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Biomacromolecule from medicinal plants-prospective theraupeutic agent

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Within the field of pharmacologically active biological macromolecules the area of stable polyethers seems rather new and attractive. A new series of linear and regular caffeic acid-derived polyether, namely poly[oxy-1-carboxy-2-(3,4-dihydroxyphenyl)ethylene] or poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDPGA) was isolated and identified in the water-soluble, high molecular weight fractions obtained from *Symphytum asperum, S.caucasicum, S.officinale,* S.grandiflorum *and Anchusa italica* (Boraginaceae). According to data of 13C, 1H NMR, 2D 1H/13C HSQC and 2D DOSY experiments the polyoxyethylene chain is the backbone of the polymer molecule. The 3,4-Dihydroxyphenyl and carboxyl groups are regular substituents at two carbon atoms in the chain. The repeating unit of this polymer is 3-(3,4-dihydroxyphenyl) glyceric acid residue. Most of the carboxylic groups of PDPGA from *A. italica* and *S.grandiflorum* unlike the polymer of *S.asperum, S.caucasicum* and *S.officinale* are methylated. PDPGA is endowed with intriguing pharmacological properties as anticomplementary, antioxidant, anti-inflammatory, burn and wound healing effect. The synthesis of racemic monomer of PDPGA 2,3-dihydroxy-3-(3,4-dihydroxyphenyl)propionic acid (DDPPA) was carried out *via* Sharpless asymmetric dihydroxylation of *trans*-caffeic acid derivatives using a potassium osmate catalyst. PDPGA and DDPPA 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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