TOWARDS THE DEVELOPMENT OF EARLY INTERVENTION DIAGNOSTICS FOR METABOLIC AGE RELATED HEARING LOSS

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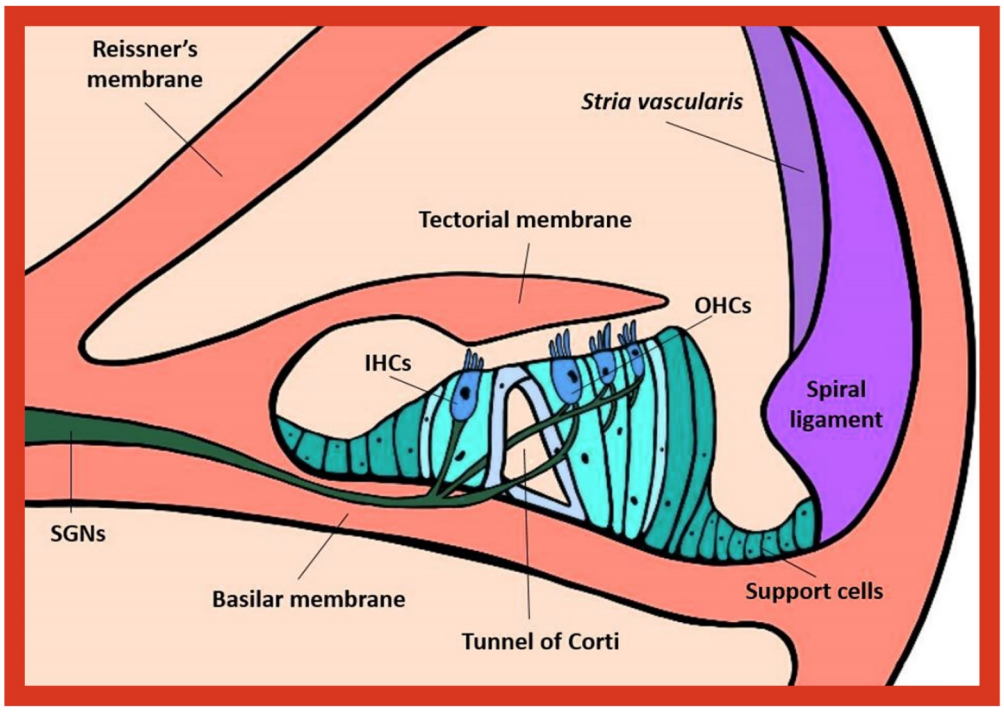
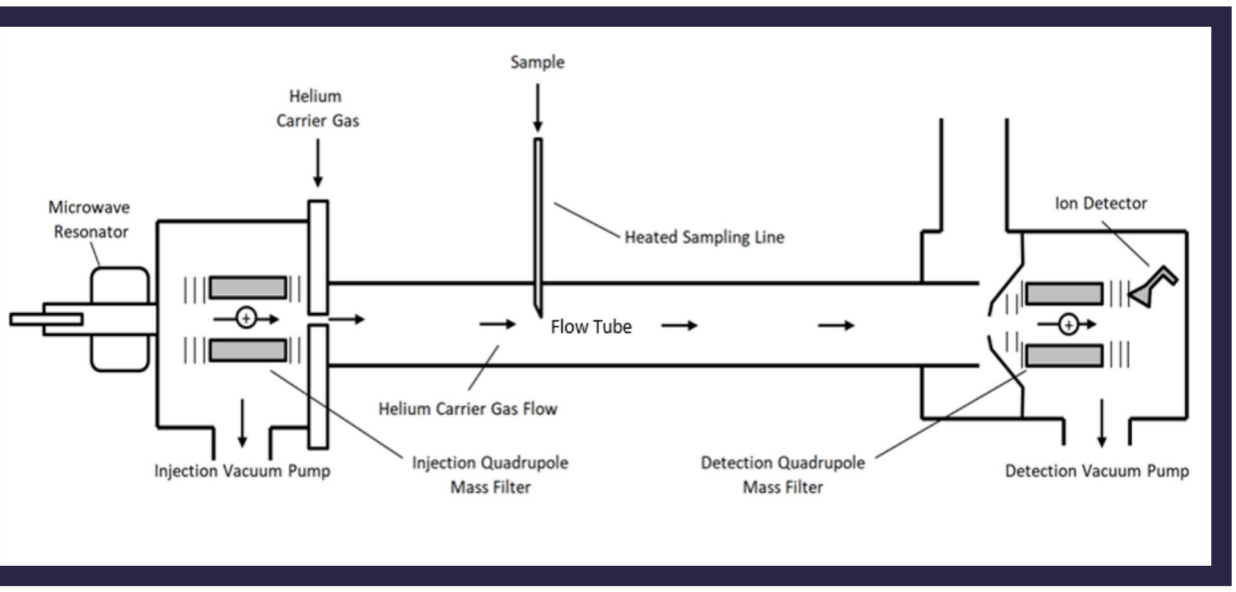
Metabolic Age Related Hearing Loss...

