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In Scientific First, Researchers Visualize Naturally Occurring mRNA

In a technique that could eventually shed light on how gene expression influences human disease, scientists at Albert Einstein College of Medicine of Yeshiva University have for the first time ever successfully visualized single molecules of naturally-occurring messenger RNA (mRNA) transcribed in living mammalian cells.

The scientific achievement is detailed in the January 16 online edition of Nature Methods.

Gene expression involves transcribing a gene's DNA into molecules of mRNA. These molecules then migrate from a cell's nucleus into the cytoplasm, where they serve as blueprints for protein construction.

Robert Singer, Ph.D., codirector of the Gruss Lipper Biophotonics Center and professor and cochair of anatomy and structural biology, was senior author of the paper. Working with his colleagues, he generated a transgenic mouse in which genes coding for the structural protein beta actin would, when expressed, yield fluorescently labeled mRNA. Beta actin mRNA is a highly expressed molecule found in all mammalian tissues.

The technique used by the Einstein researchers should be

applicable for monitoring the expression of any gene of interest. Prior to this study, Einstein researchers had monitored mRNA molecules transcribed by artificial genes.

"Our report is the first demonstration that our technique can be used to visualize the expression of an essential gene in mammalian cells," said Timothée Lionnet, Ph.D., a research fellow in Dr. Singer's lab and lead author of the Nature Methods paper. "We can study beta actin RNA molecules over their life cycle in a variety of cell types and discover where they are distributed within the cell. This has important consequences for human disease like cancer, since the way molecules of mRNA are localized within tumor cells correlates with the ability of these cells to spread, or metastasize."

Source: Nature Methods, 2011; DOI: 10.1038/nmeth.1551