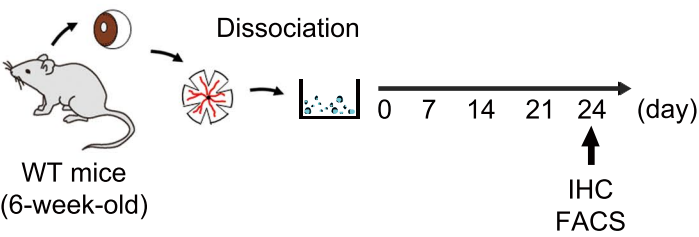
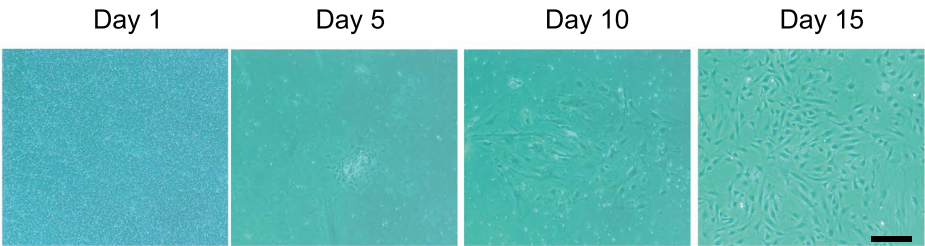


Supplementary Figure 1.

