

MnSOD activity inversely correlates with percent S-phase

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Abstract: Manganese superoxide dismutase (MnSOD) is a nuclear encoded mitochondria localized antioxidant enzyme that converts superoxide to hydrogen peroxide. Traditionally reactive oxygen species (ROS) were considered as toxic by-products of aerobic respiration. However in recent years, ROS has been shown to regulate cellular processes like proliferation. This study investigates the hypothesis that MnSOD expression inversely correlates with proliferative growth states of a cell. Confluent and exponentially growing asynchronous cultures of malignant human breast epithelial cells (MDA-MB-231) were harvested and total cellular protein and RNA extracts were used for measurements of MnSOD activity, and protein and mRNA expression. Confluent and exponential growth state of the cells was assessed by flow cytometry measurements of the DNA content using propidium iodide assay. Since cancer cells do not contact inhibit, high density cells were plated and 15 percent S-phase distribution was considered as confluency and 55 percent S-phase was considered as exponential growth. Exponentially growing cells show four fold decrease in MnSOD activity and protein expression which correlates with a significant decrease in mRNA levels. Our results show that malignant breast epithelial cells with high proliferation capacity have low MnSOD expression. These results also suggest that low MnSOD mRNA levels may be responsible for the decreased amount of MnSOD activity in human cancer cells. These results support the hypothesis that MnSOD activity is inversely correlated with percent S-phase.

