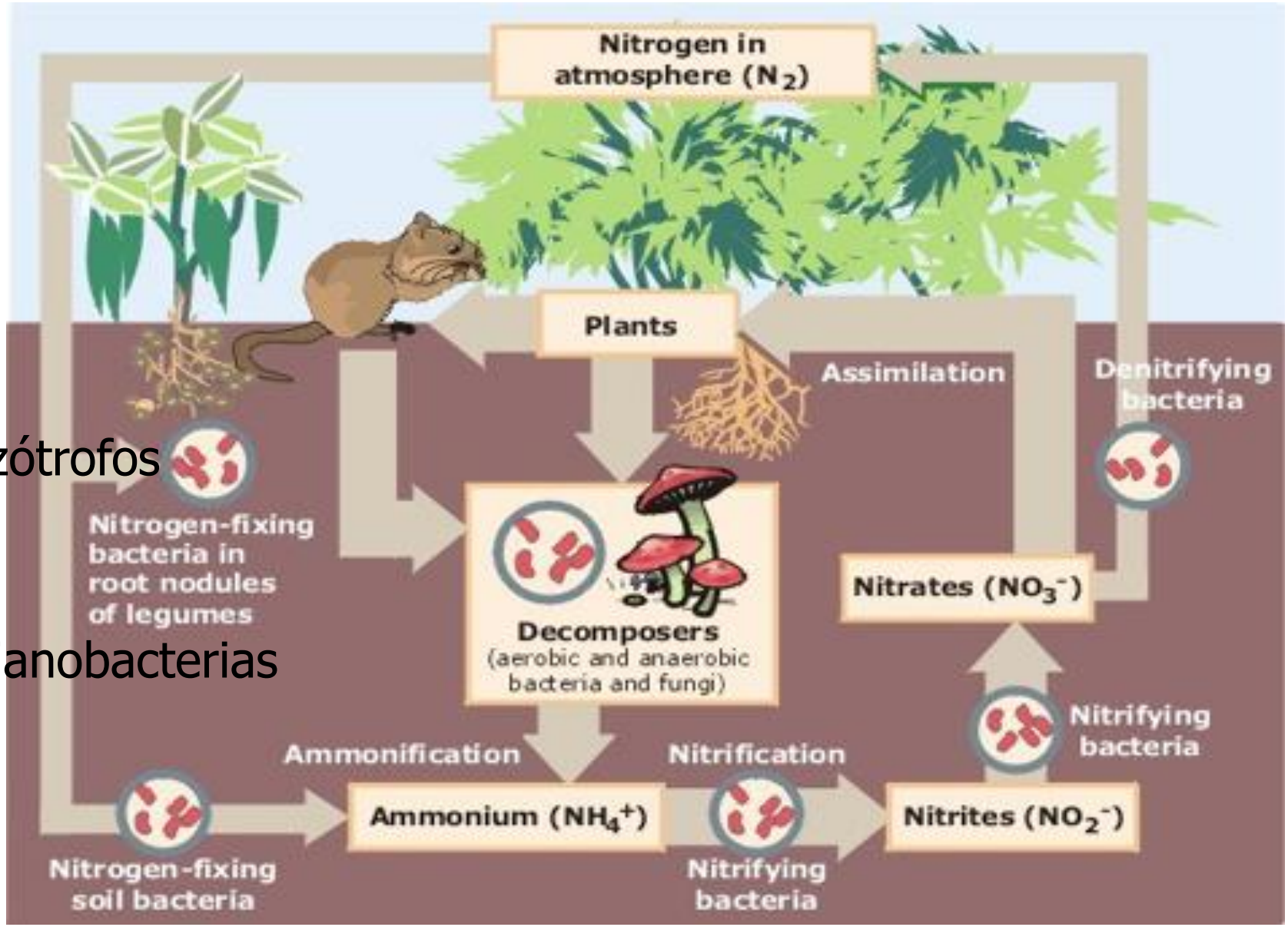
METABOLISMO DE COMPUESTOS NITROGENADOS

FIJACIÓN DE NITRÓGENO: CICLO DEL NITRÓGENO

diazótrofos

cianobacterias



FIJACIÓN DE NITRÓGENO

Diazótrofos + plantas (leguminosas) ⟶ simbiosis para fijación
Bacterias(simbiosis) termitas

Vida libre: Cianobacterias (*Nostoc*- Líquenes)
Rodobacter, Azotobacter

$$N_{2(ATM)} + 8H^+ + 8e^- + 16\ ATP \rightarrow 2NH_3 + H_2 + 16ADP + 16\ Pi$$

Nitrogenasa(bact)

NH_4^+ ⟶ Glutamato
Glutamina sintetasa/
Glutamato sintasa

Diazótrofos + plantas (leguminosas) → simbiosis para fijación

Rhizobium

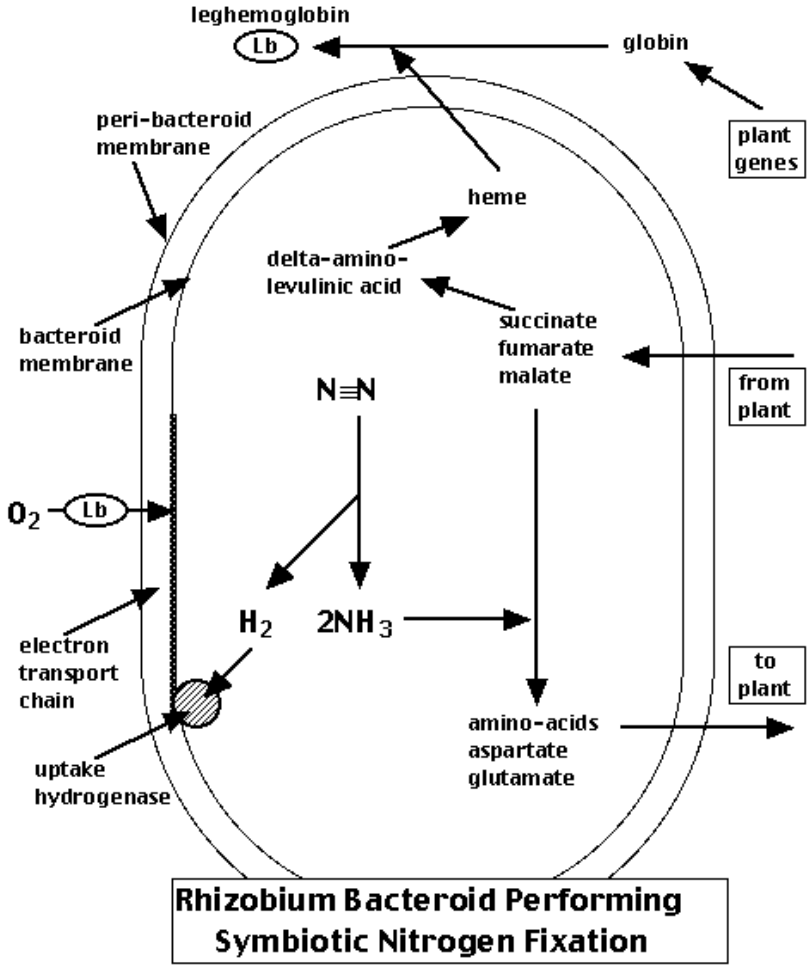
Nódulos en las raíces de las leguminosas

Protección del O_2: leghemoglobina codificada por la planta
hemo sintetizado por bacteria

