ULTRACENTRIFUGATION-ISOLATED MILK EXTRACELLULAR VESICLES: NATURAL NANOPLATFORMS FOR STABLE TROPONOID NANOENCAPSULATION AND DELIVERY

Venesa Lupçi[1], Toskë Kryeziu[1], Aida Loshaj Shala[1], Mimoza Basholli Salihu[1], Simone Carradori[2], Ufuk Bağci[3], Andreas Zimmer[4]

[1] University of Prishtina, Faculty of Medicine, Bulevardi i Dëshmorëve, Prishtina, Kosovo

[2] University of Chieti-Pescara, Department of Pharmacy, Via dei Vestini 31, Chieti, Italy

[3] University of Trakya, Faculty of Faculty of Engineering, Edirne, Türkiye

[4] University of Graz, Institute of Pharmaceutical Science, Universitätsplatz 1/EG, Graz, Austria

venesa.lupci@student.uni-pr.edu

Milk-derived extracellular vesicles (mEVs) have been highly promising as biogenic nanocarriers due to their inherent stability, non-immunogenicity, and native compatibility with bio-membranes. This article focuses on the isolation and characterization of mEVs isolated by ultracentrifugation (UC) for encapsulation and delivery of troponoid compounds with established antimicrobial as well as antioxidant properties. The vesicles thus obtained were characterized by dynamic light scattering (particle size, polydispersity index, zeta potential), and nanoparticle tracking analysis (NTA) to determine size distribution and concentration. Encapsulation efficiency of troponoid drug was quantified spectrophotometrically and stability of loaded vesicles under refrigerated storage condition was assessed. The results indicated that UC-derived mEVs exhibit nanoscale homogeneity, small negative surface charge, and high structural integrity, with excellent drug-loading capacity and extended release behavior.

These findings confirm that ultracentrifugation is a reproducible and valid process for the isolation of active milk-derived extracellular vesicles that can be utilized to formulate natural nanocarrier systems for tropanoid delivery.

References

[1] Kryeziu T.L., Haloci E., Loshaj-Shala A., Bağci U., Oral A., Stefkov G.J., Zimmer A., Basholli-Salihu M., Die Pharmazie – Int. J. Pharm. Sci., 77 (2022) 172-178.

[2] Del Pozo-Acebo L., Hazas M.L.L., Tomé-Carneiro J., Gil-Cabrerizo P., San-Cristóbal R., Busto R., Espín J.C., *Int. J. Mol. Sci.*, 22 (2021) 1105.

[3] Adriano B., Cotto N.M., Chauhan N., Jaggi M., Chauhan S.C., Yallapu M.M., *Bioact. Mater.*, 6 (2021) 2479–2490.

Venesa Lupçi, Toskë Kryeziu, Aida Loshaj Shala and Mimoza Basholli Salihu are members of NANOBALKAN Research Center (formerly NanoAlb).

All authors are part of the project: “Nano-based platforms and Phytochemicals for Enhanced Drug Delivery and Therapeutic Efficacy”. Financed through NanoKos (Funded by the European Commission).

Figures

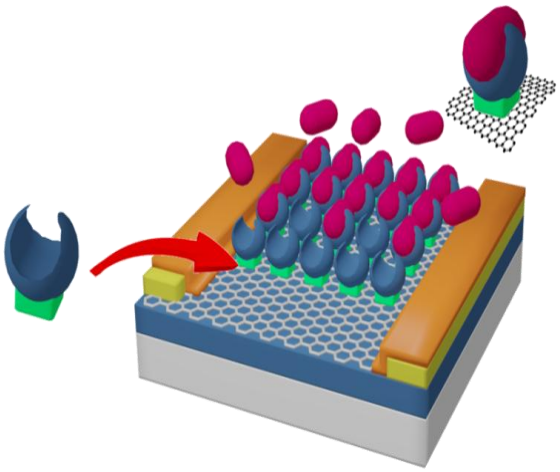

Figure 1. Insert caption to place caption below figure.