HYPMET - Hyperpolarized Magnetic Resonance at the point-of-care

At a cellular level, the metabolism can be described as the way used by cells to produce energy from nutrients and build or repair cellular structures. In one of the most important processes called glycolysis, the well-known sugar molecule glucose is broken down in smaller parts to finally produce pyruvate and releasing the energy that cells will use to synthesize essential complex molecules like proteins, DNA, RNA, and lipids. Interestingly, the onset of a number of serious diseases is commonly linked to a dysregulated cellular metabolism. The ability to monitor changes in cellular metabolism is therefore crucial for an early-stage detection in several forms of degenerative pathologies including cancer and heart failure.

In this proposal, I will develop a completely novel technology to enhance the nuclear magnetic resonance (NMR) signal of relevant metabolites, like pyruvate, that will be crucial for the early detection of dysregulated metabolism. Consider for instance that the early-stage detection dramatically improves the survival rates for many ominous diseases. In contrast to the current state of the art, the technology that I will build and use will be lightweight, portable, and affordable, promoting analysis right at the point-of-care. In order to enhance the NMR signals of metabolites found in biofluids like urine, which can also function as metabolic spies to provide information about an individual's health status, I will also look into the use of a combined approach merging two different magnetic resonance technologies for the first time.

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