Supplemental Information

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Supplemental Figure 1. BMI treatment for 48 hr significantly increased mIPSC amplitude and frequency.

A, Representative mIPSC recordings and average waveforms for each condition. **B,** Average mIPSC amplitude from Ctrl (15.45 ± 0.66 pA) and BMI-treated neurons (22.34 ± 1.33 pA, $p < 0.001$). **C,** Average mIPSC frequency from Ctrl (1.74 ± 0.17 Hz) and BMI-treated neurons (2.53 ± 0.23 Hz, $p < 0.01$). **$p < 0.01$, ***$p < 0.001$; error bars represent S.E.M.; number of neurons as indicated in bar graphs.

Supplemental Figure 2. No changes in mEPSCs at 4 hr.

A, Representative mEPSC recordings and average waveforms for each condition. **B,** BMI treatment did not affect mEPSC amplitude (Ctrl: 16.94 ± 0.73 pA; BMI: 18.10 ± 0.94 pA, $p = 0.33$). **C,** BMI treatment did not affect mEPSC frequency (Ctrl: 1.86 ± 0.28 Hz; BMI: 1.99 ± 0.30 Hz, $p = 0.74$). Error bars represent S.E.M.; number of neurons as indicated in bar graphs.

Supplemental Figure 3. Representative image frames of neurons treated with BMI and immuostained for various synaptic proteins.

A-C, Representative image frames of Ctrl and BMI-treated neurons immunostained with antibodies as indicated. The red box depicted the segment of dendrite shown as examples to the right of each image and in Figure 2. Scale bar is 5 μm.

Supplemental Figure 4. GABA-induced currents following BMI Treatment and paired-pulse ratios of eIPSCs.

A, Representative recordings of GABA-induced currents from Ctrl and BMI treated neurons. **B,** Average GABA-induced currents in Ctrl (-4892.43 ± 217.09 pA) and BMI-treated neurons (-6058.85 ± 275.08 pA, $p < 0.01$). **C,** Representative paired eIPSC recordings. **D,** Average paired-pulse ratios in Ctrl and BMI-treated neurons ($n \geq 14$): 25 ms (Ctrl 0.70 ± 0.07, BMI 0.54 ± 0.05, $p = 0.07$), 50 ms (Ctrl 0.79 ± 0.04, BMI 0.67 ± 0.05, $p = 0.10$), 75 ms (Ctrl 0.83 ± 0.05, BMI 0.72 ± 0.05, $p = 0.15$), 100 ms (Ctrl 0.81 ± 0.04, BMI 0.75 ± 0.04, $p = 0.27$), 150 ms (Ctrl 0.80 ± 0.04,

BMI 0.75 ± 0.04, p = 0.34), 200 ms (Ctrl 0.86 ± 0.04, 0.75 ± 0.03, p = 0.07). **p < 0.01; error bars represent S.E.M.; number of neurons as indicated in bar graphs.

Supplemental Figure 5. Kir2.1-expressing neurons have increased inward rectifying current.

Current-voltage relationship showing that neurons overexpressing Kir2.1 (Kir, n = 7) had significantly larger inward-rectifying currents as compared to controls expressing mutant Kir2.1 (mKir, n = 6).

Supplemental Figure 6. The effectiveness of TrkB-T1 in blocking BDNF signaling.

A, TrkB-T1 significantly blocked the BDNF-induced phosphorylation of TrkB in 293T cells. **B,** TrkB-T1 (HA-tagged) expression in neurons. **C,** Example of an untransfected neuron (red channel, filled with Alexa 568 hydriazide; pointed to with an arrow in green channel and merged image) surrounded transfected neighboring neurons (green channel).

Supplemental Table 1

The kinetics of mIPSCs from Ctrl neurons or those treated with BMI for 4 hr or 12 hr.

Cell type	**10-90% Rise time (ms)**	**Decay time (ms)**
Ctrl	1.98 ± 0.07	23.89 ± 0.90
BMI 4hr	1.97 ± 0.07	24.43 ± 1.00
BMI 12hr	1.95 ± 0.10	27.09 ± 0.98

p > 0.05 for all comparisons.

Supplemental Table 2

Firing Rates of neurons following various pharmacological treatments.

Cell type	**Firing Rate (Hz)**	**Resting Membrane Potential (mV)**
Ctrl	0.52 ± 0.13	-61.3 ± 1.8
10mM K^+	1.18 ± 0.25 *	-45.3 ± 2.2***
Ctrl	0.50 ± 0.15	-62.7 ± 1.3

BMI	1.81 ± 0.26 ***	-64.8 ± 2.1
NBQX	0.08 ± 0.05 ***	-61.6 ± 1.0
BMI + NBQX	0.10 ± 0.05 ***	-63.0 ± 1.3
Ctrl	1.09 ± 0.25	-58.4 ± 1.3
50nM Capsaicin	1.14 ± 0.21	-60.6 ± 1.6

n ≥ 16 for all conditions. *p < 0.05, **p < 0.01, ***p < 0.001.

