

## DORINA DEBRECZENI



National Academy of Scientist Education, 4<sup>th</sup> year

Semmelweis University  
Faculty of Medicine, 4<sup>th</sup> year

#### YEAR OF BIRTH

2003

#### FORMER SZENT-GYÖRGYI PUPIL

yes

#### RESEARCH UNIT

Semmelweis University

#### SZENT-GYÖRGYI MENTOR

Gábor Czirják

#### JUNIOR MENTOR

-

#### SPECIALIZATION

molecular biology and electrophysiology

#### SECONDARY SCHOOL

Bocskai István High School,  
Hajdúböszörmény

#### NAME OF TEACHER

Erika Viziné Bencsik

#### LANGUAGES

English/advanced  
German/intermediate

#### IMPORTANCE, AIMS AND POSSIBLE OUTCOME OF RESEARCH

In my research, I investigate human TMEM175 lysosomal and TRESK two-pore potassium channels and their various mutations for their electrophysiological properties and regulatory mechanisms. The TMEM175 potassium channel plays an important role in regulating the K<sup>+</sup> permeability of the lysosomal and endosomal membranes. This transmembrane protein has a special structure: it does not contain the P domain, which is the selectivity filter in all other known potassium channels. It is therefore questionable what is the reason for the high selectivity of TMEM175 for K<sup>+</sup> over Na<sup>+</sup>. We also investigate the regulation of PKB, ion selectivity, and the effect of additional inhibitors (e.g., 4-aminopyridine) on TMEM175. One variant of TMEM175 (M393T) may be associated with an early onset of a neurodegenerative disease, Parkinson's disease, according to recent research. To understand this mechanism, it is particularly important to investigate the properties of the TMEM175 channel, as it may later be the target of drug treatments. K2P channels are common determinants of the regulated K<sup>+</sup> conductance of the plasma membrane, found in most animal and plant species, but are extremely structurally and functionally diverse. The TRESK K2P channel I examined is found in significant amounts in the sensory neuron subpopulations responsible for pain perception, affecting their excitability and the intensity of the response to painful stimuli. Some mutations in TRESK cause a rare form of hereditary migraine headache. In our research, we study general and direct regulatory mechanisms of the TRESK channel in heterologous systems that are likely to be independent of the cell-expressing cell type. Thus, a significant part of the mechanisms we describe provide a good basis for further studies to elucidate the role of the TRESK channel in pain perception.

#### AMBITIONS AND CAREER GOALS

I have been very curious and busy getting to know the complex living systems, the microscopic material world around us, and I can create something scientifically lasting. I believe that research provides an opportunity to develop a new way of thinking in addition to the material knowledge that can be acquired. One of my goals is to do research in addition to my medical work after completing my studies, as this way I may help more.

#### HONORS AND PRIZES

2024 Semmelweis University Students' Scientific Conference, 1<sup>st</sup> place  
2023 National Students' Scientific Conference, 2<sup>nd</sup> place

#### PUBLICATIONS

Debreczeni, D.,<sup>1</sup> Baukál, D.,<sup>1</sup> Pergel E.,<sup>1</sup> Veres, I.,<sup>1</sup> Czirják, G.<sup>2</sup> (2023) Critical contribution of the intracellular C-terminal region to TRESK channel activity is revealed by the epithelial Na<sup>+</sup> current ratio method. *J Biol Chem*