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Biopolymer from Medicinal Plants its Synthetic Monomer and their Anticancer Efficacy



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The caffeic acid-derived biopolymers from medicinal plants comfrey and bugloss were isolated which represent a new class of natural polyethers. According to ¹³C-, ¹H-NMR, APT, 2D heteronuclear ¹H/¹³C HSQC, 1D NOE 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 was found to be poly[oxy-1-carboxy-2-(3,4-dihydroxyphenyl)ethylene] or poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDPGA). Then basic monomeric moiety of this polymer 3-(3,4-dihydroxyphenyl)glyceric acid was synthesized via Sharpless asymmetric dihydroxylation of trans-caffeic acid derivatives using a potassium osmium catalyst. Besides, methylated PDPGA was obtained via ring opening polymerization of 2-methoxycarbonyl-3-(3,4-dimethoxyphenyl)oxirane using a cationic initiator. PDPGA is endowed with intriguing pharmacological activities as immunomodulatory (anticomplementary), antioxidant, anti-inflammatory, burn and wound healing and anticancer properties. PDPGA and its synthetic monomer exerted anticancer activity *in vitro* and *in vivo* against androgen-dependent and androgen-independent 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 anticancer efficacy of PDPGA against human PCA cells is more

effective than its synthetic monomer. Methylated PDPGA did not show any activity against PCA. Overall, this study identifies PDPGA as a potent agent against PCA without any toxicity, and supports its clinical application.

Biography

Vakhtang Barbakadze has completed his Ph.D and D.Sci. in 1978 and 1999 from Institute of Organic Chemistry, Moscow, Russia and Institute of Biochemistry and Biotechnology, Tbilisi, Georgia, respectively. He is the head of Department of plant biopolymers and chemical modification of natural compounds at the Tbilisi State Medical University Institute of Pharmacochimistry. 1996 and 2002 he has been a visiting scientist at Utrecht University, The Netherlands, by University Scholarship and The Netherlands organization for scientific research (NWO) Scholarship Scientific Program, respectively. He has published more than 96 papers in reputed journals..

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