Supplemental Table 3

The passive parameters of neurons transfected with mKir2.1 or Kir2.1.

Cell type	Resting membrane potential (mV)	Input Resistance (MΩ)
mKir2.1	-59.3 ± 1.3	441.2 ± 69.8
Kir2.1	-73.6 ± 1.3 ***	156.3 ± 30.1 ***

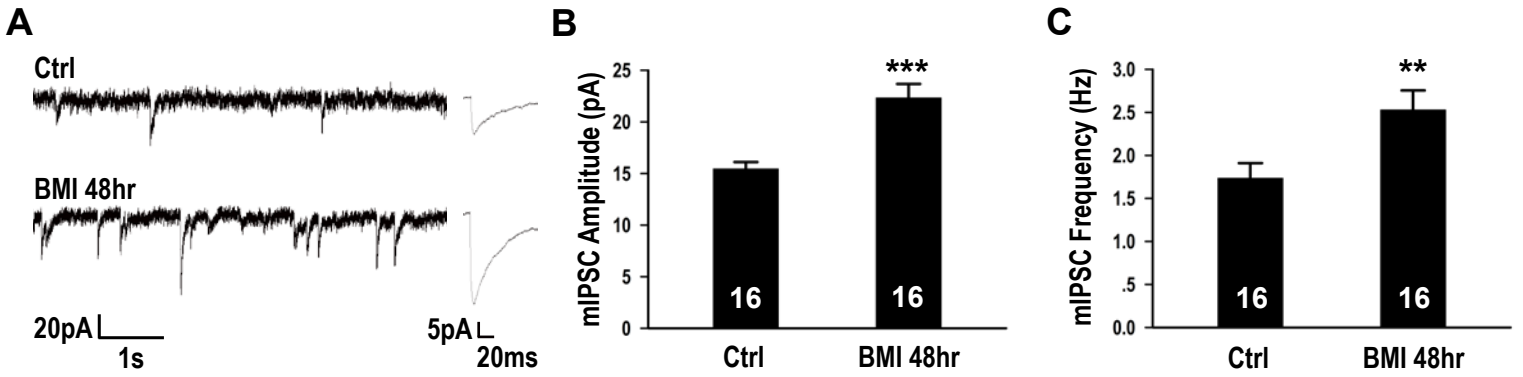
*** p < 0.001.

Supplemental Table 4

Basic properties of CA1 pyramidal neurons from Ctrl and KA-injected rats, and the kinetics of their mIPSCs.

Cell type	Membrane Capacitance (pF)	Input Resistance (MΩ)	10-90% Rise time (ms)	Decay time (ms)
Ctrl	120.4 ± 3.9	261.9 ± 11.2	1.29 ± 0.07	15.76 ± 0.62
KA	121.2 ± 4.6	259.8 ± 8.3	1.47 ± 0.08	15.81 ± 0.48

p > 0.05 for all comparisons.



