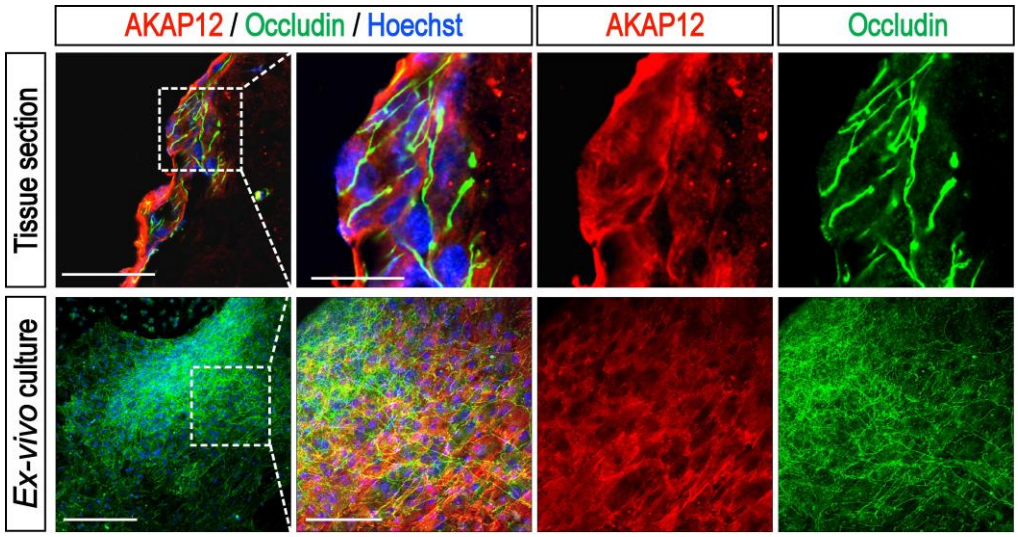
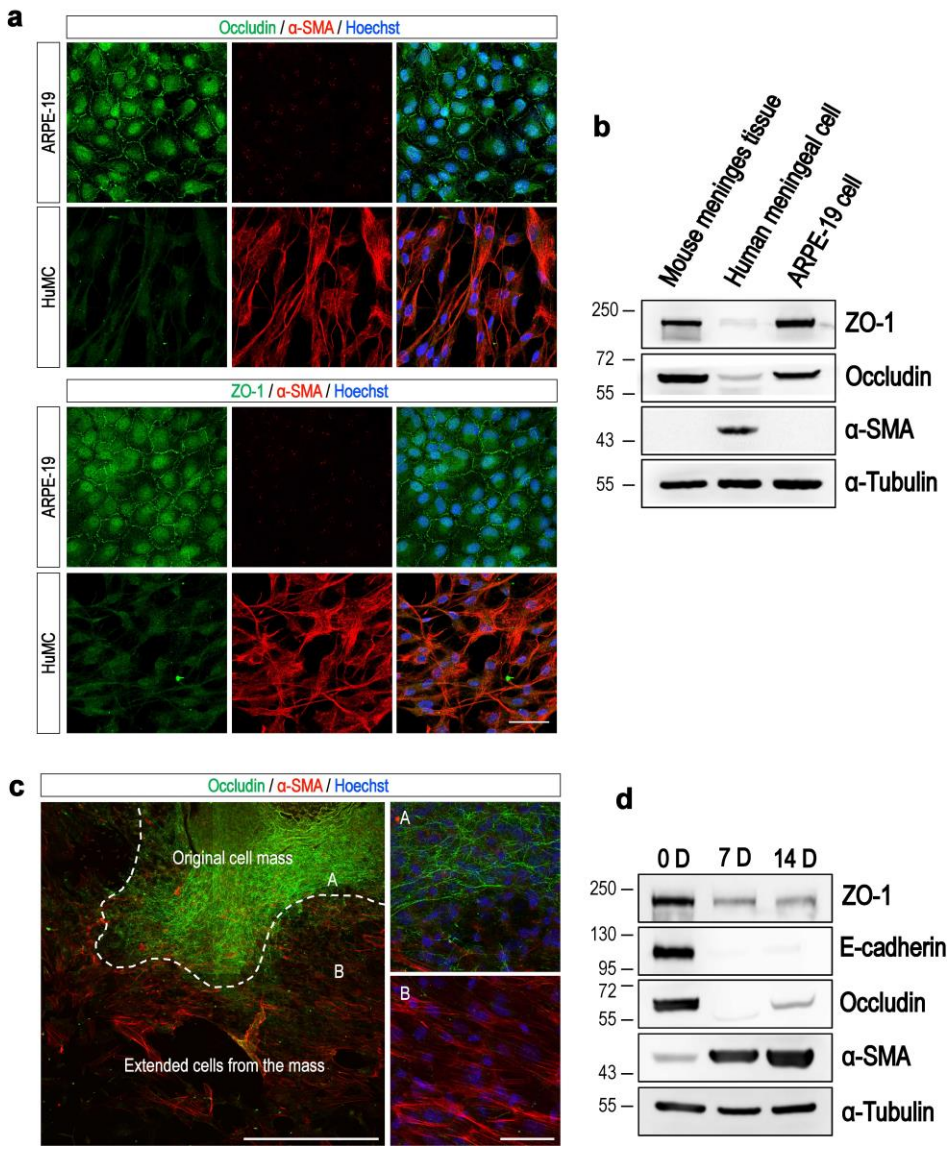
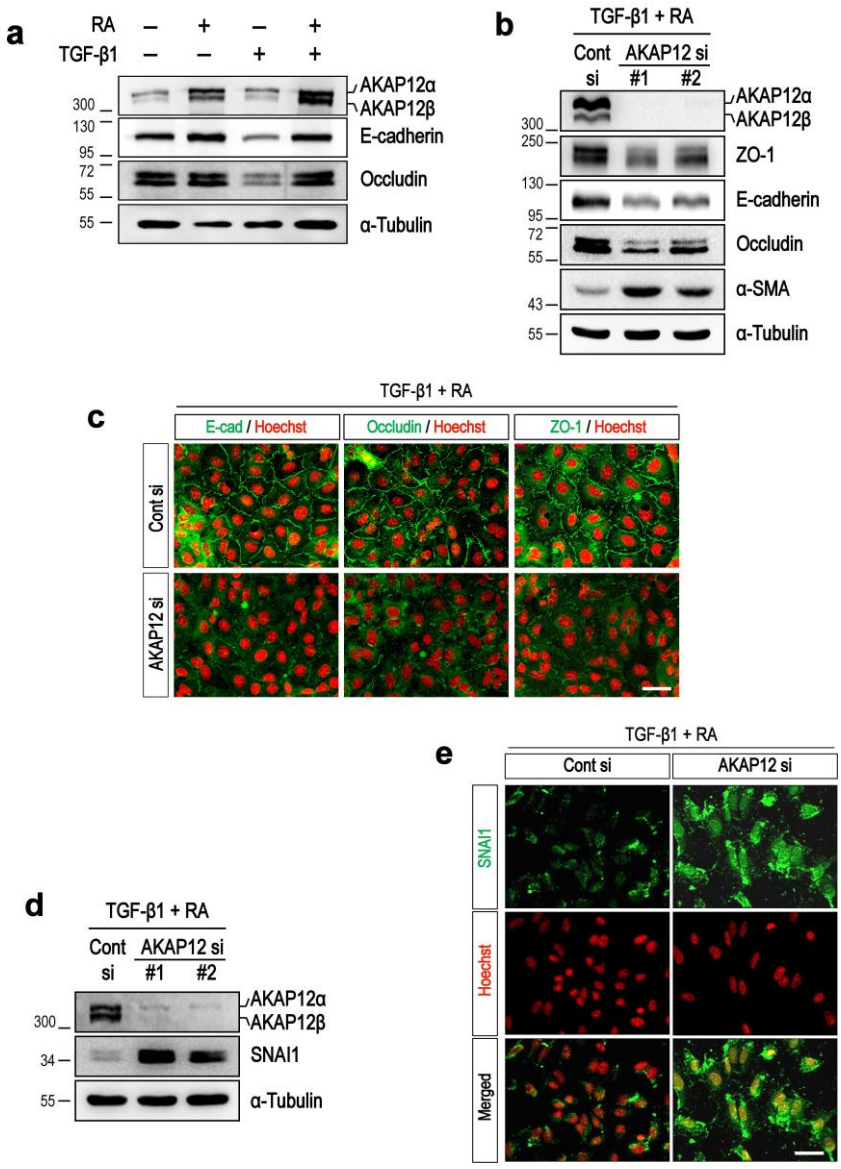


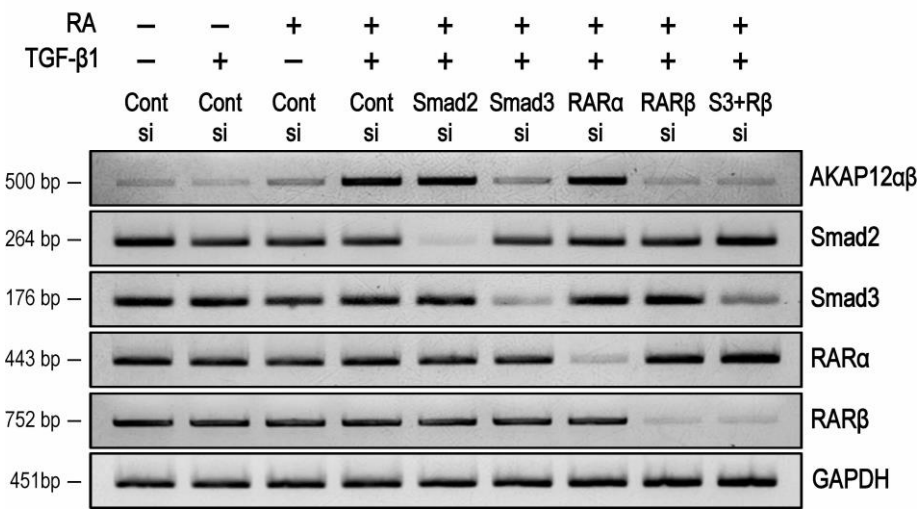
Supplementary Figure 1. AKAP12-positive meningeal cells highly express occluding AKAP12 meningeal cells expressed occludin. Brain tissue sections were stained with antibodies against AKAP12 and occludin. Nuclei were counterstained with Hoechst 33342. Scale bar: 50 μm (leftmost panel), 20 μm (magnified panels). The meninges were *ex vivo* cultured for 3 days on cover slips. AKAP12-positive meningeal cells expressed occludin with epithelial morphology. Nuclei were counterstained with Hoechst 33342. Scale bar: 200 μm (leftmost panel), 100 μm (magnified panels).These data represent the results from independent experiments repeated at least five times using different animals or conditions.



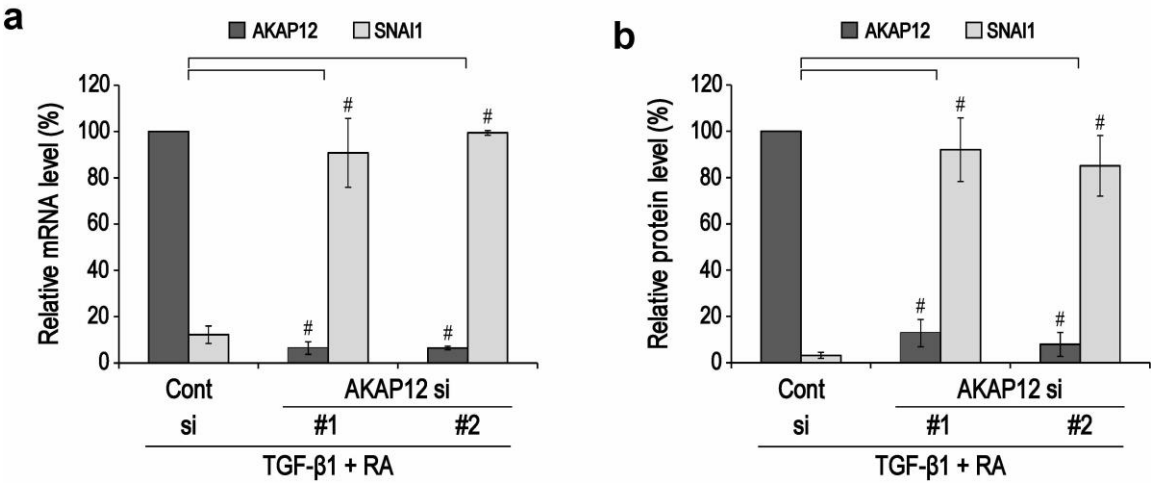
Supplementary Figure 2. Meningeal cells easily lose epithelial properties under culture condition (a) ARPE-19 and human meningeal cells on coverslips were fixed and co-immunostained with antibodies against occludin, ZO-1 and α- SMA. Scale bar: 50 μm (b) Protein levels were analyzed through western blotting. Human meningeal cell does not have epithelial properties, compared to mouse meninges tissue and ARPE-19 cell line (c) Meninges *ex vivo* cultured for 3 days on cover slip was co-stained with antibodies against occludin and α-SMA. Scale bar: 500um (largest panels), 50um (panel A, B) (d) Meninges *ex vivo* cultured for 0, 7, and 14 days were lysed and proteins were extracted. Lysates were analyzed by immunoblotting. Meninges easily lost epithelial properties and were converted to mesenchymal state. Each panel represents the results from independent experiments repeated at least four times.