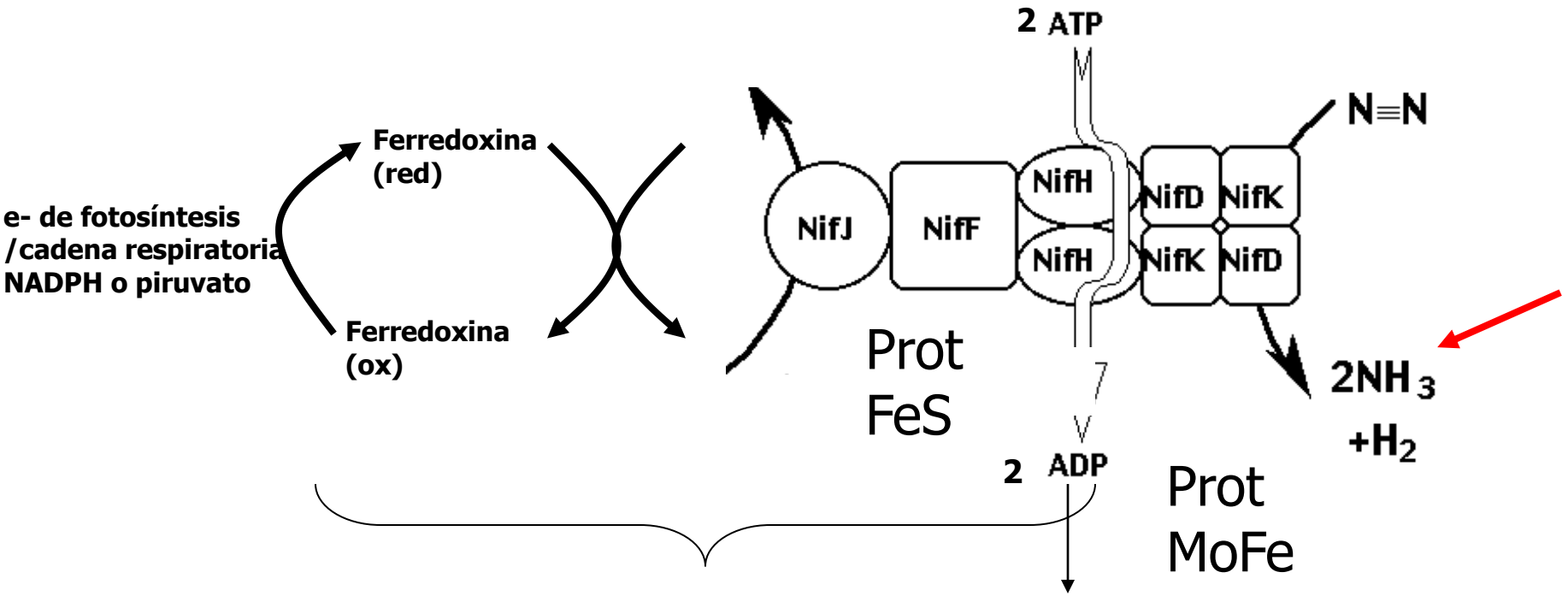
Diazótrofos + plantas

Recibe ácidos orgánicos

Recibe aminoácidos



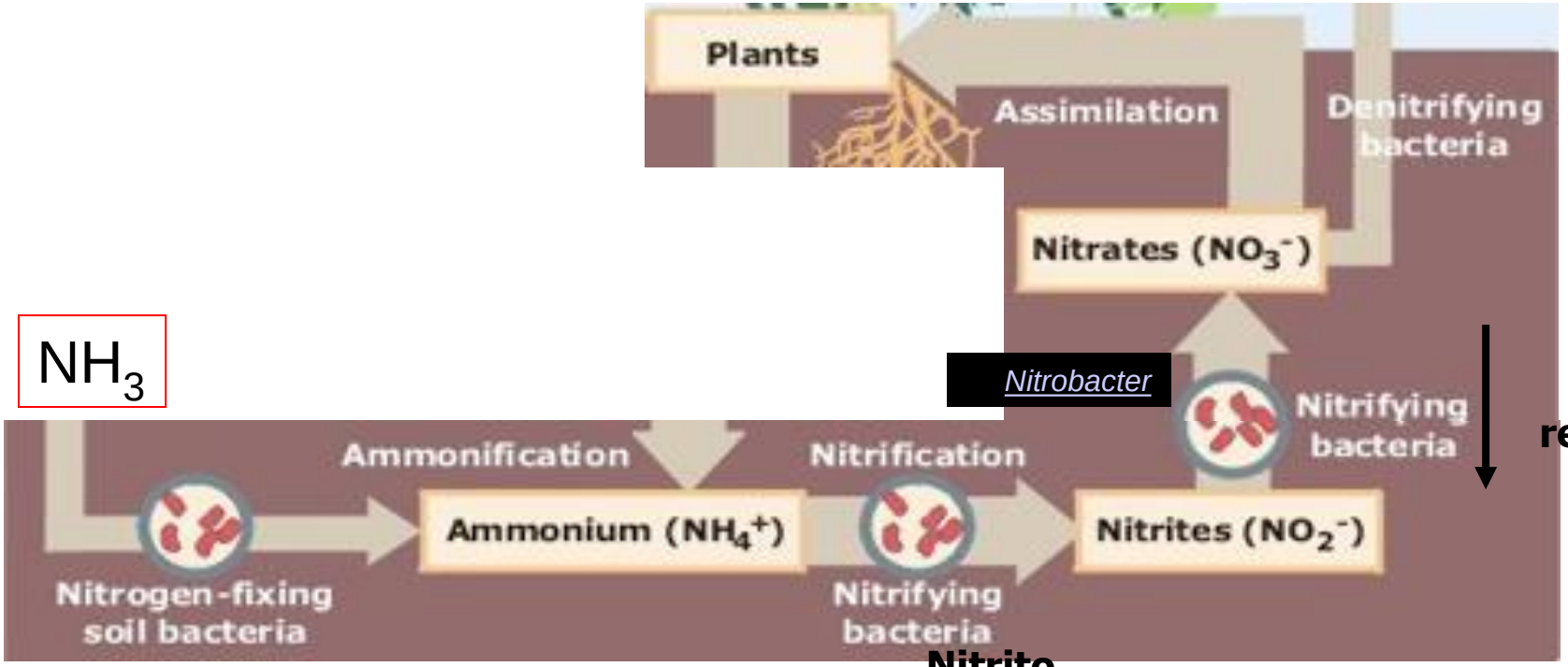
NITROGENASE



1 N_2: 8X
16 ATP

Cambio conformación:
Cambio potencial redox

N_2



NH_3

Nitrato reductasa

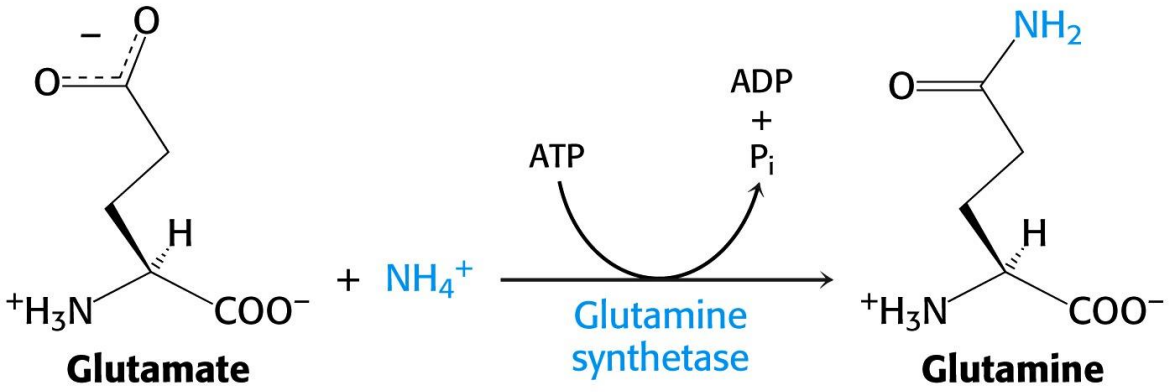
Nitrito oxidoreductasa

Nitrosospira
Nitrosomonas
Nitrosococcus

NH_3 ⟶ NH_4^+ ⟶ Incorporación a aa

α-cetoglutarato + NH_4^+ —(NADPH → $NADP^+$)→ Glutamato + H_2O

Glutamato deshidrogenasa



α-cetoglutarato + Glutamina —(NADPH → $NADP^+$)→ 2 Glutamato

Glutamato sintasa
GOGAT

Catabolismo de compuestos nitrogenados: aa

