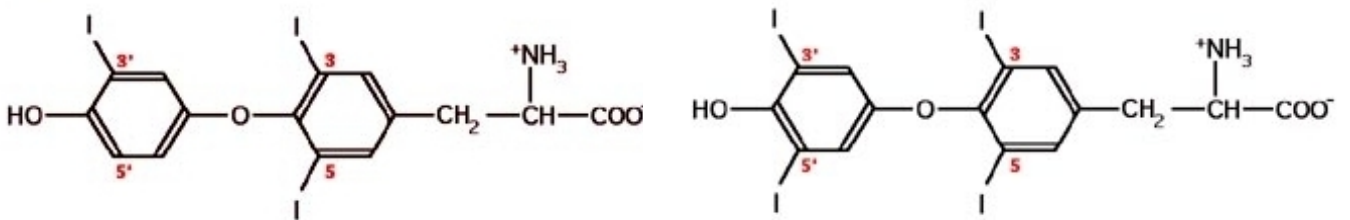
COMT



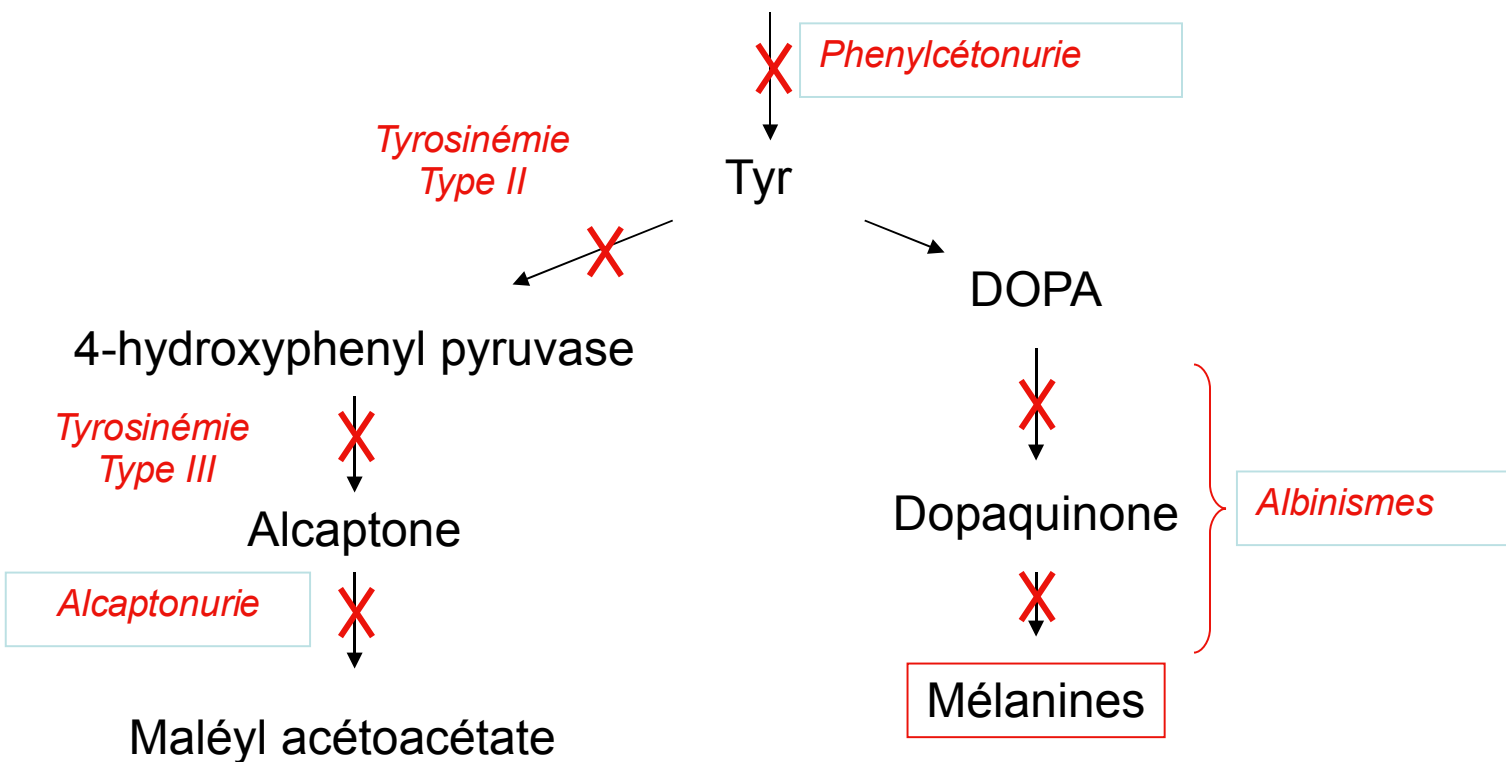
MAO



Hormones thyroïdiennes

