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Muon in biology: fundamentals and applications in cancer research

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We apply quantum beam of muon to understand life phenomena like electron transfer in protein/DNA, detection of O₂ in tissues, etc. Using muon, we propose a new noninvasive muon method to detect hypoxia in tumor/cancer tissue which will help to manage the treatment and early-stage diagnosis of cancer. We have tested the sensitivity of muon method for hypoxia detection and successfully detected the low O₂ in dilute aqueous biological solutions (hemoglobin, albumin, serum, and tris-buffered saline solutions). For further systematic study, we perform MuSR measurements and calculations (DFT and PIMD) to understand muon and muonium behavior in water and buffer at different O₂ concentrations. Recently, we have observed temperature dependent muonium oscillation at zero-field in ice. In the program, I will present new insight into MuSR in water and recent progress of muon in biology.

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