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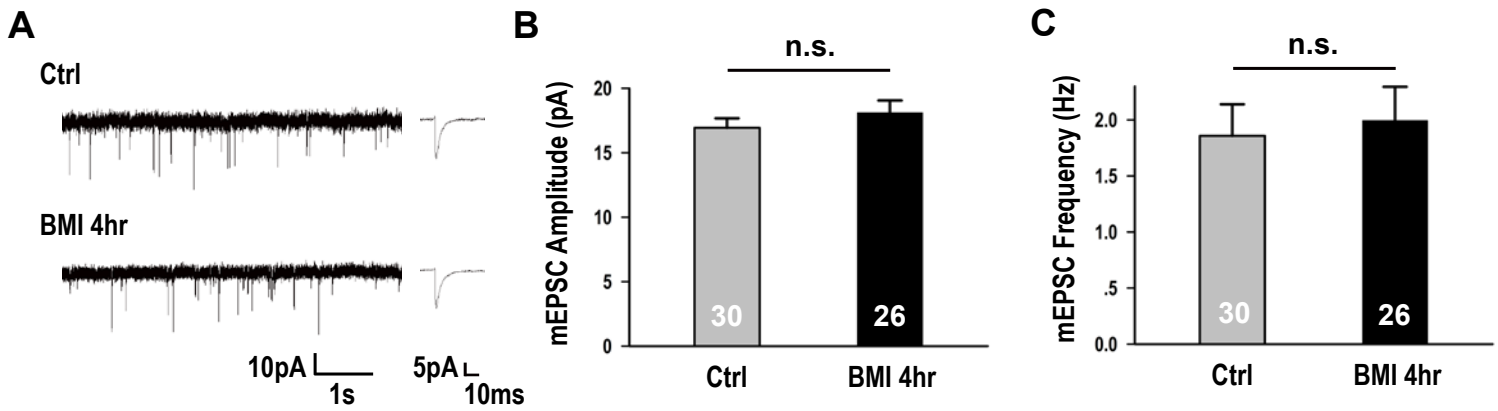
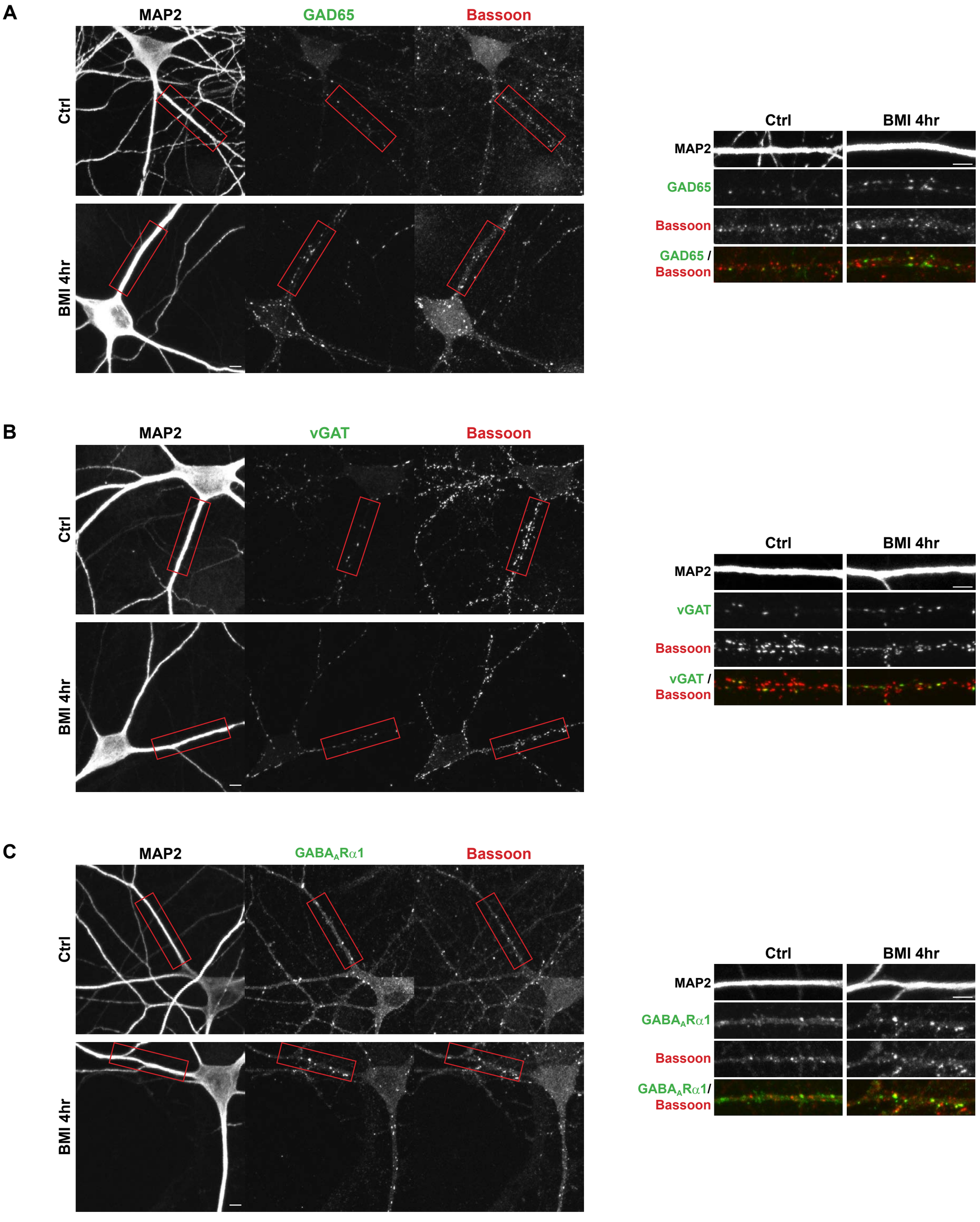
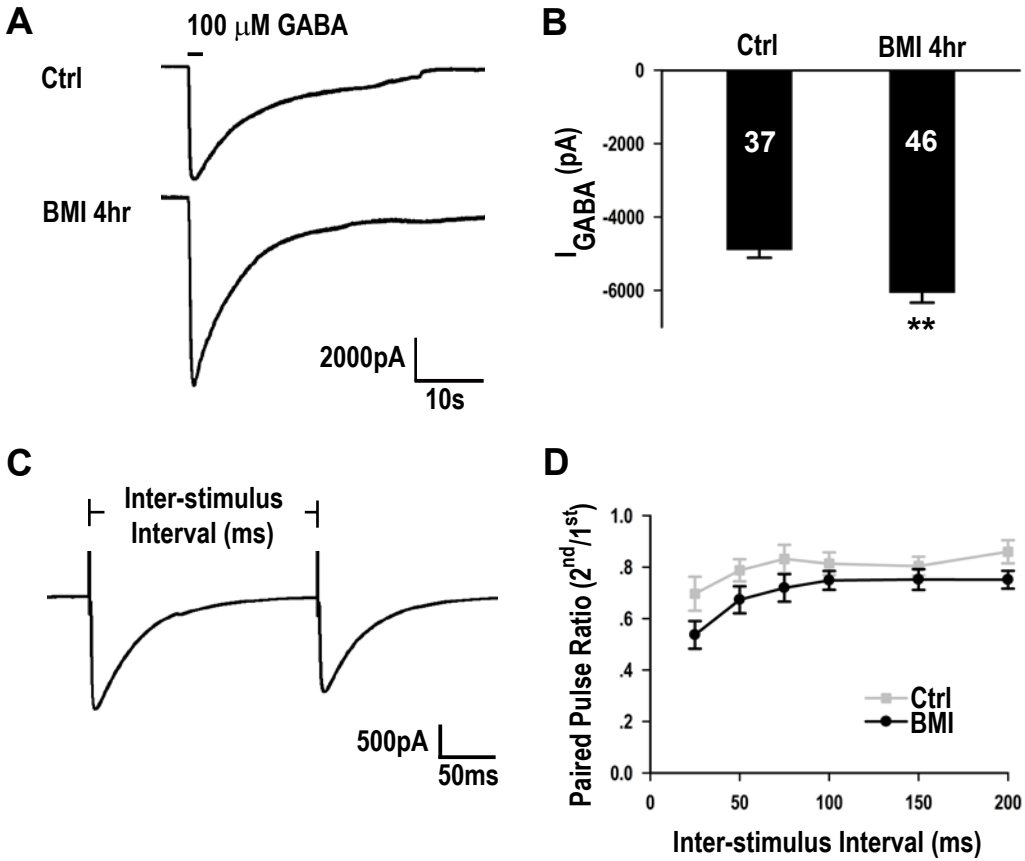