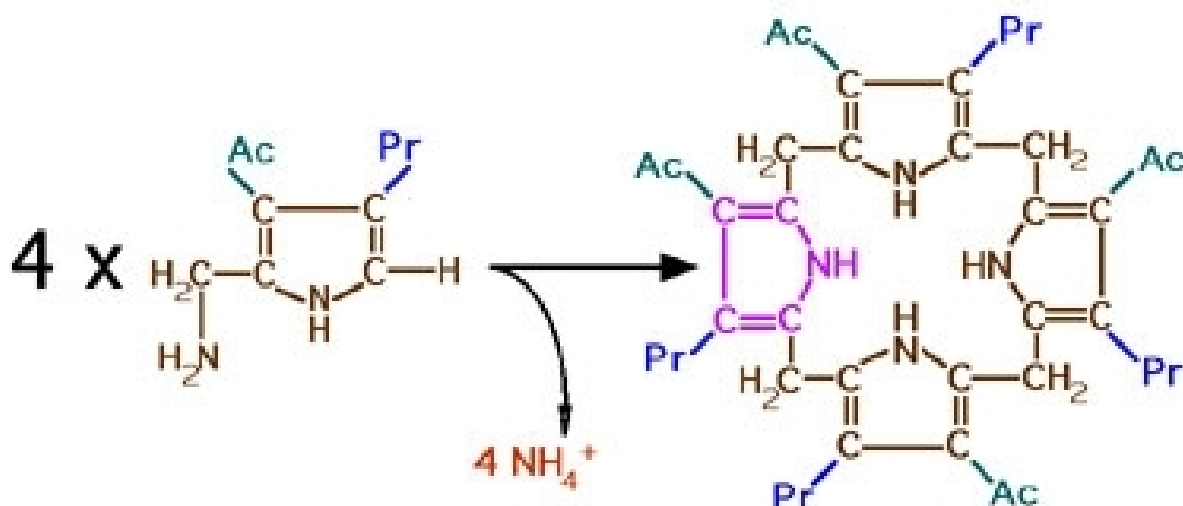
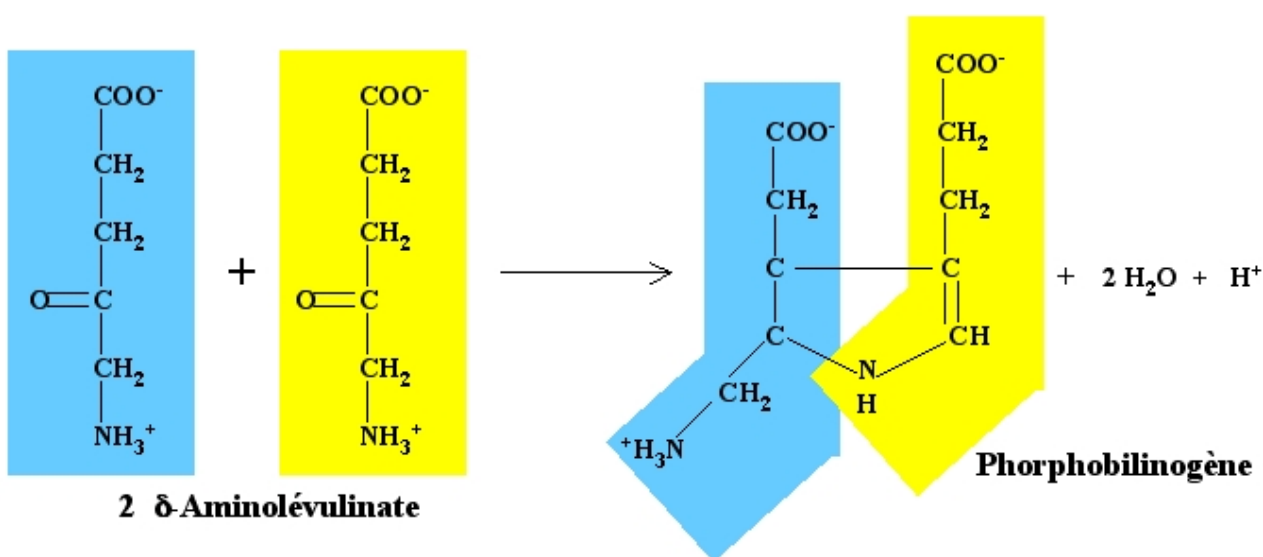
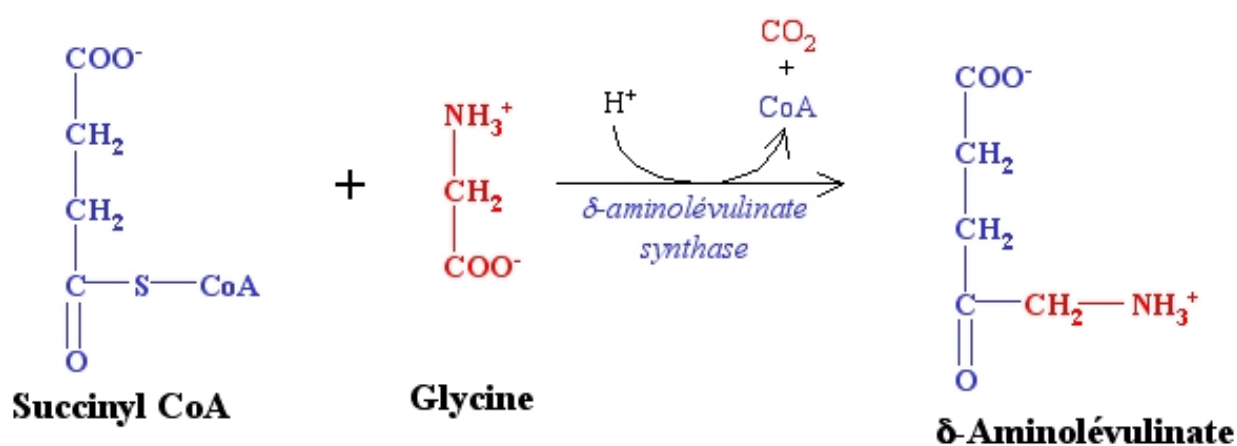


