

## Amino Acids & Nitrogen Metabolism

Stage	Enzyme	Nitrogen atoms		Oxidation-Reduction	Comments
		Entering	Leaving		
Ammonia Uptake	(2) Glutamate dehydrogenase	NH <sub>4</sub> <sup>+</sup>		NADPH/H <sup>+</sup>	
	(6) Glutamine synthetase	NH <sub>4</sub> <sup>+</sup>			N for export to liver
Ammonia Release	(1) Glutamate dehydrogenase		NH <sub>4</sub> <sup>+</sup>	NAD <sup>+</sup>	Excess N for urea cycle
	(7) Glutaminase		NH <sub>4</sub> <sup>+</sup>		Incoming excess N (muscle) for urea cycle
Transaminations	(3) Alanine aminotransferase	alanine	aa from substrate α-ketoacid		Incoming alanine cycle N (muscle)
	(4) Aspartate aminotransferase	aspartate	aa from substrate α-ketoacid		Incoming excess N (muscle) for urea cycle (reverse rxn)
	(5) Glutamate aminotransferase	glutamate	aa from substrate α-ketoacid		
Urea cycle		NH <sub>4</sub> <sup>+</sup> , aspartate	urea		Liver cells, nontoxic urea synthesized for export