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Supplementary Materials for

Tandem pore domain acid-sensitive K channel 3 (TASK-3) regulates visual sensitivity in healthy and aging retina

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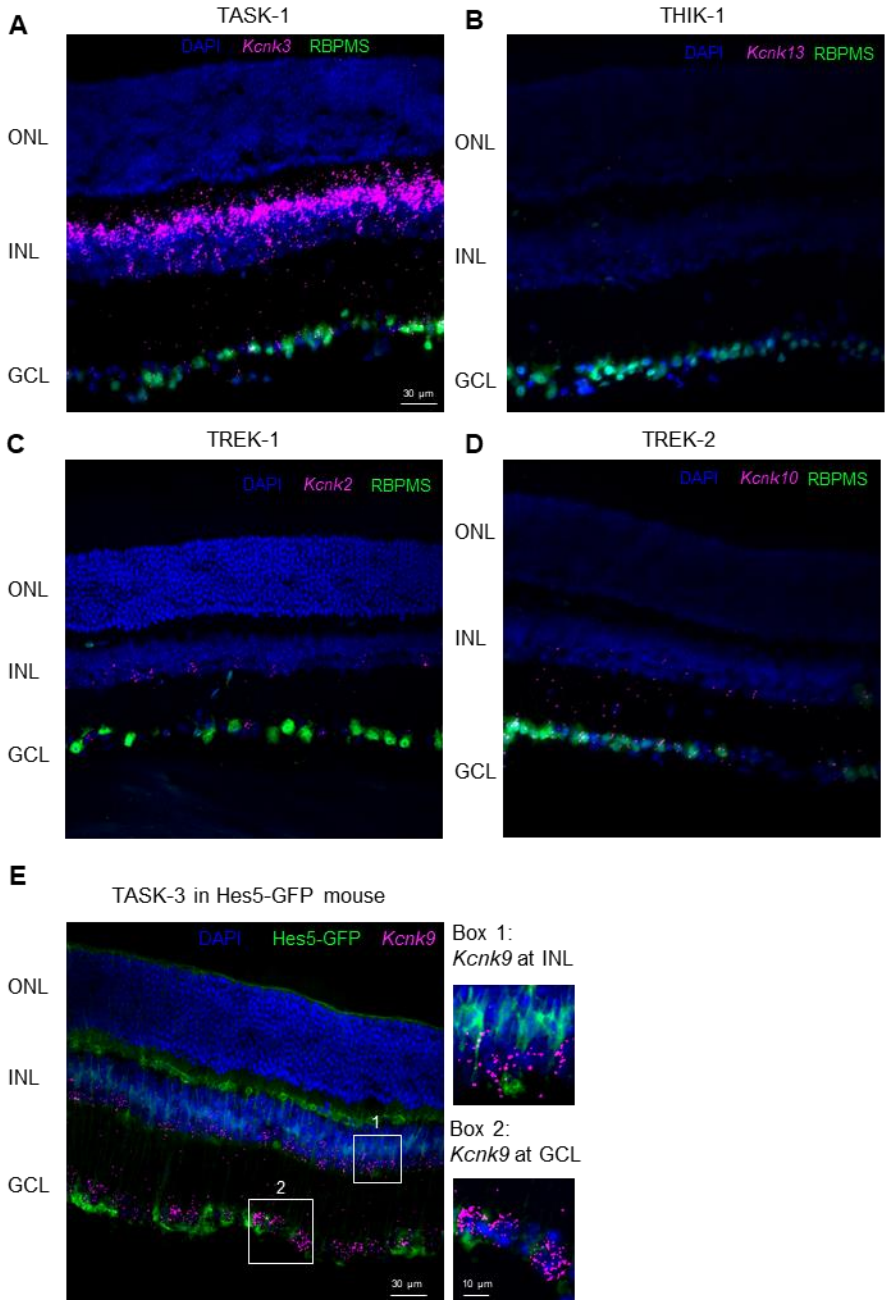
This PDF file includes:

Figs. S1 to S8

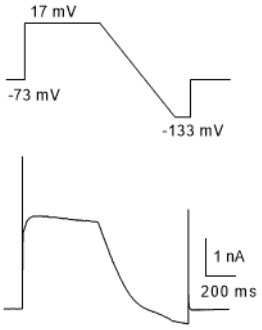
Figure S1.