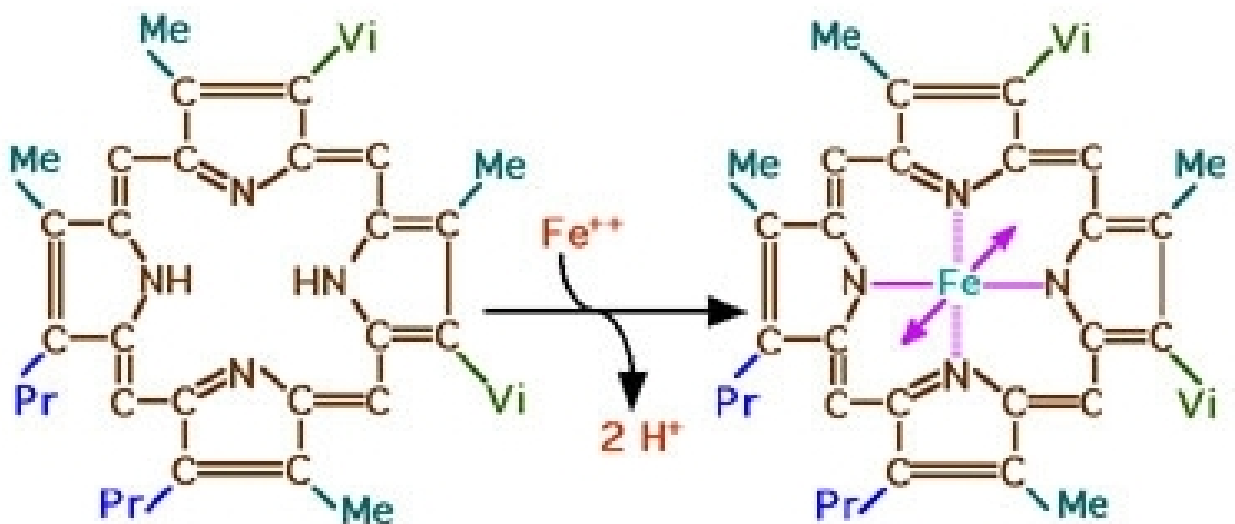
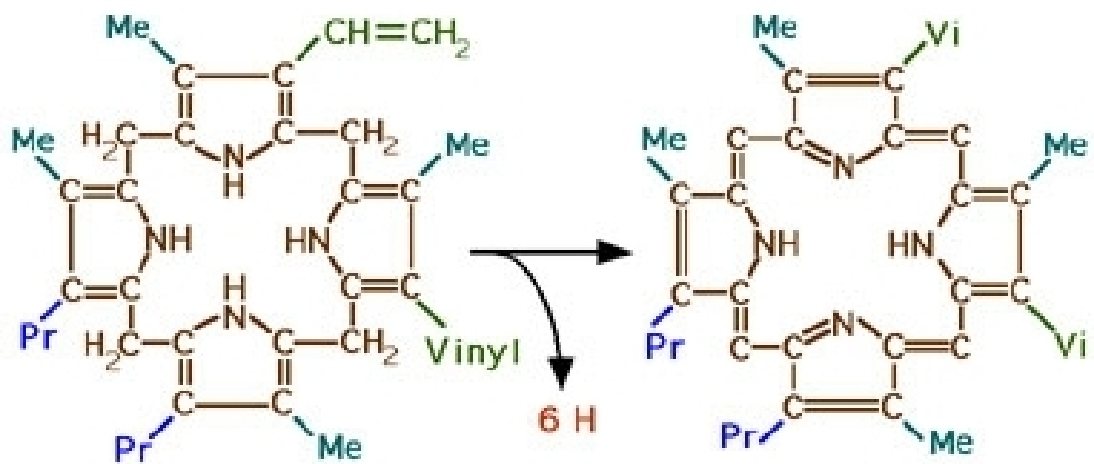
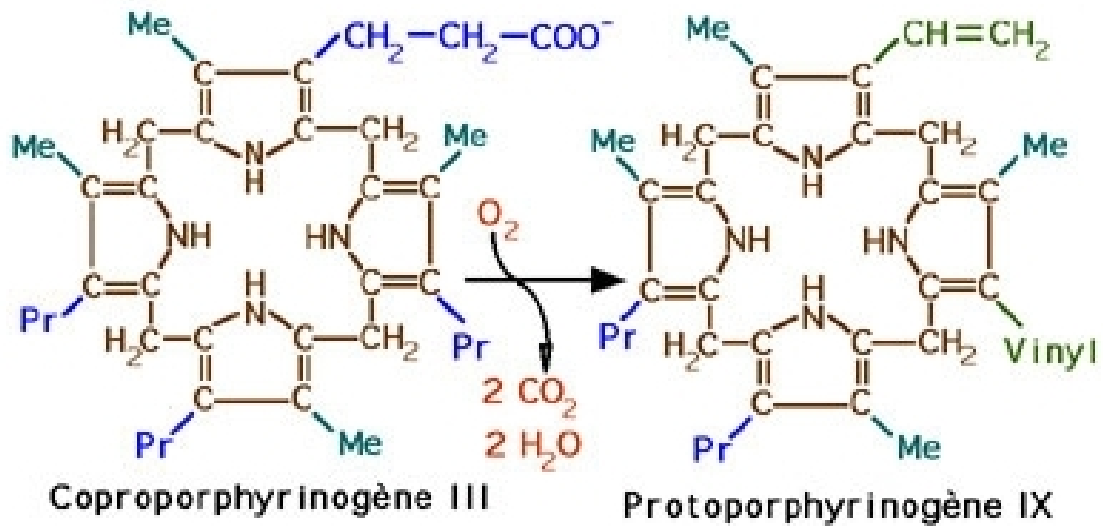
Phe



