Scientists capture single cancer molecules at work

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Researchers have revealed how a molecule called telomerase contributes to the control of the integrity of our genetic code, and when it is involved in the deregulation of the code, its important role in the development of cancer. The University of Montreal scientists involved explain how they were able to achieve their discovery by using cutting edge microscopy techniques to visualize telomerase molecules in real time in living cells in *Molecular Cell* on December 9, 2011.

"Each time our cells divide, they need to completely copy the genomic DNA that encodes our genes, but the genome gets shorter each time until the cell stops dividing," said Dr. Pascal Chartrand, a biochemistry professor at the University of Montreal and a senior author of the study. "However, the telomerase molecules can add bits of DNA called telomeres to the ends of our genome. Telomeres prevent the genome from deteriorating or joining up with other pieces of DNA, allowing cells to divide indefinitely and become cancerous. Normally, the telomerase gene is not active, but how it is controlled is poorly understood. One difficulty has been that we need to see exactly what individual telomerase molecules are doing on our genome and when." Franck Gallardo, the study's lead author, added that the team was able to apply techniques from other work that the team was doing in their lab. "We could in fact visualize what individual telomerases were doing in cells," he said.

In collaboration with Nancy Laterreur and Dr. Raymund Wellinger of the Université de Sherbrooke, Dr. Gallardo was able to tag telomerase with fluorescent proteins, which allowed them to visualize telomerase in single living cells. With this technological breakthrough, they observed that, contrary to previous theories, several molecules of telomerase cluster on only a few telomeres, and elongate the telomeres at each cell cycle. Moreover, they identified regulatory factors that restrain the activity of telomerase within a narrow time window when the cell is dividing. This new technology opens up the possibility of studying the activity of a key factor in the development of cancer at the molecular level within its cellular environment.

More information: The study, "Live cell imaging of telomerase RNA dynamics reveals cell cycle-dependent clustering of telomerase at elongating telomeres", is published in *Molecular Cell.*

Provided by University of Montreal