***In situ* RNA hybridization of K2Ps in mouse retina**

(A-D) RNAscope for TASK-1 (*Kcnk3*) (A), THIK-1 (*Kcnk13*) (B), TREK-1 (*Kcnk2*) (C), and TREK-2 (*Kcnk10*) (D) with IHC for RBPMS (green) in C57BL/6J mouse retina. **(E)** RNAscope for TASK-3 (*Kcnk9,* magenta) in Hes5-GFP mouse retina (left). The zoom-in views of the white boxes (right).

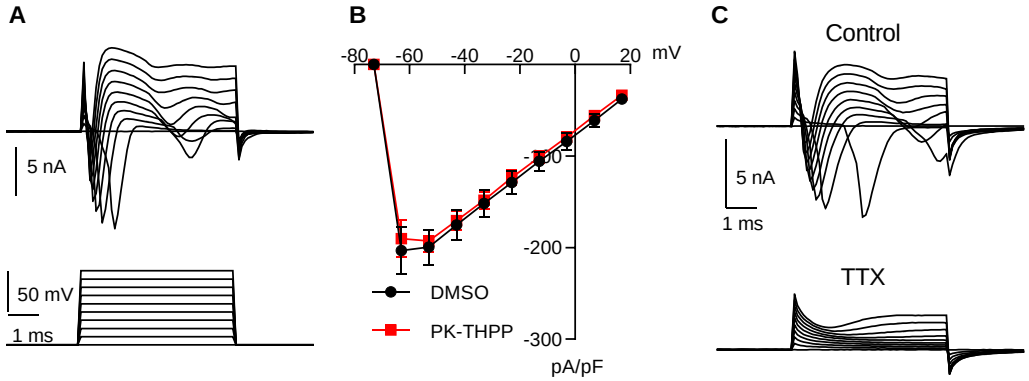
Figure S2



Example trace of RGC current recording

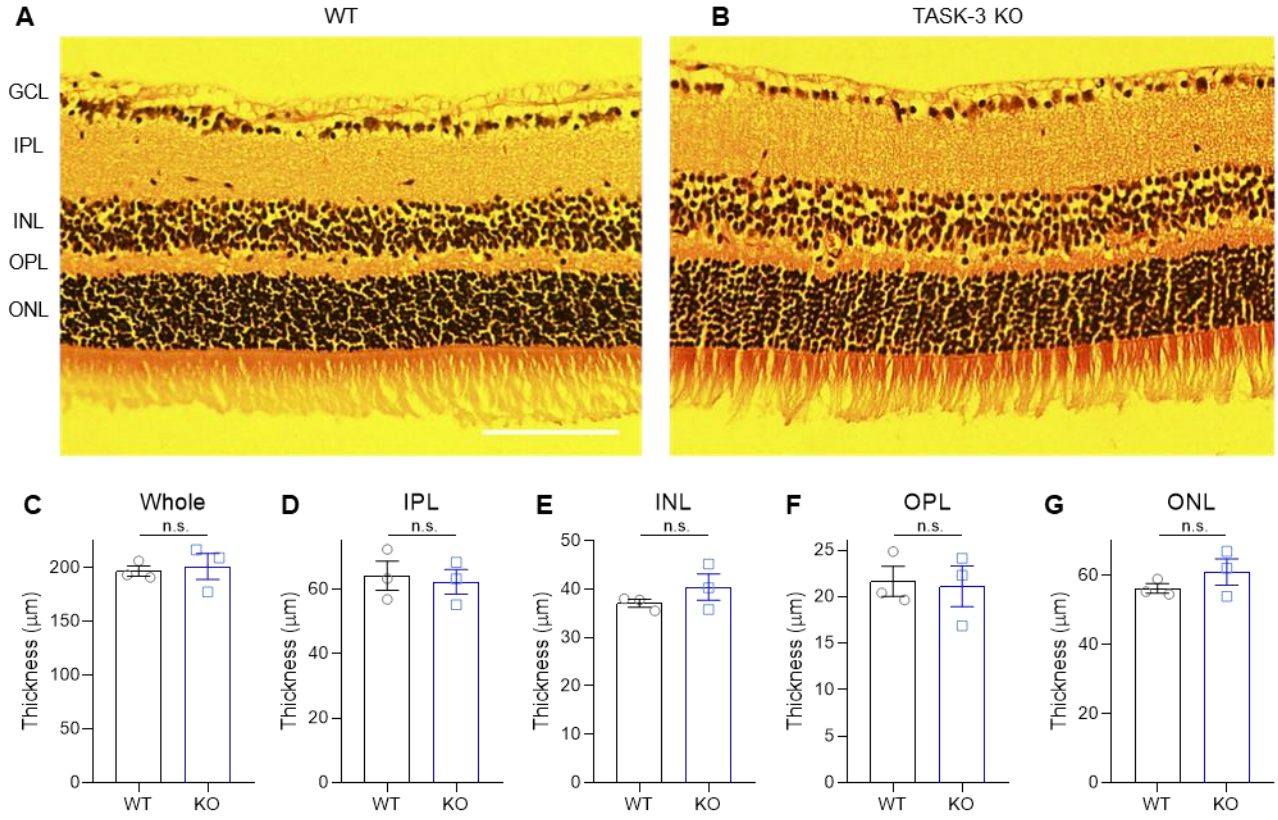
An example trace of RGC current recording under voltage clamping (bottom) and the protocol (top). The holding voltage were clamped at +17 mV for 500 ms and ramped to -133 mV within 500 ms in the presence of tetrodotoxin (TTX, 500 nM) and 4-aminopyridine (4-AP, 5 mM) in bath.

