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***BS Rad 2nd Semester***

***Vocal Examination Solution for the subject of Biochemistry***

***Answer***

***STEPS INVOLVE IN THE URIC ACID FORMATION***

The following steps involve in the uric acid formation are given below in the following.

***STEP 1***

***FORMATION OF CARBAMOYL\_PHOSPHATE***

* Condensation of co2, ammonia, and ATP to form carbamoyl phosphate is catalyzed by mitochondrial carbamoyl phosphate synthase I.
* formation of carbamoyl phosphate requires 2 Mol of ATP, one of which serves as a phosphate donor.
* the reaction proceeds stepwise. Reaction of bicarbonate with ATP forms carbonyl phosphate and ADP.
* ammonia then displaces ADP, forming carbamate and orthophosphate.
* phosphorylation of carbamate by the second ATP then forms carbamoyl phosphate.
* A cytosolic form of this enzyme, carbamoyl phosphate synthase II, uses glutamine rather than ammonia as the nitrogen donor and functions in pyrimidine biosynthesis.

***REACTION***



* CPS1 is strongly activated by N-acetyl glutamate, which controls the overall rate of urea production.

***STEP. 2***

***FORMATION OF CITRULLINE***

* The carbamoyl group of carbamoyl phosphate is transferred to ornithine, forming citrulline and ortho phosphate.
* the reaction catalyzed by ornithine trans carbamoyls.
* subsequent metabolism of citrulline take place in the cytosol.

***Reaction***



This enzyme has no regulatory significance. The reminder of the urea cycle steps take place in the cytosol. This requires the continuous export of citrulline and the uptake of ornithine across the inner mitochondrial member.

***STEP 3***

***FORMATION OF ARGINO SUCCINATE***

Arginosuccinate synthase (ASS) links aspartate and citrulline via the amino group of aspartate and provides the second nitrogen of urea.

The reaction requires ATP and involves intermediate formation of CITRULLYL-AMP.

subsequent displacement of AMP by aspartate then forms Arginosuccinate.

***REACTION***



* production of arginosuccinate is an energetically expensive process, since the ATP is split to AMP and pyrophosphate.
* the pyrophosphates is then  cleaved to in organic phosphate using pyrophosphates, so the overall reaction costs two equivalents of high energy phosphate per mole.

***STEP 4***

***CLEAVAGE OF ARGINO SUCCINATE***

* Cleavage of arginosuccinate catalyzed by Arginosuccinate lyase (ASL) proceeds with retention of nitrogen in arginine and release of the aspartate skeleton as fumarate.
* addition of water to fumarate forms L\_ malate, and subsequent NAD+\_dependent oxidation of malate forms oxaloacetate.
* transamination of oxaloacetate by glutamate aminotransferase then reforms aspartate. Carbon skeleton of aspartate fumarate thus acts as a carrier of the nitrogen of glutamate into a precursor of urea.

***REACTION***



This reaction sequence is very similar to the conversion of IMP and AMP in the purine biosynthetic pathway. In each case fumarate is formed as a by \_product. Fumarate is not transported by mitochondria, so this requires the presence of cytosolic fumarate to form malate.

***STEP 5***

***CLEAVAGE OF ARGININE***

* Hydrolytic cleavage of the guanidine group of arginine, catalyzed by the liver arginase (ARG1) releases urea, the other product, ornithine, reenters liver mitochondria for additional rounds of urea synthesis.
* ornithine and lysine are potent inhibitors of arginase, competitive with arginine.

***REACTION***



* arginine also serves as the precursor of the potent muscle relaxant nitric oxide (NO) in a Ca2+- dependent reaction catalyzed by NO synthase.