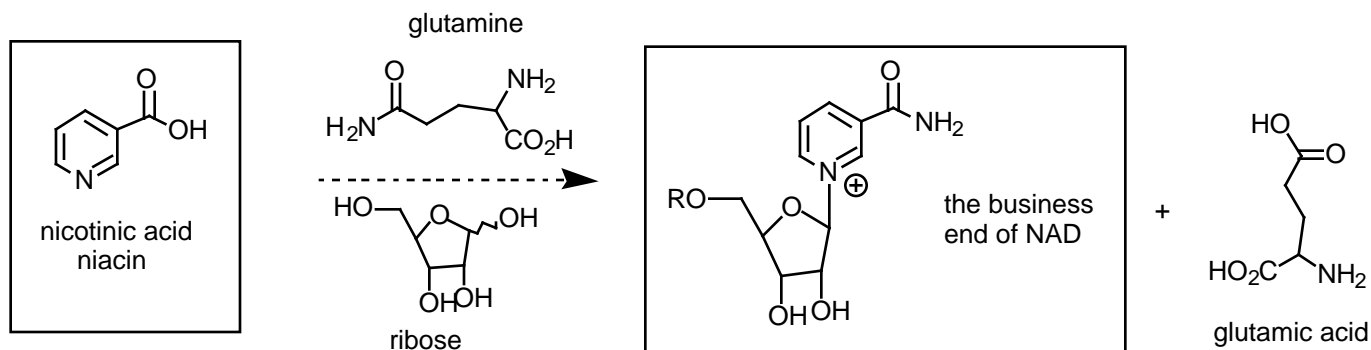


1. The original name of vitamin B was nicotinic acid, but in the 1920s, when it began to be added as an ingredient to bread, the name was changed to niacin. It obviously has no relationship to nicotine in biological activity, but, then as now, the ignorance of the consumer had to be accommodated. It is a vitamin because it is the starting material for the biosynthesis of NAD and we do not produce it by our own metabolism.



Suppose you were asked to design one or more enzymes to convert niacin into NAD. It is obvious that ribose is one co-reactant, and I can suggest using glutamine, one of the 20 natural AAs, as another component. Discuss with mechanism what activation steps are required and suggest specific amino acid side chains to do the jobs. Use your imagination (and solid chemical rationale...).

2. While racemization of α -amino acids can be a problem under conditions of fairly strong acid or base (mechanism?), under physiological conditions, the S-amino acids tend to retain their configuration. If the opposite configuration is desired (R instead of S) by some natural process, an enzyme-activation is needed to induce formation of the opposite arrangement. Pyridoxal is the cofactor which, in combination with the enzyme amino acid racemase. The system looks a lot like our simple description of an amino acid synthesis enzyme (lecture 30). Consider the scheme here, and propose a reasonable series of steps to activate the racemization process. You may invoke water when useful and add other of the natural side chains if you think one would be useful. The enzyme/cofactor complex should be unchanged when it is all over.

