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Purpose: To measure the incorporation of nitrogen into metabolites in the brains of male Sprague-Dawley rats by magnetic resonance spectroscopy (MRS) following infusion of plasma with a constant level of $^{15}$N-radiolabeled ammonia, and use these data to calculate the activity of astrocytic glutamine synthetase (GS) and other enzymes potentially involved in cerebral ammonia detoxification.

Key takeaways:
- $^1$H MRS demonstrated that glutamine (gln) begins to accumulate in the brain immediately after ammonia infusion, and continues to increase linearly over time during continued infusion.
  - Concentrations of all other measured metabolites remained unchanged during ammonia infusion.
- $^{15}$N MRS data (simultaneously collected with $^1$H data) reproducibly demonstrated incorporation of ammonia nitrogen into gln in the brain within 25 minutes of ammonia infusion, whereas any incorporation into glutamate occurred after this time point.
- The calculated rate of GS activity obtained under elevated ammonia conditions supports the key role of this enzyme in an ammonia detoxification pathway in the brain.

Related literature:
- In agreement with the MRS data presented in this study, experiments in cultured rat astrocytes have demonstrated that exposure to ammonia induces an increase in intracellular gln, an effect that is followed by an increase in astrocytic cell volume.¹
- Ammonia-induced increase of astrocytic gln has been theorized to initiate a series of events that include changes in astrocyte morphology, extracellular glutamate accumulation, and decreased neurotransmission.²
- Increased gln has also been demonstrated by MRS in multiple brain regions of patients with partial ornithine transcarbamylase (OTC) deficiency.³