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NMR metabolomics studies of mice exposed to ionizing radiation

Ionizing radiation can be fatal to a living system and is a growing concern in the fields of medicine where diagnostic imaging techniques using X-rays are frequently used on patients, the space exploration where astronauts have a great chance of exposing to high energy space particle radiation and nuclear energy generation where an unfortunate accident may happen. In this work, NMR based metabolomics combined with multivariate data analysis are used to evaluate the metabolic changes in the C57BL/6 mice 4 and 11 days post whole body 3.0 Gy and 7.8 Gy gamma radiations, including proton irradiation, using various organs (liver, spleen, lung and heart) and blood. Principal component analysis (PCA) and orthogonal projection to latent structures analysis (OPLS) are employed for classification and identification of potential metabolite markers associated with gamma irradiation. Two different strategies for NMR spectral data reduction, i.e., spectral binning and spectral deconvolution are compared with normalization to constant sum and unit weight before multivariate data analysis. It is found that the combination of spectral deconvolution and normalization to unit weight is the best way for identifying discriminatory metabolites between the irradiation and control groups. Using this method, metabolite markers responsible for gamma radiation are identified on each organ and blood, separately. The possibility of accessingindividual organ injury due to ionizing radiation via minimally invasive blood will be discussed.

Biography

Jian Zhi Hu received his PhD in 1994 and is currently a senior staff scientist and principal investigator of Pacific Norwest National Laboratory. He has published more than 170 papers in peer reviewed journals, delivered a large number of presentations, and received two US R&D 100 awards and 10 US patents.

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