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Antimicrobial and antineoplastic activity of fractions derived from geum *Urbanum L*

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Plants are a rich source of biologically active compounds with pleiotropic pharmacological effects. According to ethnopharmacological data the species from the genus *geum* are known for their anti-inflammatory and antioxidant activities. The herbaceous perennial plant species *Geum urbanum L.* had been used since ancient times in the folk medicine for gastro-intestinal diseases, disorders of the liver, biliary tract and uterus. However, the chemical composition and pharmacological properties of *G. urbanum* are still scantily studied. Aim of our study was to investigate the antimicrobial and cytotoxic activity of different fractions from *Geum urbanum L.*, including their bactericidal effect, total phenolic content, antioxidant and cytotoxic activity, as well as apoptosis induction in sensitive human normal and cancer cell lines. For this purpose roots and aerial parts were used to obtain methanol (MeOH) extracts, petroleum ether, ethyl acetate (EtOAc) and n-butanol (n-BuOH) fractions. Minimal inhibitory and bactericidal concentrations (MIC/MBC) were calculated by using broth microdilution method [ISO 20776-1:2006(E)]. The dehydrogenase activity of sensitive Gram-positive bacterial strains was measured based on tetrazolium salt reduction. Bacterial growth rate was determined by time-kill assay in dose-dependent manner. Bacterial cell surface structure was examined by SEM. The cytotoxicity was tested on normal transformed (HEK-294) and tumor (T-24, BC-3C, HeP-G2 and HuT-78) cell lines by MTT- (ISO 10993-5) and CFU assays. Apoptosis induction was observed by fluorescent microscopy and activation of caspase 3. Glutathione reduction was measured by colorimetric enzymatic assay. The statistical analysis of the data was performed with the GraphPad Prism Software. All fractions exhibited antibacterial activity against *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Bacillus cereus*. The EtOAc fraction of aerial parts was characterized by high content of polyphenols, antioxidant activity and lower cytotoxicity on normal transformed cells than on tumor cell lines. It induced apoptosis in the tumor cell line T-24 and inhibited the tumor cell proliferation as evidenced by the CFU-assay. In conclusion, the plant *Geum urbanum L.* possesses antimicrobial effect against Gram-positive bacteria, strong antioxidant properties, antineoplastic activity in tumor cell lines and favorable toxicological profile *in vitro*. Taken together, our results suggest that the EtOAc fraction from aerial parts might be beneficial for treatment of bladder carcinoma and antibacterial infections caused by sensitive Gram-positive pathogens and future *in vivo* investigations are needed to develop its medicinal potential.

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