



Certificate of attendance

This is to certify that Oniko Szecsko
has attended the

24th International Symposium **on Signal Transduction at the** **Blood-Brain Barriers**

September 21-23, 2022 - BARI (ITALY)

Prof. Daniela Virgintino

Congress Chair

Daniela Virgintino



Examination of viral peptide-targeted nanoparticles on a culture model of the Blood-Brain Barrier

Anikó Szecskó¹, Szilvia Veszélka,¹ Mária Mészáros¹, Gergő Porkoláb^{1,2}, Vera Neves³, Marco Cavaco³, Miguel A.R.B. Castanho³, Mária A. Deli¹

ELKH | Eötvös Loránd Research Network

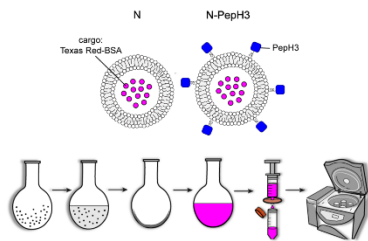
¹ Biological Barriers Research Group, Institute of Biophysics, Biological Research Centre Szeged, Eötvös Loránd Research Network, Szeged, Hungary
² Doctoral School of Biology, University of Szeged, Szeged, Hungary
³ Instituto de Medicina Molecular, Faculdade de Medicina, Universidade de Lisboa, Portugal

Introduction

Vesicular nanoparticles (NPs) are promising new tools to increase the transfer of drugs across the blood-brain barrier (BBB). NPs are suitable for targeted drug delivery by decorating their surfaces with appropriate ligands.

The aim of this study was to develop an innovative targeted vesicular NP that crosses the BBB and may act as a brain shuttle for therapeutic molecules. We investigated the ability of PepH3, a BBB shuttle peptide isolated from the capsid protein of Dengue virus alone, and as a targeting ligand of NPs to elevate cargo uptake and penetration across our well-characterized rat primary cell-based co-culture model of the BBB.

Methods

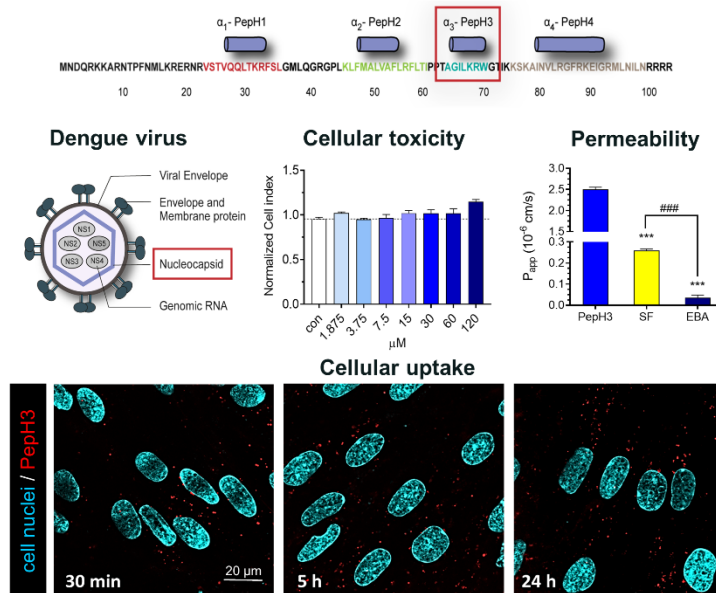


- **Preparation of NPs (niosomes):** non-ionic surfactant and cholesterol-based vesicles
- **Characterization of NPs:** size, polydispersity index, zeta potential, encapsulation efficiency
- **BBB model:** primary rat brain endothelial cells
- **Cellular toxicity:** impedance measurement
- **Cellular uptake:** visualized by confocal microscope; quantified by fluorescent spectrophotometry
- **Permeability:** measured by fluorescent spectrophotometry

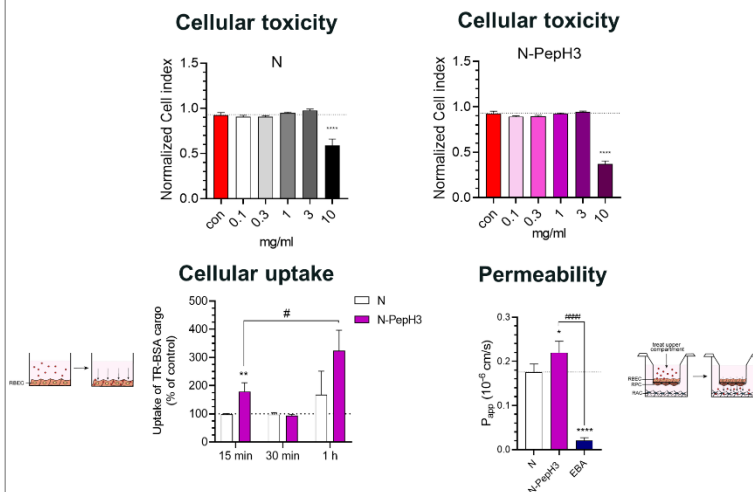
Conclusion

PepH3 peptide alone was rapidly taken up by cells and had high penetration across the BBB. The PepH3-targeted NPS showed significantly higher and quick entry into the cells and permeability across the barrier compared to non-targeted NPs. We are further investigating PepH3, as a shuttle peptide for targeted drug delivery across the blood-brain barrier using therapeutic biomolecules.

Results of PepH3 peptide



Results of PepH3-targeted nanoparticles



	Diameter (nm)	Polidispersity index	Zeta potential (mV)	Encapsulation efficiency (%)
N	110.17 ± 0.67	0.23 ± 0.01	-5.16 ± 0.75	35
N-PepH3	117.13 ± 2.02	0.27 ± 0.01	-3.44 ± 0.29	36

This work was funded by research grant 2018-2.1.15-TÉT-PT-2018-00013 by the National Research, Development and Innovation Office of Hungary. A.S. was supported by ÚNKP-22-3-SZTE-458 New National Excellence Program of the Ministry for Innovation and Technology, the Gedeon Richter Plc Centennial Foundation (2022/R/26/2533). S.V. was supported by Premium Postdoctoral Research Program (Premium-2019-469) and OTKA Young Research Excellence Program (OTKA-FK 143233) by National Research, Development and Innovation Office of Hungary. M.M. was supported by research grant PD 138930, the Gedeon Richter Plc Centennial Foundation and "National Talent Program" (NTP-NFTO-21-B-0228). G.P. was supported by the National Academy of Scientist Education under the sponsorship of the Hungarian Ministry of Innovation and Technology (FEI/F646-4/2021-ITM_SZERZ), the Stephen W. Kuffler Research Foundation, the Gedeon Richter Plc. Centennial Foundation (H-1103 Budapest, Gyömrői str. 19-21. Hungary) as well as by the ÚNKP-22-3-SZTE-446 New National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research, Development and Innovation.

