**PRESS RELEASE**

**Latest Findings on Rare Disease of the Inner Ear**

**KL Krems, Harvard Medical School and Johns Hopkins University find striking volume changes in special structures of the auditory apparatus**

**Krems, Austria, 03. August, 2023 – Elaborate 3D analysis of the inner ear now, for the first time, provide insights into volume changes of special structures in sufferers of the so-called Ménière's disease. The cause of this rare disease remains unclear to this day, although it leads to severe balance disorders, among other things. A successful collaboration between the Karl Landsteiner University of Health Sciences (Krems, Austria) and Harvard Medical School and Johns Hopkins University (both USA) has now provided new insights into the disease process. Using 3D-reconstructions of inner ears (based on anatomical slices) the international team was able to measure for the first time altered volumes of structures known as endolymphatic compartments in patients with the disease. A connection with the thickness of special membranes in the inner ear was also identified. In addition, further evidence was found concerning the functioning of a poorly understood structure in the inner ear (Bast's valve).**

Nausea, spinning dizziness, tinnitus, and hearing loss – the so-called Ménière's disease can really throw you off track. As rare as the disease is, so difficult is its treatment. In extreme cases, the vestibular nerve must be severed, or the vestibular organ surgically removed. For milder cases, antibiotic treatment has proven effective. This was confirmed by the team of the Karl Landsteiner University of Health Sciences (KL Krems) five years ago, despite an unexplained mechanism of action. The site of origin of the disease is the organ of equilibrium in the inner ear where, according to the latest findings of KL Krems, a pressure increase occurs in the case of disease. The effect on specific regions (endolymphatic compartments) of the inner ear has now been looked at in detail by the KL Krems team together with internationally renowned partners – and surprising things have been found.

**3D Inner Ear**

In addition to the cochlear duct, important parts of the inner ear are the cavernous extensions at the outer end of the cochlear duct known as sacculus and utriculus. In their study, now published in Otology & Neurotology, the team led by Dr. Béla Büki, Krems University Hospital (education and research site of KL Krems), compared inner ears of nine Ménière's patients with those of ten healthy individuals. For this, digital 3D models were created on the basis of numerous anatomical slices. These were then used to determine the volumes of the above-mentioned compartments as well as the thickness of special membranes (Reissner's membrane) and also the condition of the so-called Bast‘s valve.

Commenting on the results, which were obtained together with colleagues from Harvard Medical School and Johns Hopkins University (both USA), Dr. Büki says: "Very often, the volume of the external cochlear duct as well as the one of the sacculus was enlarged in affected patients. We were able to clearly demonstrate this in the virtual 3D models." Furthermore, the evaluations showed that the volume of the utriculus had also increased in numerous – but less – affected individuals.

**Thick & Thin**

Thanks to the detailed analysis of the inner tubes, the team was subsequently even able to measure the thickness of the membranes lining the respective compartments. "The thickness of this membrane," explains Dr. Büki "forms a mechanical resistance to the increase in pressure of the inner ear fluids known as endolymph, which we demonstrated in a previous paper. This, in turn, affects volume changes." And indeed, the membrane thicknesses fit perfectly with the analyzed volumes of the compartments: In healthy subjects, Reissner's membrane of the utriculus was thicker compared with that of the (outer) cochlear canal, as well as that of the sacculus – which could prevent volume expansion when endolymph pressure is increased. This would explain the observation that the utriculus was less frequently dilated.

But then, why was volume dilation of the utriculus nevertheless detectable in some affected individuals? Further analysis of the so-called Bast's valve, a kind of valve at the entrance to the utriculus, provided answers to this question. In fact, in all cases of Ménière's disease in which the utriculus was also swollen, Bast's Valve was open, or the surrounding membrane was ruptured. This suggests a pressure-regulating function of the valve. This is an invaluable observation considering that the exact function of this valve remains unclear nearly 100 years after its discovery.

Overall, this successful collaboration of KL Krems with Harvard Medical School and Johns Hopkins University makes an important contribution to a better understanding of a serious disease. Thus, it is also fully in line with the research focus of KL Krems: creating real clinical advances for patients.

**Original Publication:** Differential Volume Increase of Endolymphatic Compartments in Ménière's Disease Is Inversely Associated With Membrane Thickness. B. Büki, B. K. Ward & F. Santos. Otol Neurotol. 2023 Jul 18.

**DOI:**10.1097/MAO.0000000000003960

**About Karl Landsteiner University of Health Sciences (2023)**

At Karl Landsteiner University of Health Sciences (KL) in Krems, the comprehensive approach to health and disease is a fundamental objective for research and teaching. With its Europe-wide recognized bachelor-master system, KL is a flexible educational institution that is tailored to the needs of students, the requirements of the labor market as well as the scientific challenges. Currently KL hosts about 700 students in the fields of medicine and psychology. The three university hospitals in Krems, St. Poelten and Tulln as well as ion beam therapy and research centre MedAustron in Wiener Neustadt and the Psychosomatisches Zentrum Waldviertel in Eggenburg ensure clinical teaching and research at the highest quality level. In research, KL focuses on interdisciplinary fields with high relevance to health policy - including medical technology, molecular oncology, mental health and neuroscience, as well as water quality and related health aspects. KL was founded in 2013 and accredited by the Austrian Agency for Quality Assurance and Accreditation (AQ Austria). [www.kl.ac.at/en](http://www.kl.ac.at/en)

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