Article

Quantification of Berberine in Berberis vulgaris L. Root Extract and Its Curative and Prophylactic Role in Cisplatin-Induced In Vivo Toxicity and In Vitro Cytotoxicity

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Abstract: Cisplatin is amongst the most potent chemotherapeutic drugs with applications in more than 50% of cancer treatments, but dose-dependent side effects limit its usefulness. Berberis vulgaris L. (B. vulgaris) has a proven role in several therapeutic applications in the traditional medicinal system. High-performance liquid chromatography was used to quantify berberine, a potent alkaloid in the methanolic root extract of B. vulgaris (BvRE). Berberine chloride in BvRE was found to be 10.29% w/w.

To assess the prophylactic and curative protective effects of BvRE on cisplatin-induced nephrotoxicity, hepatotoxicity, and hyperlipidemia, in vivo toxicity trials were carried out on 25 healthy male albino Wistar rats (130–180 g). Both prophylactic and curative trials included a single dose of cisplatin (4 mg/kg, i.p.) and nine doses of BvRE (500 mg/kg/day, orally). An array of marked toxicity effects appeared in response to cisplatin dosage evident by morphological condition, biochemical analysis of serum (urea, creatinine, total protein, alanine transaminase, aspartate transaminase, total cholesterol, and triglyceride), and organ tissue homogenates (malondialdehyde and catalase). Statistically-significant (p < 0.05) variations were observed in various parameters. Moreover, histological studies of liver and kidney tissues revealed that the protective effect of BvRE effectively minimized and reversed nephrotoxic, hepatotoxic, and hyperlipidemic effects caused by cisplatin in both prophylactic and curative groups with relatively promising ameliorative effects in the prophylactic regimen. The in vitro cell viability effect of cisplatin, BvRE, and their combination was determined on HeLa cells using the tetrazolium (MTT) assay. MTT clearly corroborated that HeLa cells appeared to be less sensitive to cisplatin and berberine individually, while the combination of both at the same concentrations resulted in growth inhibition of HeLa cells in a remarkable synergistic way. The present validated the use of BvRE as a protective agent in combination therapy with cisplatin.

Keywords: cisplatin; Berberis vulgaris; high-performance liquid chromatography; nephrotoxicity; hepatotoxicity; hyperlipidemia