Figure S3



PK-THPP does not affect TTX-sensitive sodium current in RGCs.
(A) Up: examples of current traces elicited by voltage steps. Bottom: the voltage step protocol. **(B)** Average I-V curve of the initiated inward current in vehicle control (DMSO) and in TASK-3 specifical antagonist PK-THPP (3 μM, n = 11 cells). Data are presented as mean ± SEM. **(C)** Up: examples of current traces elicited by voltage steps showed in (A) in control bath. Bottom: in the same cell, examples of current traces elicited by voltage steps after surperfusing TTX (500 nM) in bath.

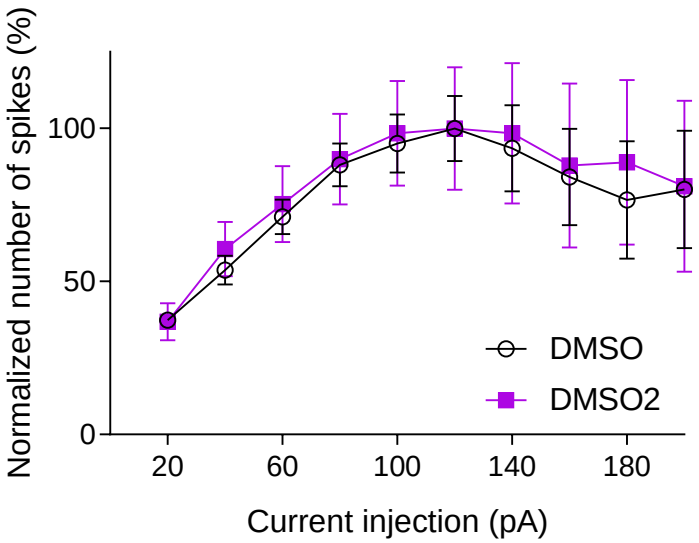
