The discovery of the metabolic control mechanism that drives malignant evolution of cancer cells

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Professor Hozumi Motohashi, Dr. Yoichiro Mitsuishi, Assistant Professor Keiko Taguchi, and Professor Masayuki Yamamoto at Tohoku University Graduate School of Medicine, Professor Hiroyuki Aburatani at Research Center for Advanced Science and Technology, University of Tokyo, and Division Leader Tatsuhiro Shibata at the National Cancer Center have jointly discovered the metabolic control mechanism that drives the malignant evolution of cancer cells. A transcription factor Nrf2, which plays a key role in the oxidative stress response in normal cells, alters metabolism of glucose and glutamine, activates anabolism and promotes cell proliferation. Cancer cells need to synthesize large quantities of proteins, lipids and nucleic acids to achieve aggressive proliferation. An increasing attention has been paid to metabolic activities that are unique to cancer cells for the development of effective anti-cancer drugs. This discovery provides an important clue to the metabolic control mechanism underlying the aggressive proliferation of cancer cells. This research result has been published in the July 10th issue of the American scientific magazine Cancer Cell. The paper's title is "Nrf2 Redirects Glucose and Glutamine into Anabolic Pathways in Metabolic Reprogramming."

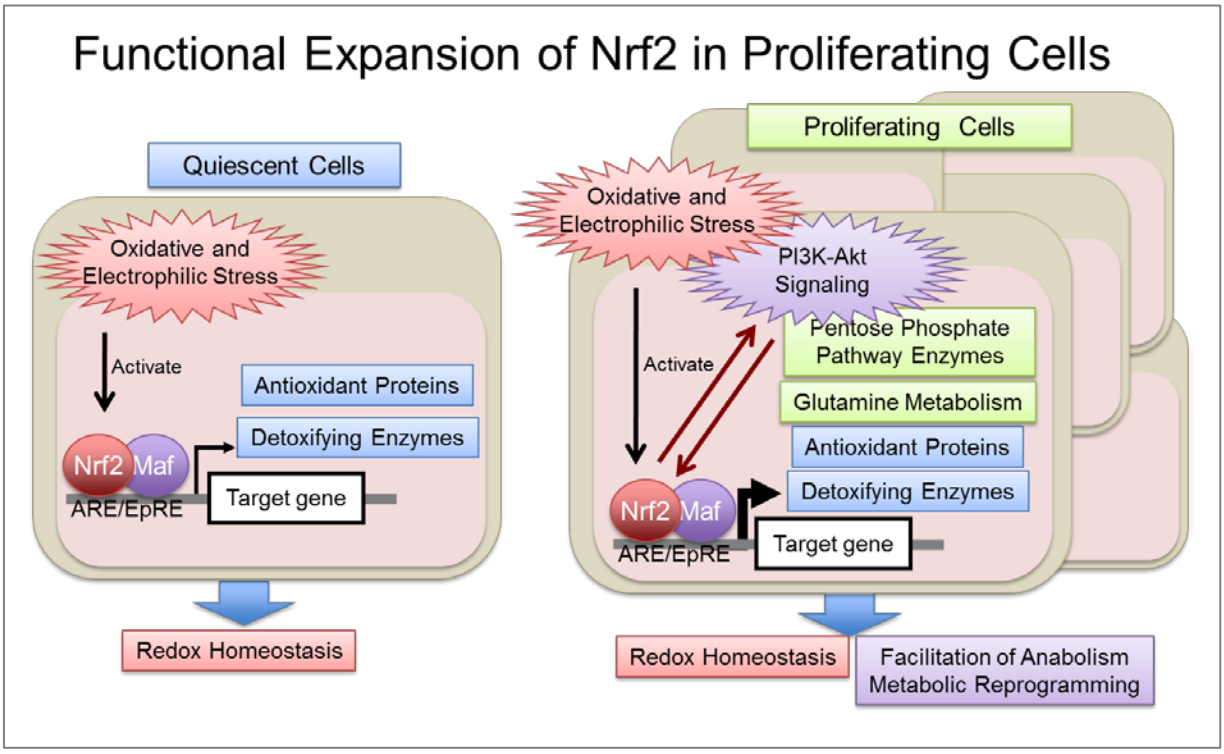

Figure: Functional Expansion of Nrf2 in Proliferating Cells.
Nrf2 regulates cytoprotective genes and maintains redox homeostasis in quiescent cells. In proliferating cells, nuclear accumulation of Nrf2 is enhanced, and Nrf2 activates metabolic genes and promotes anabolic pathway. Increased activity of Nrf2, in turn, augments Akt phosphorylation. This reciprocal activation may be one of the underlying mechanisms for the malignant evolution of cancers.

"Nrf2 redirects glucose and glutamine into anabolic pathways in metabolic reprogramming."
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