Age related hearing loss (ARHL) is often accepted as a fact of ageing, affecting the majority of those over 65 years old [1,2,3,4,5]. However, despite this acceptance, the progressively worsening condition is highly debilitating, exacerbating physical, social, and cognitive issues, and affecting approximately 299million men and 239million women. In spite of its prevalence, ARHL is relatively under-researched, with treatment options restricted to hearing aids and cochlear implants in more severe cases, options which cannot offer continued improvement over the progression of the illness. However, research would suggest that in cases of ARHL where the degradation of a support cell type known as cochlear fibrocytes (primarily located in the spiral ligament) is the leading pathology, (i.e. metabolic ARHL) biological interventions to restore fibrocytes may be possible [1,6,7,8].





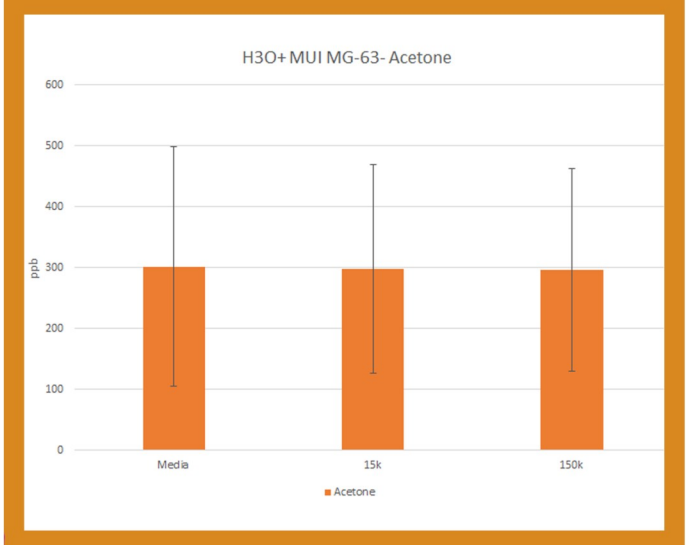
SIFT-MS for Diagnosis...

As fibrocytes are responsible for maintaining cochlear conditions, their degradation may often precede symptomatic damage [9, 10, 11]. Thus, regeneration or repair at an early enough time may allow the prevention of hearing loss. With this in mind, it is clear that an early detection strategy for fibrocyte is needed to facilitate potential rescue of hearing function. For this purpose, the present research uses selected ion flow tube mass spectrometry (SIFT-MS) to monitor cell volatile organic compound profiles.

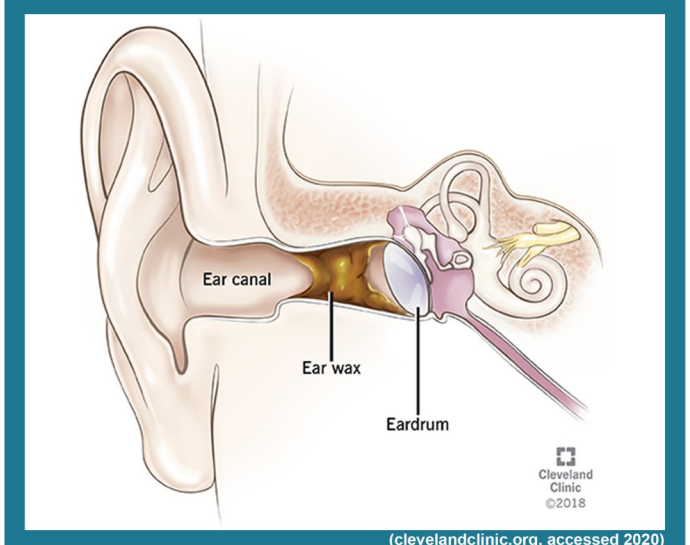
Murine Cochleae...

