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Molecular mechanism investigation of a novel Ruthenium (II) complex inhibits proliferation of human esophageal squamous cell carcinoma

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High toxicity acquired resistance and serious side effects, prompting the search for novel compounds for cancer treatment. Recently, a Ruthenium (II) complex [Ru (p-cymene)(L)Cl₂] (L = 1,3-bis(4-(tert-butyl)benzyl)-1H-imidazol-3-ium chloride), which named L-4, has been synthesized and characterized. The purpose of this study was to investigate the effects of L-4 against human esophageal squamous carcinoma (ESCC) cell line EC109. Different methods to determine the apoptotic pathways triggered by L-4 in EC109 cells were investigated by using flow cytometry, Hoechst 33258 staining, Caspases activation, mitochondria functioning, generation of reactive oxygen species (ROS) and western-blotting techniques. Results showed that a dose- and time-dependent reduction occurred in cell viability after exposure to L-4 in EC109 cells. The flow cytometry analysis showed that L-4 induced cell cycle arrest at G2/M phase in EC109 cells, concomitant to p53 and p21 up-regulation and Cyclin D1 down-regulation. L-4 also induced ROS-dependent and mitochondria-mediated apoptosis in EC109 cells by targeting the glutathione reductase, leading to generation of ROS, Ca²⁺ overloading, increase of Bax/Bcl-2 ratio, loss of MMP, release of cytochrome c into the cytosol, and then activation of Caspase-3/-9. Whereas, ROS scavengers, N-acetyl-L-cysteine, significantly attenuated the effects of L-4 on reduction of cell viabilities, activity of GR, generation of ROS, loss of MMP, the dysfunction of mitochondria and induction of apoptosis. The preliminary results suggest that the Ruthenium (II) complex, L-4, inhibits EC109 cells proliferation via blocking cell cycle progression and inducing ROS-dependent and mitochondria-mediated apoptosis, and deserves further investigation as a new chemotherapeutic strategy for patients with esophageal cancer.

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Formulation of hand sanitizer gel using the semi-purified flavonoids from the outer coverings of the red creole variety of *Allium cepa* Linn of family Alliaceae

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This research focuses on the formulation of hand sanitizer gel using the semi-purified flavonoids from the outer coverings of the Red creole variety of *Allium cepa* L. fam. Alliaceae. This study utilizes the experimental method of research. The agar cup diffusion method was used in determining the antibacterial activity of formulation with 40% semi-purified extract as compared to the two (2) locally available leading hand sanitizer brands. *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Micrococcus luteus*, *Enterobacter aerogenes*, *Proteus vulgaris*, *Salmonella typhimurium*, *Klebsiella pneumoniae*, *Bacillus subtilis* and *Bacillus cereus* were utilized as test organisms. The formulation exhibited antibacterial activity against 8 of 10 bacteria used in the experiment, while Brand A exhibited antibacterial activity against 1 of 10 bacteria and brand B manifested an antibacterial activity against 4 out of 10 of bacteria utilized in the microbial assay. Moreover, based on the result of the primary skin irritation test, the formulation is perceptibly not capable of causing irritation to the skin when applied topically. The researchers recommends that thorough investigation of the semi-purified flavonoid extract using instrumental method of analysis and isolation of the pure flavonoid should be conducted in order to determine the specific flavonoid that exhibits the antibacterial activity.

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