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Development of inhalable Paclitaxel and Curcumin formulation for lung cancer therapy

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Chemotherapy is a first-line treatment for advanced stage of lung cancer in which chemotherapeutic drugs are administered intravenously for systemic circulation. Even though the basic principle of chemotherapeutic drug is to inhibit the proliferation of cells growing at an abnormal state, it should not be overlooked that most chemotherapeutic drugs is toxic to neighboring healthy tissues (pain, nerve damage, allergic reactions etc.). Owing the route of administration, the delivery of chemotherapeutic drugs is often not target-specific, hence the unavoidable toxic effects. Inhalation of chemotherapeutic agents could be an effective approach to deliver sub-optimal concentration of chemotherapeutic drugs at tumor region while significantly reduces the toxicity effects towards healthy local tissues or other organs. In this study, inhalable formulations containing paclitaxel (PAX) and curcumin (Cur) has been engineered via milling technique. Our results demonstrated that these formulations had superior aerosol performance as fine particle fractions (FPF) were above 60% while mass median aerodynamic diameter (MMAD) ranged between 2 to 3 μm. In addition, the efficacies of monotherapy (PAX or Cur alone) or co-therapy were evaluated with human lung carcinoma (A549), human lung adenocarcinoma (Calu-3) and non-cancerous human bronchial epithelial cells (Beas-2B). It was noted that co-formulation of PAX and Cur demonstrated synergistic killing against A549 cells compared to monotherapy. In addition, the viability of Beas-2B cells was low when PAX alone was used based on MTS, apoptosis and cell cycle assays. The introduction of Cur significantly improved the viability of Beas-2B cells. In conclusion, PAX and Cur particles could be delivered via pulmonary administration for lung cancer treatment. The presence of Cur provided protective effects towards healthy cells.

Biography

Wing Hin Lee is an early career fellowship Researcher funded by Cancer Institute New South Wales and is based in Woolcock Institute of Medical Research. He has obtained his PhD in 2013 on the modulation of protein adsorption on calcium phosphate-based biomaterials. During his PhD, he collaborated with Ultraceuticals Ltd., in developing sunscreen for skin cancer prevention. He is highly interested in the treatment of cancer using nanotechnology approaches. Currently, he is actively devoting his efforts to develop potential lung cancer treatments via inhalation. He has published almost 40 peer reviewed articles and 1 book chapter. In addition, he serves as a Reviewer for several well-known international scientific journals in the field of cancer therapeutics and pharmaceutical sciences.

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