Peng *et al.*, Supplemental Figure 2



Peng *et al.*, Supplemental Figure 3



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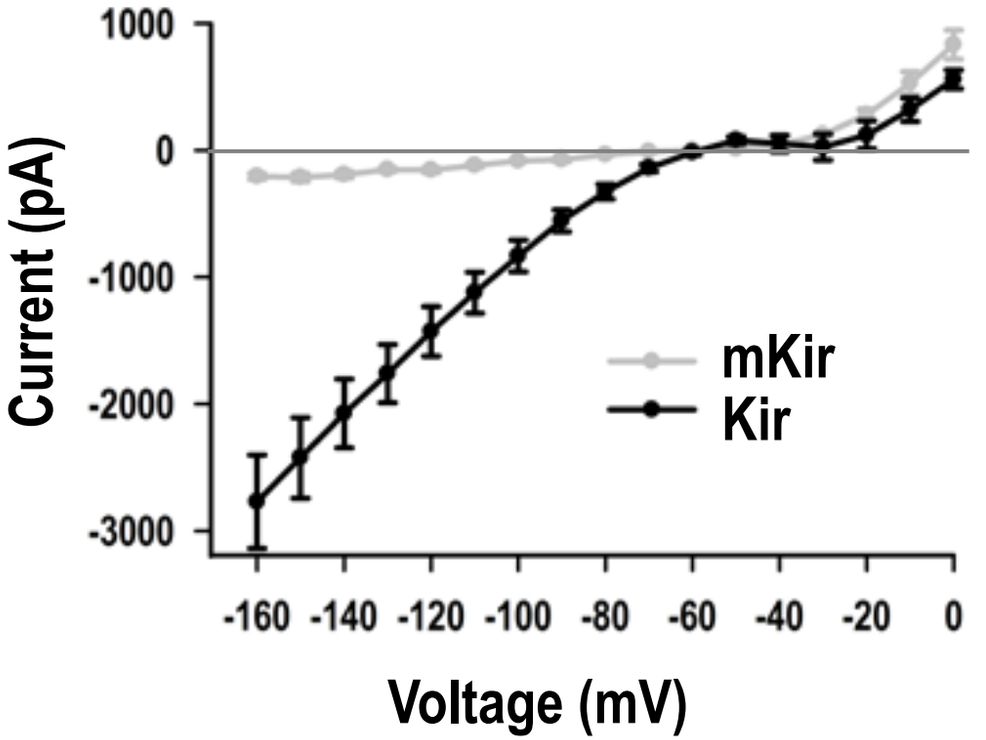

