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Developing VLP (Virus like particle) based nano-particulate HPV (Human papillomavirus) vaccine for cervical cancer

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Cervical cancer is the second most cause of cancer related death among women all over the world. Two HPV type-specific prophylactic vaccines are currently being used world-wide. However, the cost of the vaccine itself, the expensive storage system, need for an expert to administer the vaccines tremendously inhibits the global use of the vaccines. Moreover recent controversy over the side effects of both vaccines also calls for a demand to develop an alternative vaccine which will be able to address all the issues. The goal of this project is to develop a nano particulate VLP based HPV vaccine that will be cost effective, highly potent and can be used in resource poor countries. The VLP containing particulate vaccines were prepared in a simple one step spray drying process using a Eudragit polymer. The size, shape and surface morphology of the particles were determined by scanning electron microscopy (SEM). Within the particle, the presence of VLP was detected using SDS-PAGE analysis and quantified using Western blot. The functionality of the vaccine was tested in an in vivo animal model using Swiss Webster mice. The antibody obtained from serum was analyzed by ELISA. The presence of intact VLPs was confirmed by TEM images. The animal study showed the significantly high titer. Based on these primary results we envision that the current formulation would offer mucosal and systemic protection by taking the advantages of particulate form of vaccines at multiple anatomic sites that are vulnerable to HPV infection and associated disease progression.

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Chlorogenic acid: A potential molecule with β-lactamase inhibitory activity against drug resistant bacteria

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Bacterial infections have been the major cause of diseases throughout the history of human population. One of the common bacterial infection is Urinary tract infection (UTI), also called as bladder infection or acute cystitis. The causal agents include Escherichia coli, Klebsiella, Proteus, Pseudomonas, Staphylococcus, Saprophyticus and Enterobacter. The drug resistant bacterial strains are currently a major health concern in treating bacterial infections. The β-lactam antibiotics are generally prescribed to treat UTI infections. Due to their extensive and persistent usage, it has led to worldwide appearance of drug-resistant strains. Bacteria have developed resistance to β-lactams by two mainmechanisms: the production of β-lactamases (βL), sometimes accompanied by a decrease of outer membrane permeability, and the production of low-affinity, drug resistant Penicillin Binding Proteins (PBPs). The major challenge for the new drug is to be unsusceptible to the action of βL. Medicinal plants reveal important pharmacological activities for developing novel therapeutic antibacterial agents. Fifteen phytochemicals were selected for the molecular docking simulation based on their antibacterial activity. The βL in this study (TEM, OXA and AmpC) have been selected as targets. The interactions between ligands and the selected proteins were observed for different poses. The potent compound having the best docking score and good interactions with the protein has been studied. The molecular simulation data were further confirmed by nitrocefin assay to prove the inhibitory potential towards βL. Among all phytochemicals, chlorogenic acid was found to be the most potent βL inhibitor.

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