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Abstract Title

Bowen-Conradi Syndrome Decreases the Ribosome's Ability to Make Proteins

Authors

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Background

The ribosome is among the most important biological molecular machines in the human body. It is made up of proteins and ribosomal RNA (rRNA) and its role is to create proteins using an mRNA transcript. Chemical modifications to the rRNA can influence the overall function of the ribosome and its ability to synthesize proteins. One such modification is the "hypermodified uridine" located in the P site of the small ribosomal subunit, which is produced through a three-step modification process involving snR35, EMG1, and Tsr3. Disruption of the EMG1 protein is associated with a ribosomopathy called Bowen-Conradi syndrome (BCS). BCS causes affected children to die at an average age of 2-3 years and affects 1 in every 355 children in the Hutterite populations across North America. Furthermore, a decrease in the Tsr3 modification is associated with colorectal cancer.

Objective

This study investigates how variations to each step involved in the formation of the hypermodified uridine affect the ribosome's ability to produce proteins.

Methods

Yeast strains containing deletions or variants affecting each of the three steps involved in forming the "hypermodified uridine" were used. Their ability to produce protein was assessed using gel electrophoresis with total protein staining and densitometry quantification.

Results

Deletion of snR35 and Tsr3 did not produce statistically significant changes in protein abundance, while a statistically significant decrease in protein abundance was observed between EMG1-WT and EMG1-BCS. Interestingly, double deletion of snR35 and Tsr3 produced a statistically significant increase in protein abundance.

Conclusion

These results suggest that not all steps involved in the formation of the "hypermodified uridine" affect the ribosome's ability to produce protein equally. Understanding these differences provides important insight into the role of the "hypermodified uridine" in the ribosome contributes to better understanding of colorectal cancer as well as Bowen-Conradi syndrome.