Supplementary Figure 3. Results from the *in vitro* assay with the ARPE-19 cell line were confirmed with the A549 cell line (a) A549 cells were serum starved for 24 h, and then treated with TGF-β1 (10 ng/mL) and RA (10 μM) for 72 h. (b) Transfected A549 cells were serum starved for 24 h and incubated in the presence of TGF-β1 (10 ng/mL) and RA (10 μM) for 72 h. (c) Transfected A549 cells were immunostained with antibodies for E-cadherin, occludin, and ZO-1. Nuclei were stained with Hoechst 33342 (pseudo-colored red). Scale bar: 40 μm. (d) Transfected A549 cells were serum starved for 6 h and then treated with TGF-β1 (10 ng/mL) and RA (10 μM) for 24 h. (e) After serum starvation for 24 h, transfected A549 cells were treated with TGF-β1 (10 ng/mL) and RA (10 μM) for 24 h. Nuclei were stained with Hoechst (pseudo-colored red). Scale bar: 40 μm. Each panel represents the results from independent experiments repeated at least four times.

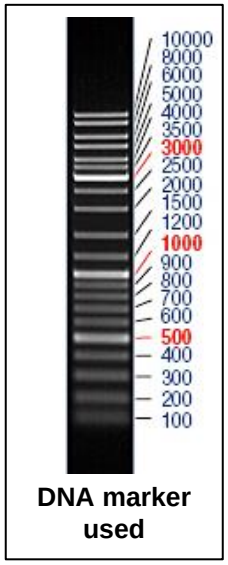


Supplementary Figure 4. Smad3 and RARβ mediate the induction of AKAP12 by TGF-β1 and RA ARPE-19 cells were co-transfected with control, Smad2, Smad3, RARα, and RARβ siRNA. Knockdown cells were treated with TGF-β1 (10 ng/mL) and RA (10 μM) for 24 h after serum starvation for 24 h. Reverse transcription PCR was performed and GAPDH was used as an internal control. Knockdown of Smad3 and RARβ specifically neutralized the induction of AKAP12 with co-treatment of TGF-β1 and RA. This data represents the results from independent four experiments.



Supplementary Figure 5. AKAP12 knockdown increases the expression of SNAI1 Two different AKAP12 siRNA were transfected into ARPE-19 cells. (a) After serum starvation for 6 h, AKAP12 knockdown cells were treated with TGF-β1 (10 ng/mL) and RA (10 μM) for 24 h. The mRNA levels were analyzed with reverse transcription PCR. Data were obtained from three independent experiments (mean ± S.D., ANOVA followed by Tukey-Kramer test: #P < 0.0005). (b) After serum starvation for 24 h, AKAP12 knockdown cells were treated with TGF-β1 (10 ng/mL) and RA (10 μM) for 24 h. Protein levels were determined by western blot analysis. Data were obtained from three independent experiments (mean ± S.D., ANOVA followed by Tukey-Kramer test: #P < 0.0005). Band intensities were analyzed with Image J and normalized to α-tubulin (a) and GAPDH (b).

Fig. 2b



DNA marker used

Fig. 2d

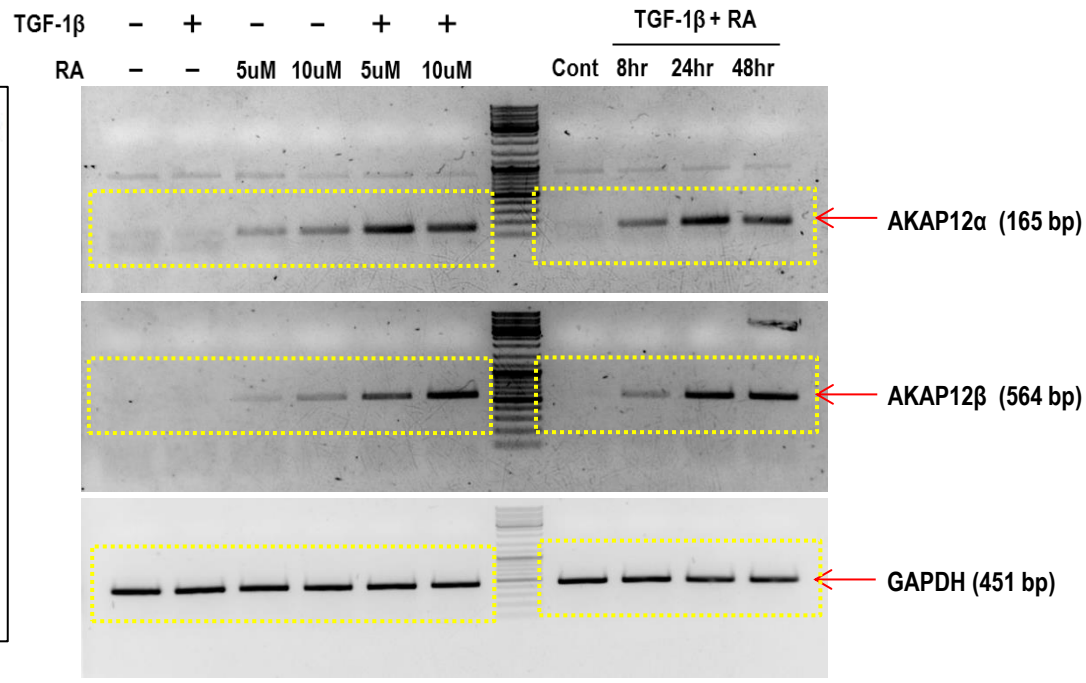
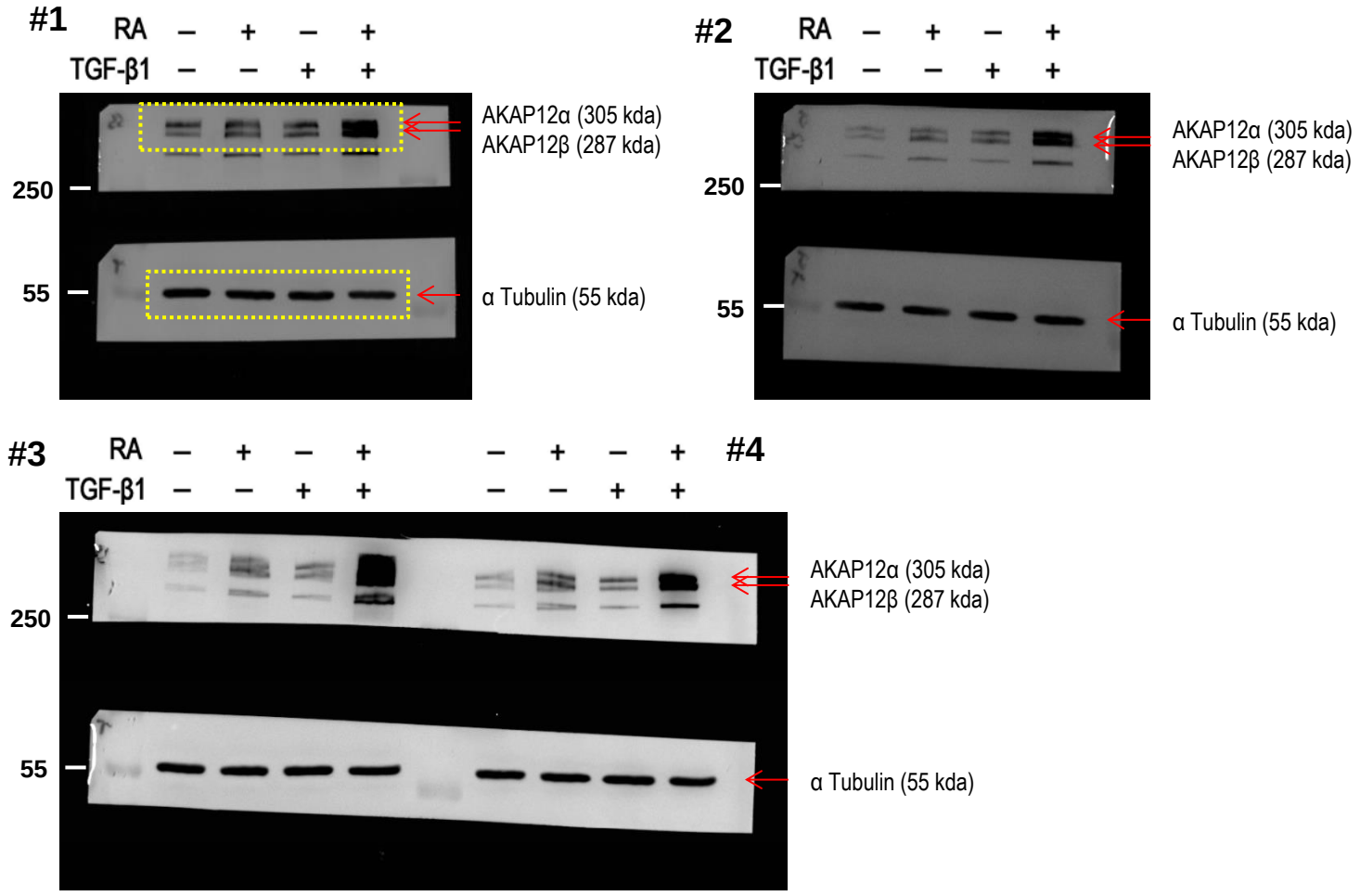
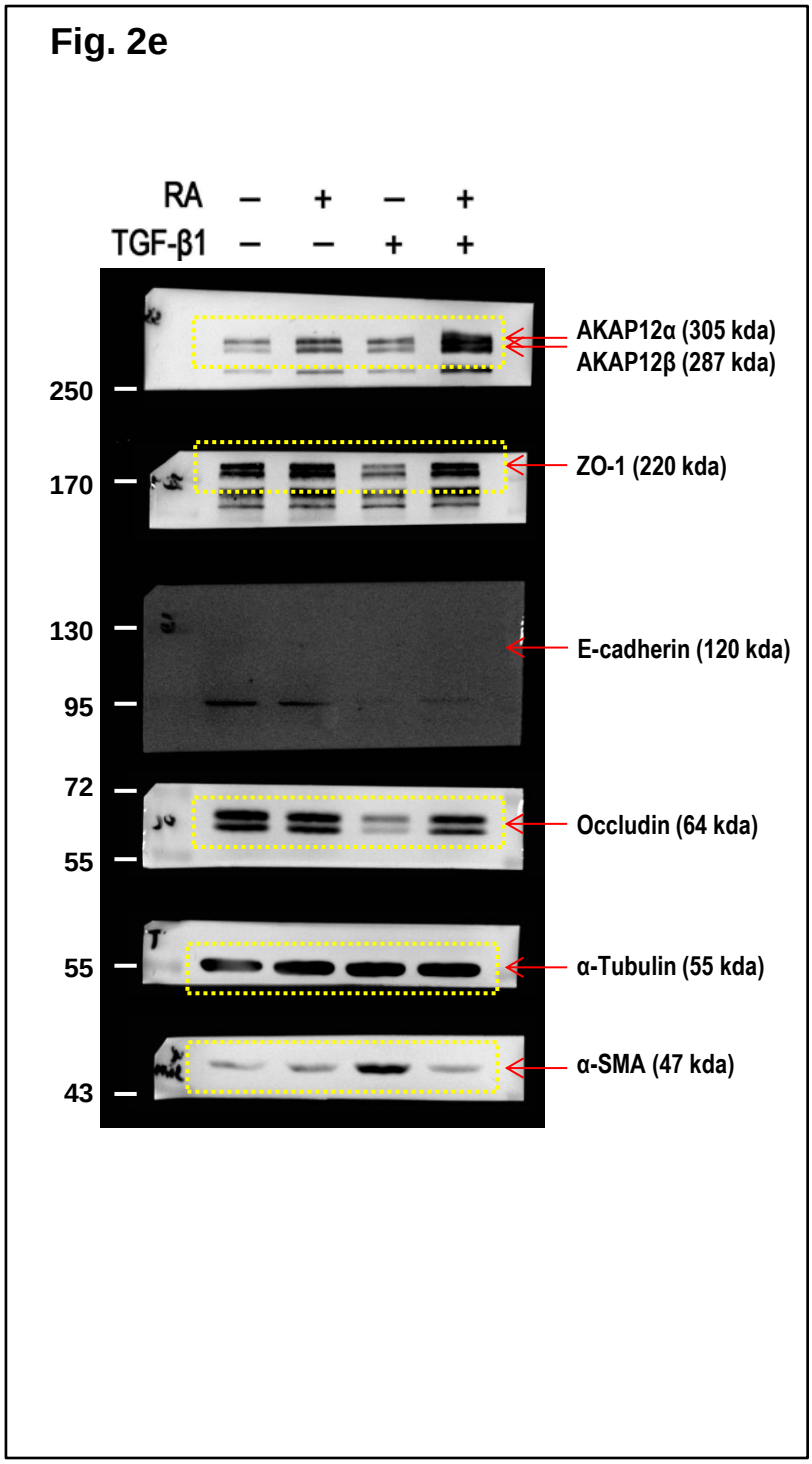