Figure S4



TASK-3 KO does not change retina anatomy

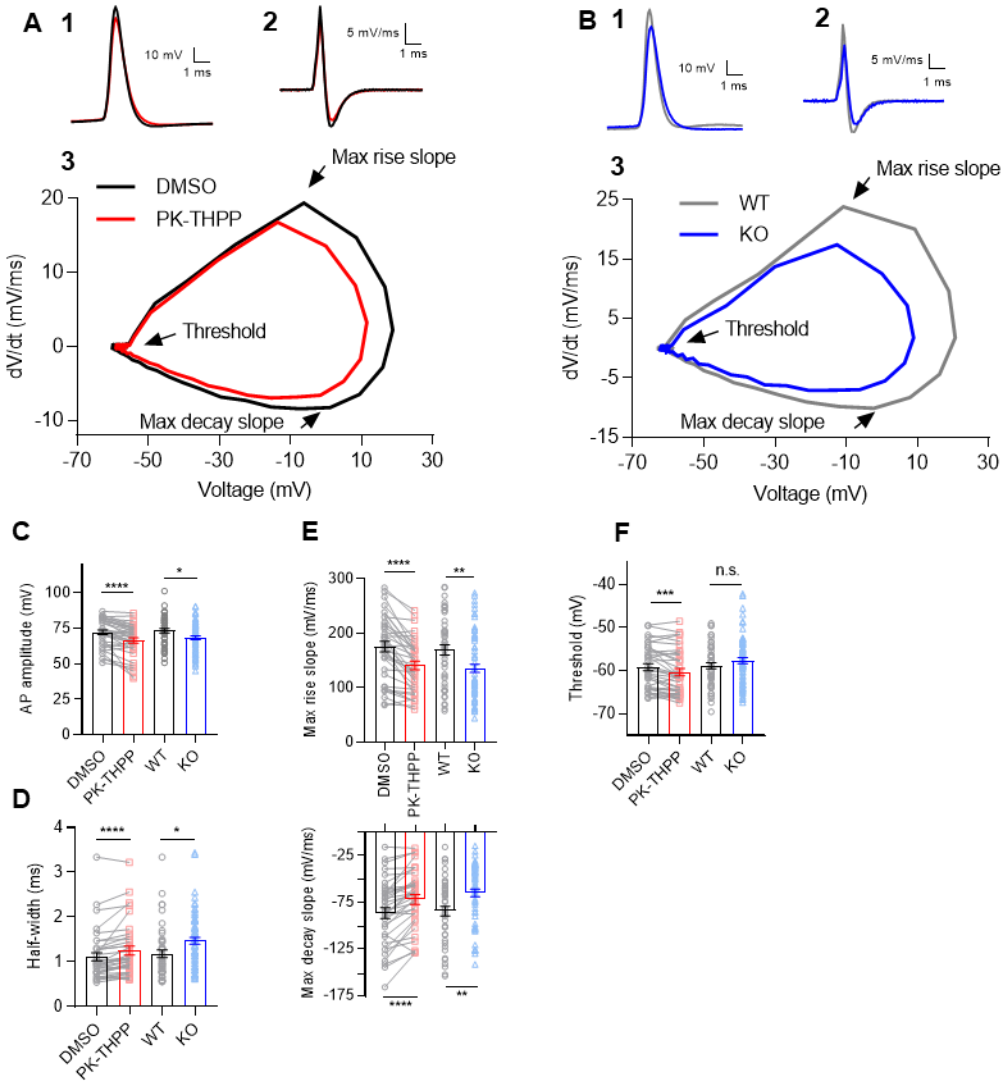
(A-B) Hematoxylin and eosin stain of retinal slices from WT (A) and TASK-3 KO (B) mice. Scale bar: 100 µm. **(C-G)** Bar graphs of whole (C), IPL (D), INL (E), OPL (F), and ONL (G) thickness of the retina from WT and TASK-3 KO mice. (n = 4, unpaired *t*-test). All data are presented as mean ± SEM. n.s. not significant.

Figure S5



The number of action potential is not declined in DMSO
Average number of action potentials under varied current injection were recorded in DMSO twice (n = 7, paired *t*-test).