aa → NH_4^+: excreción del exceso: urea

aa → Esqueleto carbonado: degradación

Desaminación
Por transaminación

aa α-cetoglutarato α-cetoácido glutamato

glutamato + oxaloacetato ⇌ α-cetoglutarato + aspartato

No hay desaminación neta

Glutamato + NAD(P)$^+$ + H_2O ⇌ α-cetoglutarato + NAD(P)H + NH_4^+

Glutamato deshidrogenasa

NH_4^+ → eliminado

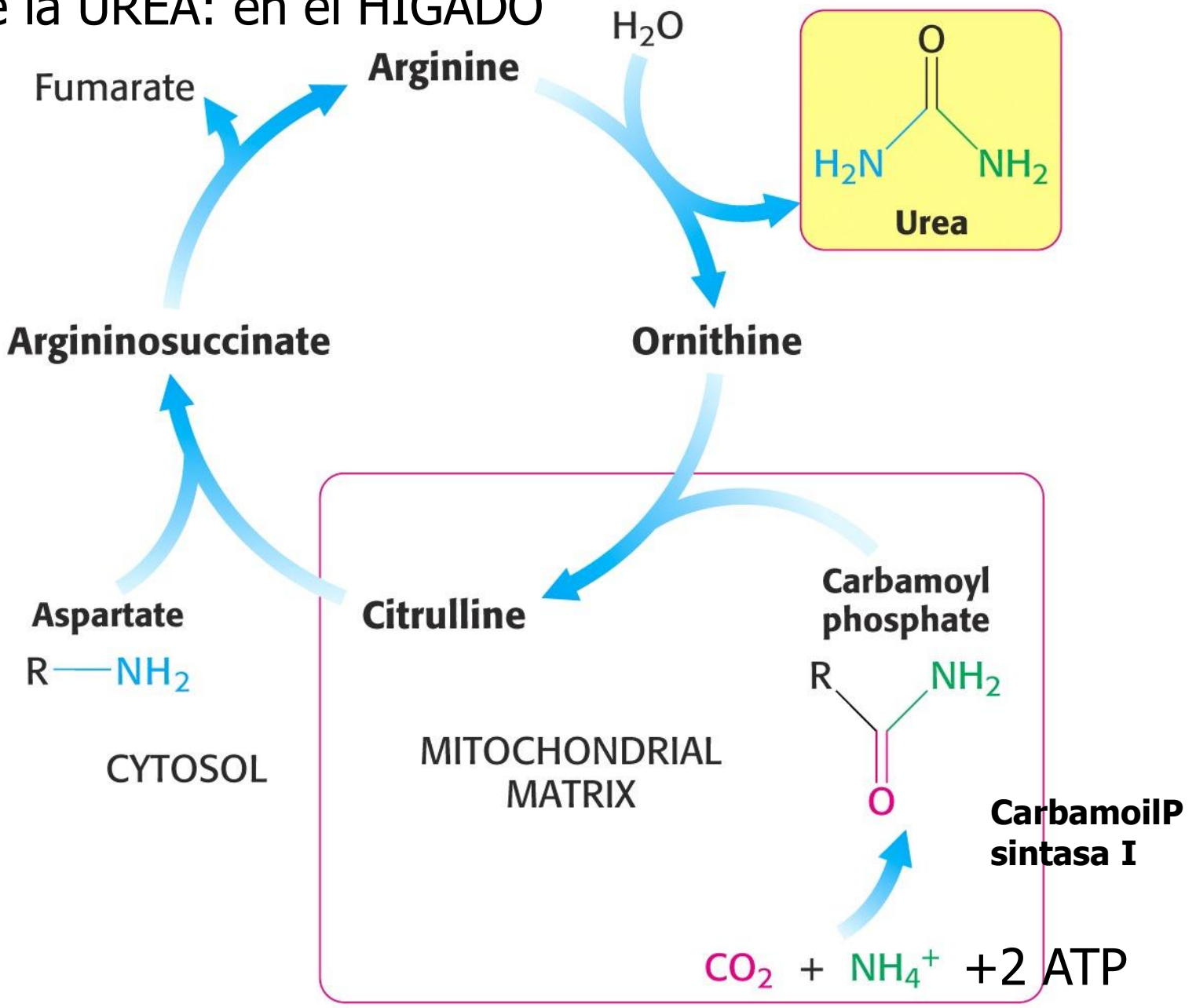
NH_4^+ en exceso:
eliminado como

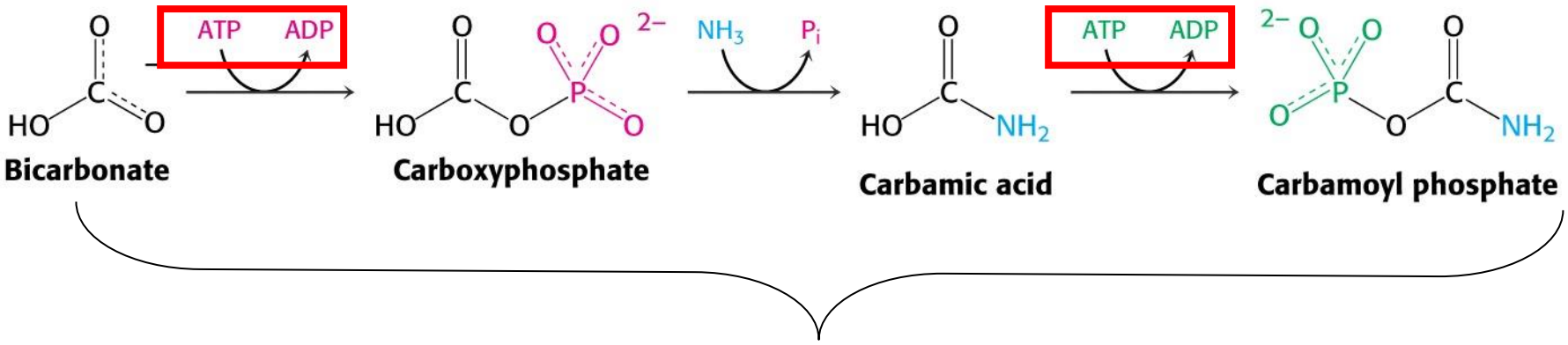
NH_3: amonotélicos: animales acuáticos

Urea: ureotélicos: mamíferos

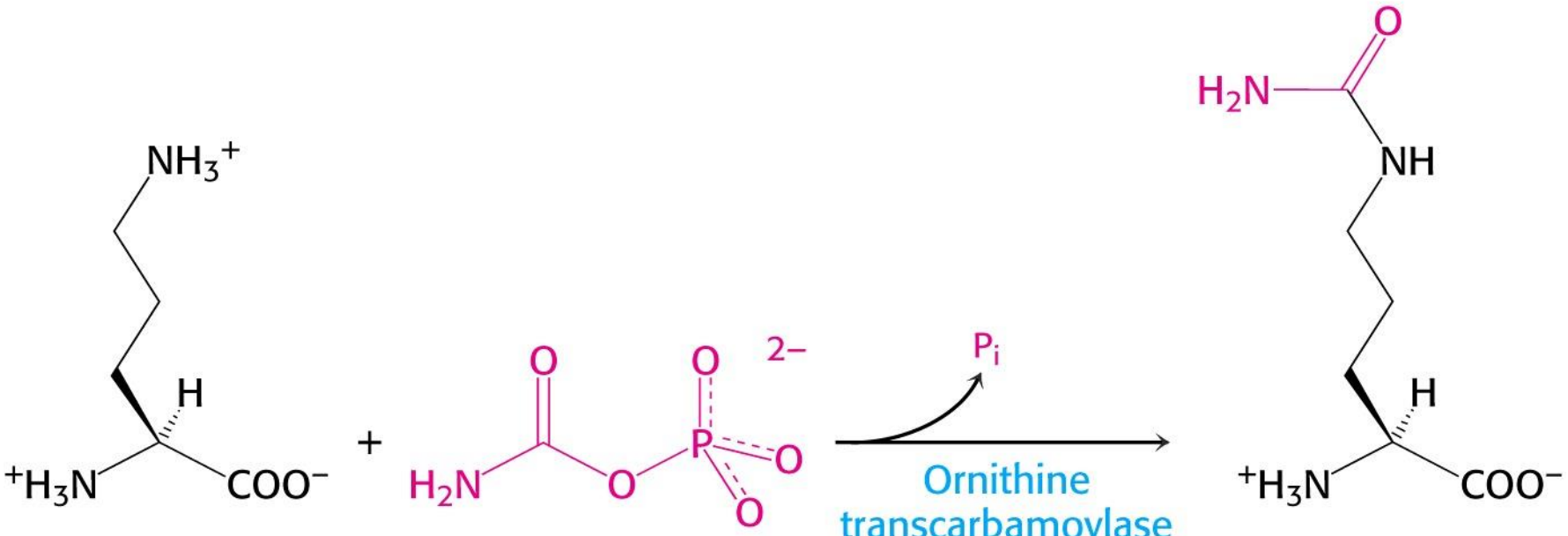
Ácido úrico: uricotélicos: aves, reptiles terrestres

