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Process optimalization of the preparation of PVP-based nanofibrous drug carrier loaded with ciprofloxacin

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Nanotechnology is one of the most intensively investigated fields within pharmaceutical technology. Therefore, a wide range of nanosized drug delivery systems is available. Nanofibers have numerous advantages such as the great variety of suitable polymers, small diameter, large surface area, and tailorable drug release. These properties can be exploited to develop medicines and medical devices. In the latter case, nanofiber applications range from protective clothing to wound management and tissue engineering. Electrospinning (ES) is the simplest technique used for producing nanofibers. The traditional ES setup contains a high-voltage supply, a polymer container, a pump, a nozzle, and a collector. The single nozzle configuration is the simplest and most common ES method. But to increase productivity, it requires scaling up or switching to nozzle-free ES.

In this work, we aimed to produce ciprofloxacin-loaded nanofibers with rapid dissolution and long-term stability. Initially, the traditional single-nozzle ES method was used, and then the process was optimized in three steps. As the first step, the optimization of the single-nozzle ES took place by comparing the morphology and the physicochemical properties of the different nanofibers. Also, the solubility and the dissolution of the drug were studied [1]. In the second step, the ciprofloxacin concentration was increased inside the fibers [2]. As the third step, the productivity was improved by using a nozzle-free ES method. Additionally, rapid dissolution was earned in every case and the samples were stable for 16 months [2].

In summary, the production of ciprofloxacin-loaded nanofibers was optimized, and homogenous, stable nanofiber mats with rapid drug dissolution were earned.

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