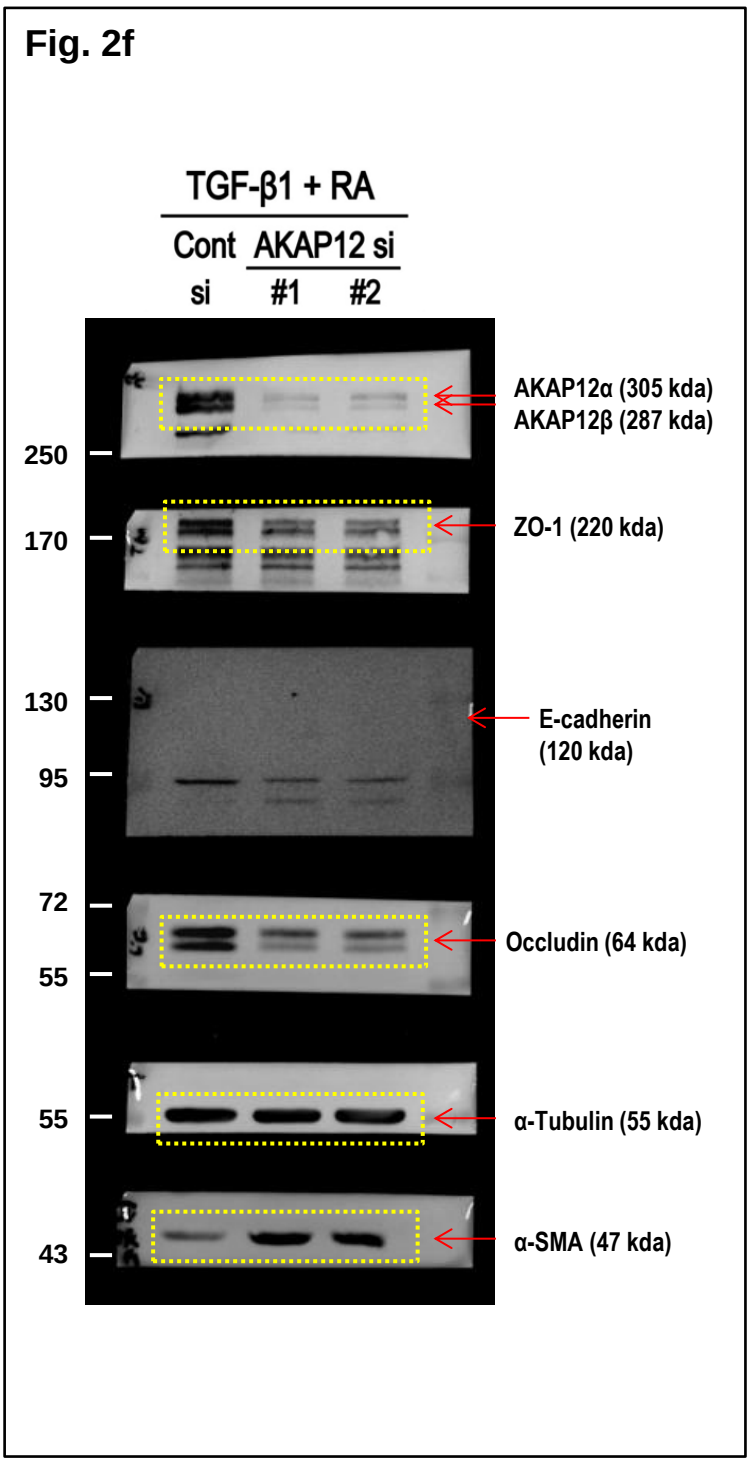
Fig. 2c

Band intensities were analyzed with Image J and normalized to α-tubulin. Results were presented as a graph.



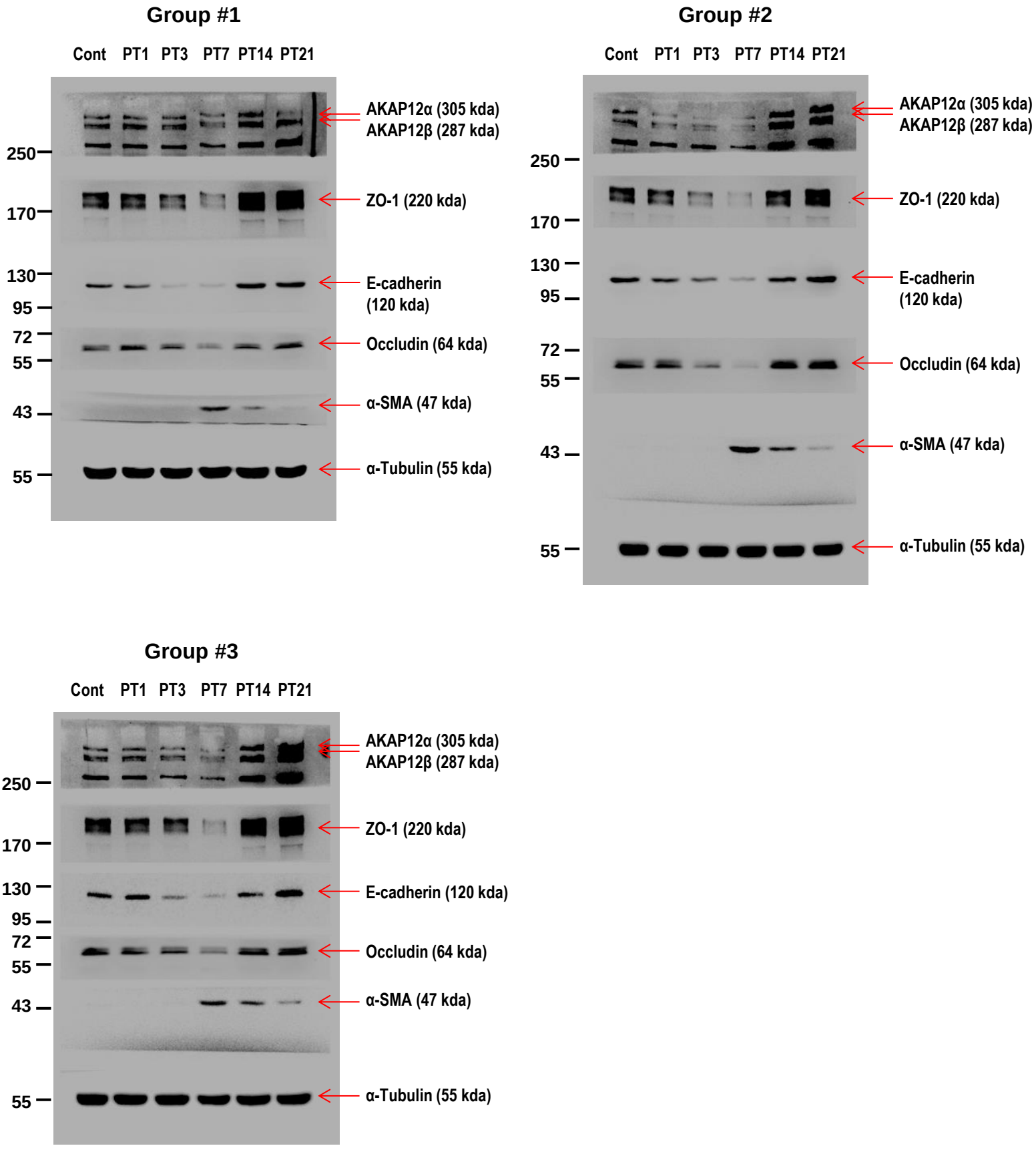
Supplementary Figure 6. Full scans of uncropped SDS-PAGE and PCR-DNA gel Bands of yellow boxes were used in Figures.





Supplementary Figure 6. Continued

Fig. 3c Band intensities were analyzed with Image J and normalized to α-tubulin. Results were presented as a graph.



Supplementary Figure 6. Continued

Fig. 3c-continue

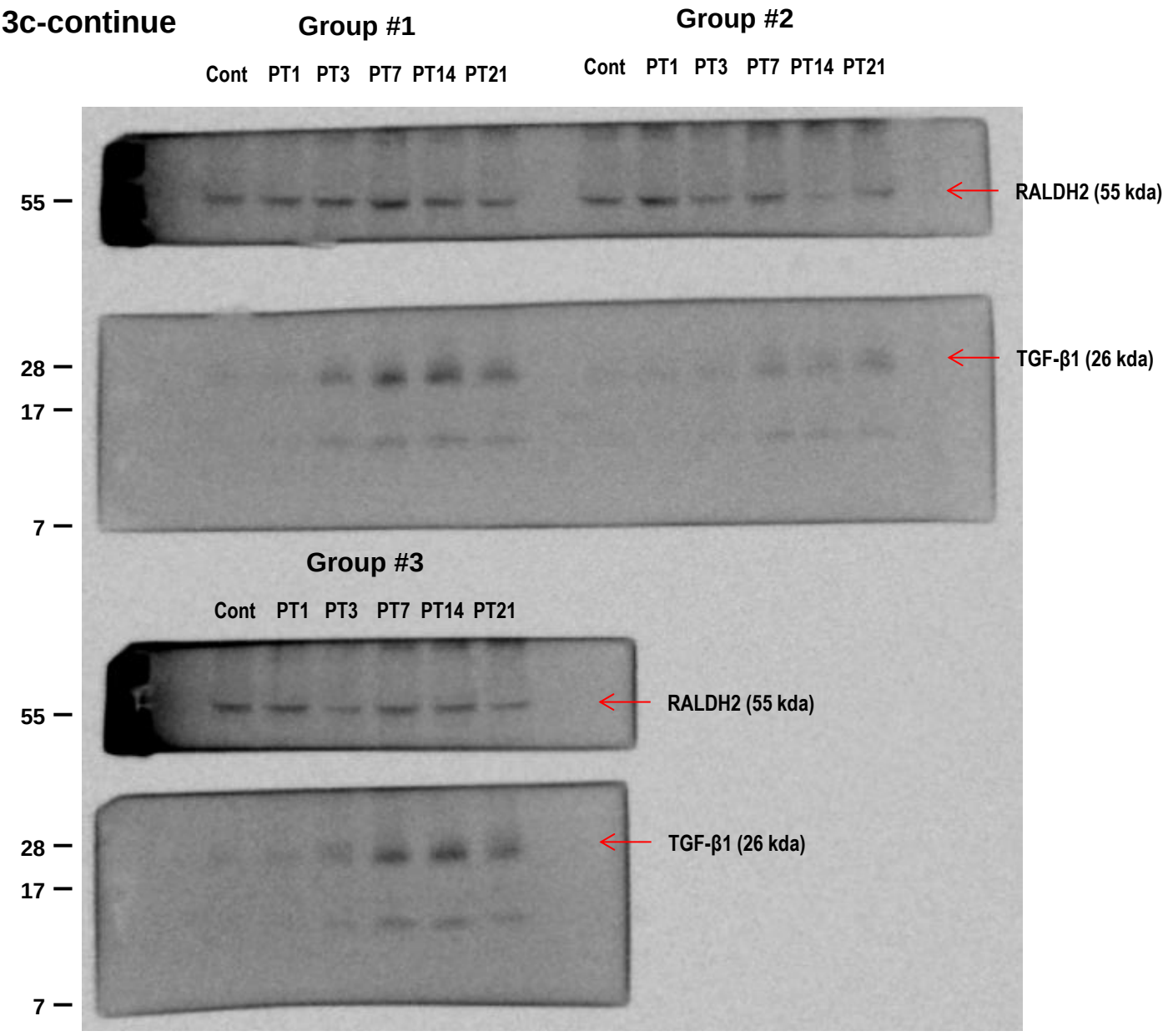
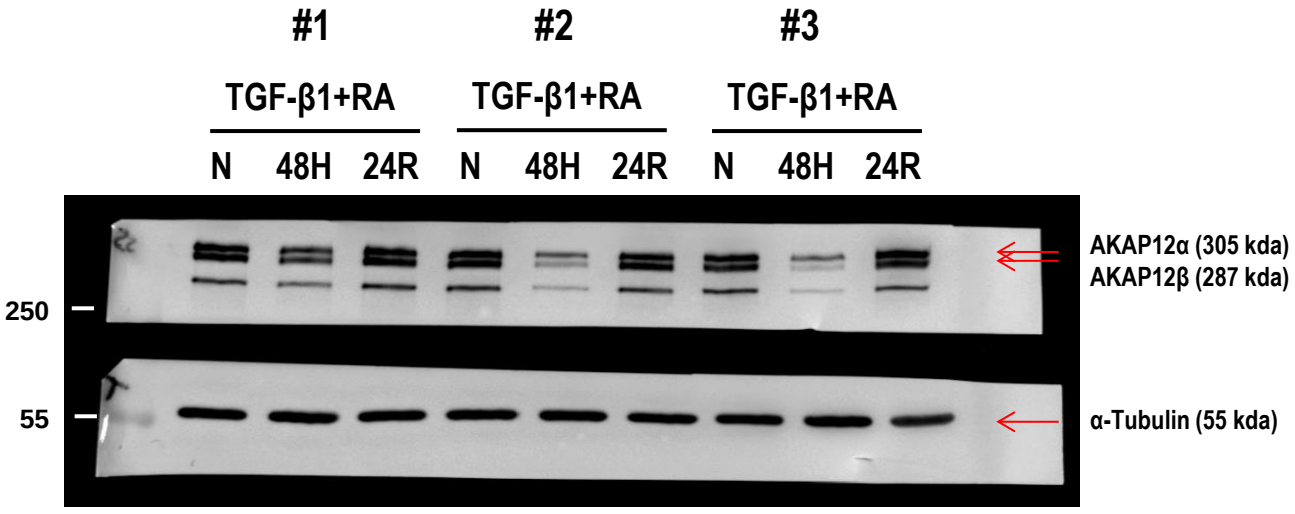


Fig. 3e Band intensities were analyzed with Image J and normalized to α-tubulin. Results were presented as a graph.