Métabolisme des porphyrines

- 1) Synthèse des porphyrines : hème
- 2) Dégradation et métabolisme de la bilirubine

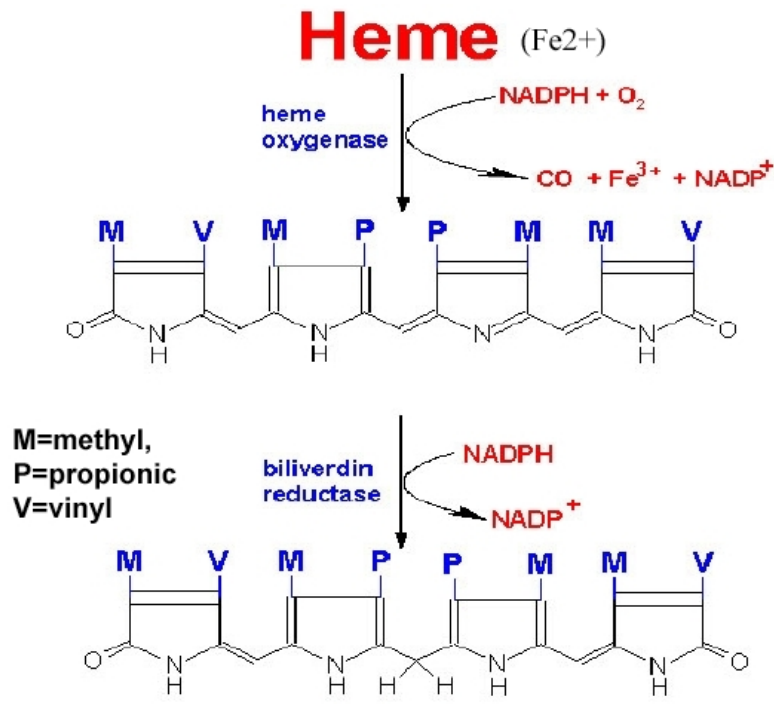




Protoporphyrine

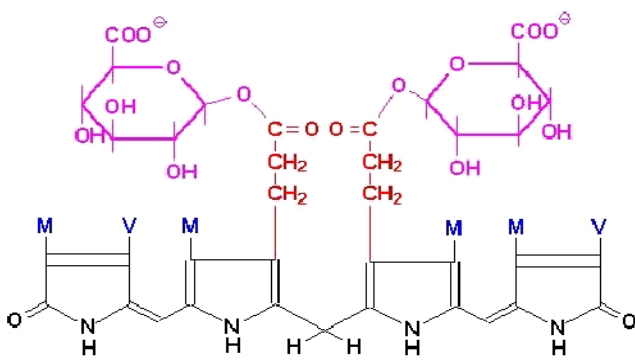
Hème

Catabolisme de l'hème



Métabolisme des pigments biliaires

Bilirubine conjuguée



Hémoglobine (90%)
Autres pigments hémériques (10%)

Ouverture du noyau porphyrrique

Biliverdine

Réduction

Bilirubine

Transport par l'albumine sérique

FOIE

Glucuronyl transférases
Bilirubine conjuguée

BILE

INTESTIN

Dihydrobilirubine

Bili non conjuguée

Mésobilirubinogène

Stercobilinogène

Stercobiline

Urobilinogène

Urobiline

FECES

URINE

Veine porte

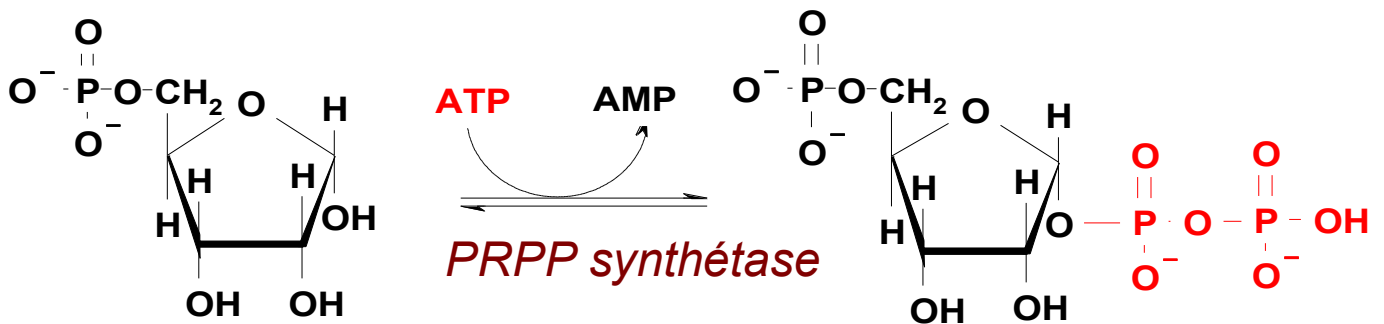
Synthèse des purines : schéma général

Ribose-5-P

- 1) Synthèse du Phosphoribosyl pyrophosphate (PRPP)
- 2) Assemblage du noyau purine sur le ribose phosphate (IMP)