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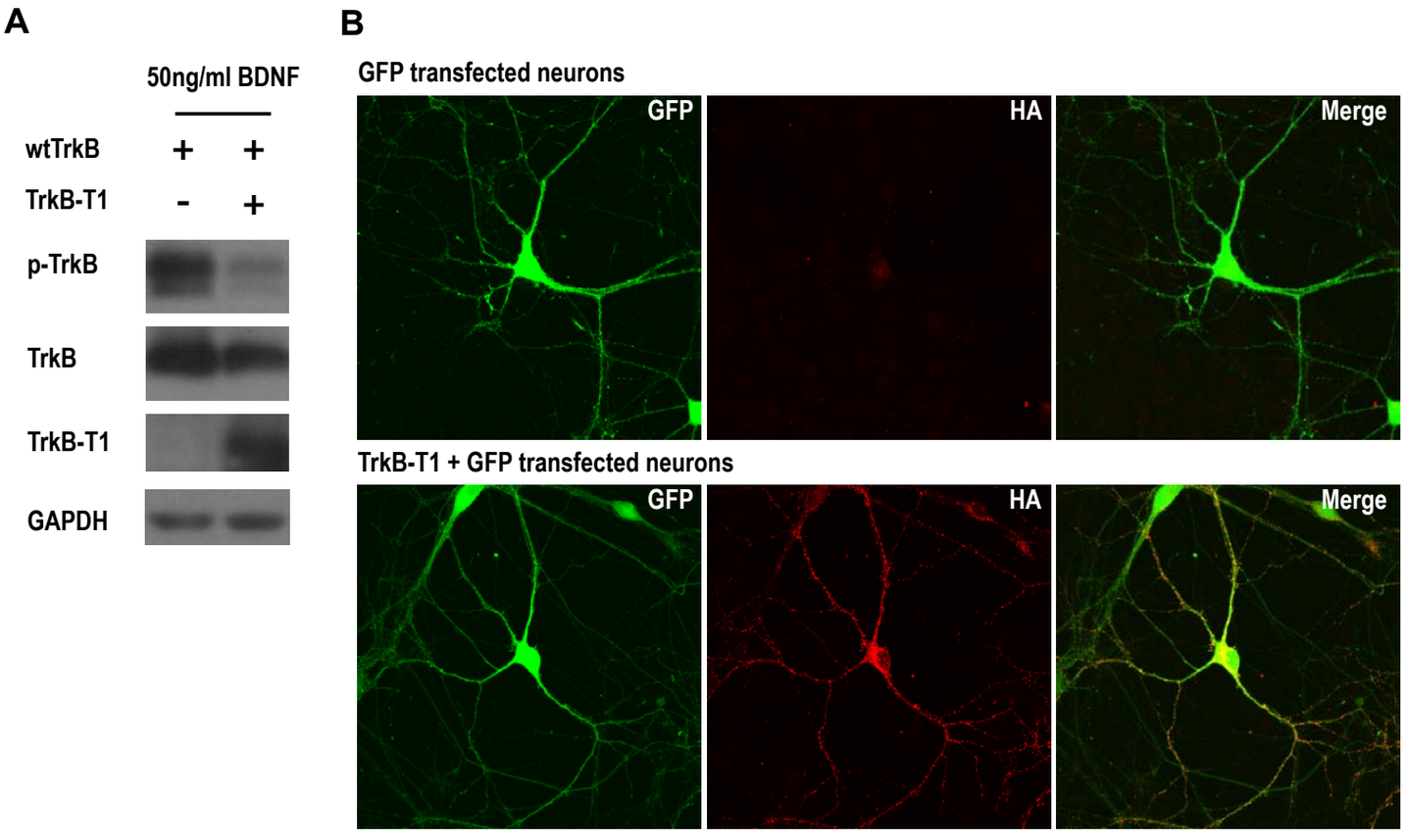

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