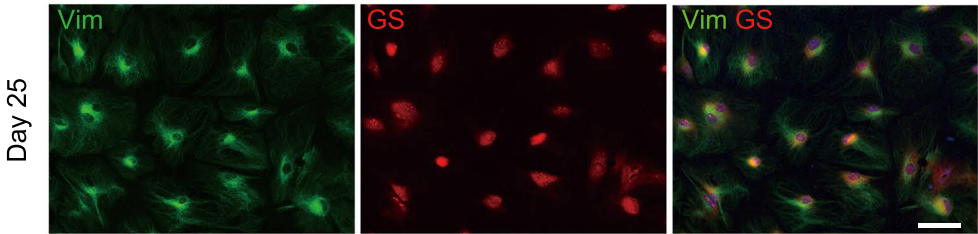
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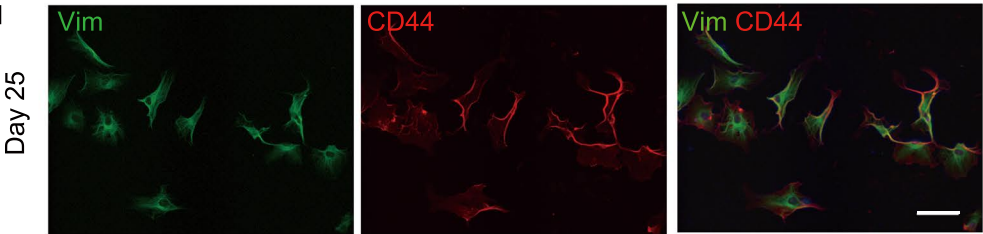
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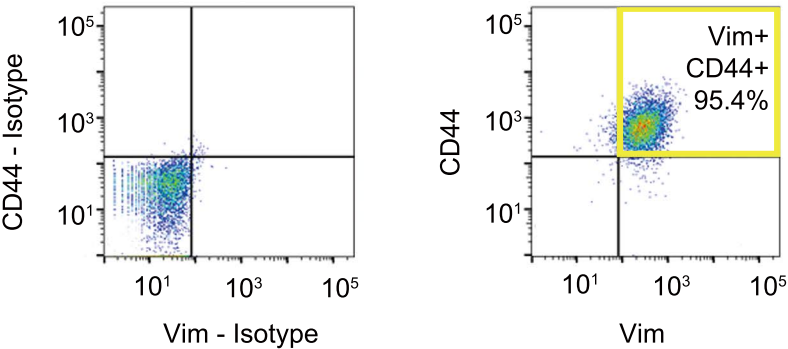
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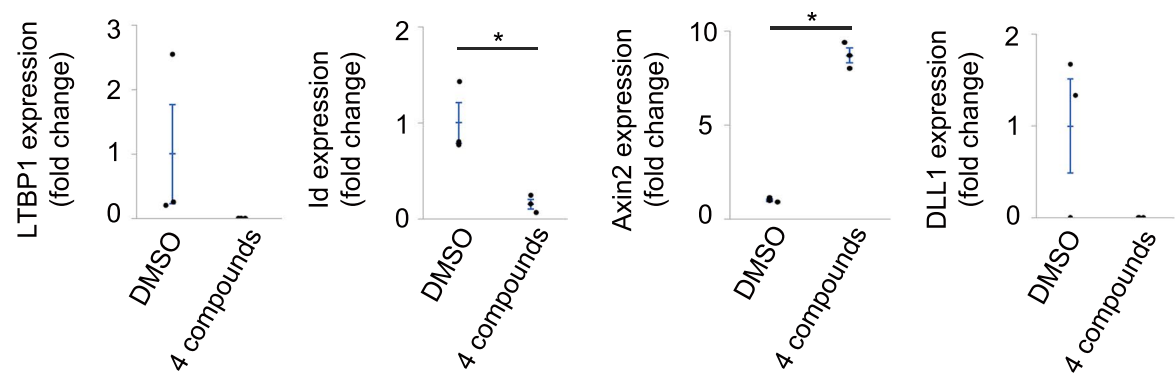
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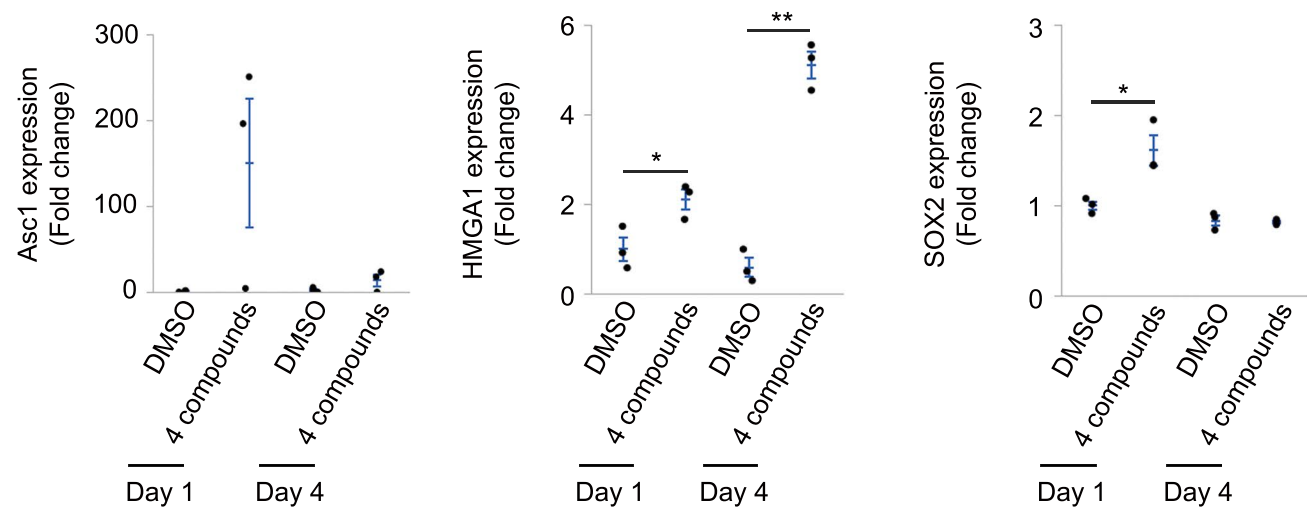
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Supplementary Figure 2.