Ciclo de la UREA: en el HÍGADO





CarbamoilP
sintasa I (mit)
Regulatoria: +N-acetilglutamato

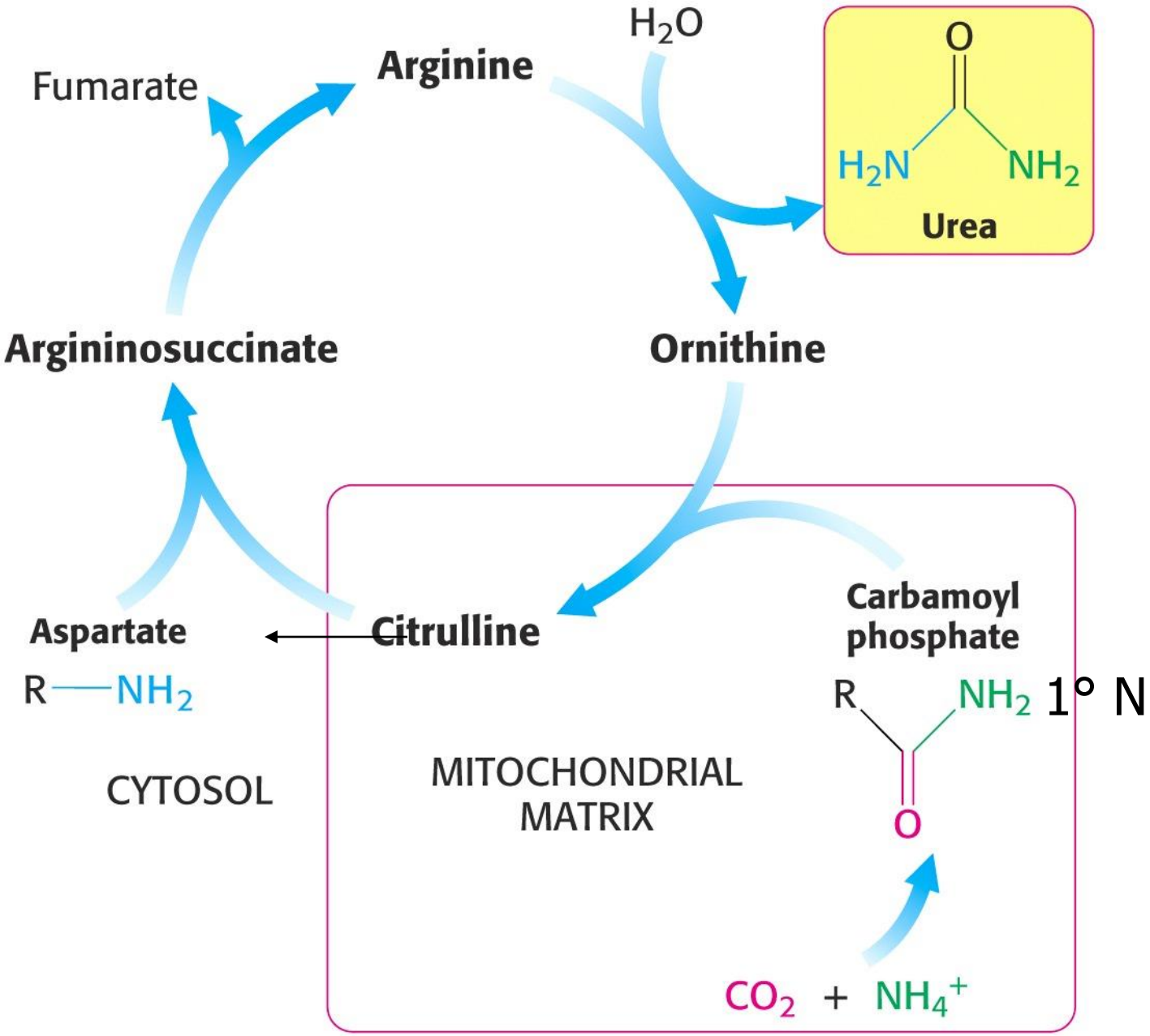


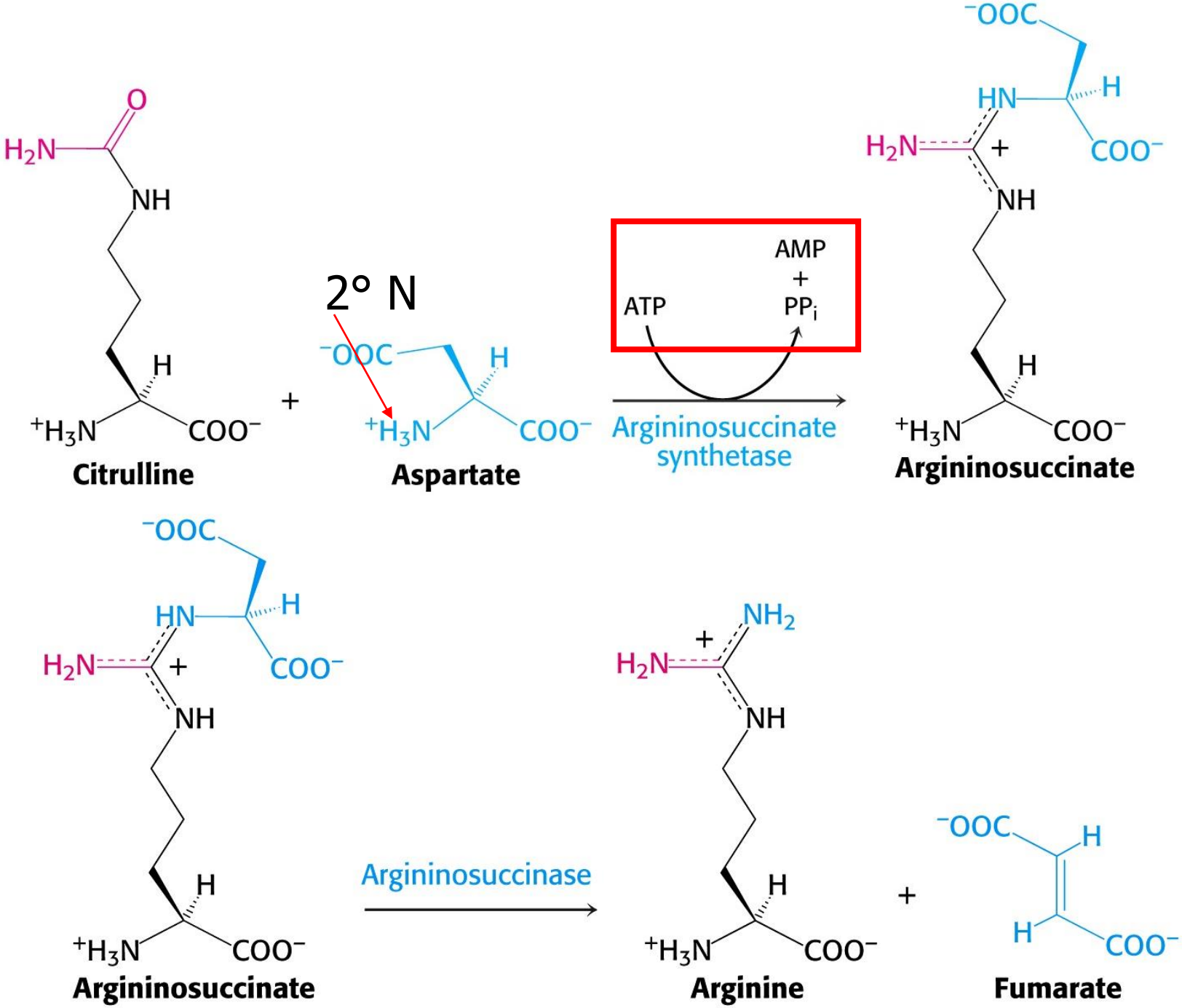
Ornithine
Entra de citosol

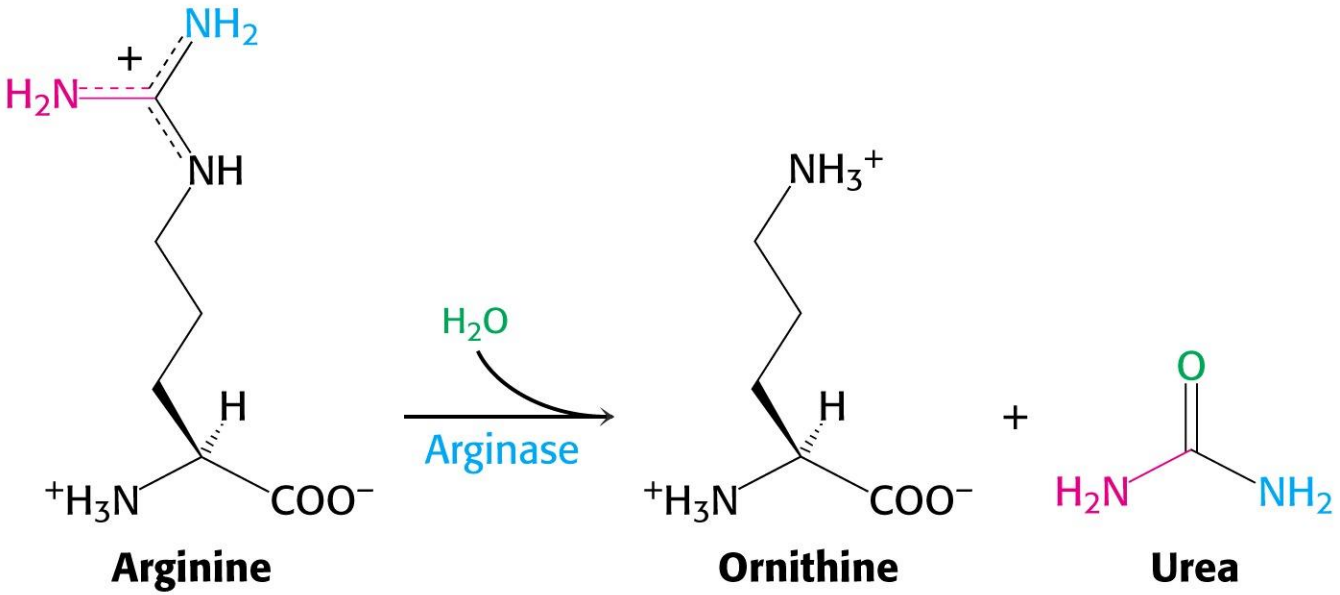
Carbamoyl phosphate

Citrulline

Sale a citosol


Fumarate
Arginine
H_2O
O
H_2N
