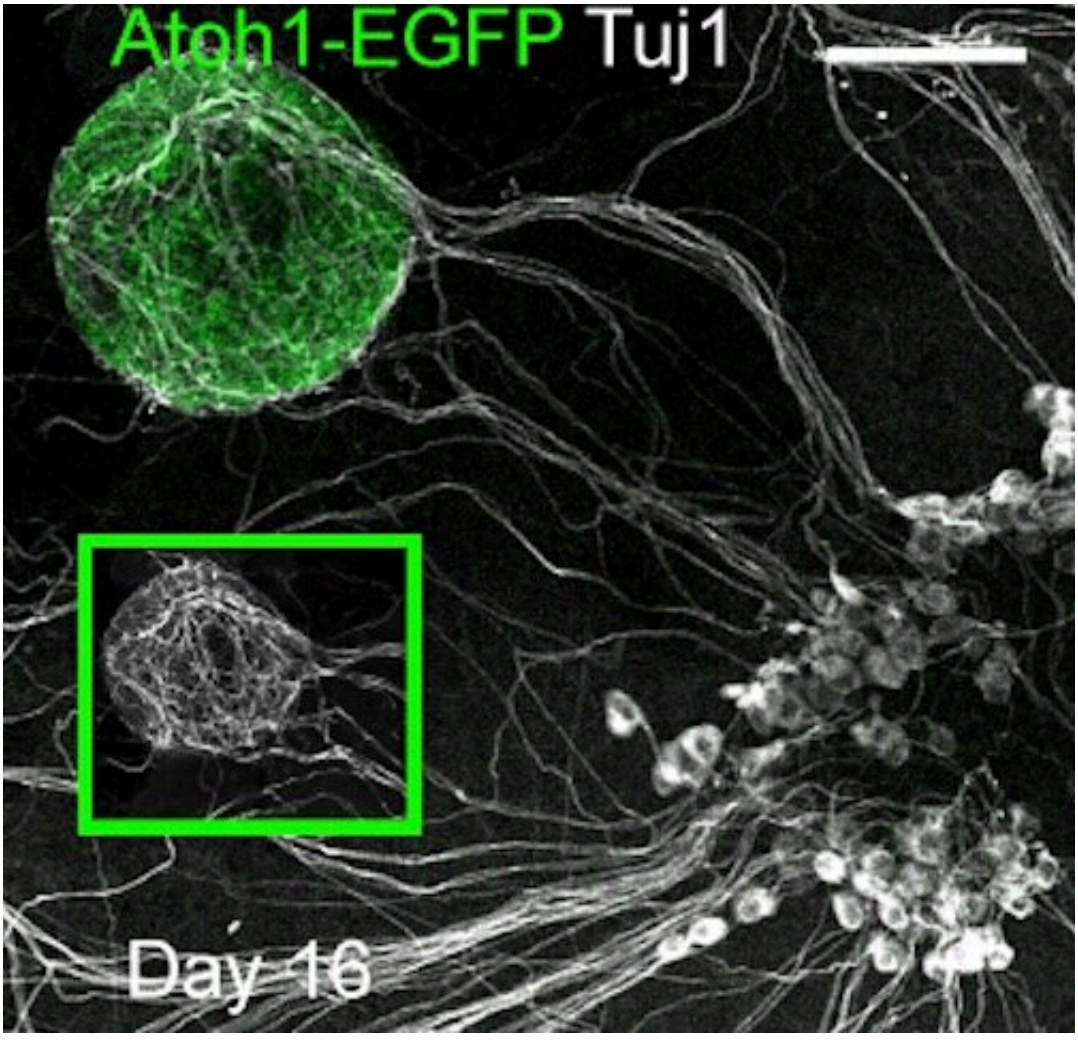
MedicalXpress

Stem cells provide a model to understand sensorineural hearing loss

January 31 2023



Stem cell researchers generated “cochlear organoids with functional synapses for the first time, which provides a platform for deciphering the mechanisms of sensorineural hearing loss,” opening up avenues for investigating new therapeutic approaches. Credit: Fudan University Eye Ear Nose and Throat Hospital in Shanghai, China

Disabling hearing loss affects one in every ten people and up to 25% of people over 60, according to the World Health Organization, and can have both genetic and environmental causes such as infections and noise exposure. Sensorineural hearing loss, the most frequent form of hearing loss, is caused by damage to specialized cells in the cochlea called hair cells (HCs) and spiral ganglion neurons (SGNs), respectively, both of which are essential for hearing.

Hair cells receive sounds as mechanical signals which are then turned into electrical impulses transmitted to the brain by SGNs. Once damaged or lost, the HCs and SGNs do not grow back, thus requiring the use of hearing aids or cochlear implants to facilitate normal / near-normal hearing.

Research into ways of regenerating those cells is limited by the lack of suitable lab-based models of cochlear physiology and function. In a recent paper published in *Stem Cell Reports*, Renjie Chai, Huawei Li, Wenyan Li and colleagues from the Fudan University Eye Ear Nose and Throat Hospital in Shanghai, China address this by generating cochlear avatars in the lab from stem cells.

By carefully fine-tuning cell culture conditions, the researchers succeeded in growing stem cells isolated from mouse cochleae. The stem cells grew as 3D structures, so-called "organoids" and were then directed into cochlear HCs by adjusting culture conditions. Importantly, mouse SGNs added to the cultures connected with the HCs and transmitted electrical signals, an important step towards modeling cochlear function in the dish.

According to the authors, this study has generated "cochlear organoids with functional synapses for the first time, which provides a platform for

deciphering the mechanisms of sensorineural hearing loss," opening up avenues for investigating new therapeutic approaches.

More information: Mingyu Xia et al, Generation of innervated cochlear organoid recapitulates early development of auditory unit, *Stem Cell Reports* (2022). DOI: 10.1016/j.stemcr.2022.11.024. www.cell.com/stem-cell-reports … 2213-6711(22)00557-4

Provided by International Society for Stem Cell Research