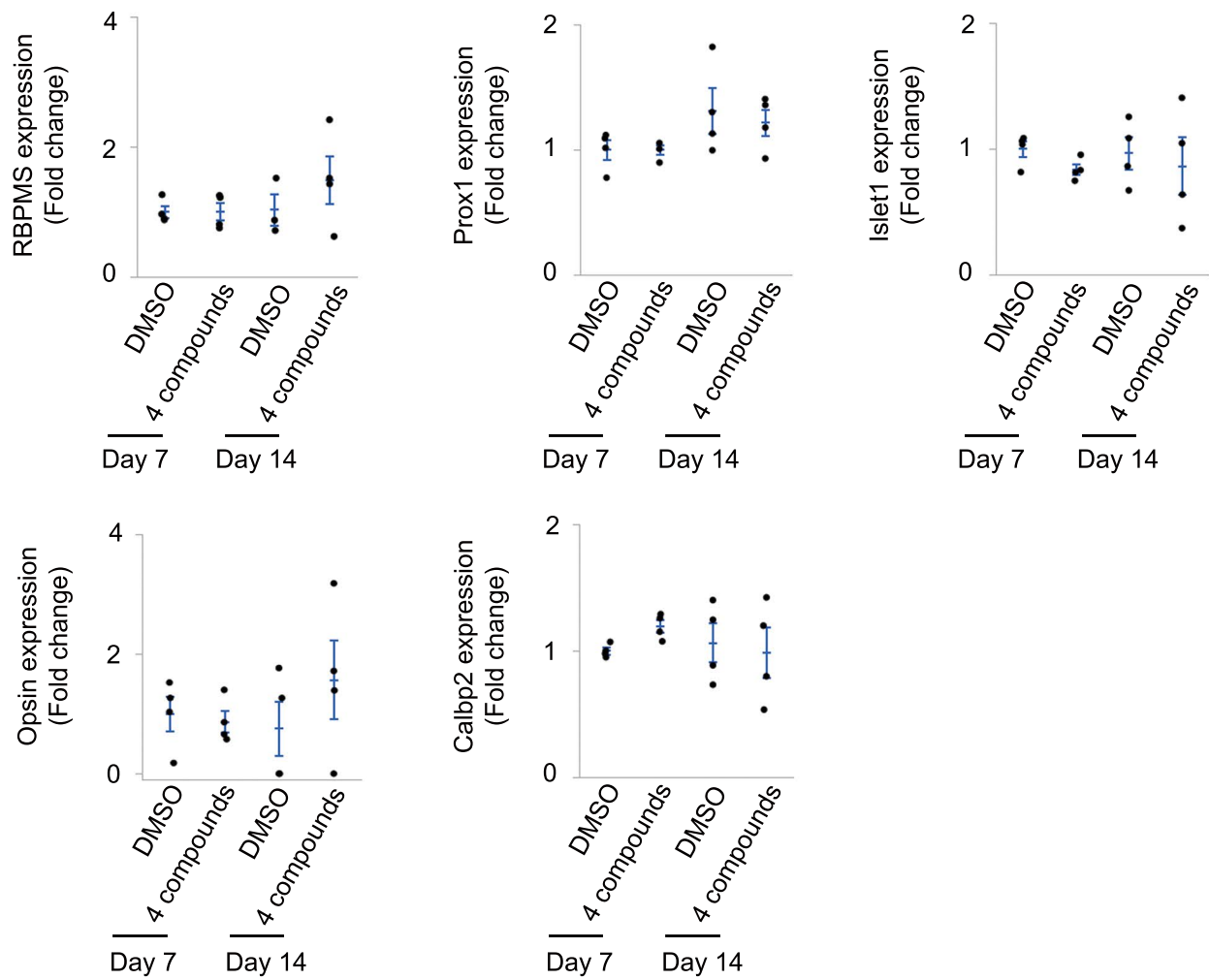


Supplementary Figure 3.

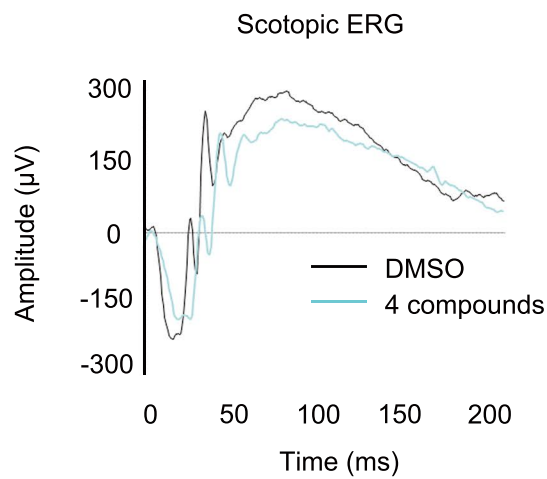


Supplementary Figure 4.