NH_2
Urea
Argininosuccinate
Ornithine
Aspartate
R—NH_2
Citrulline
Carbamoyl phosphate
R
NH_2
1° N
O
CYTOSOL
MITOCHONDRIAL MATRIX
CO_2 + NH_4^+

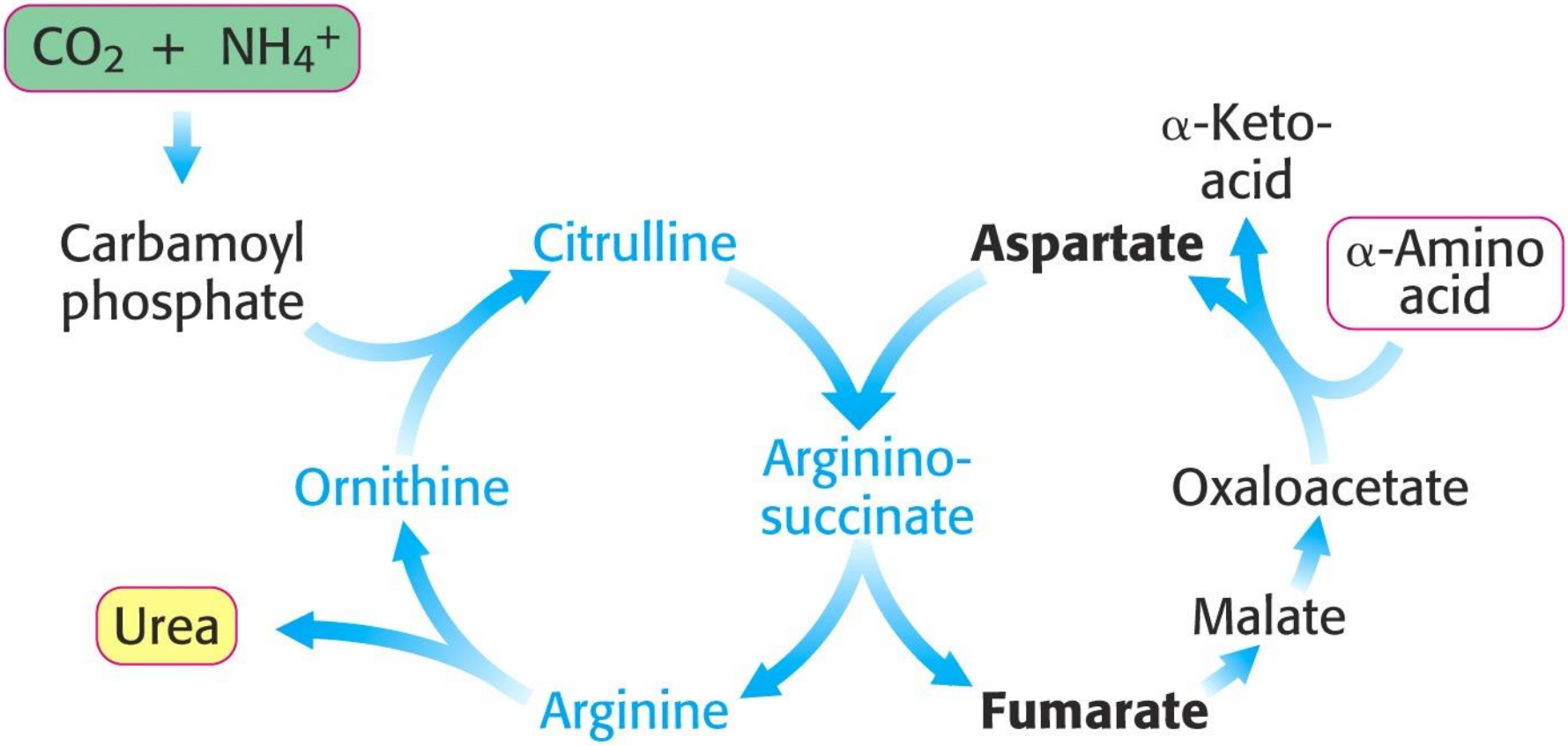

2° N
ATP
AMP
+
PPi
Argininosuccinate synthetase
Citrulline
Aspartate
Argininosuccinate
Argininosuccinase
Argininosuccinate
Arginine
Fumarate

