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mTOR pathway proteins expression after treatment of head and neck cancer cell lines with mTOR inhibitors

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Statement of the problem: An overactivation of the PI3K/AKT/mTOR signaling pathway has been described in head and neck carcinomas, and it is closely related to the development and progression of the disease. Studying substances that target effectors of such pathway is substantial for the establishment of a more specific therapy, which would be less deleterious to patients. Thus, this study aimed to evaluate the effects of curcumin and known mTOR inhibitors (everolimus and temsirolimus) on the expression of mTOR pathway proteins in head and neck cancer cell lines. Methodology & Theoretical Orientation: Dose-response curves for SCC-9 (tongue carcinoma) and FaDu (hypopharynx carcinoma) cell lines were designed, and IC50 values were established for each substance on each cell line through a MTT cell viability assay. Cells were then treated at IC50 and their proteins were extracted and quantified. A western blot assay was performed for PTEN, AKT, phospho-AKT, mTOR, phospho-mTOR and GAPDH, as control. Findings: The results indicated that curcumin reduced the expression of AKT and mTOR, and that their phosphorylated forms were also reduced in both cell lines. Interestingly, PTEN was down-regulated in SCC-9 cells after treatment with curcumin. Temsirolimus and everolimus reduced the expression of AKT and mTOR as well, with the exception of everolimus for mTOR in SCC-9 cells. Both substances reduced phospho-mTOR, and only Temsirolimus reduced phospho-AKT. No alteration in PTEN expression pattern was observed after treatment with everolimus or temsirolimus. Conclusion & Significance: Curcumin, everolimus and temsirolimus reduced the expression of both AKT and mTOR, as well as their active forms, in specific experimental conditions. Such findings instigate further studies that may help shape the knowledge on mTOR inhibitors and make their clinical application feasible and more comprehensive.

Recent Publications

1. Elias ST, Borges GA, Simeoni LA, Silveira D, Porto ALA, Magalhaes PO, Guerra ENS (2015) Radiation induced a supra-additive cytotoxic effect in head and neck carcinoma cell lines when combined with plant extracts from Brazilian Cerrado biome. Clinical Oral Investigations (Print) 19:637-646.
2. Lourenco C, Borges GA, Guerra E, Amato A, Neves F, Acevedo AC (2015) Rosiglitazone inhibits proliferation and induces osteopontin gene expression in human dental pulp cells. Journal of Endodontics 41:1-5.
3. Elias S, Borges G, Rego D, Oliveira E, Silva L, Avelino S, Nunes De Matos Neto J, Simeoni L, Guerra E (2015) Combined paclitaxel, cisplatin and fluorouracil therapy enhances ionizing radiation effects, inhibits migration and induces G0/G1 cell cycle arrest and apoptosis in oral carcinoma cell lines. Oncology Letters 10:1-5.
4. Borges GA, Ferreira JF, Elias ST, Guerra ENS, Silveira D, Simeoni L (2016) Cytotoxic effect of Plectranthus neochilus extracts in head and neck carcinoma cell lines. African Journal of Pharmacy and Pharmacology 10:157-163.
5. Borges GA, Rego DF, Assad DX, Coletta RD, Canto GL, Guerra ENS (2016) In vivo and in vitro effects of curcumin on head and neck carcinoma: A systematic review. Journal of Oral Pathology & Medicine (Online).

Biography

Gabriel Borges is a PhD student, currently in the Health Sciences PhD program at the University of Brasilia (UnB). He is part of a research group which focus on head and neck carcinogenesis and develops its projects at the Oral Histopathology laboratory at UnB. He has been working with the molecular biology of head and neck cancer, especially concerned with the establishment of new, alternative or concurrent therapeutic options for the disease.

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