

# PREDICTING PATHOLOGY

## PROGRESS TOWARDS USING SIFT-MS TO FACILITATE EARLY INTERVENTION FOR AGE RELATED HEARING LOSS

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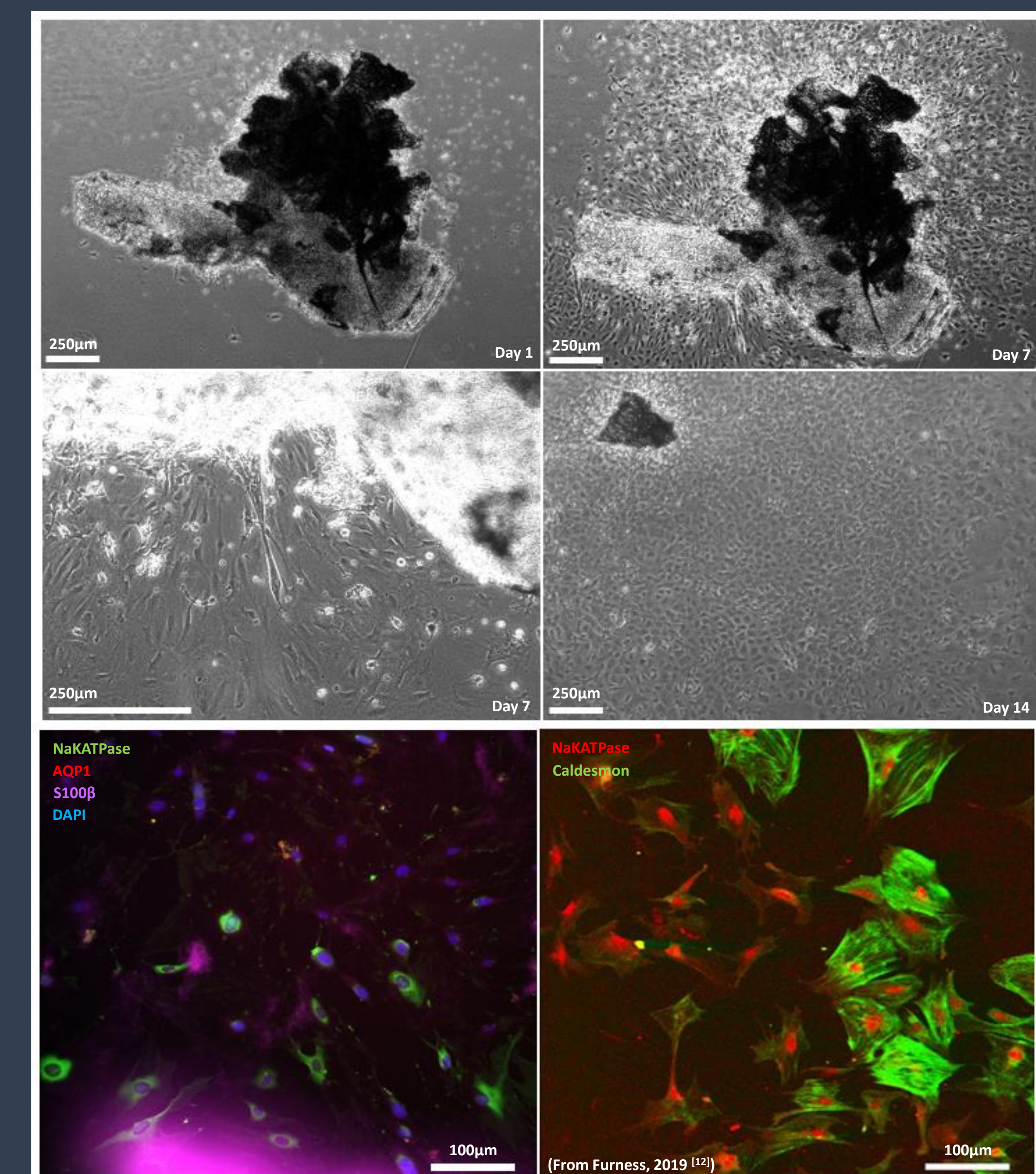
This research aims to develop the ground work for a clinically relevant early detection strategy for ARHL, wherein ear wax samples may be used to ascertain the health of cochlear fibrocytes. From this, pre-symptomatic hearing loss may be established and treated with regenerative therapies- healing hearing loss before it happens.



