Trichoderma virens strain GV41 as a possible source of new anticancer agents: a preliminary screening in colorectal cancer cells

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Background/Aim: Colorectal cancer (CRC) is one of the most common malignant diseases worldwide. According to the 2016 statistics, CRC is the third cause of cancer deaths with a high incidence in industrialized countries (Siegel *et al*., 2016). *Trichoderma virens* strain GV41 is a commercial fungal biocontrol agent used in agriculture for its activity against different pathogens responsible for plant diseases (Howell, 2006; Mukherjee and Kenerley, 2010). Here, we evaluated the effect of a total extract of *T. virens* GV41, and its fractions, on the viability of colorectal cancer cells.

Methods: A total extract of *T. virens* GV41 was fractionated using column chromatography and the fractions were analyzed by Thin Layer Cromatography (TLC). The 26 subdivided fractions were characterized by Mass Spectrometry (MS) and Nuclear Magnetic Resonance (NMR). Colorectal cancer (Caco-2 and HCT116) cells and healthy colonic epithelial cells (HCEC) were used. Cell viability was evaluated by measuring the mitochondrial reductase activity (MTT assay); apoptosis was examined by histological analysis.

Results: The total extract of *T. virens* GV41 (0.3-30 mg/mL) preferentially reduced cell viability of Caco-2 and HCT116 cells compared to HCEC (non tumoural cells). The cytotoxic effect was due to a pro-apoptotic rather than a necrotic effect, as revealed by eosin–haematoxylin staining. A bioassay-guided separation of *T. virens* GV41 extract disclosed as active compounds gliotoxin and viridiol.

Conclusions: *T. virens* strain GV41 reduced the viability of colorectal cancer cells. Active ingredients include the epidithiodioxopiperazine gliotoxin and the furan-osteroid viridiol. *In vivo* studies are needed to fully elucidate the possibility to explore this strain as a source of new antineoplastic agents.