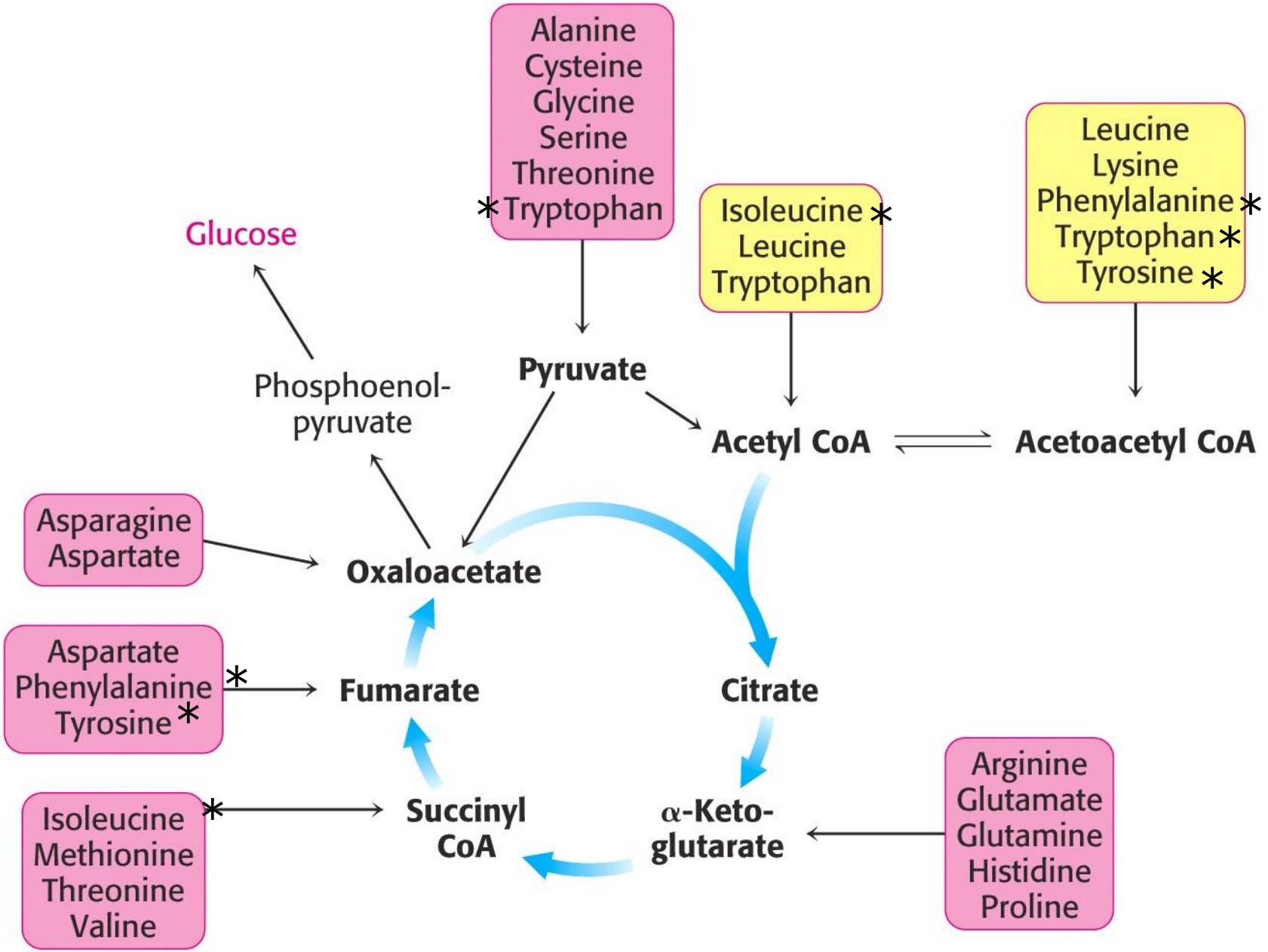


Producto no tóxico
Gasto: tres ATP y 1 PPi

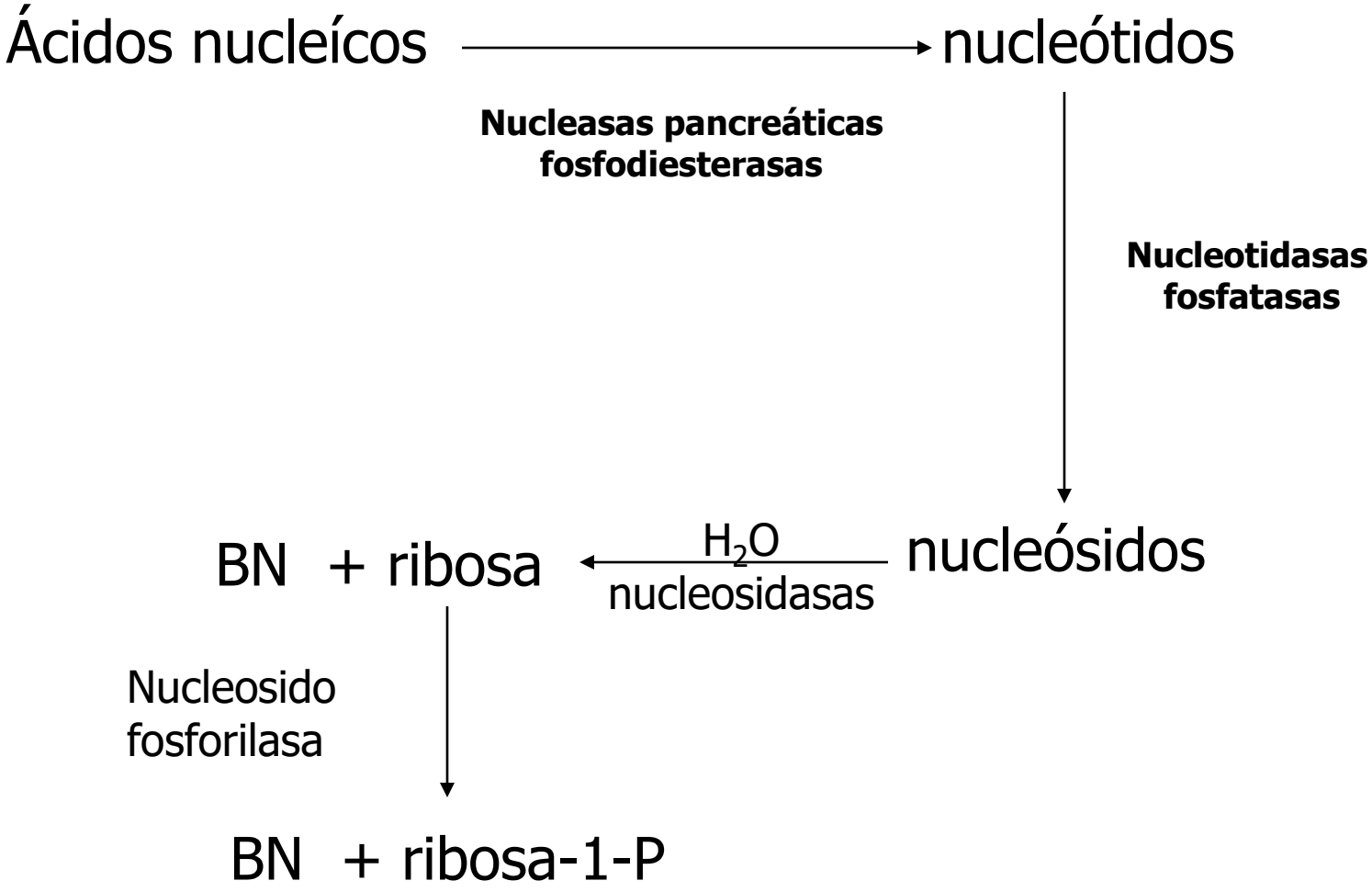
TS

75% Riñón: orina
25% colon:ureasa
Bact: amoniaco:hígado

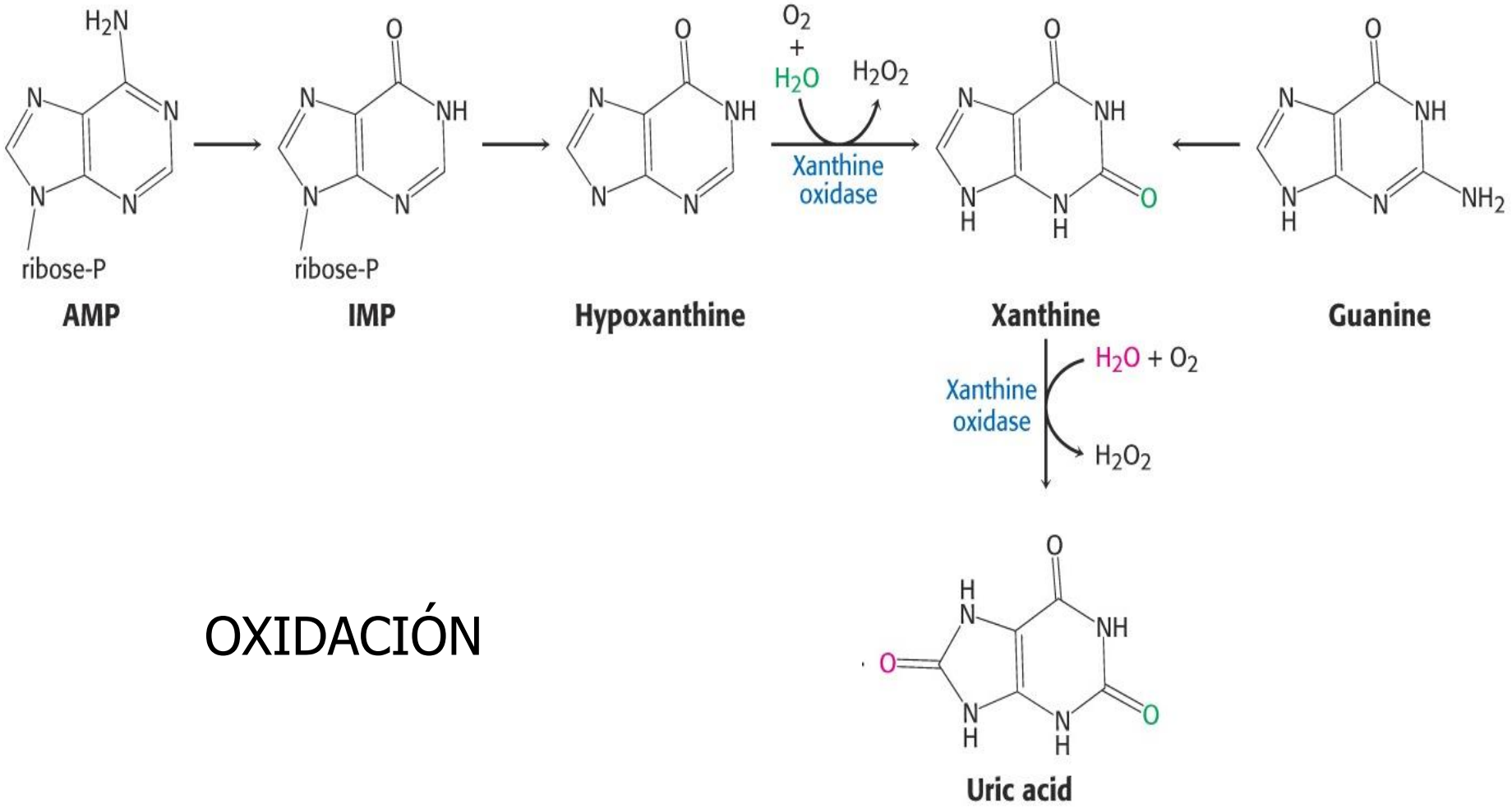

CO_2 + NH_4^+
Carbamoyl phosphate
Citrulline
Aspartate
α-Keto-acid
α-Amino acid
Ornithine
Arginino-succinate
Oxaloacetate
Urea
Malate
Arginine
Fumarate


Alanine
Cysteine
Glycine
Serine
Threonine
*Tryptophan
Glucose
Isoleucine *
Leucine
Tryptophan
Leucine
Lysine
Phenylalanine *
Tryptophan *
Tyrosine *
Phosphoenol-
pyruvate
Pyruvate
Acetyl CoA
Acetoacetyl CoA
Asparagine
Aspartate
Oxaloacetate
Aspartate
Phenylalanine
Tyrosine *
*
Fumarate
Citrate
Isoleucine
Methionine
Threonine
Valine
*
Succinyl
CoA
α-Keto-
glutarate
Arginine
Glutamate
Glutamine
Histidine
Proline

