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Progressive telomere shortening characterizes familial breast cancer patients

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Telomeres, the complex structures that protect the end of chromosomes, of peripheral blood cells are significantly shorter in patients with familial breast cancer than in the general population. Results of the study carried out by the Human Genetics Group of the Spanish National Cancer Research Centre (CNIO), led by Javier Benitez, to be published in open-access journal *PLoS Genetics* on July 28th, reflect that familial, but not sporadic, breast cancer cases are characterized by shorter telomeres. Importantly, they also provide evidence for telomere shortening as a mechanism of genetic anticipation, the successively earlier onset of cancer down generations.

Mutations in two DNA repair genes, BRCA1 and BRCA2, characterize some, but not all, instances of hereditary breast cancer. Non-BRCA1/2 breast cancer families are heterogeneous, suggesting the existence of other genes conferring susceptibility. The group has investigated the role of telomere length in hereditary breast cancer based on previous information suggesting, first, that short telomeres and subsequent genomic instability contribute to malignant transformation; second, that genetic anticipation occurs in breast cancer families and, third, that telomere shortening is associated with anticipation in other genetic diseases.

By analyzing telomere length differences between mothers and daughters from breast cancer families, the authors demonstrated that genetic anticipation is associated with a decrease in telomere length in affected daughters relative to their mothers.

The results allowed the authors not only to conclude that women carrying BRCA1/2 mutation have chromosomes with short telomeres, but also to describe for the first time that genetic anticipation in breast cancer could be explained by telomere shortening. In addition, the study expands the field of research concerning genetic predisposition to breast cancer to include genes involved in telomere maintenance. The significance of generational changes in telomere length has interesting potential clinical applications in the management of familial breast cancer, and could be extended to other hereditary cancer syndromes.

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