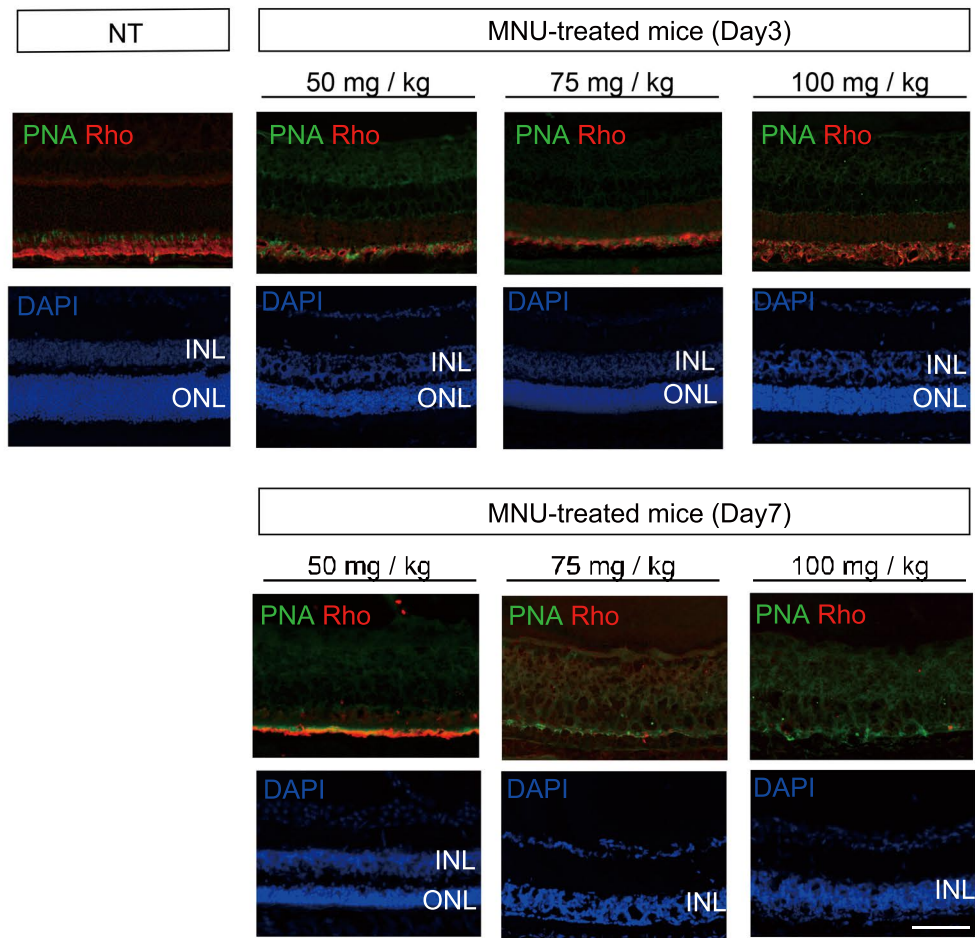
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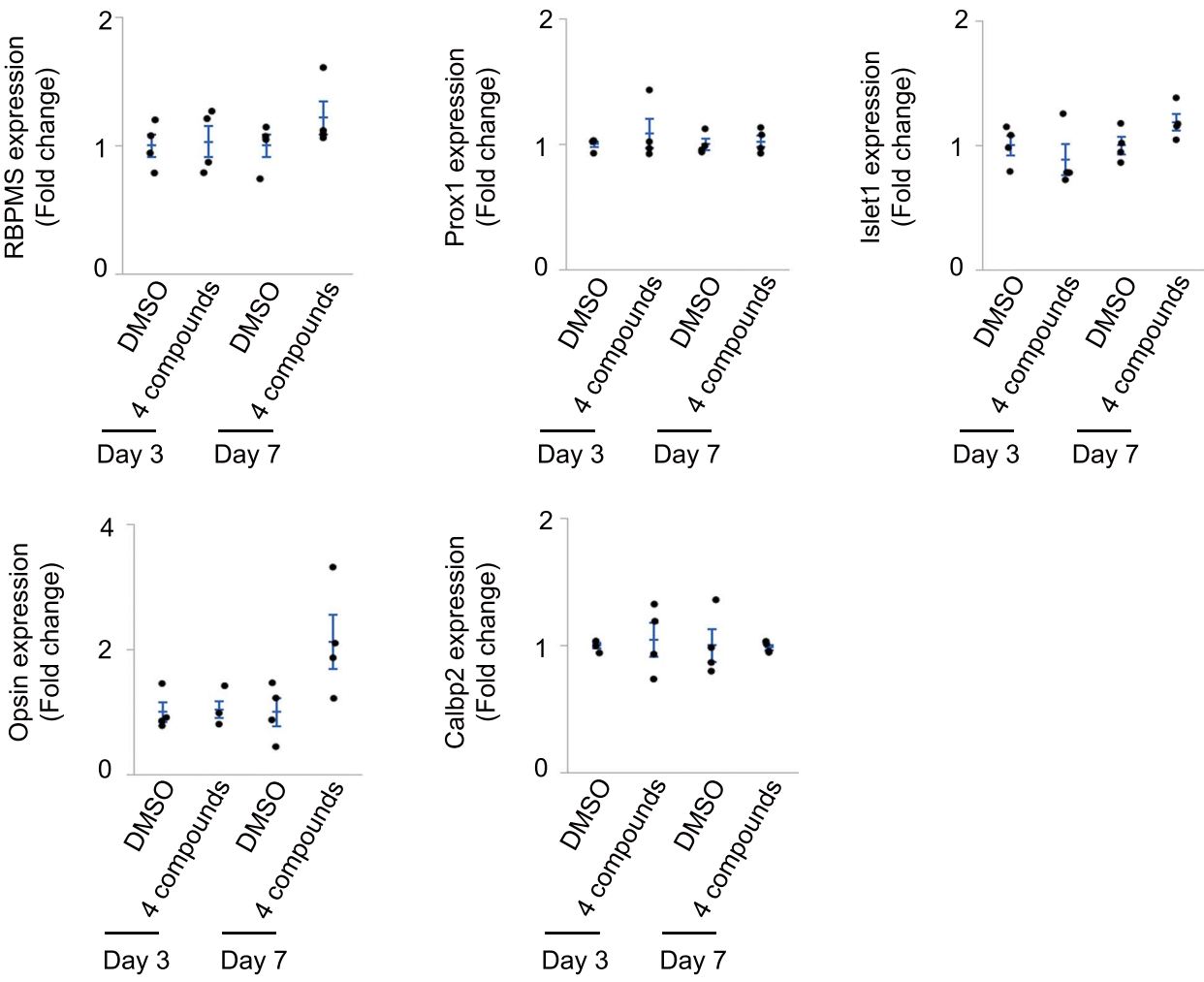
