Figure S1, related to Figure 5. JAM2 function is necessary to prevent dendritic wrapping *in vitro*. (**a**) 7div myelinating SCN cultures incubated for the final two days with either IgG or (**b**) anti-JAM2 function blocking antibody. Oligodendrocytes (asterisks) wrap myelin membranes on axons (arrowheads) and on dendrites (arrows). (**c**) the percentage of MBP+ myelin segments on MAP2+/NF- dendrites. Bar graphs represent means with s.e.m. error bars. Significance was calculated using one-tailed Students t-test. **, P = 0.0072. Scale bar: 10 micrometers.

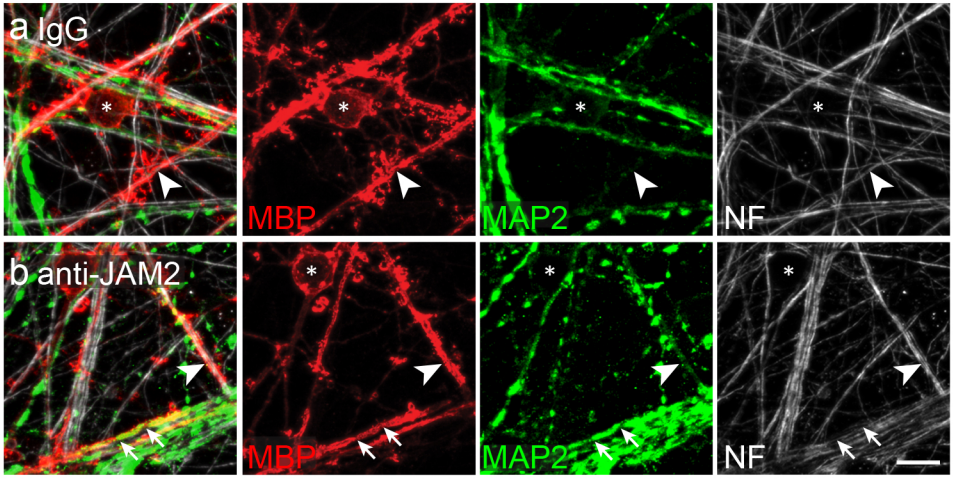
Figure S2, related to Figure 5 and 6. Oligodendrocyte ensheathment of JAM2 KO neurons *in vitro* and *in vivo* clusters somatodendritic CASPR protein. (**a**) a myelinating SCN coculture immunostained for MBP (red), CASPR (green) and MAP2 (white). Insets demonstrate examples of (**a1**) clustered CASPR on a wrapped neuron cell body, (**a2**) clustered CASPR on a wrapped dendrite, and (**a3**) no clustered CASPR signal on an unwrapped MAP2+ neuron. (**b**) a MAP2+ JAM2 KO dorsal horn neuron is wrapped *in vivo* by an MBP+ oligodendrocyte. At the edges of the MBP+ membrane is a spiraling line of clustered CASPR protein on the neuron surface. (**c**-**e**) a myelin-wrapped dorsal horn JAM2 KO neuron in three adjacent semi-thin sections stained with toluidine blue. The neuron cytoplasm is pseudo-colored green, and its nucleus is pseudo-colored blue. DAPI, blue. Scale bars: (**a-c**) 10 micrometers.

Figure S3, related to Figure 6. JAM2 is widely expressed in spinal cord gray matter. Low-field images of the (**a**) dorsal and (**b**) ventral horns in a heterozygous *jam2:beta-galactosidase* knock-in reporter mouse shows widespread colocalization of NeuN+ beta-galactosidase+ cells. The ventral horns of (**c**) *jam2* heterozygous and (**d**) knockout mice show the presence of JAM2 protein on large neurons in MAP2+ gray matter. DAPI, blue. Scale bars: 50 micrometers.

Figure S4, related to Figure 6. The spinal cord dorsal horn develops normally in JAM2 KO mice. Cross-sections of (**a**) JAM2 heterozygous (JAM2 Het) and (**b**) JAM2 KO show specific antibody labeling of JAM2 (white) on MAP2+ neuron cell bodies (arrowheads) in dorsal horn gray matter. In the dorsal horns of (**c**) WT and (**d**) JAM2 KO mice the densities of NeuN+ neurons and CC1+ oligodendrocytes is not significantly different. Quantification of (**e**) NeuN+ and (**f**) CC1+ cells in WT and JAM2 KO mouse dorsal horns. Bar graphs represent means with s.e.m. error bars. n = 3 littermate pairs. Significance was calculated using the paired two-tailed Students t-test. DAPI, blue. Scale bars: 20 micrometers.

