University of Lethbridge NEWS RELEASE

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ULethbridge researchers help determine 3-D structure of an important human RNA

A collaboration between a University of Lethbridge graduate student, two highly specialized ULethbridge research labs and the University of Vienna has determined the three-dimensional structure of a specific long noncoding RNA molecule involved in cancer suppression and gene regulation.

Their study, led by Michael D'Souza, a graduate student, was recently published in Nucleic Acids Research and establishes a framework for identifying the overall structure of the molecule — a key brick in building the foundation of knowledge toward suppressing cancer and possible treatments.

Understanding the function of RNA begins with determining its molecular structure. Researchers at ULethbridge's Laboratory of Medicinal Biophysics recently visualized the long noncoding RNA known as Long Intergenic Noncoding RNA-p21 (LincRNA-p21).

RNA is a multifaceted molecule present in all living cells that performs many functions, including the coding and expression of genes into functional proteins. More than 98 per cent of the human genome also transcribes noncoding RNA that is involved in regulating gene expression, especially genes involved in cancer suppression and other diseases.

The structure of these noncoding RNAs is generally unknown and researchers don't know how these RNAs fold in three-dimensional space or how they communicate with proteins to perform essential functions.

The team applied analytical ultracentrifugation, in collaboration with ULethbridge's Dr. Borries Demeler, and light-scattering methods to ensure the purity of the LincRNA-p21. Using X-ray scattering techniques, Dr. Trushar Patel, a professor in the Department of Chemistry & Biochemistry and Canada Research Chair, and his team have determined the overall three-dimensional structure for parts of LincRNA-p21. In collaboration with Dr. Michael Wolfinger from the University of

Vienna, the team also helped produce high-resolution models which show how these noncoding RNAs could fold in the human body.

“The noncoding RNA we examined is linked to genes that are observed to be regularly mutated in cancer cells,” says Patel. “By identifying their overall structure, and how specific structural elements affect and interact with cellular targets, researchers are working to build a foundation of knowledge toward cancer suppression and likely treatments.”

Because of technological limitations and the flexibility and fragility of human noncoding RNAs, the researchers developed a multi-pronged approach that used different techniques, such as biophysical and computational methods, to help determine the three-dimensional structure.

“Our work provides a framework for an integrated approach that can be used to streamline structure determination of other human RNAs,” says Patel.

This news release can be found online at Long Intergenic Noncoding RNA-p21.

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