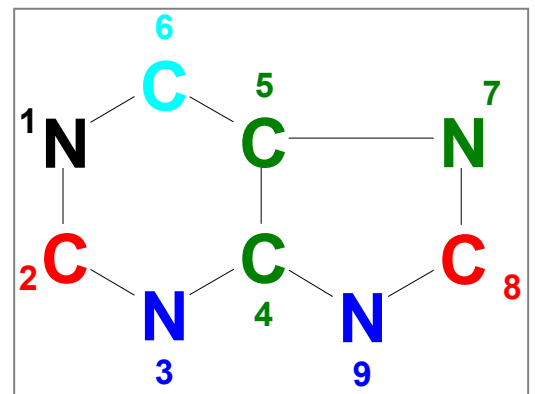
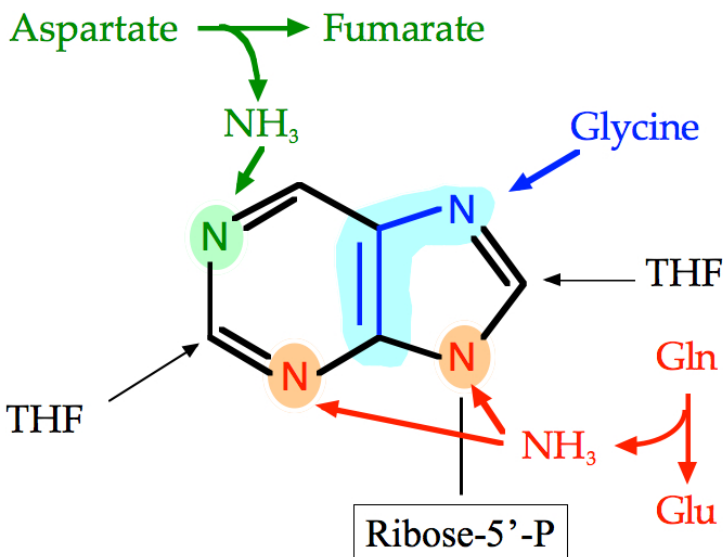
Synthèse de l'adénylate
(AMP)

