SUPPORTING MATERIALS

Table S1. OHC Hair bundle mechano-transduction parameters

Symbol		Apex	Base	Description	Reference
H	(μm)	5	2	Hair bundle height	1
γ	-	0.11	0.3	Elongation of the gating spring per unit displacement of hair bundle tip	2
A	(ms^{-1})	100*	100	Channel activation rate constant	3
k_{GS}	(mN/m)	6	6	Gating spring stiffness	2
b	(nm)	0.8	0.8	Gating swing	2
c	(nm)	0.7	0.7	Ca binding modification	2, 4
k_B	($ms^{-1}\mu M^{-1}$)	0.4	0.4	Ca binding coefficient	2, 4
K_D^C	(μM)	20	100	Ca dissoc. const. when a channel is closed	2
K_D^O	(μM)	1	1	Ca dissoc. const. when a channel is open	2
C_0	(μM)	1	1	$[Ca^{2+}]$ near the channel when a channel remains closed	5, 6
C_1	(μM)	20	100	$[Ca^{2+}]$ near the channel when a channel remains open	5, 6

* For Fig. 6, $A = 10\ ms^{-1}$ was used for the apical model.

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Table S2. **Organ of Corti structural properties**

Structure	Parameter	Apex**	Base**	Reference
Basilar membrane*	Width Thickness YM_X, YM_Z	280 0.7 1000, 0.1	160 3.8 1000, 0.2	1, 2, 3
OHC soma	Diameter Length YM	8 50 0.015	8 20 0.015	4 4 5, 15
OHC hair bundle	Height Stiffness	5 5	2 50	6, 7, 8, 9
Pillar cells	Diameter YM	4 2	8 20	10, 11 12†
Deiters cell (base, process)	Diameter YM	10, 1 0.1, 0.5	10, 1.5 1, 0.5	10, 11 12†
Reticular lamina (tunnel of Corti, OHC)	Thickness YM_X, YM_Z	5, 2 0.4, 0.04	5, 2 4, 0.4	
Tectorial membrane (root, body)	Width Thickness YM_X YM_Z	105, 105 25, 50 4e-3, 1e-3 50e-6	40, 40 25, 30 0.04,0.01 500e-6	13, 14‡

Dimensions are in μm for length, MPa for YM (Young's modulus) and mN/m for stiffness.
*We did not consider the difference between the acuate and pectinate zone.
** All the parameter values have a longitudinal gradient. Even within each apical or basal finite element model, the values are exponentially graded. The values at two points presented here set the gradient.
† The pillar cell has orthogonal property: stiff in the axial direction because of its bundled micro-tubules. Because isotropic property was used for simplicity, the pillar cell in this work has comparable bending stiffness to the orthotropic one, but more compliant in the axial direction.
‡ Values of these YM are from ref#13. The ratio between the body and the root of TM is taken from ref#14.

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