Supplementary Figure 6. Continued

Fig. 3f

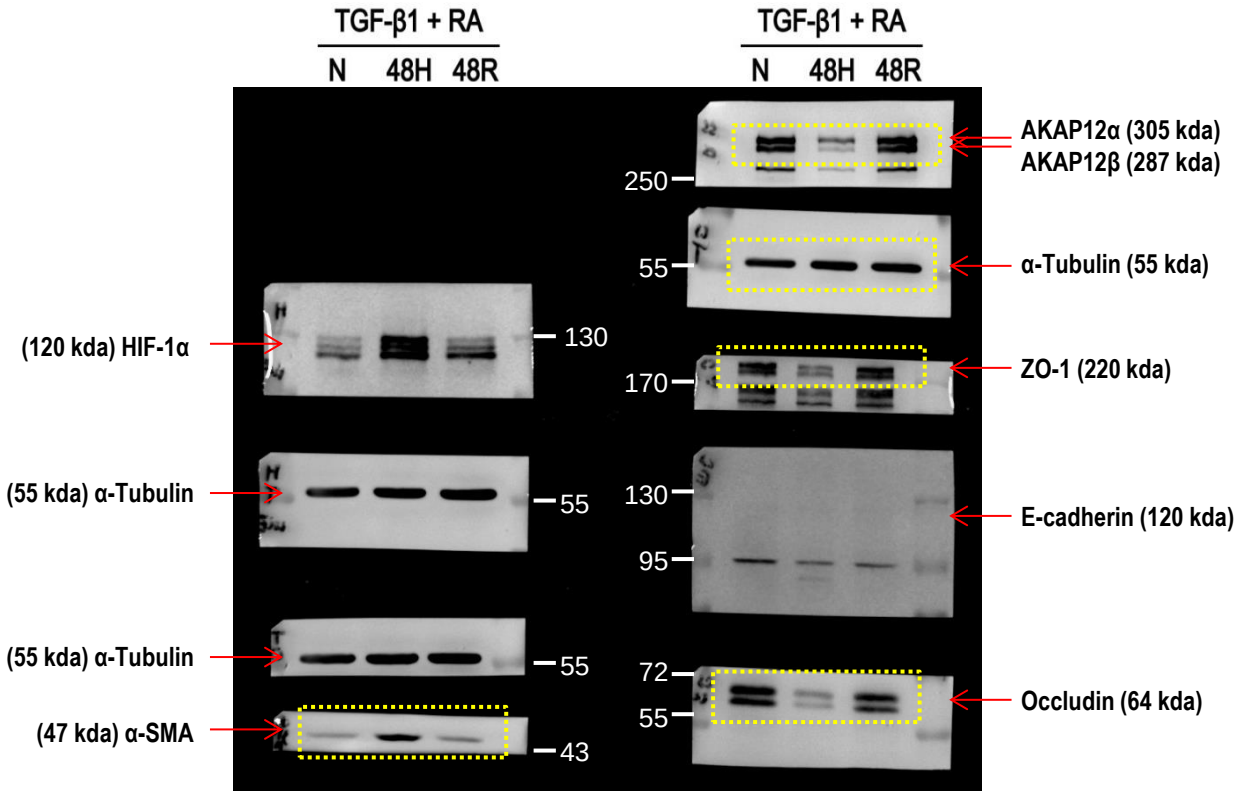
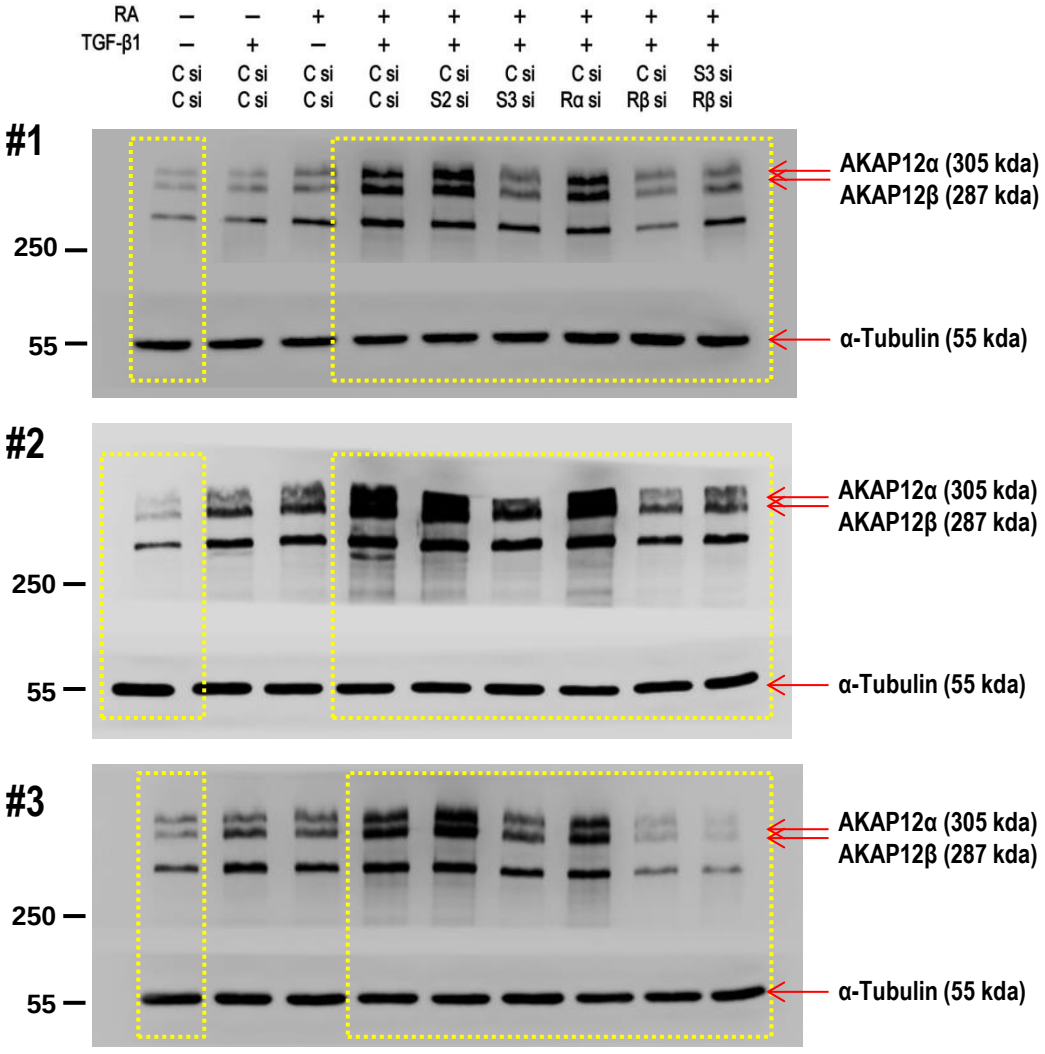


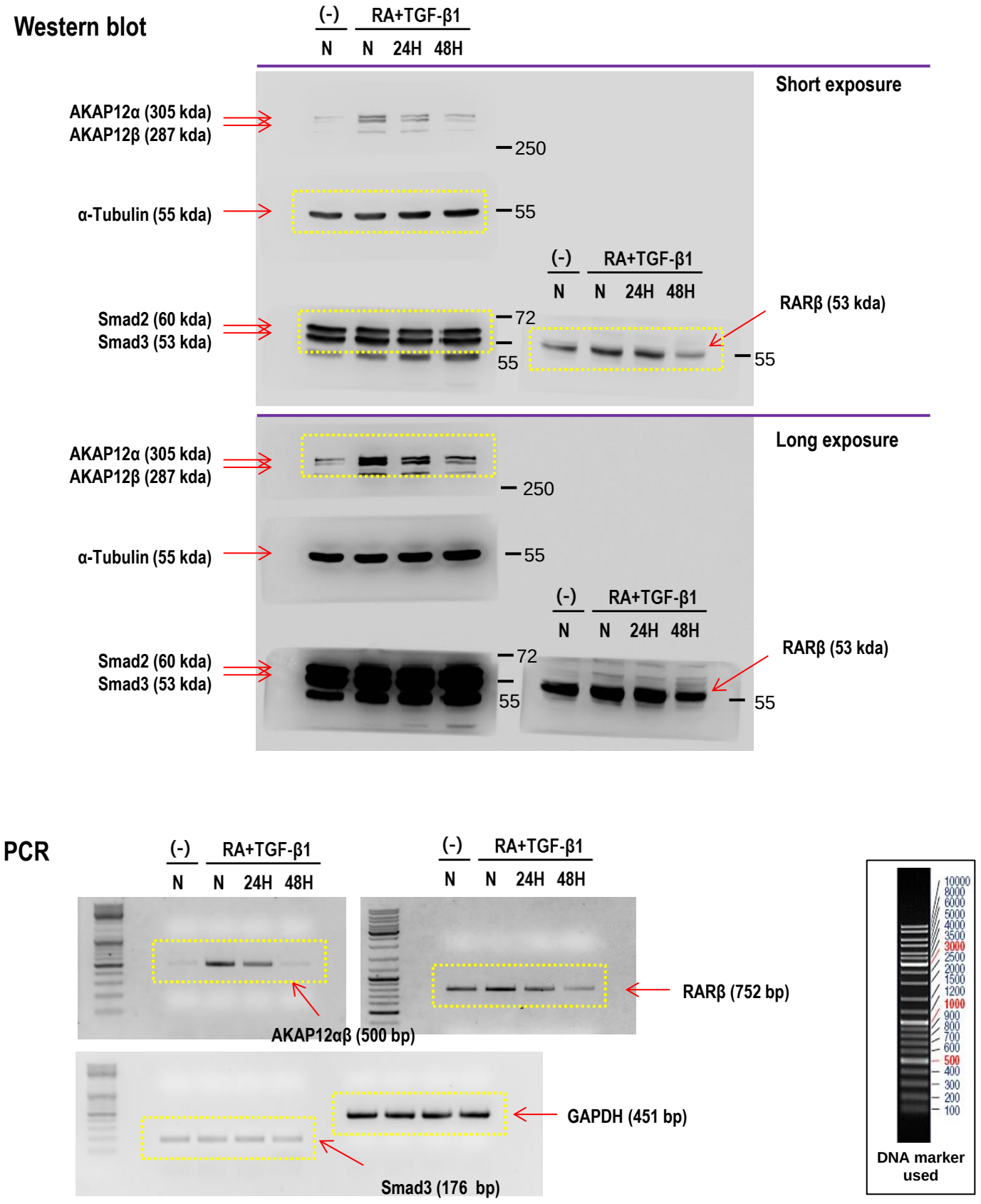
Fig. 4a



Band intensities of yellow boxes were analyzed with Image J and normalized to α-tubulin. Results were presented as a graph.

