

A better way to count molecules discovered

November 21 2011

(PhysOrg.com) -- Researchers at the Swedish medical university Karolinska Institutet have developed a new method for counting molecules. Quantifying the amounts of different kinds of RNA and DNA molecules is a fundamental task in molecular biology as these molecules store and transfer the genetic information in cells. Thus, improved measurement techniques are crucial for understanding both normal and cancer cells.

It is very difficult to detect small individual molecules in a complex mixture. Therefore, the signal is usually first amplified by making many copies of each molecule. Unfortunately, the copying complicates tracking the exact number of original molecules. The reason is that it is virtually impossible to tell afterwards exactly how many times each original molecule was copied as all copies originating from same type of molecules are indistinguishable from each other.

In an article published by the scientific journal [Nature Methods](#) the researchers present a method in which the molecules are first artificially made different in such a way that the copies made from different original molecules can be later distinguished. Then the molecules can be efficiently counted using the new high-throughput sequencers that can read millions of short DNA stretches in parallel. The idea behind the method is astonishingly simple, yet it enables counting the absolute number of molecules in a cell sample whereas many current methods can only measure relative differences between samples.

Professor Jussi Taipale's group applied the new method to

simultaneously count thousands of different types of [messenger RNA](#) molecules present in cells. The new method proved to be more accurate than the one that has been commonly used for this task. Efficient and reliable counting of messenger [RNA molecules](#) is important because their abundances reveal which genes are active in the cells of interest. Professor Taipale's group studies regulation of cell growth and thus wants to understand not only which genes are active in normal cells but also genes that are aberrantly activated in [cancer cells](#).

The new molecule counting method was developed as collaboration between Jussi Taipale's and Sten Linnarsson's groups at Karolinska Institutet, The method has turned out to be especially suitable for counting molecules from a small number of cells. Thus, Sten Linnarsson plans to apply it to counting molecules from a single cell - a very exciting and challenging task. The principle of the new method can also be used to improve other important measurement techniques, and to develop technologies that allow more accurate sequencing of genomes of cancer cells and various organisms.

More information: Kivioja T*, Vähärautio A*, Karlsson K, Bonke M, Enge M, Linnarsson S, Taipale J, Counting absolute numbers of molecules using unique molecular identifiers, *Nature Methods*, advance online publication 20 november 2011.

Provided by Karolinska Institutet

Citation: A better way to count molecules discovered (2011, November 21) retrieved 26 April 2024 from <https://phys.org/news/2011-11-molecules.html>

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