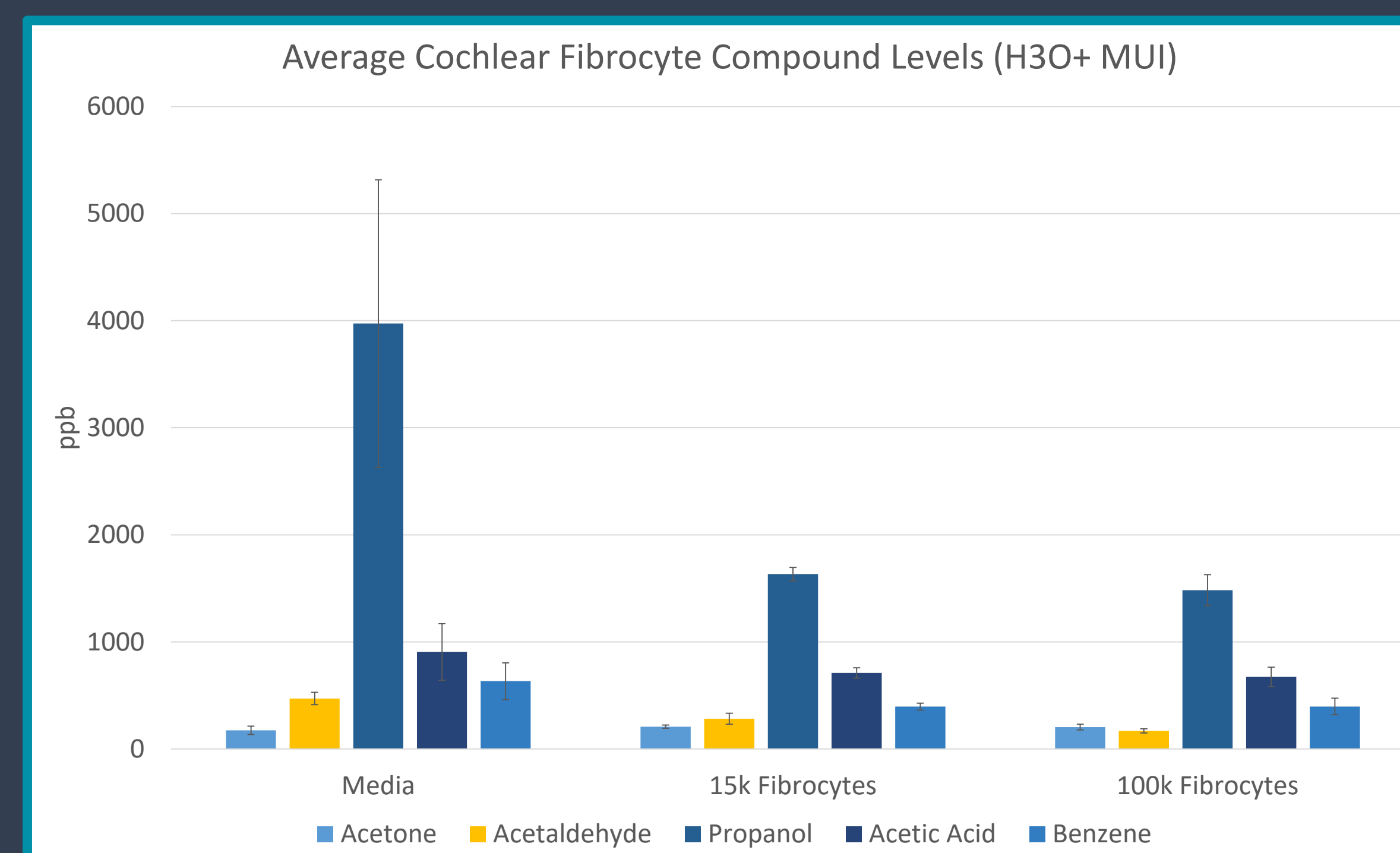
- Age related hearing loss (ARHL) is often accepted as a fact of ageing, affecting the majority of those over 65 years old<sup>[1,2,3,4,5]</sup>.
- In spite of its prevalence, ARHL treatment options are restricted to hearing aids and cochlear implants, which cannot offer continued improvement.
- However, research suggests that in cases of ARHL where the degradation of a support cell type known as cochlear fibrocytes is the leading pathology, (i.e. metabolic ARHL) biological interventions to restore fibrocytes may be possible<sup>[1,6,7,8]</sup>.
- As fibrocytes are not responsible for the sensory aspect of hearing, rather for maintaining the conditions required by sensory cells (cochlear hair cells), their degradation may often precede symptomatic damage (i.e. hearing loss) when optimum conditions are lost<sup>[9, 10, 11]</sup>.
- Thus, regeneration or repair at an early enough time point may allow the prevention, or at least delay, of hearing loss due to fibrocyte damage.

