Purpose: To use hyperpolarized ¹³C Magnetic Resonance Spectroscopy for early detection of Radiation Induced Lung Injury (RILI) by quantifying the ratio between metabolites of ¹³C-lactate and ¹³C-pyruvate

Methods: Rats were irradiated with dose of 14 Gy to the thorax region to induced RILI using a ⁶⁰Co source. The contrast agent, ¹³C-pyruvate was hyperpolarized using Dynamic Nuclear Polarization (DNP) that increases signal intensity by four orders of magnitude. It was injected into the animals two weeks post irradiation and dynamic ¹³C-spectroscopy was performed. Proton Images were acquires prior to the spectroscopy for proper localization of the thorax region.

Results:A factor of more than two increase in the ¹³C-lactate to ¹³C-pyruvate ratio was observed for the irradiated rats compared to the normal animals. This result supports the hypothesis that an increase in production of lactate is evident with onset of hypoxia, which is a consequence of RILI.

Conclusions:Significantly higher ratio of ¹³C-lactate to ¹³C-pyruvate is seen the irradiated animals compared to the normal animals demonstrating the feasibility of using ¹³C pyruvate to probe in in vivo metabolism and its use as an early market for onset of RILI.