

# Toward Mapping Physiological Levels of Glucose and Amino Acids *in vivo*

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## Research Question

- **Motivation:** The ability to monitor and diagnose patients through various imaging techniques is a considerable opportunity for physicians and scientists. One interesting idea is to develop a glucose-sensitive imaging technique to monitor if a tumor is growing or not.
- **Research Question:** Can Deuterium Metabolic Imaging (DMI) detect glucose at physiological levels using NMR Spectroscopy *in vitro*?
- **Project Goals:**
  - i. Gain expertise and background knowledge through a deep literature review.
  - ii. Determine if glucose can be mapped at physiological levels.

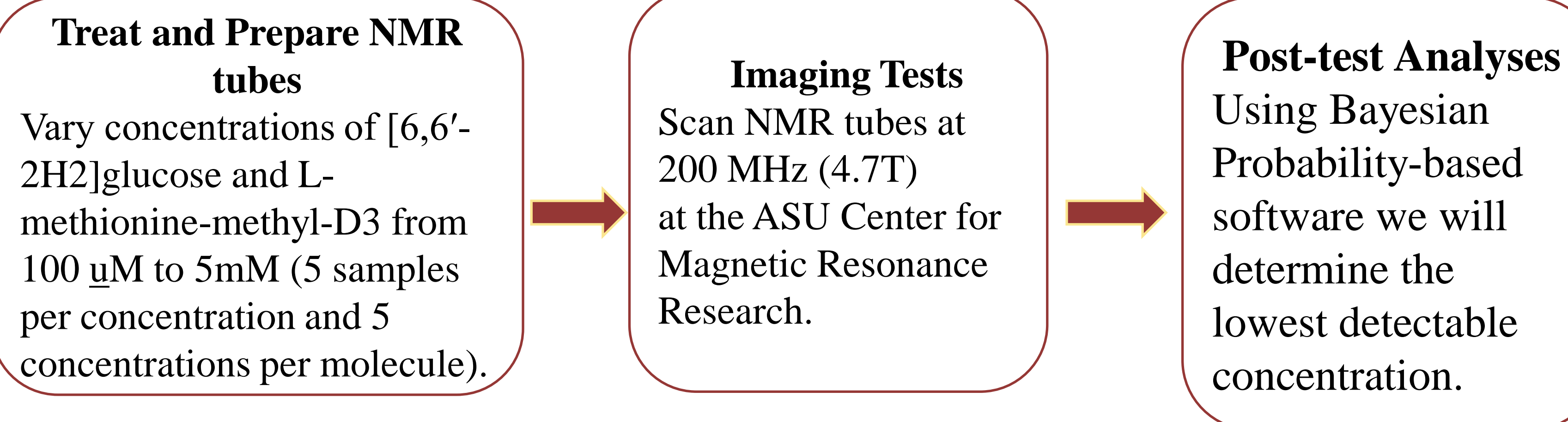
## Background

- In a recent study, deuterated glucose was administered noninvasively to rats, metabolic maps of high spatiotemporal resolution were generated
  - Clear differences in metabolism of [6,6'-2H<sub>2</sub>]glucose and [2H<sub>3</sub>]acetate between normal brain and tumor tissue in a rat glioma model were shown [1]
- A technique called GlucoCEST found they could successfully map the metabolism of unlabeled glucose *in vitro* with concentrations between 5 mM and 10 mM using MRI [2]
- Another process for imaging called STRIDE used Raman Scattering imaging to map carbon-deuterium bonds at a detection limit of 10 mM [3]

## Future Direction

- The next step is to perform NMR spectroscopy on NMR tubes with [6,6'-2H<sub>2</sub>]glucose and L-methionine-methyl-D<sub>3</sub> at varying concentrations. This will allow us to determine at what concentrations we can successfully map glucose *in vivo*.
- We can then move toward mapping other substrates that tumors depend on for growth such as fructose, calcium and/or pyruvate.
- Finally, we will move toward *in vivo* testing to find the most efficient and effective substrate to test for tumor malignancy.

## Experimental Design



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