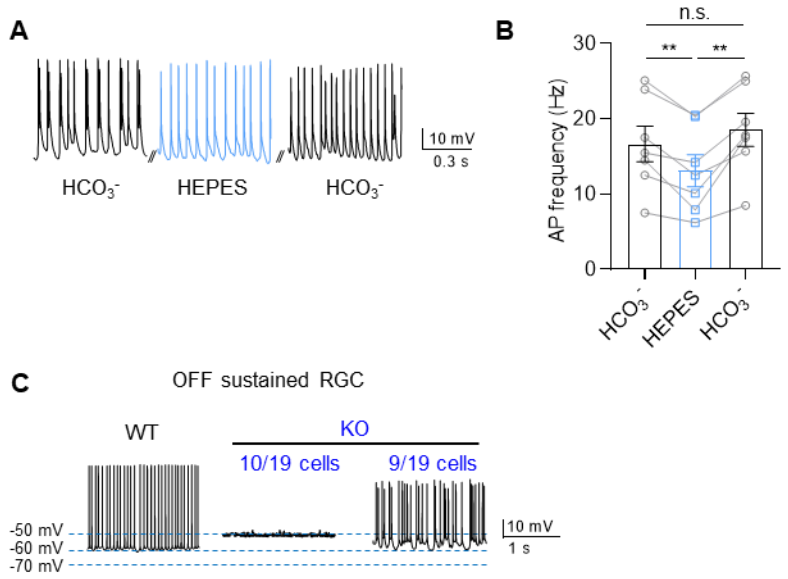
Figure S6



The profile of initial action potentials

(A) A1: Examples of initial action potentials of RGCs in DMSO and followed in PK-THPP (3 μM). **A2:** The first derivatives for the APs of (A1). **A3:** The phase plane plots of APs shown in (A1), illustrating threshold, maximal rise slope, and maximal decay slope. **(B)** Similar with (A), examples of initial APs of RGCS from WT and TASK-3 KO mice. **(C-F)** Bar graphs of properties of AP in DMSO, PK-THPP, WT, and TASK-3 KO. **C:** AP amplitude; **D:** Half-width; **E:** top: Max rise slope; bottom: Max decay slope; **F:** Threshold (DMSO vs PK-THPP, n = 37, paired *t*-test; WT vs KO n = 47 to 66, unpaired *t*-test). All data are presented as mean ± SEM. n.s. not significant, * $P < 0.05$, ** $P < 0.01$, **** $P < 0.0001$.

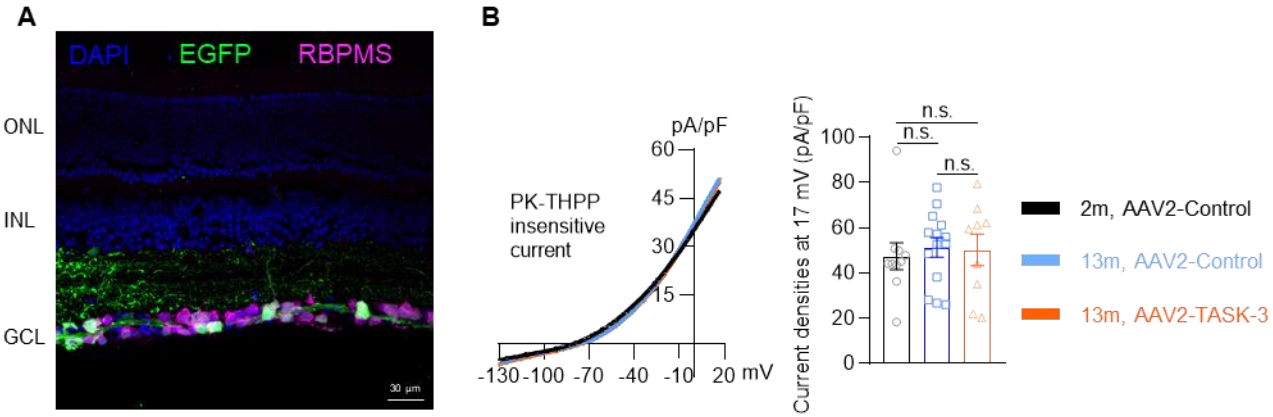
Figure S7



Action potentials recorded in OFF sustained RGCs

(A) Examples of spontaneous APs from dark-adapted OFF sustained RGCs of WT mice. APs were recorded with HCO_3^- buffer, followed with HEPES buffer (10 mM), and washed out with HCO_3^- buffer again in the same cells. **(B)** Bar graph of spontaneous APs frequency recorded from WT OFF sustained RGCs with different pH buffers. The APs were recorded with HCO_3^- buffer, followed with HEPES buffer (10 mM), and washed out with HCO_3^- buffer in the same cells. (n = 7, one-way ANOVA test with Tukey's post hoc test). **(C)** Examples of spontaneous APs from dark-adapted OFF sustained RGCs of WT and KO mice. Dashed lines represented different membrane potentials. All data are presented as mean ± SEM. n.s. not significant, ** $P < 0.01$.

Figure S8



The supplementary data for TASK-3 overexpression experiments

(A) Immunohistochemistry for RBPMS (magenta) in the retina slice of 2-month-old mouse intravitreally injected with control virus (AAV2-Ple345(NEFL)-EGFP). **(B)** PK-THPP-insensitive currents of RGCs recorded from AAV2-Control and AAV2-TASK-3 injected eyes (n = 9 to 14, one-way ANOVA test with Tukey's post hoc test).