An epigenetic difference in twins explains different risk of breast cancer

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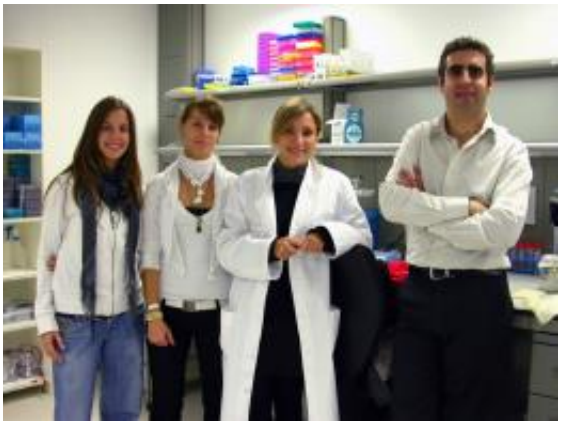

Two monozygotic twins and Dr. Manel Esteller, along a collaborator.

Monozygotic twins have the same genome, that is, the same DNA molecule in both siblings. Despite being genetically identical, both twins may have different diseases at different times. This phenomenon is called "twin discordance". But how can people who have the same genetic sequence present different pathologies and at different ages? The explanation partly lies in the fact that the chemical signals added in the DNA to "switch off" or "switch on" genes can be different. These signals are known as epigenetic marks.

The research team led by Manel Esteller, director of the Cancer Epigenetics and Biology Program at the Bellvitge Biomedical Research Institute (IDIBELL), Professor of Genetics at the University of

Barcelona and ICREA researcher, has identified an epigenetic change in the twin who will develop breast cancer but not in her healthy one. The finding has been advanced this week in the journal *Carcinogenesis*.

The research group led by Dr. Esteller studied the levels of DNA methylation (the best known epigenetic mark) in the blood of 36 pairs of twins diagnosed with breast cancer or healthy. Researchers analyzed half a million pieces of the genome in each twin and compared them with each other, and they found that women who have developed breast tumours showed a pathological gain of methylation in the DOK7 gene. " an epigenetic alteration associated with an increased risk of breast cancer can be detected in the sick twin a few years before the clinical diagnosis", said Dr. Esteller about the research results.

The next step for the researchers will be knowing the exact function of the DOK7 gene. "We believe it is a regulator of tyrosine kinases, an antitumor drug target already used for the treatment of breast cancer. If DOK7 performs this function, new studies to test drugs with tumour chemopreventive effects in breast cancer could be planned in the future", concludes the research coordinator.

More information: Heyn H, Carmona FJ, Gomez A, Ferreira HJ, Bell JT, Sayols S, Ward K, Stefansson OA, Moran S, Sandoval J, Eyfjord JE, Spector TD, Esteller M. DNA methylation profiling in breast cancer discordant identical twins identifies DOK7 as novel epigenetic biomarker. Carcinogenesis. Published online October 10 2012.

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