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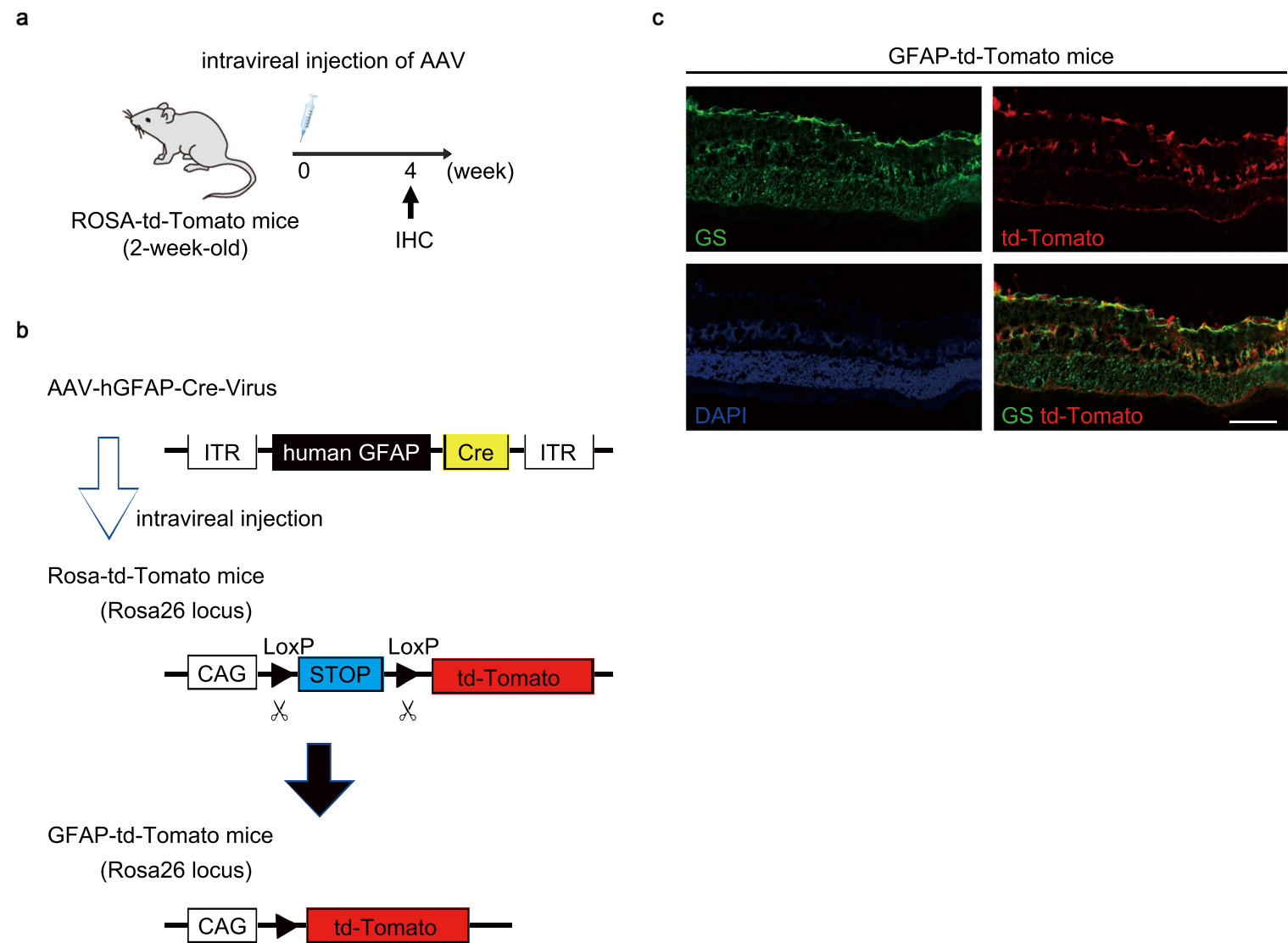
Supplementary Figure 5.