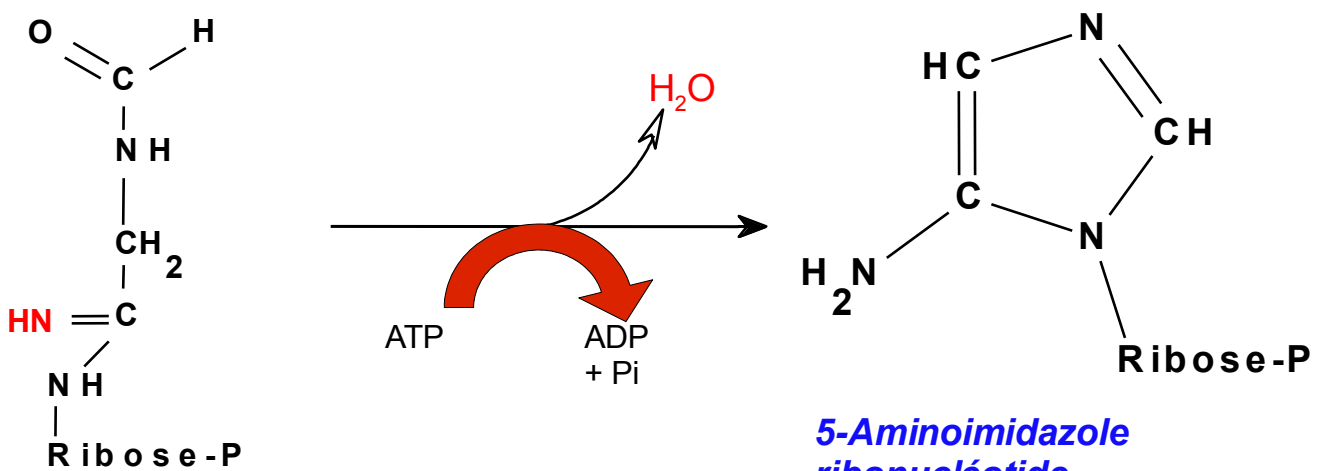
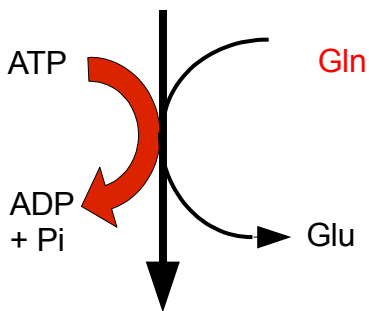
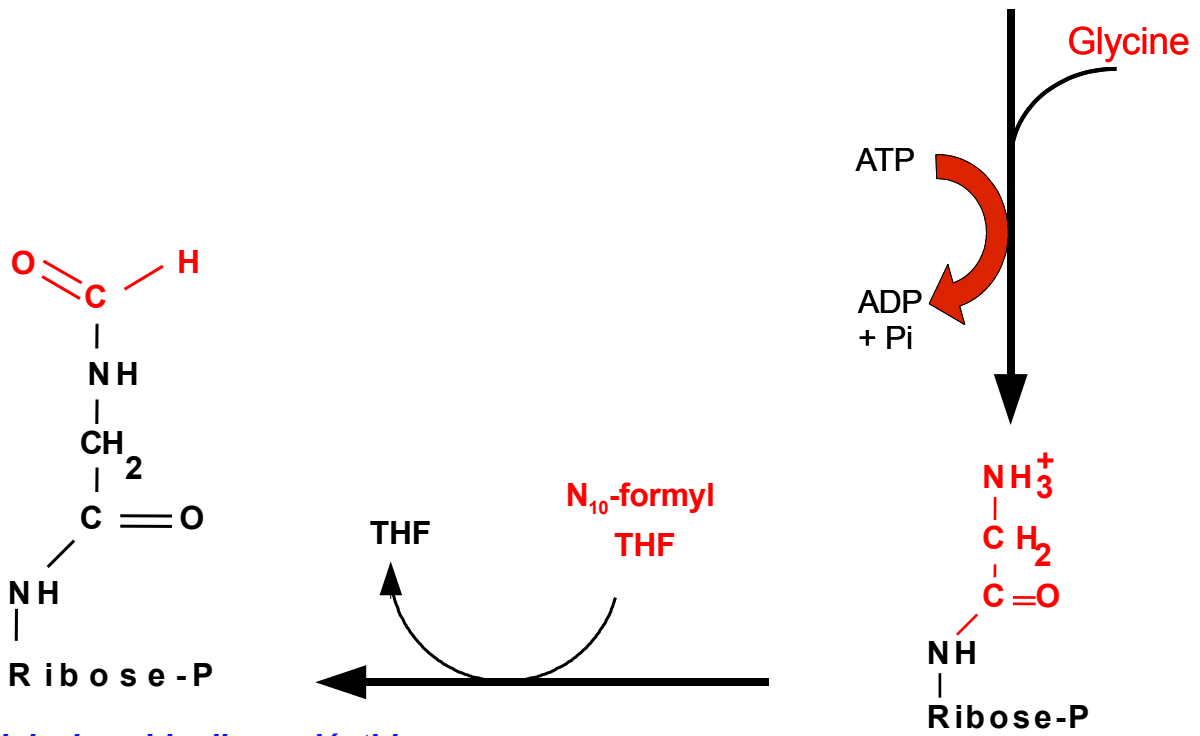
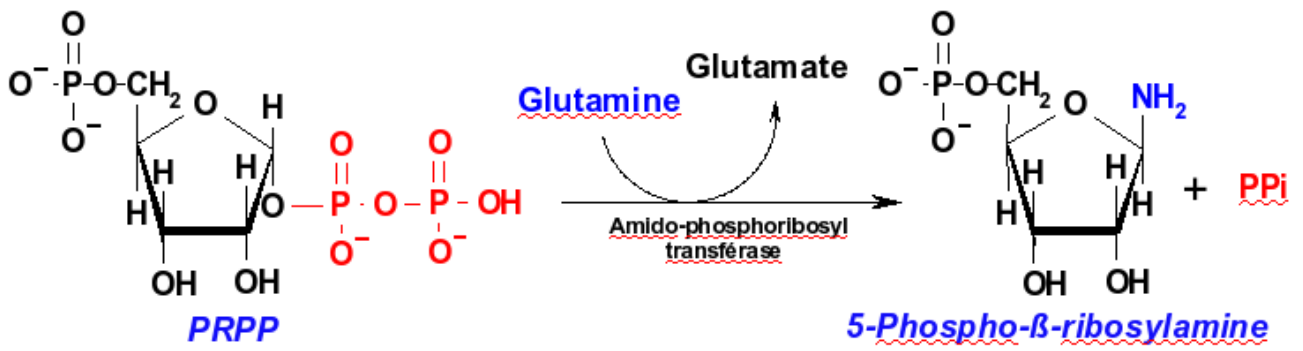
Synthèse du guanylate
(GMP)



