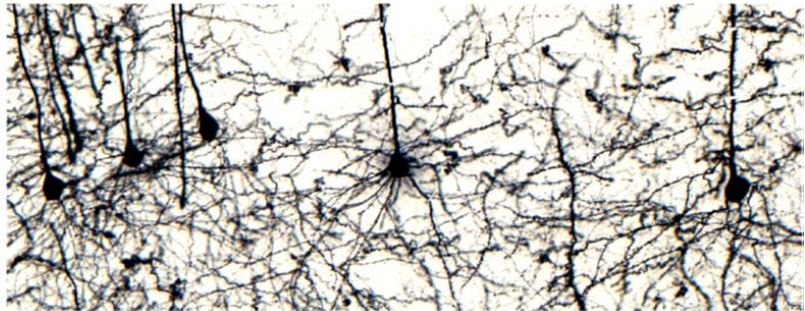


HuNDoC

5th Hungarian Neuroscience Meeting
for Undergraduate Students, Graduate
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**5th Hungarian Neuroscience Doctoral Conference for Undergraduate Students,
Graduate Students and Junior Postdocs
26 January 2022, Budapest**

POSTER SESSION

POSTER GROUP – VII.

- Anikó Szecskó - Examination of viral peptide-targeted nanoparticles on a culture model of the blood-brain barrier
- Evelin Szabó – Use of glucose oxidase-based electrode (amperometric biosensor) in animal experiments
- Bence Tamás Varga - Attempt to transfer a pharmacological neurovascular uncoupling model from mice to rats
- Adrienn Szabó - Abnormal hypothalamic–pituitary–thyroid axis might influence the outcome of food-motivated learning tests in the triple transgenic Alzheimer’s disease model mice
- Alex Horanszky - The impact of environmental exposures on the neuronal differentiation of pluripotent stem cells
- Emese Kincső Páli - Testing modified cyclodextrins on cell culture models of the blood-brain barrier

POSTER GROUP – VIII.

- Éva Pichner: Topographical mapping of the frontal cortex related thalamic circuits
- Klaudia Sípó - Examination the role of nesfatin-1 in the supraoptic nucleus of rats
- Tamás Láng - Chemogenetic evidence that posterior intralaminar thalamic neurons stimulate maternal behavior in rats
- Dóra Keserű - Sleep effect of bromocriptine-evoked prolactin release suppression during the reproductive cycle
- Szidónia Farkas - Investigating the effect of female hormone depletion on the progression of Alzheimer’s disease
- Roland Zsoldos - Analysis of ultrasonic vocalizations (USV) in mice

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EXAMINATION OF VIRAL PEPTIDE-TARGETED NANOPARTICLES ON A CULTURE MODEL OF THE BLOOD-BRAIN BARRIER

Anikó Szecskó¹, Mária Mészáros¹, Gergő Porkoláb^{1,2}, Vera Neves³, Marco Cavaco³, Miguel A.R.B. Castanho³, Mária A. Deli¹, Szilvia Veszélka¹

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- 3 Universidade de Lisboa, Instituto de Medicina Molecular, Faculdade de Medicina, Lisboa, Portugal

Drug delivery to the central nervous system is challenging because of the blood-brain barrier (BBB), which is composed of endothelial cells of brain capillaries. Nanoparticles (NPs) are promising new tools to increase the transfer of drugs across the BBB. The advantage of vesicular NPs is that they increase the penetration of cargo molecules across biological barriers and by decorating their surfaces with appropriate ligands they are suitable for targeted drug delivery. 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. In our experiments, we used Quasar570-labeled PepH3 and prepared PEGylated PepH3-targeted NPs loaded with the fluorescent protein mCherry as cargo. The physico-chemical properties of NPs, such as particle size, polydispersity index and surface charge were measured by dynamic light scattering. The effect of PepH3 alone and PepH3-targeted NPs on the viability of primary rat brain endothelial cells (RBECs) was monitored by impedance measurement. The cellular uptake of PepH3 and PepH3-targeted NPs were visualized by confocal microscope. We investigated the entry of the peptide and peptide-targeted nanovesicles into cells and their penetration across the culture model of the BBB with fluorescence spectrophotometry. The mean diameter of untargeted and PepH3-targeted particles was 114 nm and 164 nm, respectively. The NPs have slightly negative surface charge and relatively narrow size distribution. The encapsulation efficiency of mCherry cargo was around 10% in both cases. PepH3 had no effect on the viability of RBEC and was rapidly taken up by RBEC cells supported by the visualization and cellular uptake studies. PepH3 peptide alone had high penetration across the BBB model compared to marker molecules. The mCherry cargo loaded in PepH3-targeted NPs showed significantly higher entry into the cells compared to non-targeted NPs, but the penetration of PepH3-targeted NPs across the BBB model was lower than the non-targeted group. We are further investigating PepH3, as a shuttle peptide for targeted drug delivery across the BBB using therapeutic biomolecules.

This work was funded by NKFIH (2018-2.1.15-TÉT-PT-2018-00013). A.S. was supported by ÚNKP-21-2-SZTE-364 New National Excellence Program of the Ministry for Innovation and Technology. S.V. was supported by Premium Postdoctoral Research Program (Premium-2019-469). M.M. was supported by NKFIH (PD 138930), the Gedeon Richter Plc Centennial Foundation and "National Talent Program" (NTP-NFTÖ-21-B-0228). G.P. was supported by the Szeged Scientists Academy (FEIF/646-4/2021-ITM_SZERZ) and ÚNKP-21-3-405.