Figure S5, related to Figure 7. Pax2+ dorsal horn neurons have no or few somatic synapses *in vivo.* Quantification of the number of (**a**) VGLUT1, VGLUT2 or VGAT synapses onto PAX2+ neuronal somata in Jam2 -/- or Jam2 +/- mice. (**b**) VGAT puncta on a Pax2+ neuron soma. (**c**) a Pax2+ neuron wrapped by MBP+ membrane has no VGLUT1+ synaptic puncta on its soma. Bar graphs represent mean with s.e.m. error bars. n = 4 littermate pairs. Significance was calculated using the two-tailed Mann-Whitney U test. Scale bars: (**b**-**c**) 10 micrometers.

Figure S1


a IgG
MBP
MAP2
NF
b anti-JAM2
MBP
MAP2
NF

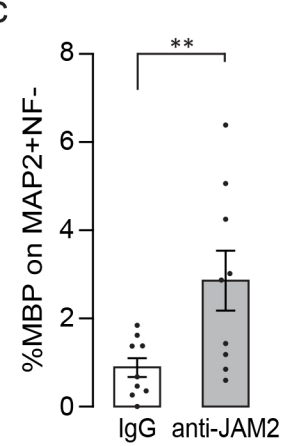

c
%MBP on MAP2+NF-
8
6
4
2
0
**
IgG
anti-JAM2

Figure S2

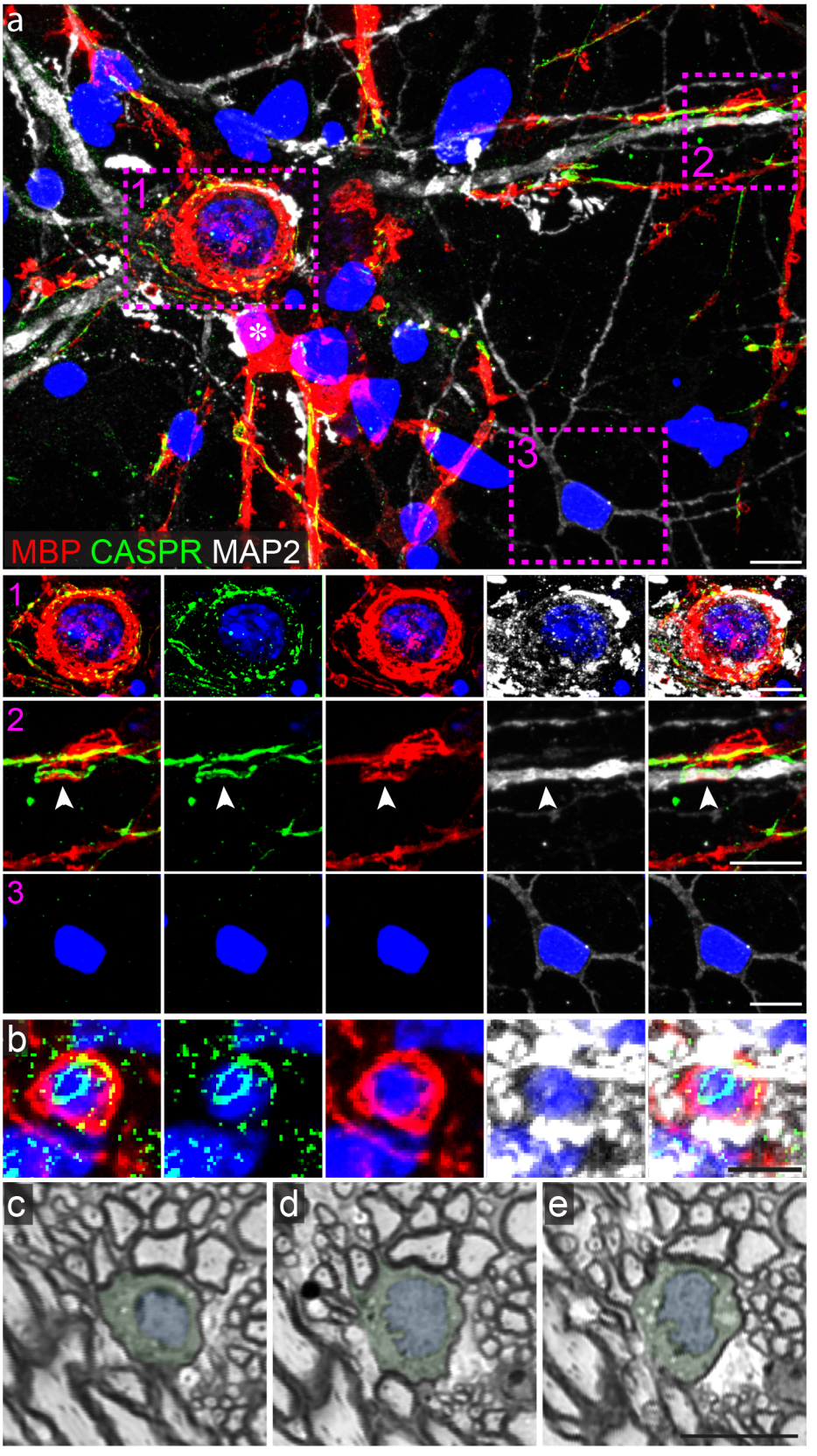


Figure S3

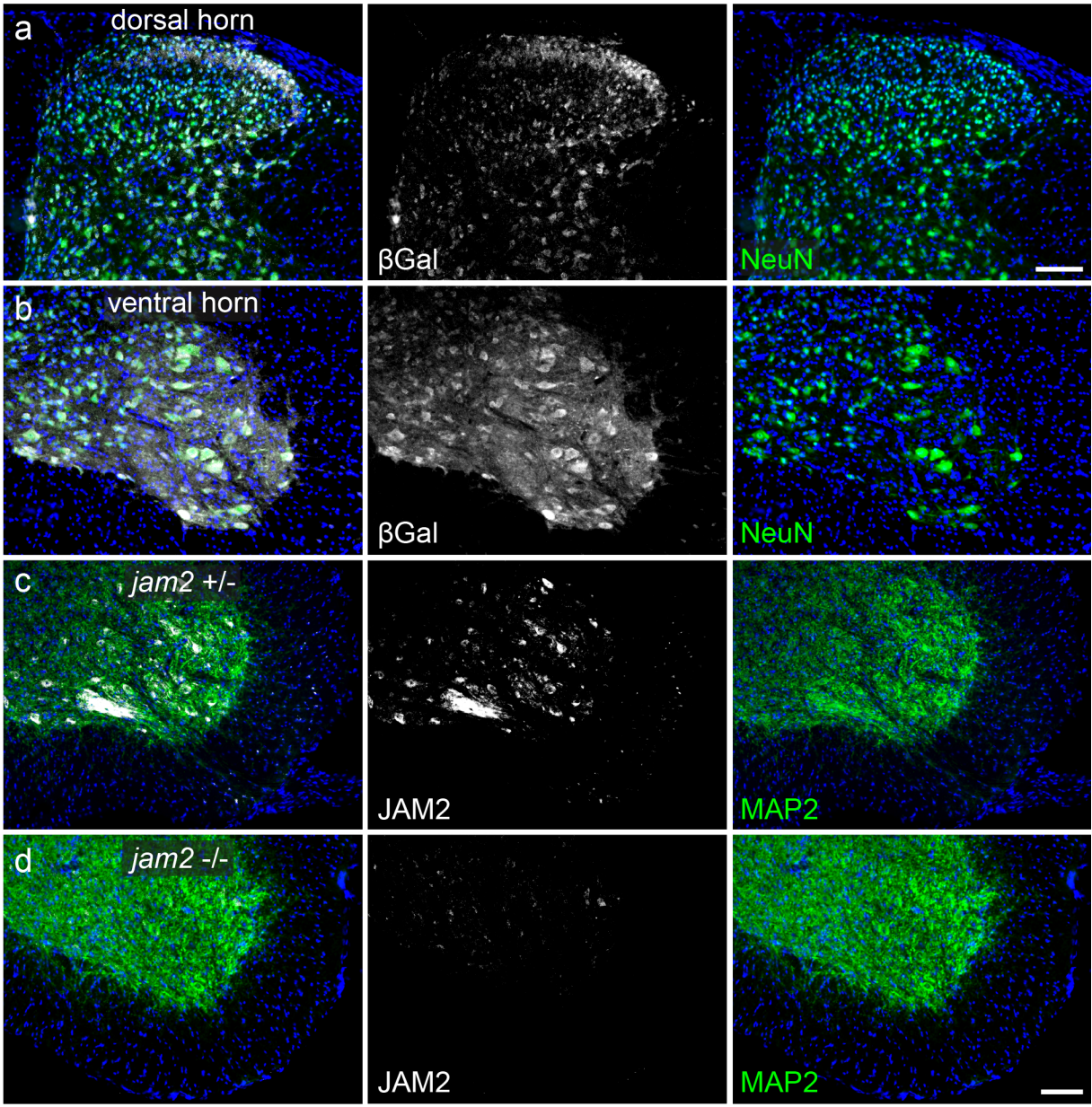

a
dorsal horn
βGal
NeuN
b
ventral horn
βGal
NeuN
c
jam2 +/-
JAM2
MAP2
d
jam2 -/-
JAM2
MAP2