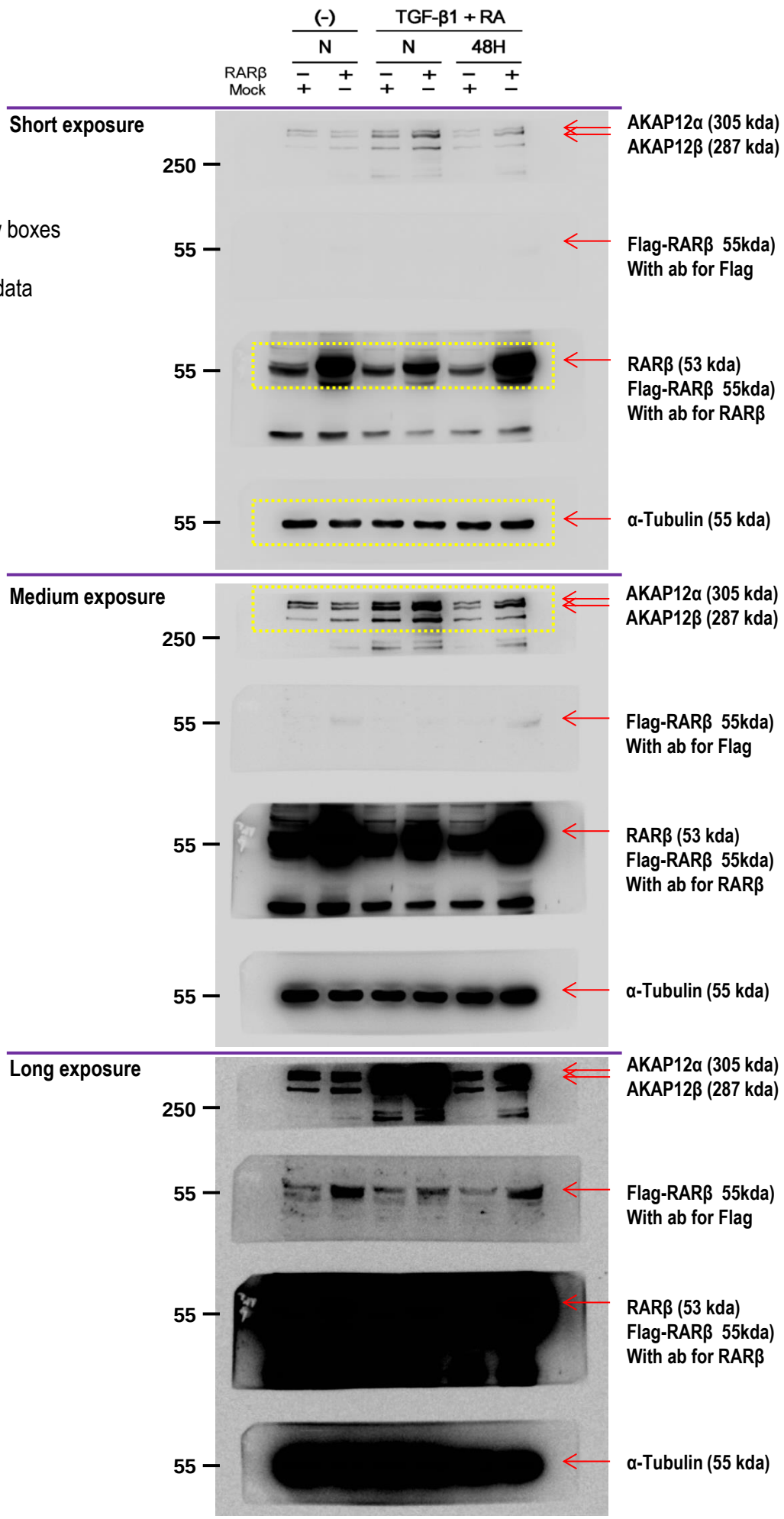
Supplementary Figure 6. Continued

Fig. 4b



Supplementary Figure 6. Continued

Fig. 4C



Bands of yellow boxes were used as representative data

Supplementary Figure 6. Continued

Fig. 5a and Supplementary Fig. 5a

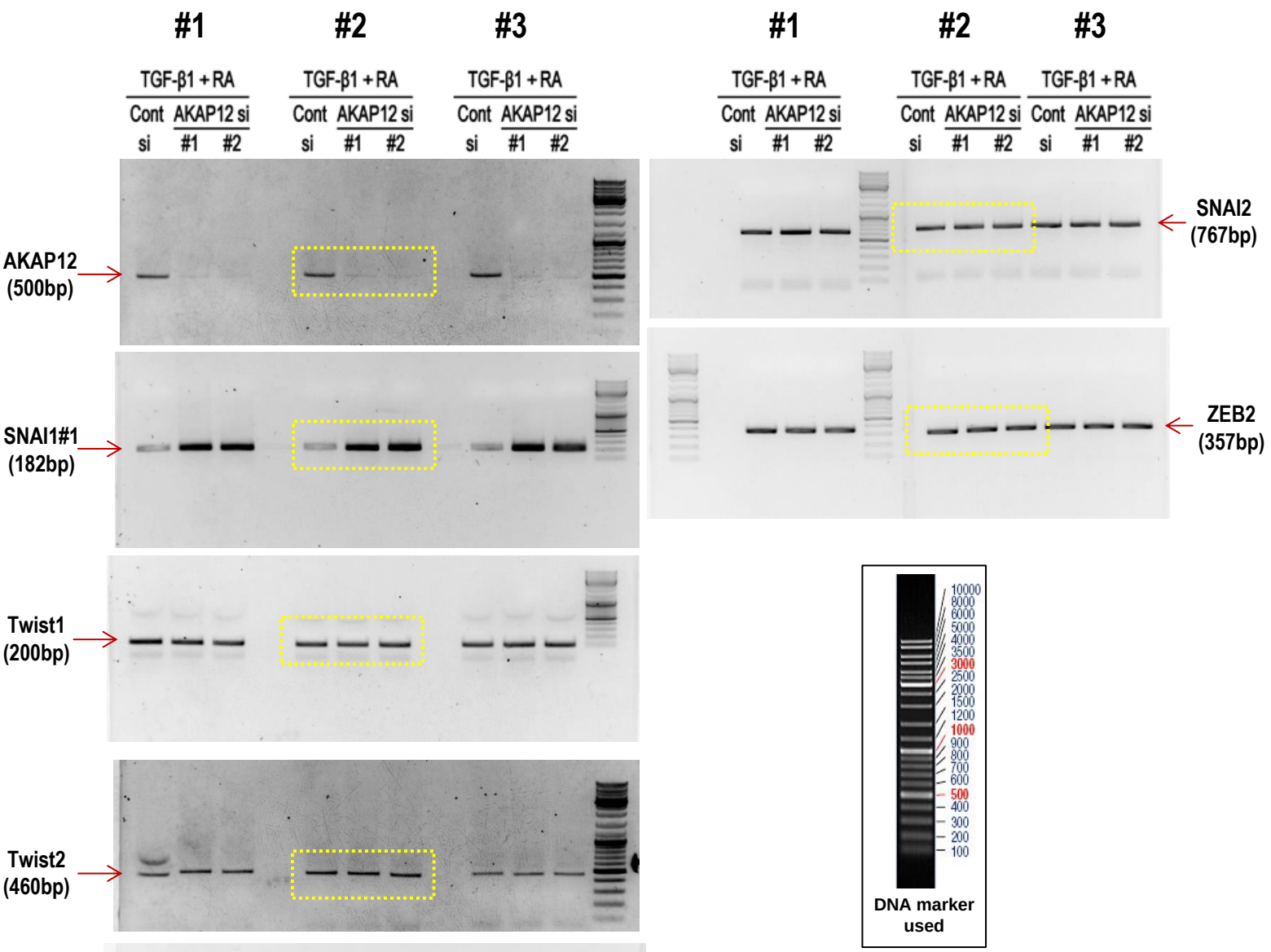


Fig. 5a

Bands of yellow boxes were used as representative data

Supplementary Fig.5a

Band intensities of AKAP12 αβ and SANI1 were analyzed with Image J and normalized to that of GAPDH. Results were presented as a graph.

Supplementary Figure 6. Continued

Fig. 5b and Supplementary Fig. 5b

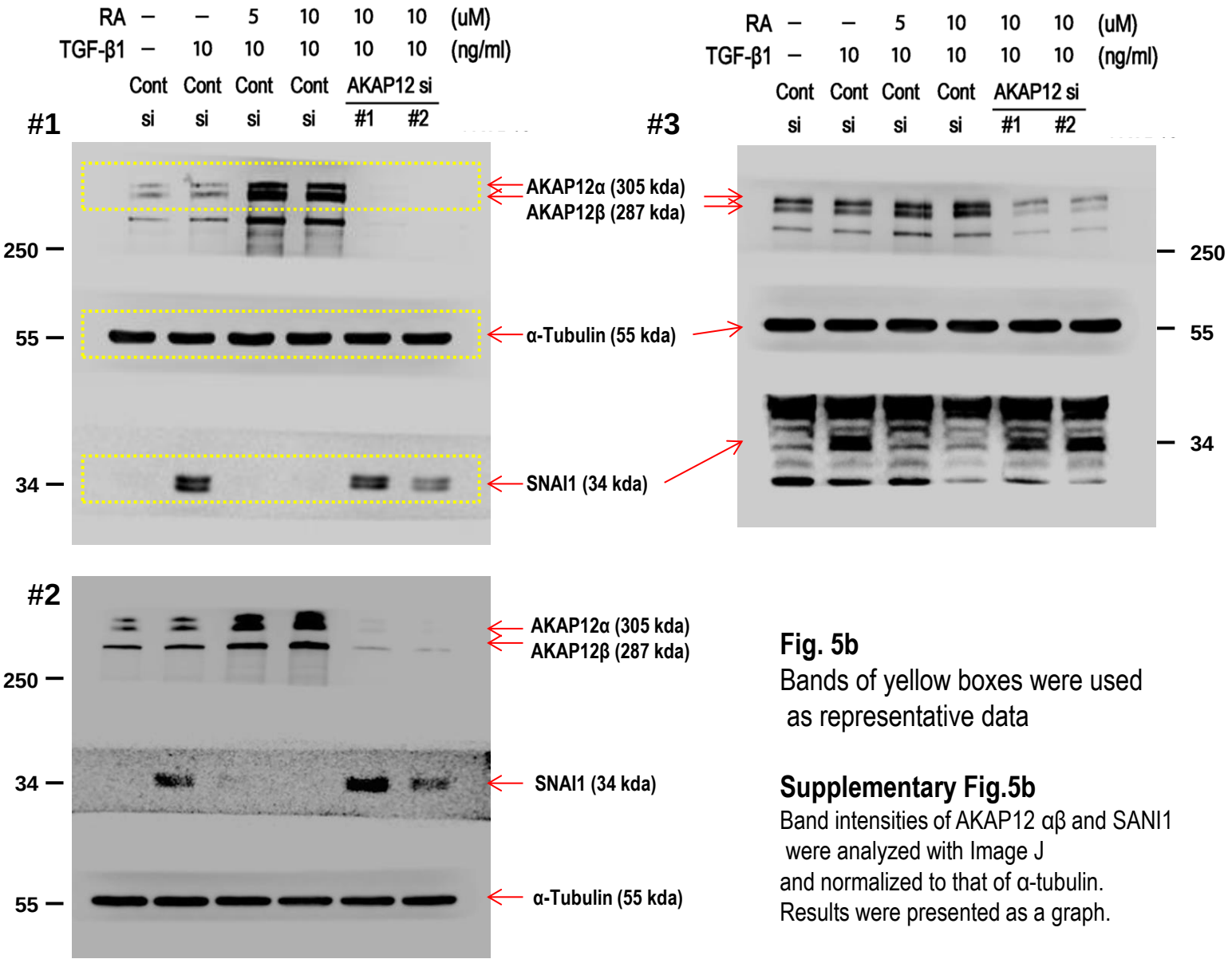
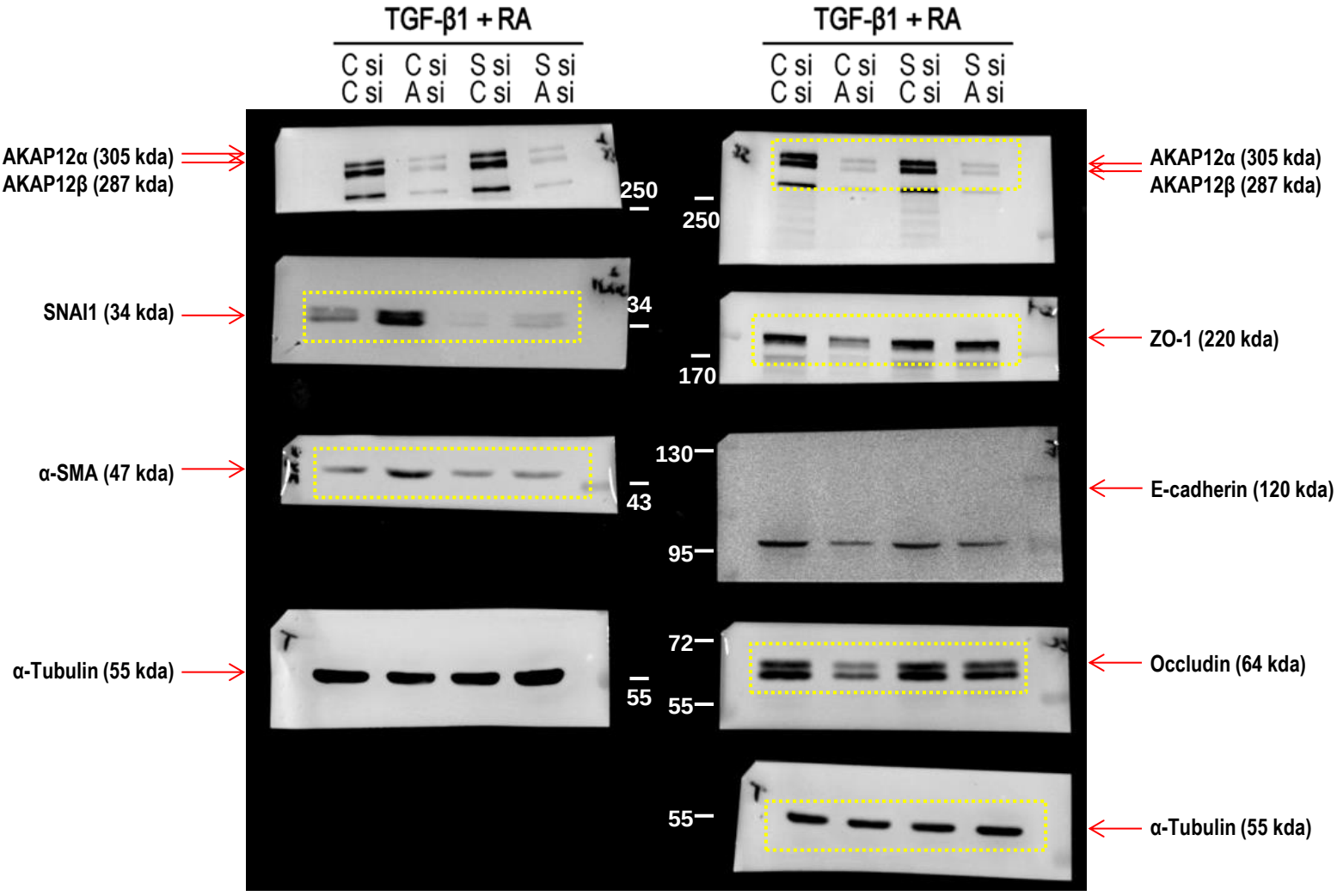


Fig. 5b
Bands of yellow boxes were used as representative data

Supplementary Fig.5b
Band intensities of AKAP12 αβ and SANI1 were analyzed with Image J and normalized to that of α-tubulin. Results were presented as a graph.

