Anti-Cancer Quinone

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Contributor: Yu-Jung Chang

Natural quinones are secondary metabolites of plant and are categorized as benzoquinone, naphthoquinone, phenanthrenequinone, and anthraquinone according to their aromatic carbon skeleton [3]. Quinones are highly electrophilic molecules that accept one- or two-electrons from flavoenzymes and iron-sulfur proteins to form semiquinone or hydroquinone. They exert cytotoxic effects through alkylating proteins or DNA and affect the redox cycle with their semiquinone radicals to generate reactive oxygen species.

Keywords: isoplumbagin ; NQO1 ; quinone ; cancer ; metastasis

1. Introduction

Medicinal plants and their metabolites are great sources for pharmaceutical applications. The metabolites in plants provide a rich variety of bioactive compounds with anticancer, antioxidant, anti-inflammatory, or antimicrobial activities. Some of these drugs such as paclitaxel, docetaxel, resveratrol, vincristine, and vinblastine are approved of and used extensively in treating several types of cancer, including breast, head and neck, testicular, and bladder cancers [1][2]. Natural quinones are secondary metabolites of plant and are categorized as benzoquinone, naphthoquinone, phenanthrenequinone, and anthraquinone according to their aromatic carbon skeleton [3]. Quinones are highly electrophilic molecules that accept one- or two-electrons from flavoenzymes and iron-sulfur proteins to form semiquinone or hydroquinone. They exert cytotoxic effects through alkylating proteins or DNA and affect the redox cycle with their semiquinone radicals to generate reactive oxygen species. Their cytotoxicity promotes inflammatory reactions, oxidizes DNA, and induces cell death. Quinone-based drugs such as doxorubicin and mitomycin C have been used clinically for cancer chemotherapy, but their adverse side effects and toxicity have been an issue [4]. Consequently, there is a continued search for the development of quinone-based agents displaying antitumor activity that are less toxic and have reduced side effects.

2. Datas

Isoplumbagin (5-hydroxy-3-methyl-1,4-naphthoquinone) can be isolated from the bark of Lawsonia inermis [5] and Plumbago europaea [6] and has been shown to exhibit anti-inflammatory activity against Carrageenan-induced rat paw oedema [7] and antimicrobial activity against invasive vaginitis strains [6]. Chronic inflammation facilitates the initiation and progression of cancer [8].

Figure 1. Schematic summary of the molecular mechanisms of isoplumbagin-mediated anti-cancer effect.

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