Figure S4

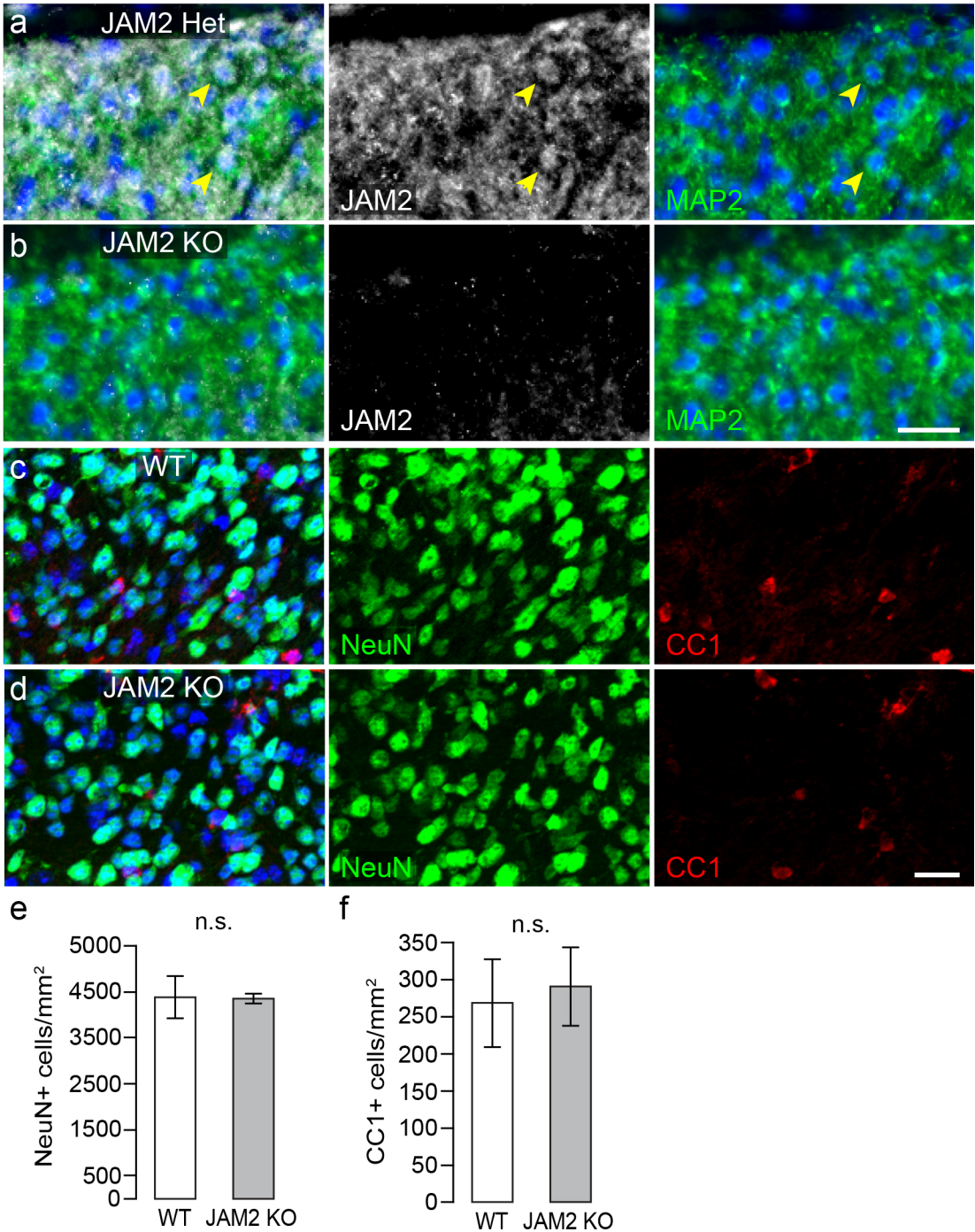
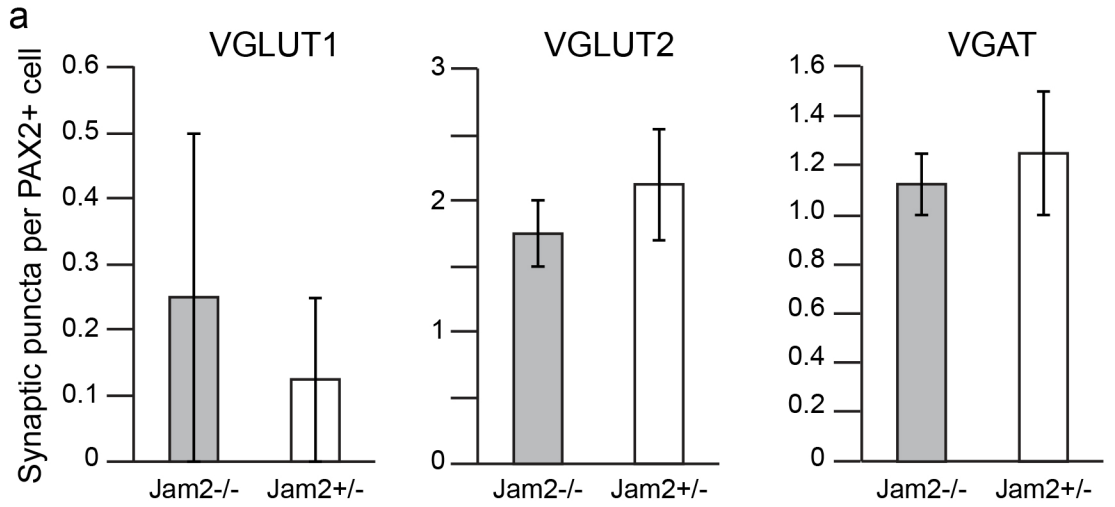
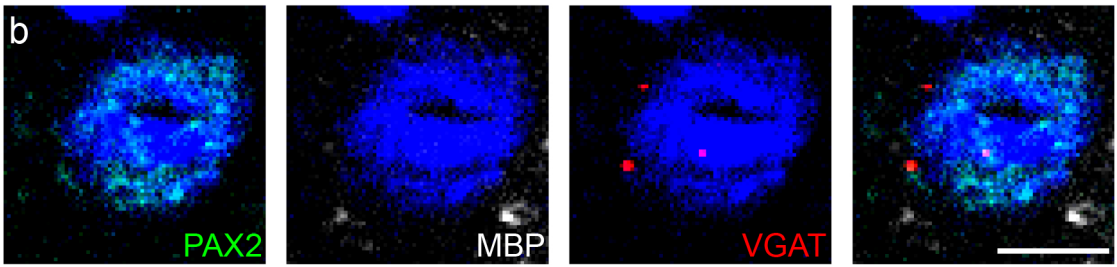
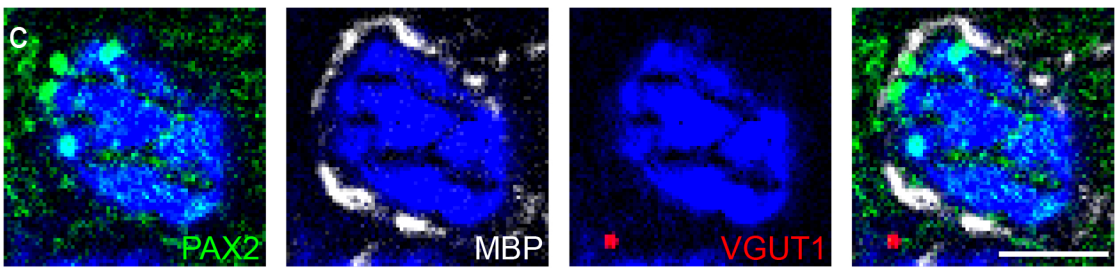

a
JAM2 Het
JAM2
MAP2
b
JAM2 KO
JAM2
MAP2
c
WT
NeuN
CC1
d
JAM2 KO
NeuN
CC1
e
n.s.
NeuN+ cells/mm²
5000
4500
3500
2500
1500
500
0
WT
JAM2 KO
f
n.s.
CC1+ cells/mm²
350
300
250
200
150
100
50
0
WT
JAM2 KO

Figure S5


a
VGLUT1
VGLUT2
VGAT
Synaptic puncta per PAX2+ cell
0.6
0.5
0.4
0.3
0.2
0.1
0
3
2
1
0
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
Jam2-/-
Jam2+/-
Jam2-/-
Jam2+/-
Jam2-/-
Jam2+/-


b
PAX2
MBP
VGAT


c
PAX2
MBP
VGUT1