P53-Induced Convection of Cancer Cells promotes Cancer Cell Growth and Resistance to Treatment

Authors: Javier Lee Mary Rogers Paula Oliver Rebecca Wells Sandra Farmer

Published Date: 02-09-2017

Samford University

School of Computer Science

The induction of p53 induces the production of caspase-3 from activated alkylating estrogen receptors. Expression of caspase-3 is activated in cancer cells. Caspase-3 can then control the transfer of cellular energy between the mitochondria, the cellâ€™s energy factory, and the liver.

Caspase-3 is a focal protease capable of modifying many proteins at once. In recent years, researchers have linked caspase-3 activation in cancer cells to a negative effect on normal cells (i.e., causing cancer cell growth and metastasis). Further, increasing caspase-3 expression in cancer cells has been associated with increased aggressiveness of the cancer.

In an effort to understand whether or not cancer patients are characterized by a greater or reduced expression of caspase-3, researchers embarked on the task of analyzing the effects of caspase-3 in breast cancer cells and found that the activation of caspase-3 caused the re-uptake of ATP from energy-depleting nutrients in the cellâ€™s nucleus. â€œAlkylating estrogen receptors have long been a reason for the activation of caspase-3 in cancer cells,â€ says ViÃ©gas de Clerc, Professor of Biochemistry at Emory University and co-principal investigator of the study. â€œCaspase-3 controls a signaling pathway by which various ATP-dependent, extracellular nucleotide metabolites reach the nucleus and return to the cytoplasm, and is thus crucial to activation of this pathway in cancer cells.â€

To investigate the effects of increased caspase-3 in breast cancer cells, researchers examined the effects of different levels of caspase-3. Expression of caspase-3 â€“ the highest level â€“ resulted in increases in serum carbon and manganese isotopes in the breast cancer cells. Reduced caspase-3 expression resulted in decreased carbon and manganese isotopes, indicating a decrease in oxygen available to energy production. As a final marker of increased caspase-3, activated caspase-3 was detected as an expression factor in the serum of the cells.

Compared to levels of caspase-3 present in normal breast cells, activated caspase-3 was found to increase the amount of activated caspase-3, but did not cause tumors to develop. Finally, increased caspase-3 expression caused breast cancer cell growth to increase to previously established cancer cell growth rates and were associated with a slight increase in metastasis.

â€œWhat we suggest is that p53 is significant in activating caspase-3 production,â€ says Nichola S. Rothery, also of Emory University and co-principal investigator of the study. â€œOur data suggests that increased expression of caspase-3 in breast cancer cells, either by apoptosis or by overactivation, is important to enhance cancer growth.â€

According to Jeffrey Ryan, Ph.D., neuroendocrinologist and Affiliate Investigator at Emoryâ€™s UH Cancer Center, â€œMany factors can modulate caspase-3 expression, and these clinical observations of elevated caspase-3 expression in cell lines suggests a valid link between caspase-3 and cancer cell proliferation.â€

A Fire Hydrant In The Middle Of A Forest