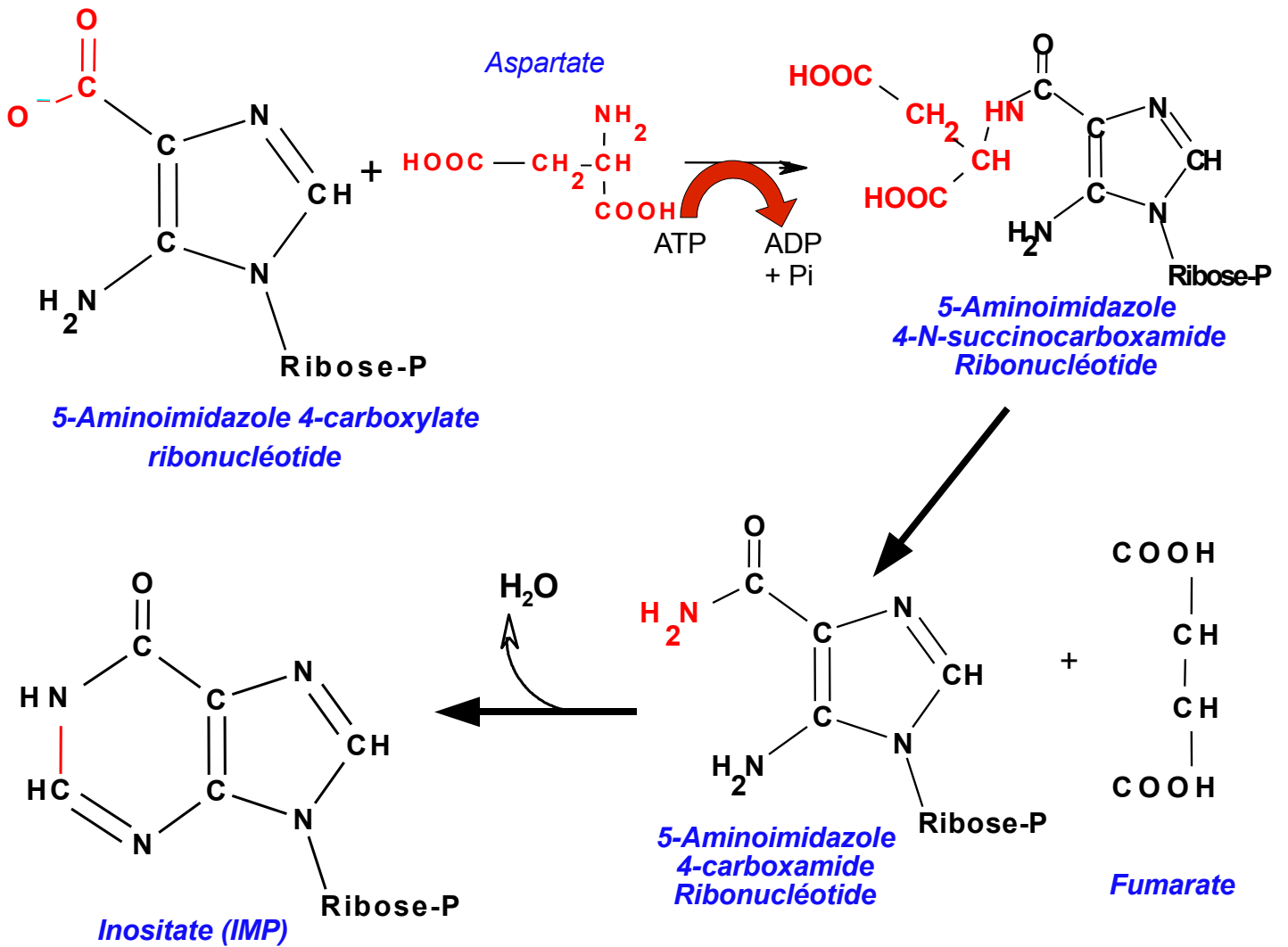
Ribose-5-P

PRPP



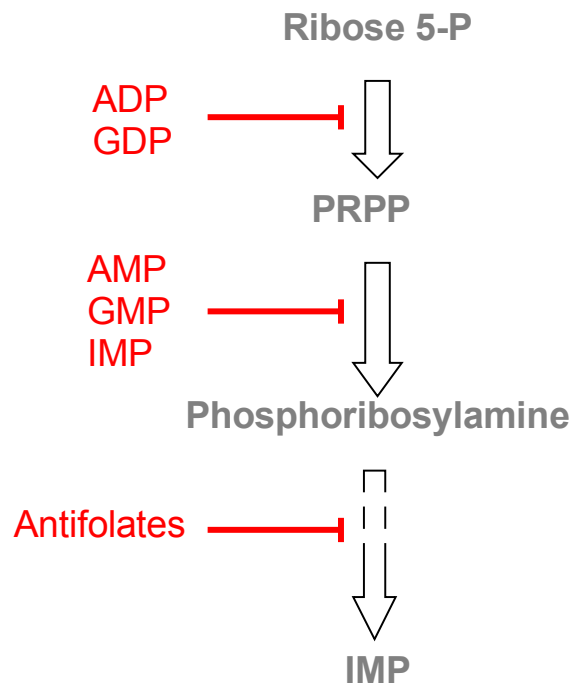
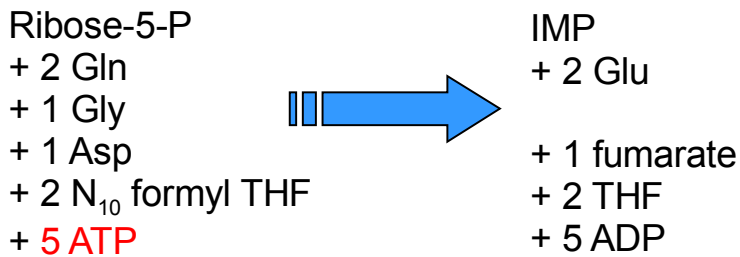


