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**REVIEW ARTICLE****OPEN ACCESS**

## Tip links and Top Connector Proteins in Stereocilia: a pursuit in hearing loss

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**ABSTRACT**

Hearing depends on the functioning of sensitive micromachinery of the inner ear cochlea. The sound vibrations received in the cochlea is amplified through stereocilia of the hair cells gated by the tip links. Proteins anchoring to the tip link to the cytoskeleton in the stereociliary links to cadherin 23 and protocadherin 15 are the part of the regulatory process that forms the actin core and the transduction apparatus. The tip links and lateral links are maintaining optimal bundle cohesion and stiffness for transduction. The loss of cross-links of the outer hair cells resulting in disarrangement of the stereociliary bundles are the result of Noise Induction leads to permanent sensorineural hearing loss. This review summarizes about the structure, function and composition of stereociliary linkages of the links and how they are relevant to human hearing impairment.

**Keywords:** Ankle link, Lateral links, Noise induced hearing loss, Shaft link, Stereocilia, Tip links

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**INTRODUCTION**

Noise induced hearing loss (NIHL) is defined as hearing impairment due to an exposure of high decibel sound. The normal range of sound is about less than 80dB and the highest level is 150dB. Exposure to loud sound can result in temporary or permanent hearing loss. Noise induce hearing loss is one of the most frequently occurring occupational disease as noise factor is presumed as a most prevalent and common perilous in the worksites. The workers in different industries are exposed to hazardous sound level in workplace; by continuous exposure to loud sound over an extended period of time such as noise generated in mines, manufacturing and fabrication units of industries. Around 30 million adults in the United States are exposed to loud sound level at workplace. Among these 30 million people, one in four will acquired a permanent hearing loss as a result of their occupation [1]. Hearing is the process by which the ear transforms sound vibration into nerve impulses that are transferred to the brain by auditory nerve. Exposure to loud sounds causes injury to sensitive structure in the inner ear hair cells and auditory nerve.

The auditory system is composed of three components: Outer, Middle and Inner ear, which work together to transform sounds from the environment to brain. The inner ear is complex structure, sound waves enter the outer ear and pass through a narrow passage called ear canal which leads to the ear drum. The ear drum can vibrate and these vibrations pass to the middle ear via ossicular chain consists of three tiny bones are malleus, incus and stapes. Malleus link to the tympanic membrane, stapes inserts into the oval window in the inner ear and the incus is in between the malleus and stapes. The vibrations are transferred through ossicular chain into inner ear via stapes. The vibration enters in the inner ear of cochlea and converts sound waves into neural signal. The inner ear consist cochlea and vestibular system responsible for hearing and equilibrium. Cochlea is a snail like structure which is filled with fluid contains perilymph and endolymph in three chambers which are scala tympani, scala media and scala vestibule. Two outer chambers filled with perilymph fluid, third centred chamber i.e. cochlear duct secretes