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Parallel pathways at the auditory periphery

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We should consider the possibility that Low- and High-spontaneous rate (SR) auditory nerve fibers (ANFs) [1] constitute two different parallel pathways at the auditory periphery. The present study used a computational model of the auditory periphery [2] to demonstrate that Low- and High- SR ANFs have contrasting response properties. Anatomical studies suggest that Low- and High- SR ANF types have separate innervation sites (Figure 1A) on the same inner hair cell; lower-SR fibers synapse on the modiolar side and high-SR fibers synapse on the pillar side [3]. My hypothesis, prior to modeling the tuning curves (Figure 1B), was that Low Spontaneous Rate (Low-SR) fibers have a higher threshold for simulation and thus will have demonstrably sharper frequency selectivity than High-SR fibers. The results of the simulation support this framework; Low-SR ANFs were shown to have sharper frequency tuning (Figure 1B) than High-SR ANFs throughout a range of characteristic frequencies (CFs). While Low-SR ANFs have sharper frequency selectivity (Figure 1B), High-SR ANFs have finer temporal resolution, as the rate of change of the mean firing rate in High-SR ANFs was well above that of Low-SR fibers in the simulation (Figure 1C). It would seem that Low-SR and Medium-SR fibers (i.e. Lower-SR fibers) are optimized for "place theory" frequency coding and High-SR fibers are optimized for "volley-theory" synchronous phase locking. Future modeling efforts might maintain the integrity of these two parallel pathways, optimized for fine spectral (Lower-SR) and fine temporal (High-SR) resolution, by separating rather than summing their respective outputs.

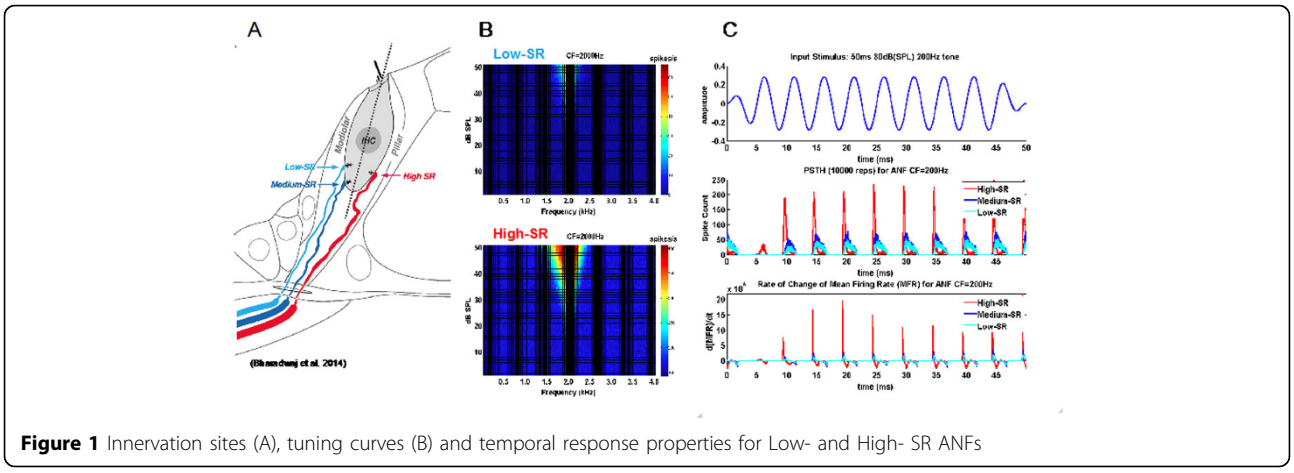

Figure 1 Innervation sites (A), tuning curves (B) and temporal response properties for Low- and High- SR ANFs

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References

1. Liberman MC: **Auditory-nerve response from cats raised in a low-noise chamber.** *J Acoust Soc Am* 1978, **63(2)**:442-455.
2. Zilany MSA, Bruce IC, Carney LH: **Updated parameters and expanded simulation options for a model of the auditory periphery.** *J Acoust Soc Am* 2014, **135**:283-286.
3. Bharadwaj HM, Verhulst S, Shaheen L, Liberman M, Shinn-Cunningham BG: **Cochlear neuropathy and the coding of supra-threshold sound.** *Front Syst Neurosci* 2014, **8(26)**.

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