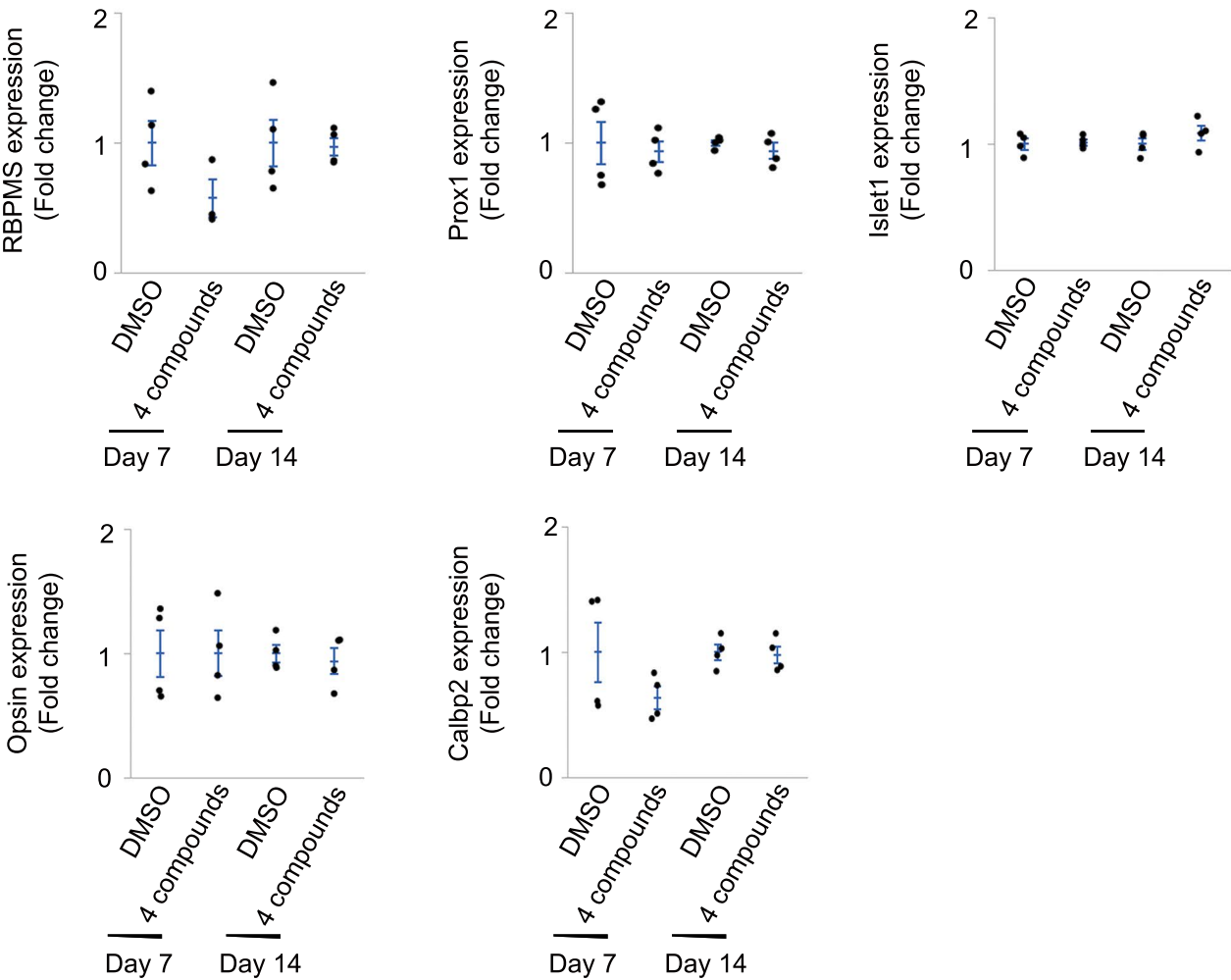
Supplementary Figure 6.



