Environmental factors 'turn on and off' cancer related genes

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Research performed at the Center of Research and Advanced Studies (Cinvestav) has identified that certain food and lifestyle habits can turn on or off the expression of cancer related genes. If this changes in the activity of genes are detected during the first stages of the disease, is possible to detain its appearance.

An interesting example in relationship with lifestyle is the lack of sleep and stressful conditions that a lot of people endure and that deteriorate the immune response, with a chance of increasing the incidence of some types of cancer.

These findings are useful when explaining the global growth of

incidence in cancer during the last decades and its relationship with modern day lifestyle. Those nutritional, hormonal and even environmental factors related with the appearance of malignant tumors are beginning to be identified.

This research, headed by Patricio Gariglio Vidal, is focused on the study of the epigenetic changes occurring in the genes that participate on the development of cancer, meaning, oncogenes and tumor suppressing genes.

Epigenetic changes refer to those modifications that turn on (activate) or off (inhibit) the expression of cancer genes without the intervention of mutations (mutations make direct changes in the conformation of the gene). These modifications are related with external factors such as nutrition, overconsumption of estrogen, infections (like the persistent infection of Human Papilloma Virus), smoking and people's lifestyle.

According to the expert at the Center of Research and Advanced Studies (Cinvestav), who has been awarded with the Aida Weiss research prize, this kind of alterations occur in the genes at a molecular level, later producing cellular variations that can derivate in malignant tumors or other diseases.

Gariglio Vidal also mentioned that an example of epigenetic change is a phenomenon known as methylation, which can occur directly in the DNA or in the histones (proteins) that pack the genetic material. This happens when methyl groups (byproducts of metabolism) introduce themselves in the promoter region of a gene that normally inhibits the development of cancer (tumor suppressing genes); this would lead to a lack of expression of these genes, getting a step closer to the development of cancer.

Another case of epigenetic regulations occurs due to the alterations of

acetyl groups inside the histones that pack the cancer activator or inhibitor genes. Epigenetic regulation also involves changes in the ARN that is coded by cancer inhibitor genes and that carries the information for the construction of proteins needed to avoid the development of cancer.

"Cancer is a disease that involves irregular cellular processes that can make a cancerous cell to multiply thousands fold. With the use of transgenic mice (animal models genetically modified to develop cancer more often) we have identified several biological processes implied in cancer and genes that are activated or inhibit in early stages of carcinogenesis", the researcher explained.

For the specialist at Cinvestav, some of the molecular alterations that occur at a genetic level are related to people's lifestyle. For example, "good eating habits, with a great consumption of fruits and vegetables (vitamin A; that works against molecules that can cause epigenetic changes) could lead to some of the tumor suppressing genes to work better; but if people stop ingesting this foods is possible for some of this benefic genes to stop working (don't get expressed as often)".

It has been discovered that epigenetic modifications can be reversed because the gene does not suffer a direct mutation. Therefore, if a preventive diagnosis of epigenetic regulated cancer genes is made, it would be possible to avoid the appearance of the disease.

That is the reason why the study performed in the Department of Genetic and Molecular Biology of the Cinvestav is also oriented to look for adequate diagnosis that identify epigenetic changes and be able to reverse the cellular degenerative process before it leads to cancer. For example, one of the lines of research is related to changes in the levels of microARN (small chain of genetic information that can regulate the expression of other genes) on cervical tumors and blood samples; aiming

to make an early diagnosis of cervical cancer and reverse its development.

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