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Natural polymer of plant origin, its synthetic basic monomeric moiety and their anticancer efficacy

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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 and bugloss, which are endowed with intriguing pharmacological properties as anticancer agents. According to ¹³C, ¹H NMR, APT, 2D hetero-nuclear 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 under study 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 an osmium catalyst. Besides, it is well known that epoxides are valuable synthons in organic synthesis and have been introduced into several industrial, especially pharmaceutical applications, such as in the synthesis of antitumor drugs. Subsequently, the building blocks for the production of derivatives of such polyethers, methyl-3-(3,4-dimethoxyphenyl)glycidate and benzyl-3-(3,4-dibenzyloxyphenyl)glycidate, were synthesized based on the Darzan reaction or by oxidation with oxone (Shi oxidation) in order to produce in future derivatives of synthetic analogue of natural polymer. PDPGA and its synthetic monomer exerted anti-cancer efficacy *in vitro* and *in vivo* against human prostate cancer (PCA) cells. Overall, this study identifies PDPGA as a potent agent against PCA without any toxicity, and supports its clinical application.

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Herbal medicinal Plants: As an immunomodulator

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Indian and worldwide medicinal studies have reported a large number of plants included to promote the physical mental and defense mechanism in the body. On other hand a large number of medicinal plants included in Rasayanas have been claimed to possess immunomodulatory activities. Medicinal plants which are used as immunomodulatory effect to provide alternative potential to conventional chemotherapy for a variety of diseases, especially in relation to host defense mechanism. The use of plant product like polysaccharides, lectins, peptides, flavonoids and tannins has been the immune response or immune system in various *in-vitro* and *in-vivo* models. The immune system is a part of body which detects the pathogen by using a specific receptor to produce immediately response by the activation of immune components cells, cytokines, chemokines and also release of inflammatory mediator. In the innate immune the nature killer cell plays an important role to the defiance against virus-infected and malignant cell to destroy the abnormal cells. The drug affecting the immune system is termed as immunomodulatory or adaptogenic. Some repress the system and are value in, for example, preventing rejection of transplanted organs and other are stimulating and can be used to help combat viral infection such as AIDS or assist in the treatment of cancer. Also, the use of natural immunomodulators in synergy with existing drugs may involve the functional manipulation of multiple molecular targets leading to improved therapeutic efficacy and reduced toxicity

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