

Scientists identify molecular basis for DNA breakage

July 19 2011

Scientists from the Hebrew University have identified the molecular basis for DNA breakage, a hallmark of cancer cells. The findings of this research have just been published in the journal *Molecular Cell*.

The DNA encodes the entire genetic information required for building the proteins of the cell. Hence, DNA breaks disrupt the proteins and lead to changes in the cell function. These changes can lead to defects in the control of <u>cellular proliferation</u> resulting in <u>cancer development</u>.

Using <u>cutting edge technologies</u>, researchers Prof. Batsheva Kerem and doctoral student Efrat Ozeri-Galai, of the Alexander Silverman Institute of Life Sciences in the Faculty of Science were able to characterize for the first time the DNA regions which are the most sensitive regions to breakage in early stages of cancer development. This is a breakthrough in our understanding of the effect of the DNA sequence and structure on its replication and stability.

"A hallmark of most human cancers is accumulation of damage in the DNA, which drives cancer development," says Prof. Kerem. "In the early stages of cancer development, the cells are forced to proliferate. In each cycle of proliferation the DNA is replicated to ensure that the <u>daughter cells</u> have a full DNA. However, in these early stages the conditions for <u>DNA replication</u> are perturbed, leading to DNA breaks, which occur specifically in regions defined as 'fragile sites'."

In this research Prof. Kerem and Ozeri-Galai used a sophisticated new



methodology which enables the study of single <u>DNA molecules</u>, in order to study the basis for the specific sensitivity of the fragile sites. The findings are highly important since they shed new light on the DNA features and on the regulation of DNA replication along the first regions that break in cancer development.

The results show that along the fragile region there are sites that slow the DNA replication and even stop it. In order to allow completion of the DNA replication the cells activate already under normal conditions mechanisms that are usually used under stress. As a result, under conditions of replication stress, such as in early cancer development stages, the cell has no more tools to overcome the stress, and the DNA breaks.

The results of this study reveal the molecular mechanism that promotes cancer development. Currently, different studies focus on the very early stages of cancer development aiming to identify the events leading to cancer on the one hand and on their inhibition, on the other. The result of the current research identified for the first time DNA features that regulate DNA replication along the fragile sites, in early stages of cancer development. In the future, these findings could lead to the development of new therapeutic approaches to restrain and/or treat cancer.

Provided by Hebrew University of Jerusalem

Citation: Scientists identify molecular basis for DNA breakage (2011, July 19) retrieved 3 May 2024 from <u>https://phys.org/news/2011-07-scientists-molecular-basis-dna-breakage.html</u>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.