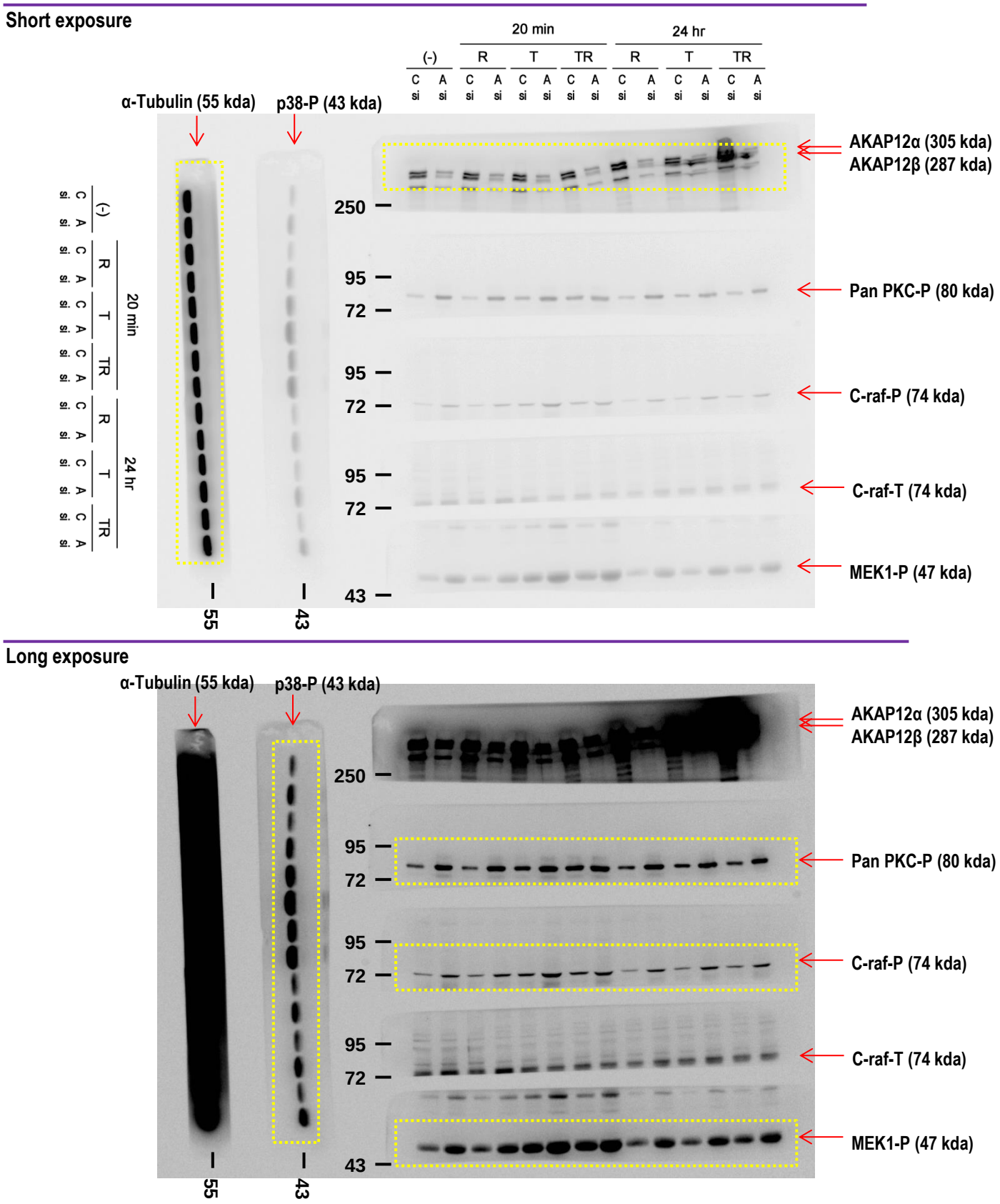
Supplementary Figure 6. Continued

Fig. 5d



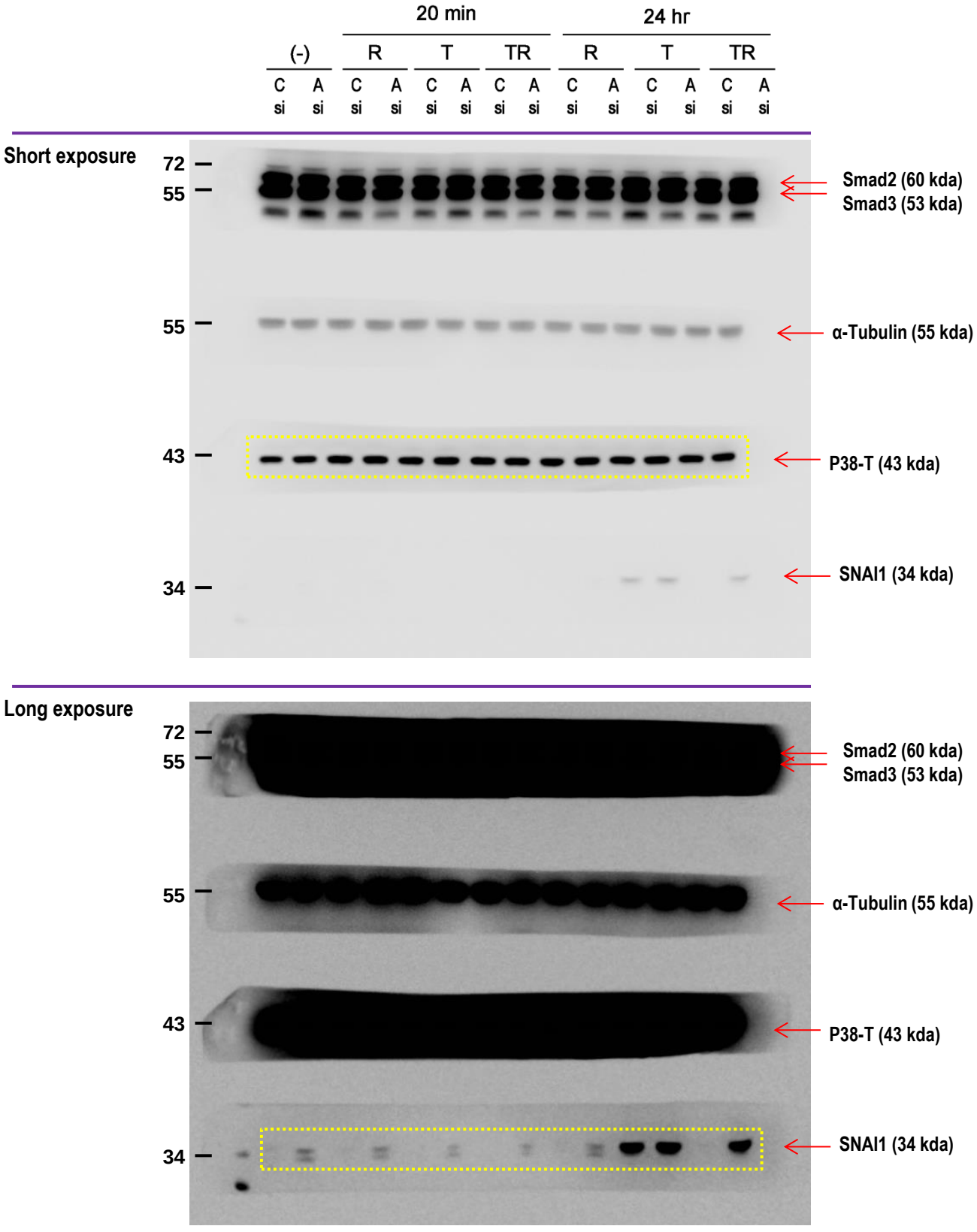
Supplementary Figure 6. Continued

Fig. 6a



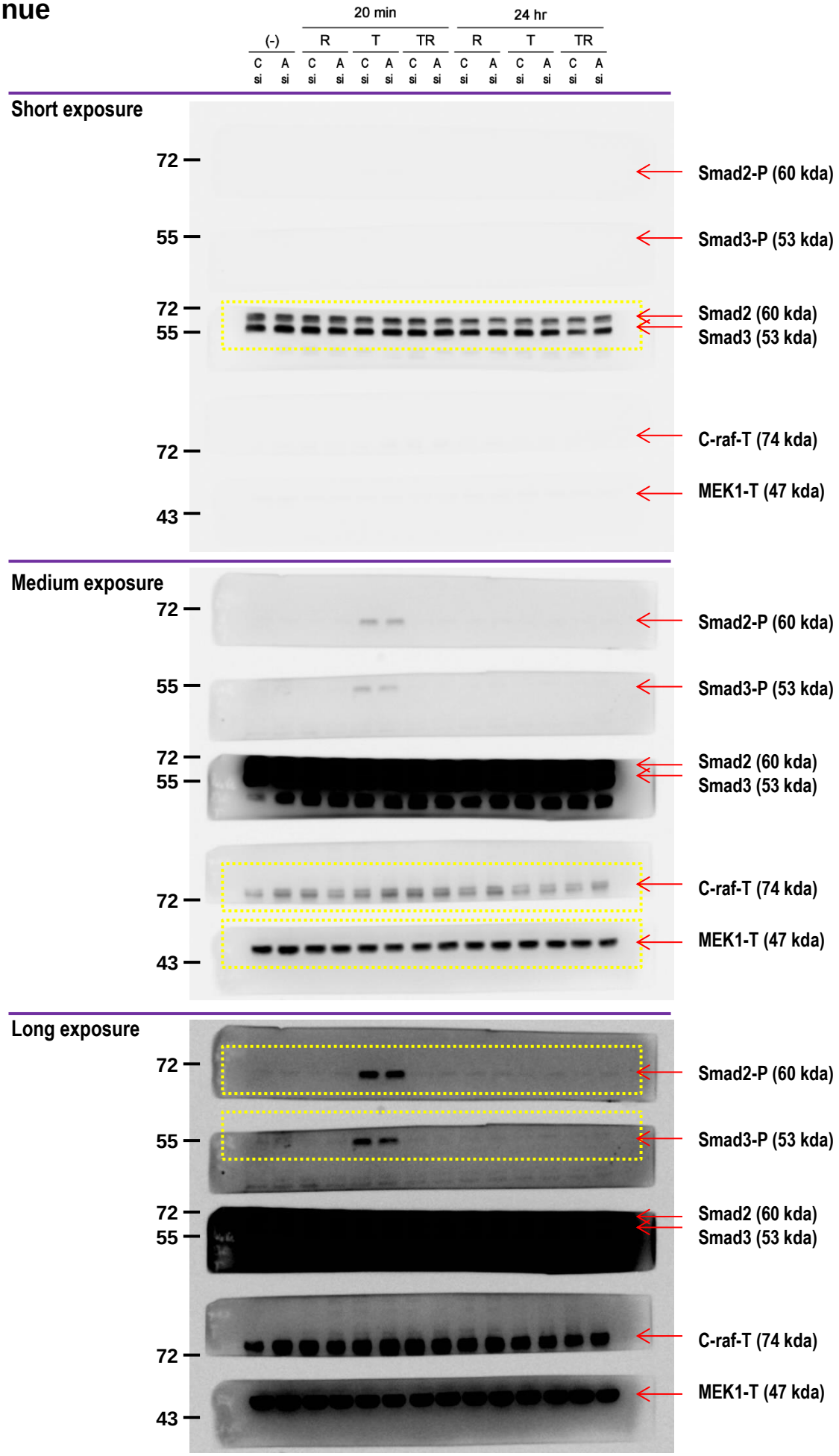
Supplementary Figure 6. Continued

Fig. 6a-continue



Supplementary Figure 6. Continued

Fig. 6a-continue

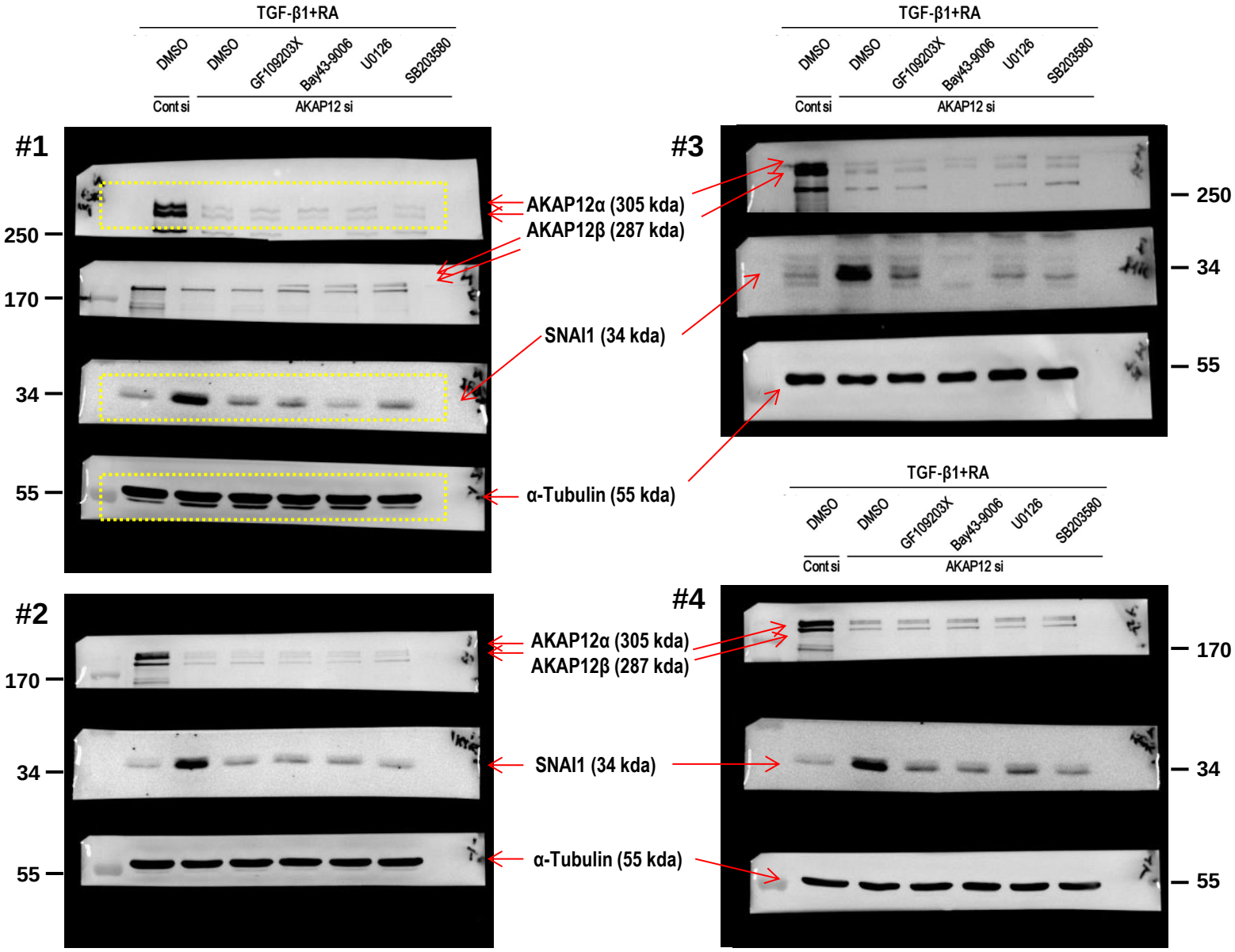


Supplementary Figure 6. Continued

Fig. 6b

Bands of yellow boxes were used as representative data

