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PLA-based nanofibrous systems for the treatment of periodontal disease

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The plaque-induced forms of periodontal diseases are the most prevalent chronic inflammatory conditions seen in humans worldwide. Not only does it cause tooth loss, but it is also independently associated with systemic chronic inflammatory diseases [1–2].

The aim of this study was to develop and characterize a PLA-based nanofibrous drug delivery system containing metronidazole for local periodontitis treatment.

Delivery systems were characterized in the form of native fiber mats and compressed disks. Scanning electron microscopy, X-ray diffraction analysis, and different measurements were carried out regarding wettability, *in vitro* drug release, and antimicrobial effectiveness.

Results of the X-ray diffraction analysis suggest that PLA has a semi-crystalline structure, while metronidazole is in a crystalline form among the fibers. SEM pictures indicate that fibers are not damaged during compression. Wettability measurements show that the penetration of an aqueous medium is much easier in the case of fiber disks than in fiber mats. *In vitro* drug diffusion measurements revealed that – in accordance with the wettability results – the fiber mats and disks show different drug release profiles: disks provide rapid (24 h) dissolution of metronidazole, while mats exhibit sustained (96 h) drug release. Results of the microbiological study suggest that disks could inhibit the growth of disease-inducing anaerobic bacteria for 2–3 days.

In conclusion, the produced delivery systems could supplement or be an alternative to subgingival mechanical debridement and contribute to an effective periodontitis treatment.

References

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2. Leber A., *Pharmaceutics* 11(3), 142 (2019)

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