Catabolismo de compuestos nitrogenados: Nucleótidos

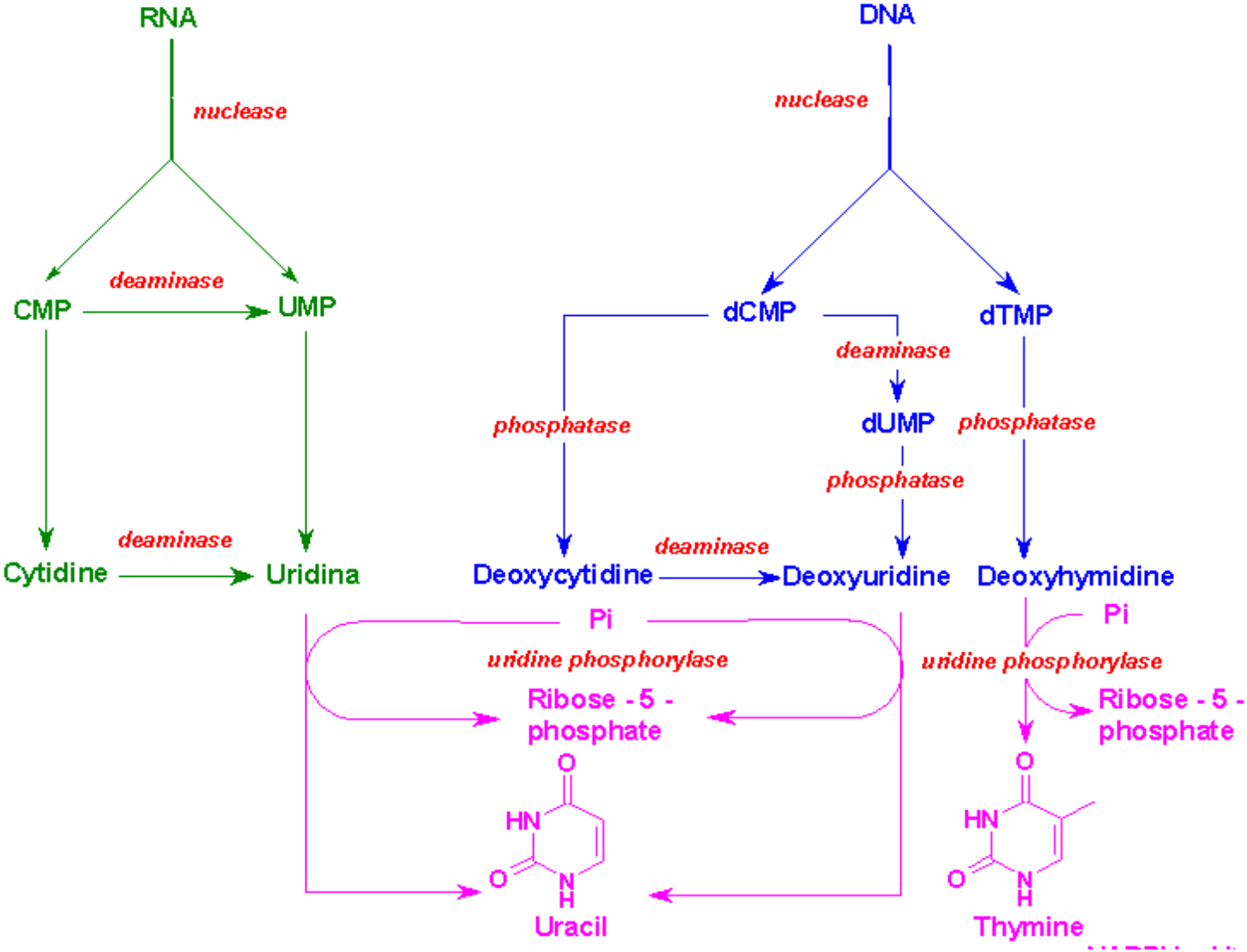


Catabolismo de compuestos nitrogenados: PURINAS

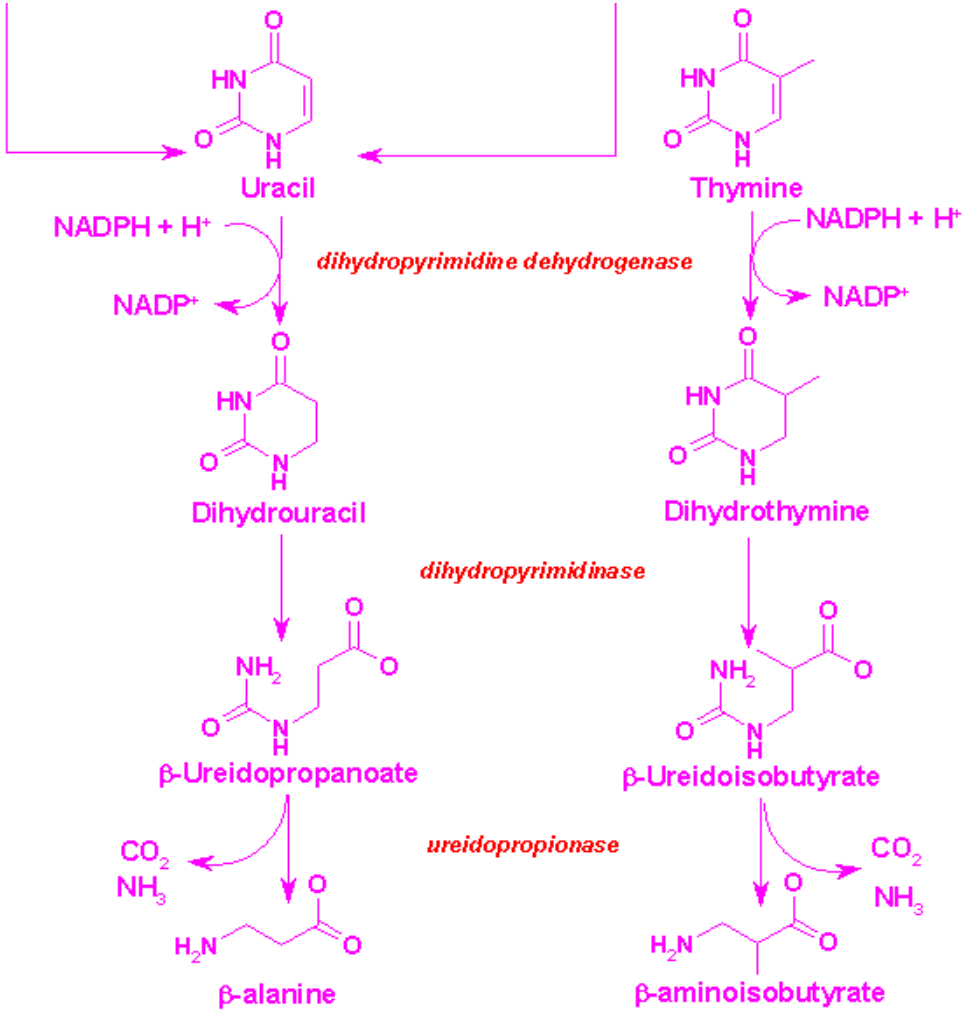


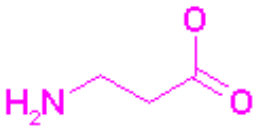
OXIDACIÓN

Catabolismo de compuestos nitrogenados: pirimidinas

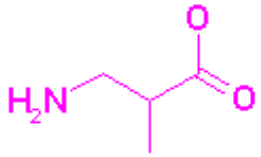


Reducción:
en hígado





β- alanine



β - aminoisobutyrate

α -ketoglutarate

transaminase

glutamate

Glutamato + NAD(P)$^+$ + H_2O ⇌ α-cetoglutarato + NAD(P)H + NH_4^+

Glutamato deshidrogenasa

malonate semialdehyde

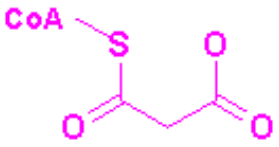
methylmalonate semialdehyde

urea

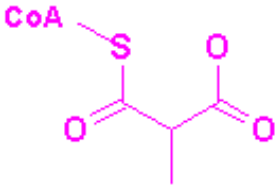
CoA - SH + NAD$^+$

dehydrogenase

NADH + H$^+$



malonyl - S - CoA



methylmalonyl - S - CoA

SALVAGE PATHWAY

Activated ribose (PRPP) + base

↓

Nucleotide

Adenina + PRPP → AMP +PPi

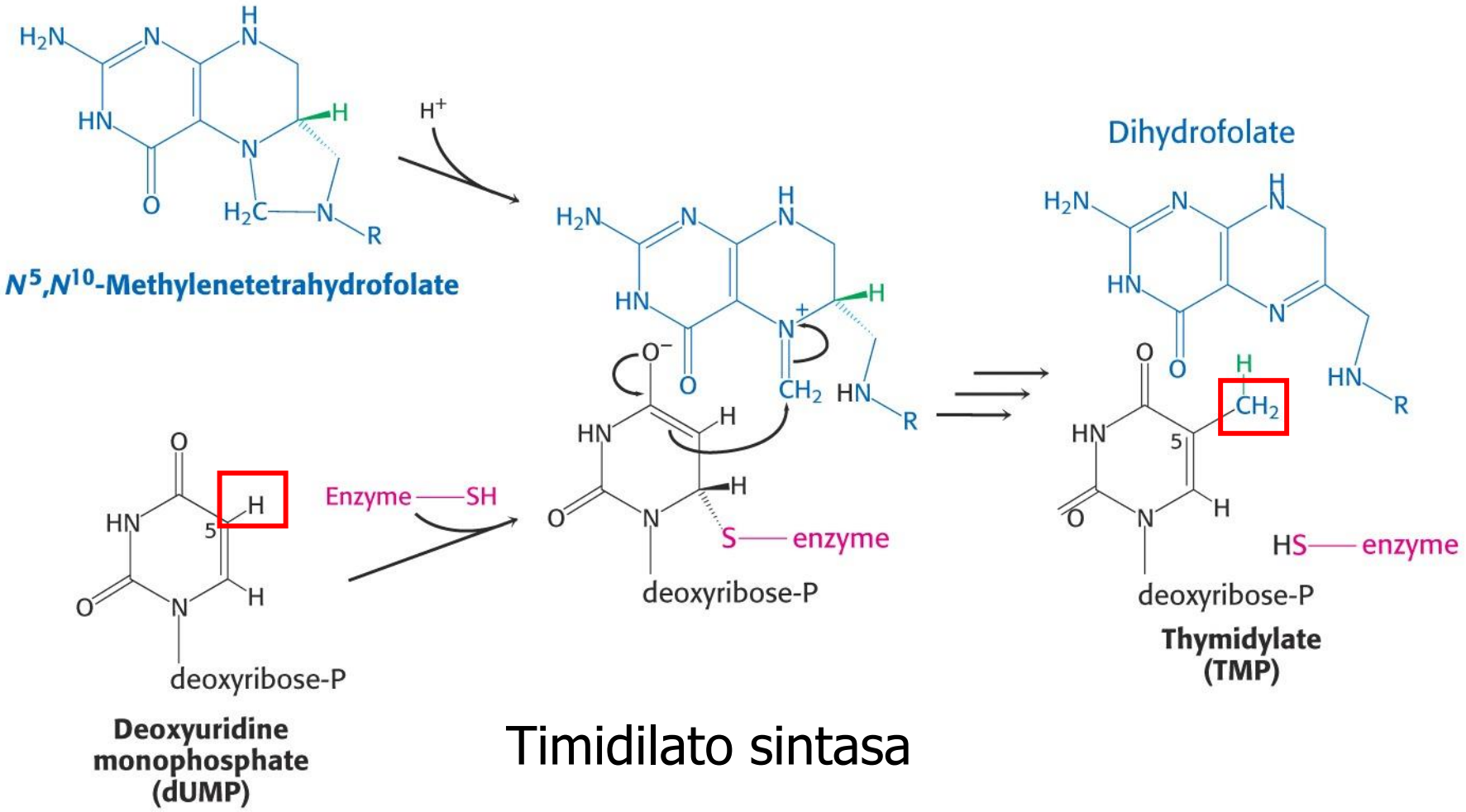
Adeninafosforribosiltransferasa
APRT

Hipoxantina + PRPP →IMP +PPi

Hipoxantina guanina fosforribosiltransferasa
APRT

Guanina + PRPP → GMP +PPi

Síntesis de timidilato (timina)



Timidilato sintasa