Band intensities of AKAP12 αβ and SANI1 were analyzed with Image J and normalized to that of α-tubulin. Results were presented as a graph.



Supplementary Figure 6. Continued

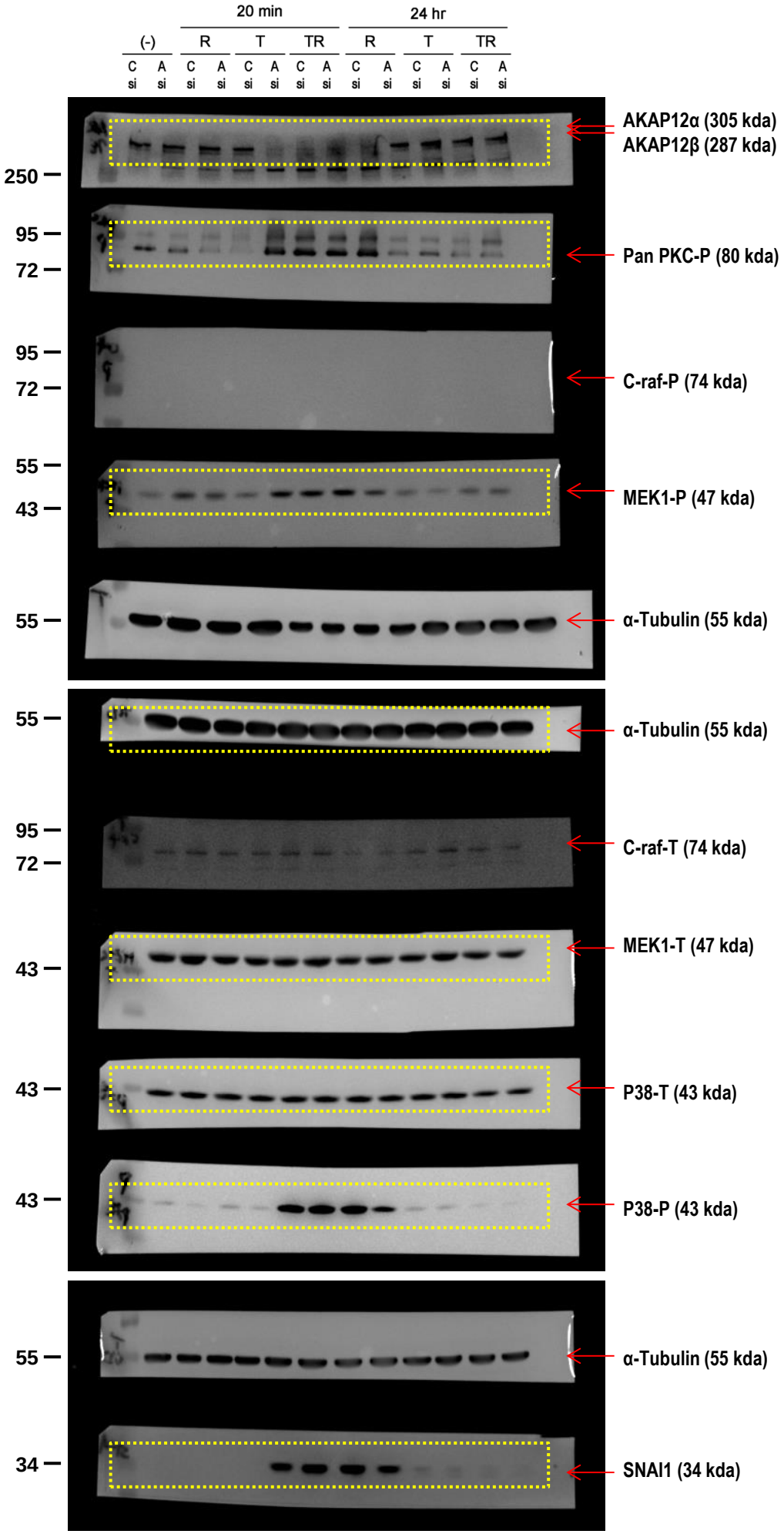
Fig. 6c

Bands of yellow boxes
were used as representative data

AKAP12, SNAI1, and pan-PKC-P
densities were normalized to
that of a-tubulin.

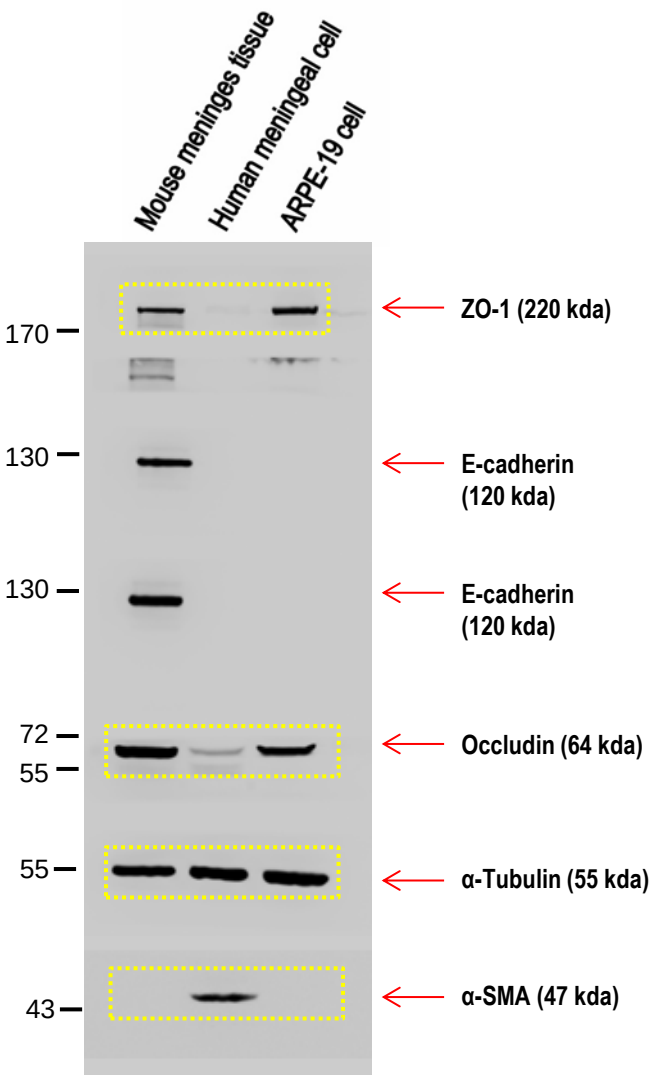
The densities of MEK-P and p38-P
were normalized to
that of total MEK and total p38,
respectively.