(Furness, 2020- Dissection Video)

Before Method Refinement...

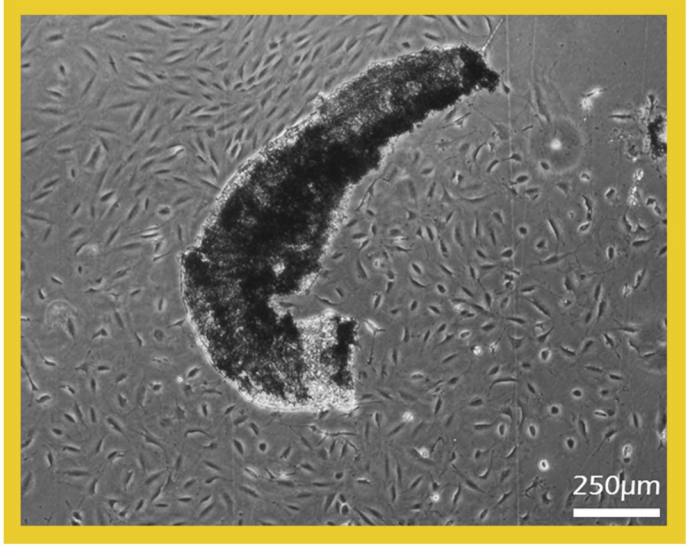


Ear Wax...

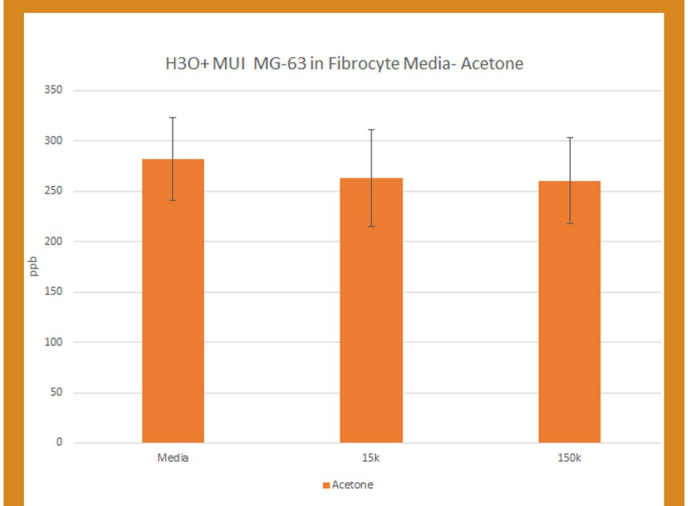


(clevelandclinic.org, accessed 2020)

Successful Cultures...



After Method Refinement...



Non-invasive Diagnoses...

Moving forward, SIFT-MS measurements of human ear wax samples will be taken in order to establish a known SIFT-MS VOC profile. Ear wax, an effective VOC trapping mechanism and indicator of many bodily changes [12, 13], has previously been used in VOC identification and diagnostics, and is an ideal route for non-invasive fibrocyte sampling.

1) Gates and Mills, 2005; 2) Oshima et al., 2010; 3) Stevens et al., 2011; 4) Sánchez-Rodríguez et al., 2016; 5) Watson et al., 2017; 6) Schuknecht & Gacek, 1993; 7) Dubno et al., 2013; 8) Ciorba et al., 2015; 9) Hequembourg & Liberman, 2001; 10) Mahendrasingam et al., 2011; 11)Zhao, 2017; 12) Prokop-Prigge et al., 2014; 13) Barbosa et al., 2019