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Head and neck (H&N) squamous cell cancer adapted to high levels of nitric oxide (NO) causes down regulation of condensin complex I protein in (SCC)

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Hypothesis: In head and neck epithelial cell lines down regulation of condensin complex I gene, NCAPD2, promotes carcinogenesis.

Objective: Carcinogenesis is a multi-factorial phenomenon, including abnormal changes or functioning in genes responsible for appropriate cell cycle regulation. There are many free radicals by product produced by all cells of the human body including NO. NO helps in communication and transmission of signals throughout the body. Down regulation of many important mitotic regulator genes involved in cell cycle regulation is observed in cell lines those are exposed and have accordingly adapted to high levels of NO, thereby leading to chromosomal instability (CIN). NCAPD2 is one such gene that encodes for condensing complex I, which plays a crucial role in proper condensation, and segregation of chromosomes in addition to supporting genome stability, cell differentiation and development. To understand the relationship between increased NO levels and any metastatic potential, five H&N SCC cell lines were subjected to high levels of NO. After adaption to the high NO levels, NCAPD2 gene was observed to be down regulated in these cell lines.

Method: In this experiment, five pairs of H&N cell lines (parent and cancer cell lines) were studied: SCC016, SCC040, SCC056, SCC114, and SCC116. The bioinformatics resources were retrieved from DAVID and the provided data for the cell lines were studied. The genes causing any types of defect in cell cycle processes were noted and it was found that the cell cycle process is interrupted by down regulation of many genes among head and neck cell lines. These genes were separated, and analysis was completed for the down regulated genes, using Blue J, a comparative gene program.

Results: In head and neck cell lines, after comparing all down regulated genes, NCAPD2 was the one common gene correlated with cell cycle processes which possibly promoted tumorigenesis.

Conclusion: Decreased expression of NCAPD2, which is an important mitotic regulator gene involved in cell differentiation and development, is found when exposure and adaptation of H&N SCC cell lines are done in high levels of NO. An observable correlation is found between high levels of NO and its effect on aggressive or metastatic cancer cell lines, where down regulation of NCAPD2 leads to CIN. Further studies involving varying levels of NO and its effects on other such similar genes will warrant a better understanding on the subject matter.

Biography

Mahsa Vahdatian has achieved her Bachelor's degree from the University of Illinois, Chicago, IL in Biological Sciences. She joined the Oncology Research Lab of Dr. James Radosevich at UIC College of Dentistry and started her research on the effects of Nitric Oxide (NO) on cancer cell lines and has numerous abstracts published in many major journals such as Tumor Biology. She was on the organizing committee of the 43rd ISOBM annual conference held during September, 2016 in Chicago, IL and is currently a Board Member of Oncomarks.org, which is an online scientific research related source for individuals in the field of medicine. Additionally, she is also a Member of the ISOBM organization. She is actively interested in Oncology-related research programs especially in the fields of Immune System response to brain injuries, function and role of microglial cells during CNS injuries, and effects of nitric oxide on down/up regulations of genes leading tumorigenesis.

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