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Novel biopolymer with anticancer activity

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Within the field of pharmacologically active biopolymers the area of stable polyethers seems rather new and attractive. Caffeic acid-derived polyethers are a class of natural products isolated from the root extracts of comfrey (*Symphytum asperum*) and bugloss (*Anchusa italica*). According to ^{13}C, ^{1}H NMR, 2D heteronuclear $^{1}H/^{13}C$ HSQC and 2D DOSY experiments, the polyoxyethylene chain is the backbone of the polymer molecule. 3,4-Dihydroxyphenyl and carboxyl groups are regular substituents at two carbon atoms in the chain. The repeating unit of this regular polymer is 3-(3,4-dihydroxyphenyl)-glyceric acid residue. Thus, the structure of natural polymer under study was found to be poly[oxy-1-carboxy-2-(3,4- dihydroxyphenyl)ethylene] or poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDPGA). PDPGA is endowed with intriguing pharmacological properties as anticomplementary, antioxidant, anti-inflammatory, burn and wound healing and anticancer properties. We examined the efficacy of PDPGA of *S.asperum* (PDGPA- SA) and *S.caucasicum* (PDGPA-SC) in androgen-dependent (LNCaP) and independent (22Rv1 and PC3) human prostate cancer (PCA) cells. PDPGA-SA Treatment (100 mcg/ml for 48 hrs) decreases the live cell number by 65, 64 and 35% and increases the cell death by 16, 8 and 12 folds in LNCaP, 22Rv1 and PC3 cells, respectively. Similarly, PDPGA-SC treatment (100 mcg/ml for 48hrs) decreased the live cell number by 87, 25 and 33% and increased the cell death by 19, 10 and 9 folds in LNCaP, 22Rv1 and PC3 cells, respectively.PDPGA and its synthetic monomer exerted anti-cancer efficacy *in vitro* and *in vivo* against human prostate cancer (PCA) cells via targeting androgen receptor, cell cycle arrest and apoptosis without any toxicity, together with a strong decrease in prostate specific antigen level in plasma. However, our results showed that anticancer efficacy of PDPGA is more effective compared to its synthetic monomer. Overall, this study identifies PDPGA as a potent agent against PCA without any toxicity, and supports its clinical application.

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