Summary of research work

The main objective of the present research work is to design a biopolymer-based transdermal drug delivery system. Transdermal drug delivery refers to the transfer of a drug through the skin and into systemic circulation. A range of innovative drug delivery technologies is being developed to improve drug penetration through the skin barrier. A film is a type of transdermal device that adheres to the skin and carries drugs. The isolated biopolymer-based has been also explored for transdermal delivery. Natural biodegradable polymers have several benefits over conventional polymers, including multifunctionality, natural abundance, biodegradability, hydrophilicity, cytocompatibility, minimum toxicity, and biocompatibility with other excipients or therapies. In this present study, the transdermal films of **5-Fluorouracil** were designed by utilizing bio-gradable natural polymer in different compositions. **Cassava (***Manihot esculenta***)** is a natural polymer with several biological properties. The physicochemical parameters of the films were evaluated (film permeability, elongation, pH, drug content uniformity, and release kinetics). FT-IR and DSC were used to investigate the physicochemical incompatibility of drugs and polymers, which revealed that no incompatibility existed. Formulated transdermal films were tested for thickness, weight instability, % flatness, folding durability, % moisture loss and absorption, water vapor transmission rate, drug content, and in-vitro release experiments. The modified Diffusion cell was used to conduct in-vitro permeation tests on formulations. Formulation F2 was considered to be an optimized formulation with the release of 97.471% at the end of 8 hrs. the optimized formulation F2 follows zero-order kinetics of drug release (R2 =0.9924). Thus, according to ICH requirements, formulation F2 was stable for 3 months as there was no significant difference observed in drug content and diffusion profile. The in vitro study of isolated biopolymer-based transdermal film has been accomplished. Then the transdermal films were further subjected to in-vivo studies. Comparative anticancer evaluation of formulated isolated biopolymer-based transdermal film with placebo films and direct drug treatment revealed that no restoration changes were seen in the blank transdermal patch, whereas the drug-loaded biopolymer-based transdermal film shows more promising and restorative results in cancer-bearing animals when compared to topical 5-Fluorouracil treatment. Animals treated with a 5-FU transdermal film had their antioxidant levels restored, indicating that the 5-Fluorouracil-loaded transdermal film had anticancer properties. Histopathological examinations revealed the initiation, development, and proliferation of malignant cells on skin cells in provoked animals, as well as cell normalization in the 5 FU-loaded transdermal films. The study of the lipid profile in the 5 FU transdermal patch revealed that there were favorable changes in the lipid profile. In this study, we can appreciate that the obtained transdermal film has favourable biosafety and good anticancer effects which makes them attractive for treatment. Then, the skin irritation test was evaluated t, it may be stated that the formulation causes no or very little skin irritation.