**Exploring encapsulation of berberine into nanoparticles utilizing microfluidic technique**

**Edona Krasniqi1, Dafina Fondaj2, Nunzio Denora2, Aida Loshaj Shala 1,\***

*1 Department of Drug Analysis and Pharmaceutical Technology, Faculty of Medicine, University of Prishtina, 10000 Prishtina, Kosovo;* [*edona.krasniqi17@student.uni-pr.edu*](mailto:edona.krasniqi17@student.uni-pr.edu)

*2 Department of Pharmacy—Pharmaceutical Sciences, University of Bari “Aldo Moro”, Orabona St. 4, 70125 Bari, Italy;* [*dafina.fondaj@uniba.it*](mailto:dafina.fondaj@uniba.it) *;* [*nunzio.denora@uniba.it*](mailto:nunzio.denora@uniba.it)

*\*Correspondence:* [*aida.shala@uni-pr.edu*](mailto:aida.shala@uni-pr.edu)*; Tel.: +38349145225*

Berberine, an isoquinoline alkaloid present in various plant species including Berberis, offers diverse health benefits, albeit hindered by poor aqueous solubility, limited absorption, and low bioavailability. To surmount these challenges, the application of nanotechnology has been contemplated. In order to encapsulate this substance, the microfluidic technique was employed. In our efforts to encapsulate berberine in liposomes, we have conducted measurements for size, polydispersity index (PDI), count, intensity, zeta potential, and encapsulation efficiency (EE) to better track our progress in this project. The liposomes produced using the microfluidic technique had an average size of 115.41 +/- 9.17, indicating a relatively uniform particle size, a polydispersity index (PDI) of 0.293 +/- 0.02 suggests a wide range of particle sizes within the formulation. Furthermore, the encapsulation efficiency was measured at 76%, signifying the effectiveness of the liposomes in encapsulating the desired substances. In conclusion, the encapsulation of berberine in liposomes has demonstrated success through the implementation of the microfluidic technique. This method offers precise control and uniformity in the encapsulation process, potentially contributing to advancements in drug delivery and the bioavailability of berberine.

Keywords: berberine, poorly water-soluble, encapsulation, nanoparticles, liposomes, microfluidic technique.

**References**

1. Thuan Thi Duong, Antti Isomäki, Urve Paaver, Ivo Laidmäe, Arvo Tõnisoo, Thi T, et al. (2021 April). Nanoformulation and Evaluation of Oral Berberine-Loaded Liposomes, 1-3 , 14-16 . <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8125214/>
2. Elaheh Mirhadi, Mehdi Rezaee, Bizhan Malaekeh-Nikouei. (2018 May). Nano strategies for berberine delivery, a natural alkaloid of Berberis, 469-471. <https://www.sciencedirect.com/science/article/abs/pii/S0753332218317384?via%3Dihub>
3. Celia Marques, Maria Helena Fernandes, Sofia A. Costa Lima. (2023 September). Elucidating Berberine’s Therapeutic and Photosensitizer Potential through Nanomedicine Tools. Pharmaceutics.1-7, 13. <https://www.mdpi.com/1999-4923/15/9/2282>
4. Saba Sahib Mohsen Al-Obaidy. (2018 April). Nanocarrier-formulated antimicrobials and microfluidics-based screening assays. 19-23. <https://hull-repository.worktribe.com/output/4222342/nanocarrier-formulated-antimicrobials-and-microfluidics-based-screening-assays>