Resveratrol-Induced Temporal Variation in the Mechanical Properties of MCF-7 Breast Cancer Cells Investigated by Atomic Force Microscopy

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Atomic force microscopy (AFM) combined with fluorescence microscopy has been used to quantify cytomechanical modifications induced by resveratrol (at a fixed concentration of 50 µM) in a breast cancer cell line (MCF-7) upon temporal variation. The ability of resveratrol to induce cancer cell death, alone and/or in combination with other therapeutic drugs, as well as to prevent growth-factor-induced cancer progression has been already tested [1–3]. Such inhibitory effects on epidermal growth factor receptor (EGFR) expression levels induced changes in morphology and stiffness of single cells [4, 5].
Here, cell indentation has been utilized to determine simultaneous variations of Young's modulus, the maximum adhesion force, and tether formation, thereby determining cell motility and adhesiveness. Effects of Resveratrol treatment have been measured at several time-points (0–6 h, 24 h, and 48 h). An overnight incubation showed to induce the maximum variation in mechanical properties before cell proliferation was compromised, while drug incubation for longer periods (48 h) caused a gradual loss of properties that concluded in cell death. These results confirm the validity of the AFM technique as an optimal tool to detect irreversible transformations at the nanoscale level that might affect normal cell functioning, or even their malignancy, as in the case of cancerous cells.

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