**Supplementary Materials**

**Impact of auditory experience on structural plasticity of the AIS in the mammalian brain throughout the lifespan**

Eun Jung Kim1, Chenling Feng2, Fidel Santamaria2, and Jun Hee Kim1\*

1The Department of Cellular and Integrative Physiology, UT Health San Antonio, Texas 78229, USA, 2The Department of Biology, University of Texas San Antonio, Texas 78249, USA

\*Corresponding author: Jun Hee Kim, Ph.D. (kimjh@uthscsa.edu)

We implemented a multi-compartmental model of an MNTB neuron based on a previous publication([1](#_ENREF_1), [2](#_ENREF_2)). The model consisted of a soma, a primary dendrite, an axonal hillock, and an axonal initial segment (AIS). The reference model was built to replicate the structure and physiology of HF MNTB neurons in the normal sound environment. The lengths and diameters of each segment are described in Table 1.

Table 1. MNTB neuron compartmental model under normal sound environment.

|  |  |  |
| --- | --- | --- |
| **Segment** | **Length (µm)** | **Diameter (µm)** |
| Dendrite | 40 | 3 |
| Soma (spherical) |  | 20 |
| Hillock | 10.4 | 2 |
| AIS | 13 | 2 |

The MNTB model had the following conductances: leak, sodium (Nav1.1), potassium (KV1.1 and KV3.1), and HCN. The kinetics were obtained from a previous publication. The conductance density were adjusted to replicate the action potential shape and excitability experimentally measured for animals raised in the normal sound environment. For this, we used a Monte Carlo approach that generated random vectors over the parameter space of all the conductances. All simulations consisted in delivering current steps to the soma from 0 to 0.3 nA. For each simulation, we calculated the number of spikes, the height, the width at half-height, and the threshold of the first spike (Figure 1). Table 2 shows the density of each channel and Table 3 shows the kinetics of each conductance.

Table 2. Maximum conductance for each channel expressed in the MNTB neuron model. All in S/cm2x10-3.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Conductance | dendrite | Soma | hillock | AIS |
| Leak | 0.08 | 0.08 | 0.08 | 0.08 |
| NaV1.1 |  |  |  | 362.53 |
| KV3.1 |  | 186.42 |  |  |
| KV1.1 |  |  |  | 2.95 |
| H channel | 0.04 | 0.06 |  |  |