Formylglycinamide ribonucléotide

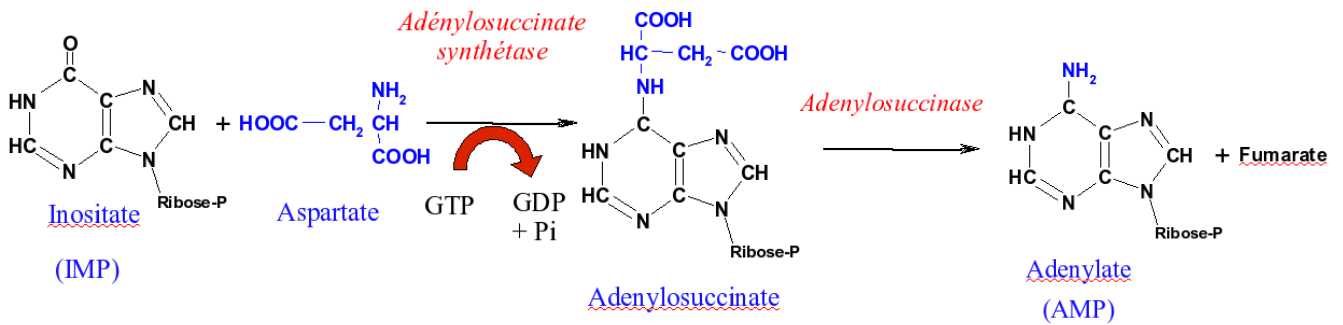


Régulation

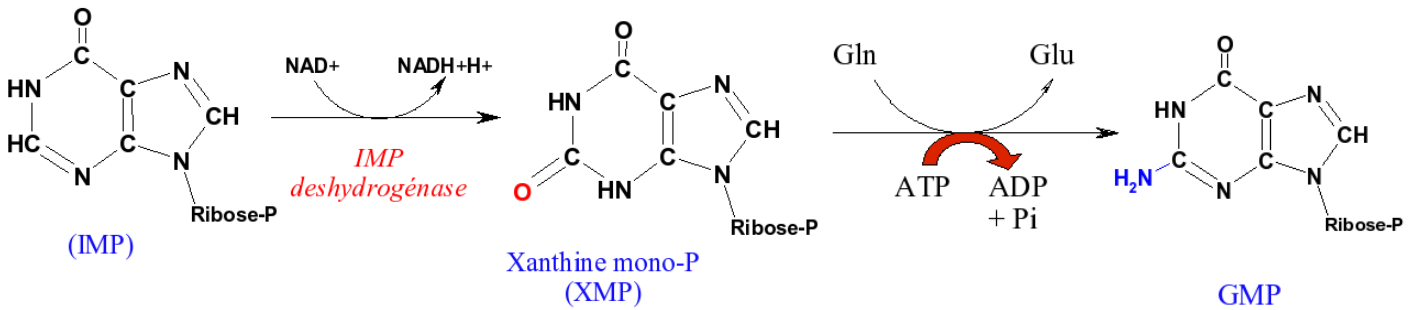
Synthèse de l'IMP : bilan



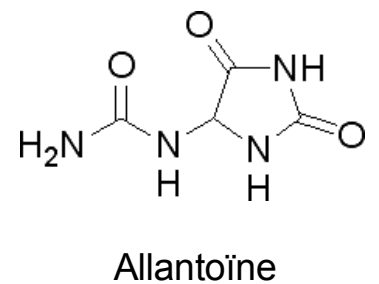
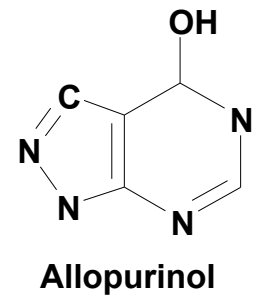
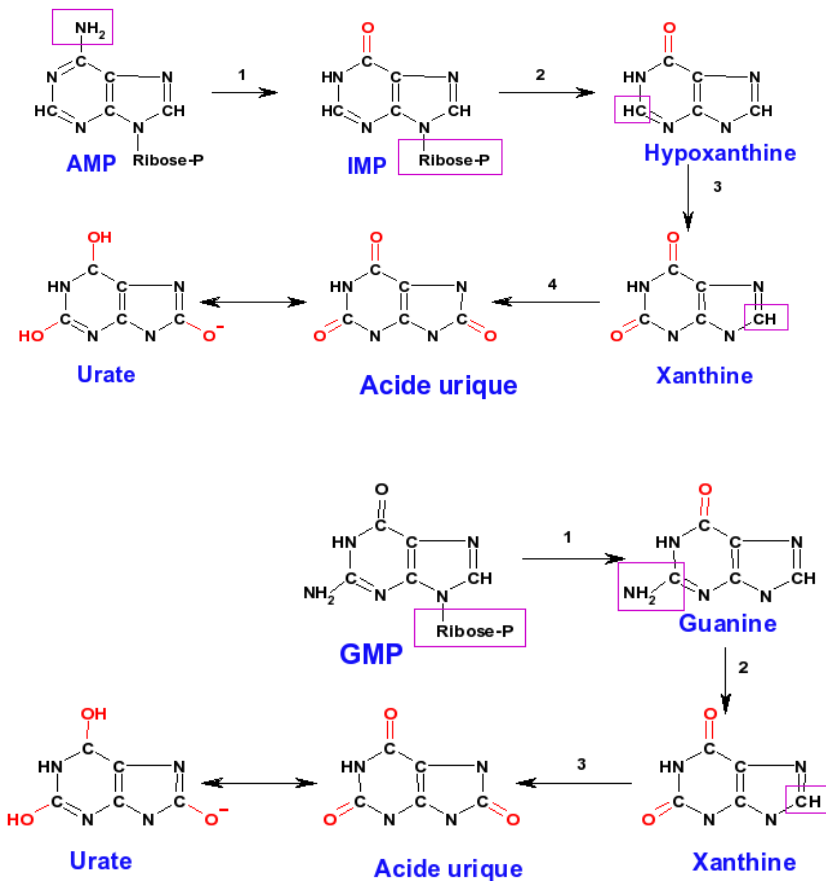
Synthèse de l'AMP



Synthèse du GMP



Dégradation des purines : formation d'ac urique ; la goutte



Métabolisme des bases pyrimidiques