Supplementary Figure 7.



Supplementary Figure 8.



Supplementary Table 1. Primer sequences

Gene	Forward	Reverse
(Mouse)		
B-actin	GATGACCCAGATCATG	GGAGAGCATAGCCCTC
Rho	TTGCCACACTTGGAGGTGAA	CCACCACGTAGCGCTCAAT
CD44	GGGACGGTGGAAGAGAGGAA	CCCAATCTTCATGTCCACAC
Ki67	AGGGTAACTCGTGGAACCAA	TTAACTTCTTGGTGCATACAATGTC
PDE6b	GCAGCACTTTTTGAACTGGTG	CATTGCGCTGGCGGTACATA
RBPMS	GTACCCAGCGGAGTTAGCG	AAGACAGGTGTGTTGGGCTTT
Prox1	AGAAGGGTTGACATTGGAGTGA	TGCGTGTTGCACCACAGAATA
Islet1	ATGATGGTGGTTTACAGGCTAAC	TCGATGCTACTTCACTGCCAG
Opsin	TGTACATGGTCAACAATCGGA	ACACCATCTCCAGAATGCAAG
Calbp2	AGTACACCCAGACCATACTACG	GGCCAAGGACATGACACTCTT
Ascl1	GCAACCGGGTCAAGTTGGT	GTCGTTGGAGTAGTTGGGGG
HMGA1	CTCCAGGGAGGAAACCAAG	CAGAGGACTCCTGGGAGATG
SOX2	CATCCACTTCTACCCACCTT	AGCTCCCTGTCAGGTCCTT
LTBP2	AACAGCACCAACCACTGTATC	CCTGGCATTCTGAGGGTCAAA
Id	CCTAGCTGTTGCTGAAGGC	CTCCGACAGACCAAGTACCAC
Axin2	TGACTCTCCTTCCAGATCCCA	TGCCCACACTAGGCTGACA
DLL1	CAGGACCTTCTTTGCGGTATG	AAGGGGAATCGGATGGGGTT
Nxn1	GAAGTGGAGACAGAGGCAGA	AAGAAGTCTTTGAGGACTGGG
(Rat)		
B-actin	CCCGCGAGTACAACCT	CGTCATCCATGGCGAACT
Rho	AACCTTGAGGGCTTCTTTGCCA	AAGTTGCTCATGGGCTTGCAGA
GS	TACCCGAGTGGAACCTTGATG	TAAAGTTGGTGTGGCAGCCTG

Legends to Supplementary Figure 1-8.

