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Melatonin sensitizes human breast cancer cells to ionizing radiation

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Nowadays radiotherapy and adjuvant endocrine therapy represent a standard treatment option in management of breast cancer. Melatonin exerts oncostatic actions on human breast cancer cells. Therefore, the purpose of this study was to investigate the effects of a combination of radiotherapy and melatonin on human breast cancer cells. Radiation inhibited MCF-7 cell proliferation in a dose-dependent manner, and pretreatment with melatonin one week before radiation led to a significantly decrease of cell proliferation compared with radiation alone. Melatonin pretreatment also decrease G2-M phase arrest compared with radiation alone, with a higher percentage of cells in G0-G1 phase and a lower percentage of cells in S phase. Regarding double-strand DNA break repair proteins, melatonin led to a significantly greater decrease in RAD-51 and DNA-PKcs mRNA gene expression compared with radiation alone. Melatonin pretreatment also upregulated the tumor suppressor p53. We have also demonstrated that melatonin pretreatment induced a greater decrease in aromatase and sulfatase, two main enzymes involved in the tumoral synthesis of estrogens, compared with radiation alone. Therefore, melatonin reduces active estrogens levels at tumoral cell. This is an important finding since anti-estrogens and anti-aromatase drugs have potential application with radiotherapy. Our findings suggest that melatonin may act as a radiosensitizer in breast cancer cells by inhibiting tumor alestrogen production, decreasing cell proliferation, inducing cell cycle arrest and down-regulating proteins involved in double-strand DNA break repair through its regulatory action on p53. Thus, these results may have high translational potential for the adjuvant therapy in breast cancer patients.

Biography

Carolina Alonso-González has finished her PhD from University of Cantabria in 2009, where she has received various research awards, and she completed a Postdoctoral fellowship at University of London, School of Pharmacy. Currently, she is an Associate Professor at the School of Medicine, University of Cantabria (Spain). Her recent research is focused on the sensitization effects of melatonin to chemotherapy and radiotherapy, studying the molecular changes that modulate the process. She has published over 30 articles and book chapters in peer-reviewed journals in the field of breast cancer research and have present her research at national and international conferences.

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