## CELLS AND SMELLS - RESULTS SO FAR

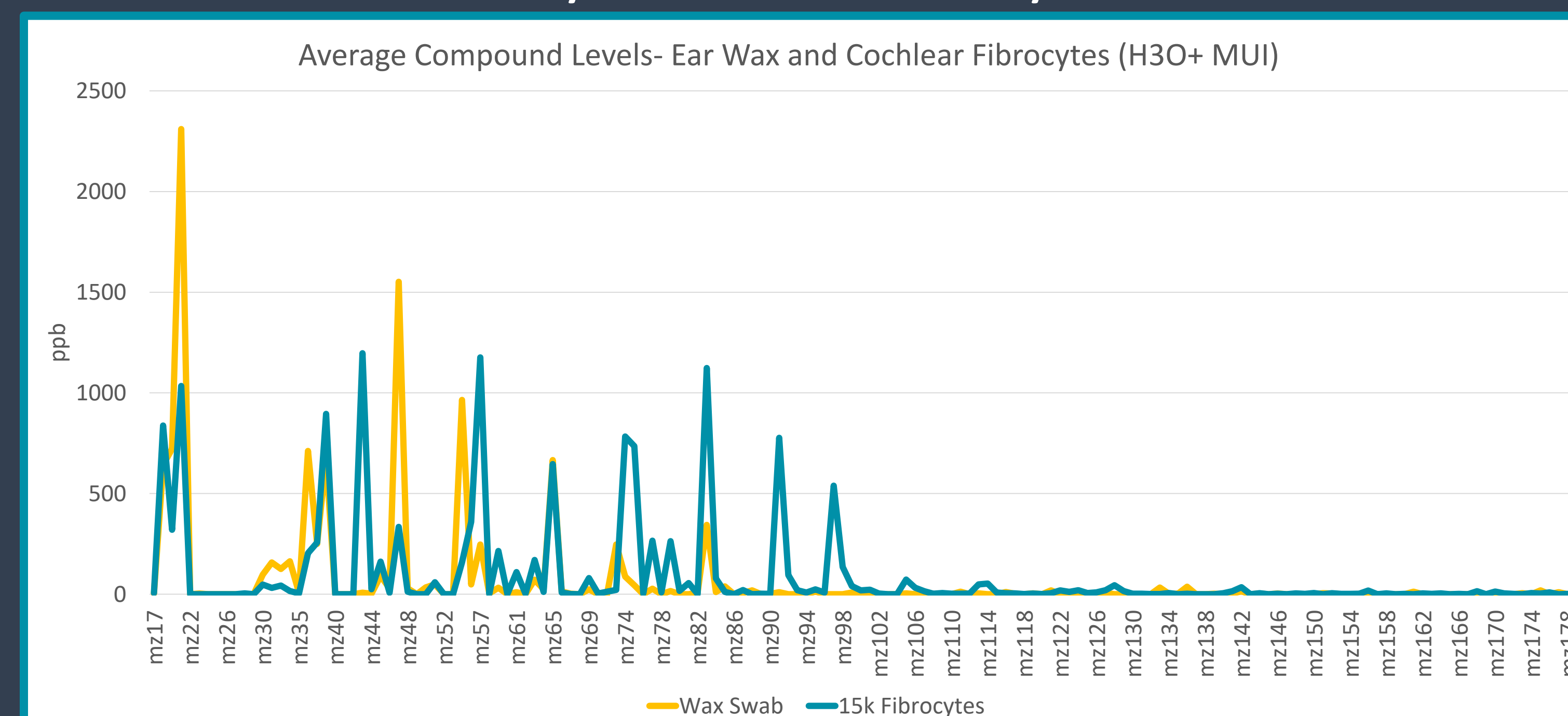
Cells emerge successfully from explanted tissue and stain positively for known markers of cochlear fibrocytes:



VOCs from fibrocytes are distinguishable even at low cell numbers:



A VOC profile of ear wax is identifiable and distinct from that of healthy cochlear fibrocytes in culture:



In steps towards development of an early detection method, this research examined levels of volatile organic compounds (VOCs) in the headspace of murine cochlear fibrocyte cultures and human ear wax samples in real time using selected ion flow tube mass spectrometry (SIFT-MS). Murine cochlear fibrocyte cultures were isolated from tissue explants, with cell type characterised via morphological assessment and immunocytochemistry. VOCs in the headspace of cell and wax samples were measured via SIFT-MS using precursors H3O+ and NO+.

## DEATH AND WAXES- NEXT STEPS

- Establish a volatile organic compound profile of damaged cochlear fibrocytes via SIFT-MS.
- Begin investigation into the detection of cell VOC signals via ear wax.
- Verify SIFT-MS findings using additional spectrometry and spectroscopy methods.