Supplementary Figure 1. Isolation of primary MCs from the retina.

a Purification of primary MCs. **b** Microscopic images of cultured cells. Scale bar = 200 μm . **c** Immunofluorescence of Vim (green) and GS (red) expression on day 24. Scale bar = 100 μm . **d** Immunofluorescence of Vim (green) and CD44 (red). Scale bar = 100 μm . **e** Results of the FACS analysis. Vim⁺ CD44⁺ cells accounted for 95.4% of the total cells.

Supplementary Figure 2. Changes in expression of downstream molecules of each compound.

Real-time qPCR results of downstream molecules in each pathway of the four compounds on day 7 after stimulation. The expression of LTBP1 and DLL1 was below the detection sensitivity in the compound group. Inhibitor of DNA binding (Id) expression was significantly decreased, and Axin2 expression was clearly increased in the compound group. Axin2, downstream molecule of Wnt/ β -catenin pathway; LTBP1, downstream molecule of TGF- β pathway; Id, downstream molecule of BMP pathway; DLL1, downstream molecule of the Notch pathway.

All data are presented as the mean $\pm$ SEM. $n = 3$, $*P < 0.05$, Student's t -test.

Supplementary Figure 3. Upregulation of neural differentiation-related genes after the administration of 4 compounds.

Real-time qPCR results of Ascl1, HMGA, and SOX2 expression on days 1 and 4 after the administration of the four compounds. Ascl1 expression peaked on day 1. HMGA expression significantly increased on days 1 and 4, and SOX2 expression increased on day 1 by the four compounds.

All data are presented as the mean $\pm$ SEM. $n = 3$, $*P < 0.05$, $**P < 0.01$, Student's *t*-test.

Supplementary Figure 4. Effects of compounds on expression of neural markers other than Rho and waveforms of ERG in WT mice.

a Real-time qPCR results of retinal neuron specific markers from the whole retina on days 7 and 14 after intravitreal injection of the four compounds. $n = 4$. **b** Scotopic responses of ERGs on day 7 after intravitreal injection of the four compounds. ERGs showed no clear differences between the control and compound-stimulated groups. $n = 4$.

All data are mean $\pm$ SEM.

Supplementary Figure 5. Differences in outer retinal damage due to MNU concentration.

Immunohistochemistry of PNA (green) and Rho (red) on days 3 and 7 at 50, 75, and 100 mg/kg MNU-treated mice respectively. It has been shown that 75 mg/kg is sufficient to cause loss of photoreceptors on day 7 post-dose. Scale bar = 100 μ m.

Supplementary Figure 6. Effects of compounds on expression of neural markers other than Rho in MNU-treated mice.

Real-time qPCR results of retinal neuron specific markers from the whole retina on days 3 and 7 after intravitreal injection of the four compounds. All data are presented as the mean $\pm$ SEM. n = 4.

Supplementary Figure 7. Introduction of td-Tomato proteins into MCs by Cre-LoxP system.

a Time course of *in vivo* experiments for MC lineage tracing using pAAV.GFAP.Cre.WPRE.hGH and Rosa-td-Tomato mice. Four weeks after AAV injection, we tested whether td-Tomato could be efficiently induced into MC. AAV, pAAV.GFAP.Cre.WPRE.hGH

b Schematic images of the introduction of td-Tomato protein for MCs using the Cre-LoxP system.

c Immunohistochemistry of colocalization of td-Tomato (red) and GS (green) in Rosa-td-Tomato mice 4 weeks after AAV injection. Scale bar = 100 μ m.

Supplementary Figure 8. Effects of compounds on expression of neural markers other than Rho in rd10 mice.

Real-time qPCR results of retinal neuron specific markers from the whole retina on days 7 and 14 after intravitreal injection of the four compounds. All data are presented as the mean $\pm$ SEM. n = 4.