

Researchers discover connection between low oxygen levels and a human gene

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A depiction of the double helical structure of DNA. Its four coding units (A, T, C, G) are color-coded in pink, orange, purple and yellow. Credit: NHGRI

University of Texas at Arlington researchers have established a link between hypoxia, a condition that reduces the flow of oxygen to tissues, and HOTAIR, a noncoding RNA or molecule that has been implicated in several types of cancer.

RNA, or ribonucleic acid, is present in all living cells. Its primary role is to carry instructions from DNA.

In a study published in the journal *Gene* this month, Marco Brotto, a professor of nursing at the College of Nursing and Health Innovation, and Subhrangsu Mandal, an associate professor of chemistry, write that [hypoxia](#) helps aid the growth of cancer cells in people with the HOTAIR gene. The paper was co-written with three graduate students from UTA's Department of Chemistry: Arunoday Bhan, Paromita Deb and Nadine Shihabeddin; and Khairul Ansari, a former UTA adjunct faculty in that department. Brotto and Mandal were the paper's senior authors.

Noncoding RNAs are a newly discovered class of molecules that are emerging as a master regulator or facilitator of cancer. In this study, the authors show a connection between Hypoxia and HOTAIR.

"This could have very important implications," said Brotto, the George W. and Hazel M. Jay professor at UTA's College of Nursing and Health Innovation. "We know that with aging, humans have higher probability of cancer, but with aging, humans also have more Hypoxia, because of reduced respiratory capacity."

Hypoxia is a condition in which a person experiences low oxygen. Among other things, oxygen provides nutrition to brain cells, muscle cells, cardiac cells and burns fat. Conditions such as chronic [obstructive pulmonary disease](#) or COPD, pollution, environment causes, climate change and aging are among the biggest causes of Hypoxia, said Brotto.

"Hypoxia is a critical driver of tumor growth," said Mandal, adding that the study offers an opportunity for novel drug treatments of cancer.

Brotto and Mandal have been studying Hypoxia and HOTAIR respectively for more than a decade. Together, they worked on this study for more than two years by performing systematic experiments on different cells in their labs.

Brotto said this study offers hope for the development of a drug to inhibit the development of cancer by targeting HOTAIR.

"In the meantime, we all can do things to stave off hypoxia, such as regular exercise, nutrition and improving our climate conditions," he said.

Anne Bavier, dean of UTA's College of Nursing and Health Innovation, said this study is a boon for the college, the university and the fight against [cancer](#). Advancing health and the human condition is one of one the four pillars of UTA's strategic plan.

"For more than a century, scientists have been taking a sledgehammer at this formidable malady," said Bavier. "Yes, we still have a long way to go but we have also come a long way. This most recent work by Brotto, Mandal and their fellow researchers strikes another important blow against this disease."

Brotto said this study is a good example of why science funding is so important in health care research.

"This discovery was only possible because of continued substantial grant funding," Brotto said. "Otherwise this devastating diseases, which we are very close to finding cures for, we'll never find them and that would be a shame."

More information: Arunoday Bhan et al. Histone methylase MLL1 coordinates with HIF and regulate lncRNA HOTAIR expression under hypoxia, *Gene* (2017). [DOI: 10.1016/j.gene.2017.07.069](https://doi.org/10.1016/j.gene.2017.07.069)

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