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Redox imaging of cancer metastasis

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Abnormal metabolism is a hall mark of cancer and metastasis accounts for 90% cancer death. Using the Chance redox scanner, i.e., the 3D cryogenic NADH/oxidized flavoprotein (Fp) fluorescence imager, we previously discovered that the mitochondrial redox state discriminated the normal from the pre-cancer/cancer and differentiated among tumors of various metastatic potential in mouse models. The cancerous/tumor tissues were relatively more oxidized and more heterogeneous than normal tissues. Among tumors with different metastatic potential, the more metastatic ones exhibited more oxidized redox state that was also more heterogeneous. We then extended our ability of quantitatively measuring the mitochondrial redox state to breast tissue biopsies from breast cancer patients. We saw both Fp (including FAD) and NADH contents and the redox ratio Fp/(NADH+Fp) in the cancerous tissues were significantly higher than those in the normal tissues (p<0.05). We are in the process of investigating the prognostic value of this imaging procedure. In the present study, we investigated the redox state of breast tumor metastases in distant organs in mouse models. We found that the lung metastases were relatively more reduced compared to the primary tumors and exhibited differential redox states. This may assist in better understanding of the metastatic mechanisms. Together our findings suggest that redox state is an important factor involved in cancer progression to metastasis, and further study of its roles may result in better understanding of cancer transformation and progression and aid in early detection, more accurate prediction of prognosis, and developing individualized treatment strategies for cancer patients.

Biography

He N Xu completed her PhD from Drexel University and Postdoctoral studies from University of Pennsylvania. She is a Senior Research Investigator at Perelman School of Medicine at University of Pennsylvania. Her research interests include redox imaging by optical and hyperpolarized NMR techniques. She has more than 25 publications on redox imaging and serves as a peer reviewer for several scholarly journals. She was an Organizing Committee Member for the International Symposium on Metabolic Imaging and Spectroscopy in honoring the 100th Birthday of Britton Chance.

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