Results were presented as a graph

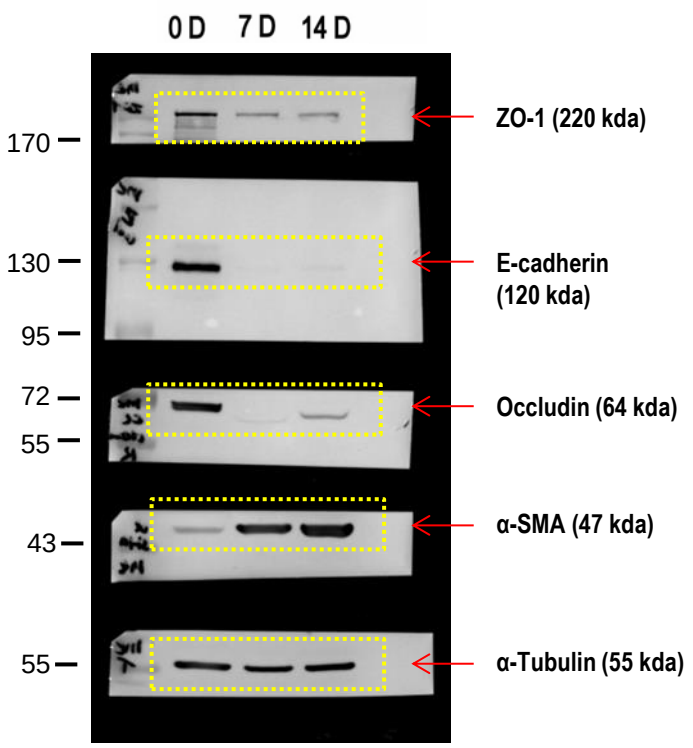


Supplementary Figure 6. Continued

Supplementary Fig. 2b

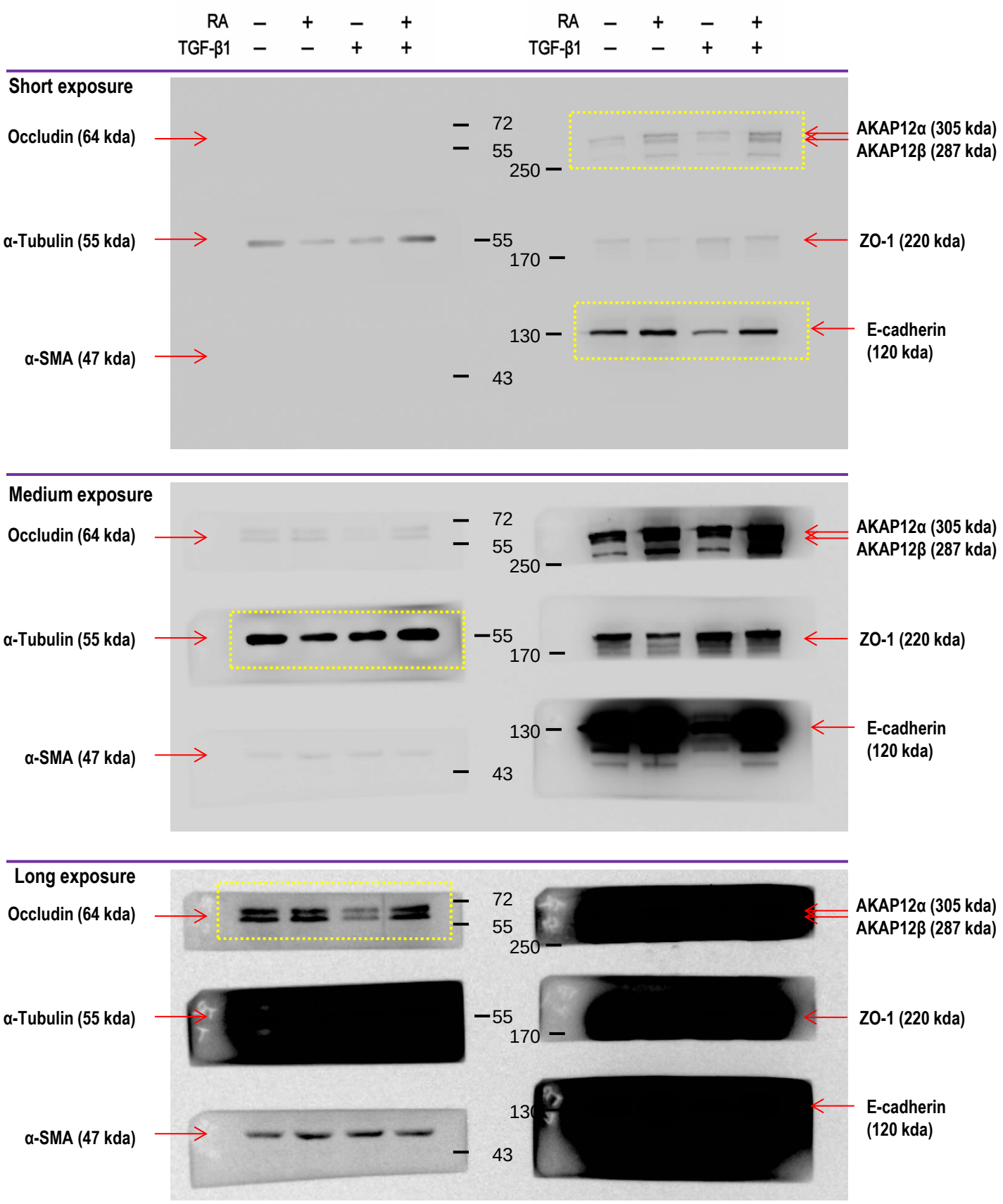


Supplementary Fig. 2d



Supplementary Figure 6. Continued

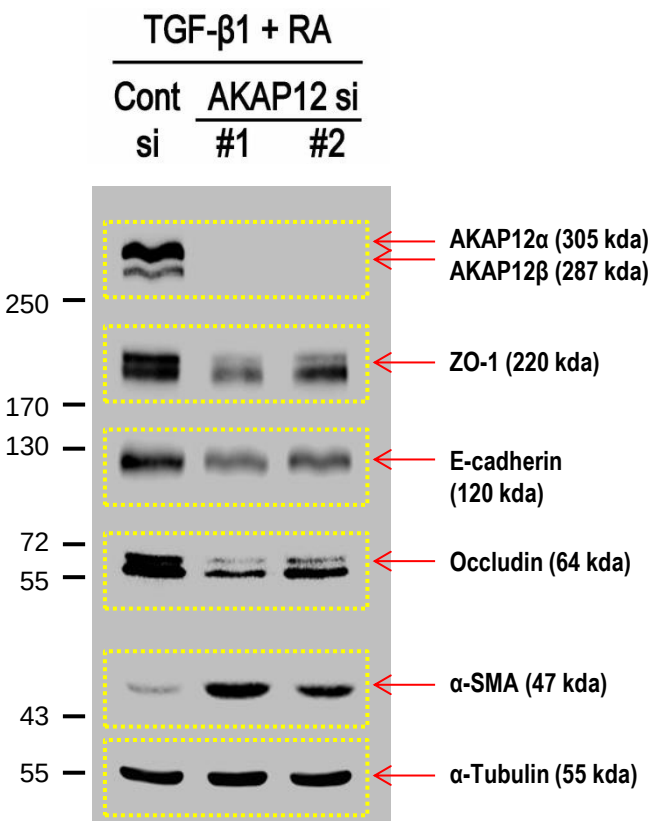
Supplementary Fig. 3a Bands of yellow boxes were used as representative data



Supplementary Figure 6. Continued

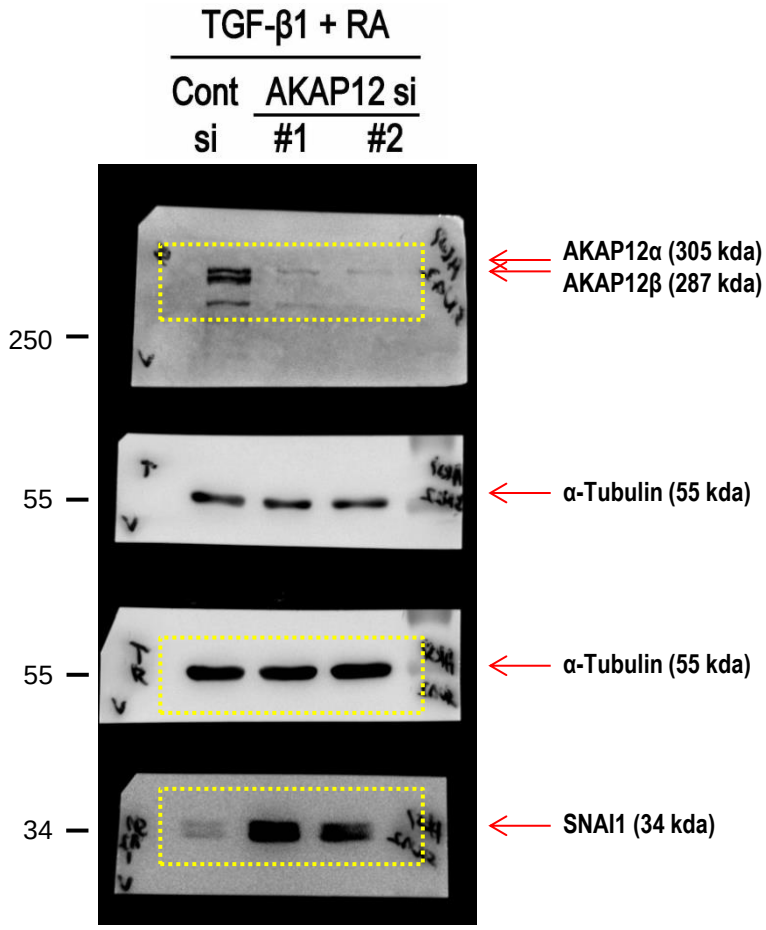
Supplementary Fig. 3b

Bands of yellow boxes
were used as representative data



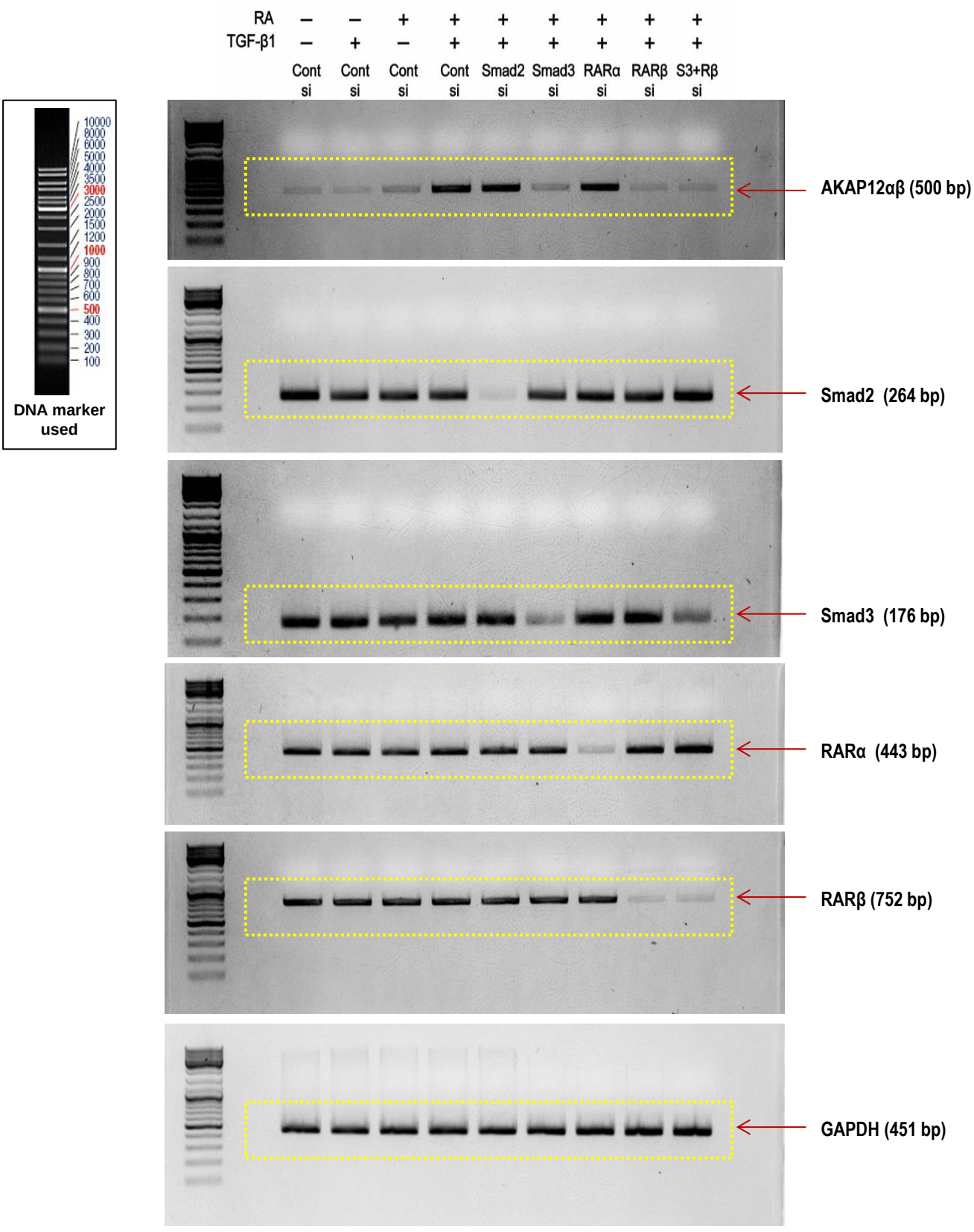
Supplementary Fig. 3d

Bands of yellow boxes
were used as representative data



Supplementary Figure 6. Continued

Supplementary Fig. 4



Supplementary Figure 6. Continued

Supplementary table 1. Sequences for siRNAs and PCR primers

siRNA sequence		
GFP	5'-GUU CAG CGU GUC CGG CGA G dT-3'	
AKAP12 #1	5'-UCU GCA GAA UCU CCG ACU A dT-3'	
AKAP12 #2	5'-AGA CGG AUG UAG UGU UGA A dT-3'	
SNAI1	5'-GGU GUG ACU AAC UAU GCA A dT-3'	
Smad2	5'-UCU UUG UGC AGA GCC CCA A dTdT-3'	
Smad3	5'-ACC UAU CCC CGA AUC CGA U dTdT-3'	
RARα	5'-GAA CAU GGU GUA CAC GUG U dTdT-3'	
RARβ	5'-UUA AGC AGA UGG CAC UGA GAA GGC C dTdT-3'	
PCR primer		
AKAP12α	F5'-GTC TCC TTC ATT CGC AGG CT-3' R5'-CAT GGC TCC TCC GCA CTT CTC-3'	Tm: 55 ℃, Cycle: 30
AKAP12β	F5'-AGG GCA CCT CCG GTT CTC-3' R5'-GGT TCG CTT TCT TTG GAT GC-3'	Tm: 55 ℃, Cycle: 26
AKAP12αβ (α, β common)	F5'-AAG TCA GCG GTT GTT CAC GAC-3' R5'-CTG TTT CAC TGG TCA CGG GAC-3'	Tm: 55 ℃, Cycle: 24
SNAI1	F5'-TTT ACC TTC CAG CAG CCC TA-3' R5'-TTT CCC ACT GTC CTC ATC TG-3'	Tm: 60 ℃, Cycle: 35
SNAI2	F5'-GCC TCC AAA AAG CCA AAC TAC AG-3' R5'-GTG TGC TAC ACA GCA GCC-3'	Tm: 60 ℃, Cycle: 32
Twist1	F5'- GGA GTC CGC AGT CTT ACG AG-3' R5'-TCT GGA GGA CCT GGT AGA GG-3'	Tm: 57 ℃, Cycle: 35
Twist2	F5'-GCC GCC AGG TAC ATA GAC TT-3' R5'-CCC CAA ACA TAA GAC CCA GA-3'	Tm: 57 ℃, Cycle: 35
ZEB1	F5'-CGA GTC AGA TGC AGA AAA TGA GCA AAA C-3' R5'-ACC CAG ACT GCG TCA CAT GTC TT-3'	Tm: 55 ℃, Cycle: 31
ZEB2	F5'-TGC TCG CAC TAC AAT GCA TC-3' R5'-ACA GGG TGA GCT TAA CAC TG-3'	Tm: 55 ℃, Cycle: 31
Smad2	F5'-AGA TCA GTG GGA TAC AAC AGG-3' R5'-GGC ACT AAT ACT GGA GGC AA-3'	Tm: 62 ℃, Cycle: 28
Smad3	F5'-TGC TGG TGA CTG GAT AGC AG-3' R5'-CTC CTT GGA AGG TGC TGA AG-3'	Tm: 60℃, Cycle: 27
RARα	F5'-AGC ATC CAG AAG AAC ATG GTG-3' R5'-CTT GAG GAG GGT GAT CTG GTC-3'	Tm: 60℃, Cycle: 28
RARβ	F5'-AGG AGA CTT CGA AGC AAG-3' R5'-GTC AAG GGT TCA TGT CCT TC-3'	Tm: 58℃, Cycle: 26
GAPDH	F5'-ACC ACA GTC CAT GCC ATC AC-3' R5'-TCC ACC ACC CTG TTG CTG TA-3'	Tm: 55℃, Cycle: 22