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Development of attachable single-use wearable cellulose-based curcumin skin patch for breast cancer prevention

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As at the end of 2020, breast cancer is considered the world's most prevalent cancer. In addition to the conventional treatment approaches such as chemotherapy and radiotherapy, recent attention has focused on developing preventive care approaches. It is believed that preventive care will be a better alternative to reduce initial hazards that lead to cancer. Among the different preventive medications, the use of curcumin as a natural plant derived material has gained attention over the years due to its remarkable antioxidant, anti-inflammatory and antitumoral properties that are exceptionally important in cancer prevention. In that sense, transdermal delivery of drug compounds targeting breast cancer has taken many contemplations over the years. Transdermal delivery would allow localized drug application, thereby minimizing the first pass metabolisms. In this regard, this study has focused on the fabrication of a transdermal skin patch via the electrospinning technique using polyethylene oxide (PEO) and ethyl cellulose (EC) as the polymers. An optimization procedure was conducted to obtain beadless fibers. Once these systems were optimized, curcumin was used as a potential drug material with various beneficial properties (such as anticancer, anti-inflammatory and antioxidant) to be entrapped inside the nanofibers. The ease of obtaining elctrospun nanofibers as paper patches made them more attractive to be formulated into a single-use breast pad. Prepared fibers were characterized using SEM, FT-IR, DSC and XRD while their drug releasing ability was assessed over a period of time. In addition, transdermal penetrability was also assessed. The results indicated that a higher content of curcumin is released in a periodical manner from PEO:EC system. Transdermal drug delivery assessed by UV-Vis spectral analysis confirmed the penetration of curcumin through the skin membranes.

Keywords: Cancer prevention, cellulose, curcumin, electrospinning

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