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Introduction

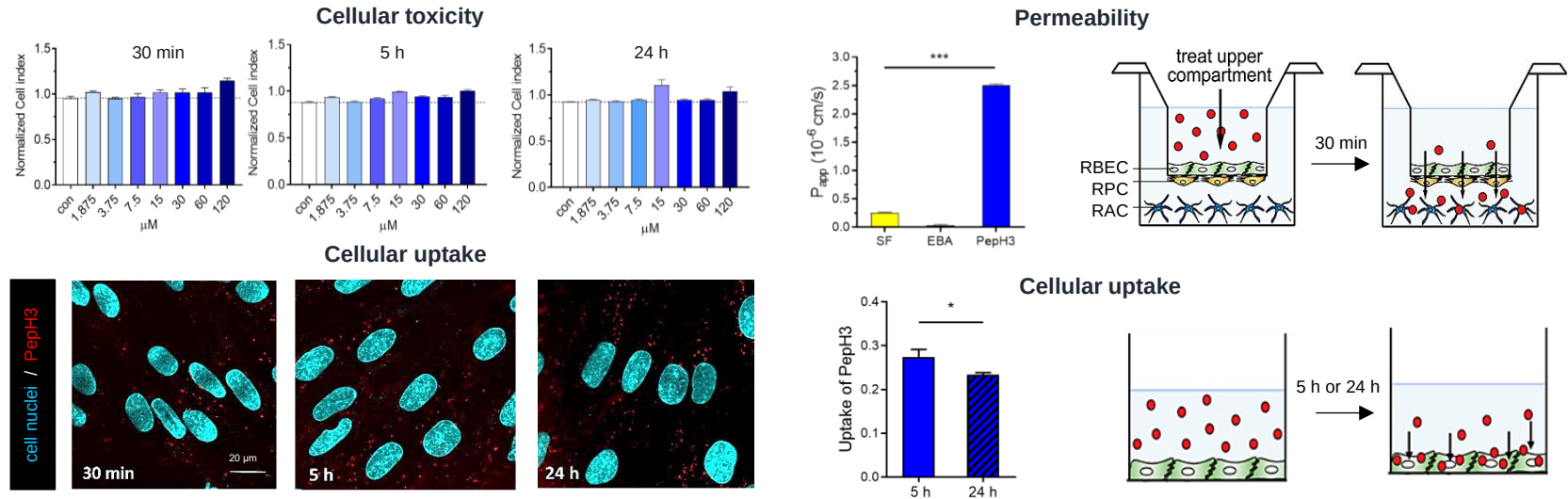
Vesicular nanoparticles (NPs) are promising new tools to increase the transfer of drugs across the blood-brain barrier (BBB). NPs are suitable for targeted drug delivery by decorating their surfaces with appropriate ligands.

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.

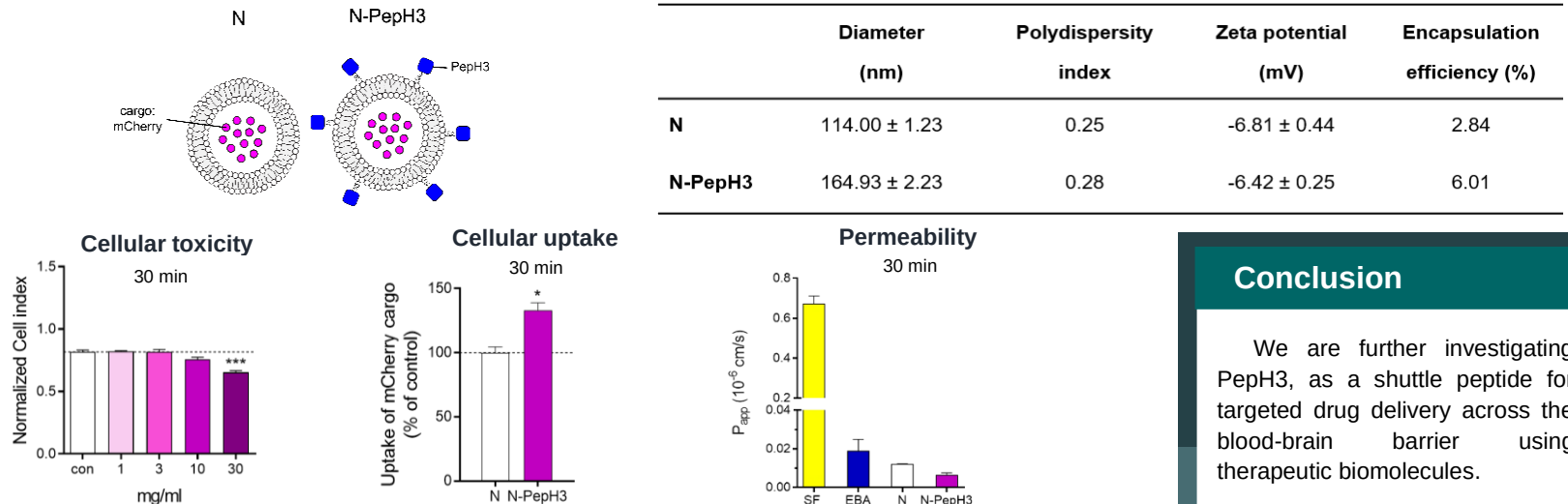
Methods

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

Results of PepH3 peptide



Results of PepH3-targeted nanoparticles



Conclusion

We are further investigating PepH3, as a shuttle peptide for targeted drug delivery across the blood-brain barrier using therapeutic biomolecules.