Supplementary figure legends

Supplementary Figure S1. RBM10 is a candidate tumor suppressor. (A-C) Low expression of RBM10 is associated with colorectal and breast cancer patients. The RBM10 expression and colorectal and breast cancer patient survival data (MSK, Cancer cell 2018) (TCGA, Cell 2015) were downloaded from the cBioPortal for Cancer Genomics (http://www.cbioportal.org). Logrank Test, P-Value: 8.911e-4. (D) Analysis of mutual exclusivity was retrieved from cBioPortal for the gene alteration status of RBM10 and TP53.

Supplementary Figure S2. RBM10 is located in the nucleus. (A and B) HCT116$^{p53+/+}$, HCT116$^{p53-/-}$, MCF7 and MDA MB 231 cells were harvested for analysis of subcellular fractions by IB with indicated antibodies. (C) Localization of RBM10 in HCT116$^{p53+/+}$ cells as detected by immunofluorescence staining (RBM10 in red; DAPI in blue).

Supplementary Figure S3. RBM10 induces p53-dependent apoptosis. (A-D) HCT116$^{p53+/+}$ HCT116$^{p53-/-}$, H460, U87 and MCF7 cells were transfected with RBM10 for 48 h, and harvested for IB analysis using antibodies as indicated. (E) HCT116$^{p53+/+}$ cells were transfected with control shRNA, RBM10 shRNA #1, or RBM10 shRNA #2, and harvested 48 h post transfection for IB analysis with indicated antibodies. (F) HCT116$^{p53+/+}$ cells were transfected with pcDNA or RBM10 plasmid and treated with pan-caspase inhibitor (Z-VAD) during 24 h before being harvested for IB analysis with indicated antibodies.

Supplementary Figure S4. RBM10 does not affect the RNA level of p53. (A and B) HCT116$^{p53+/+}$ cells were transfected with pcDNA or RBM10 plasmid and harvested 48 h post transfection for qRT-PCR.

Supplementary Figure S5. RBM10 regulates the expression of some p53 target genes involved in cell migration and metastasis. (A) HCT116$^{p53+/+}$ and HCT116$^{p53-/-}$ cells were transfected with pcDNA or RBM10 plasmid and harvested 48 h post transfection for qRT-PCR (B-F) HCT116$^{p53+/+}$ cells were transfected with pcDNA or RBM10 plasmid and harvested 48 h post transfection for qRT-PCR.

Supplementary Figure S6. RBM10 inhibits mitochondrial respiration in part dependently of p53. (A-D) HCT116$^{p53+/+}$ and HCT116$^{p53-/-}$ cells were transfected with pcDNA or RBM10 plasmid and harvested 48 h post transfection for mitochondrial respiration as measured by Seahorse XF.

Supplementary Figure S7. RBM10 inhibits p53 degradation in H460 cells. p53's half-life is increased upon RBM10 overexpression. Cells were treated with pcDNA or RBM10 for 48 h were treated with 50 μg ml^{-1} of CHX and harvested at different time points as indicated for IB analysis.

Supplementary Figure S8. RBM10 does not appear to bind to mutant p53s. (A and B) HCT116$^{p53-/-}$ cells were transfected with plasmids encoding RBM10 and Flag-p53(R249S) or Flag-

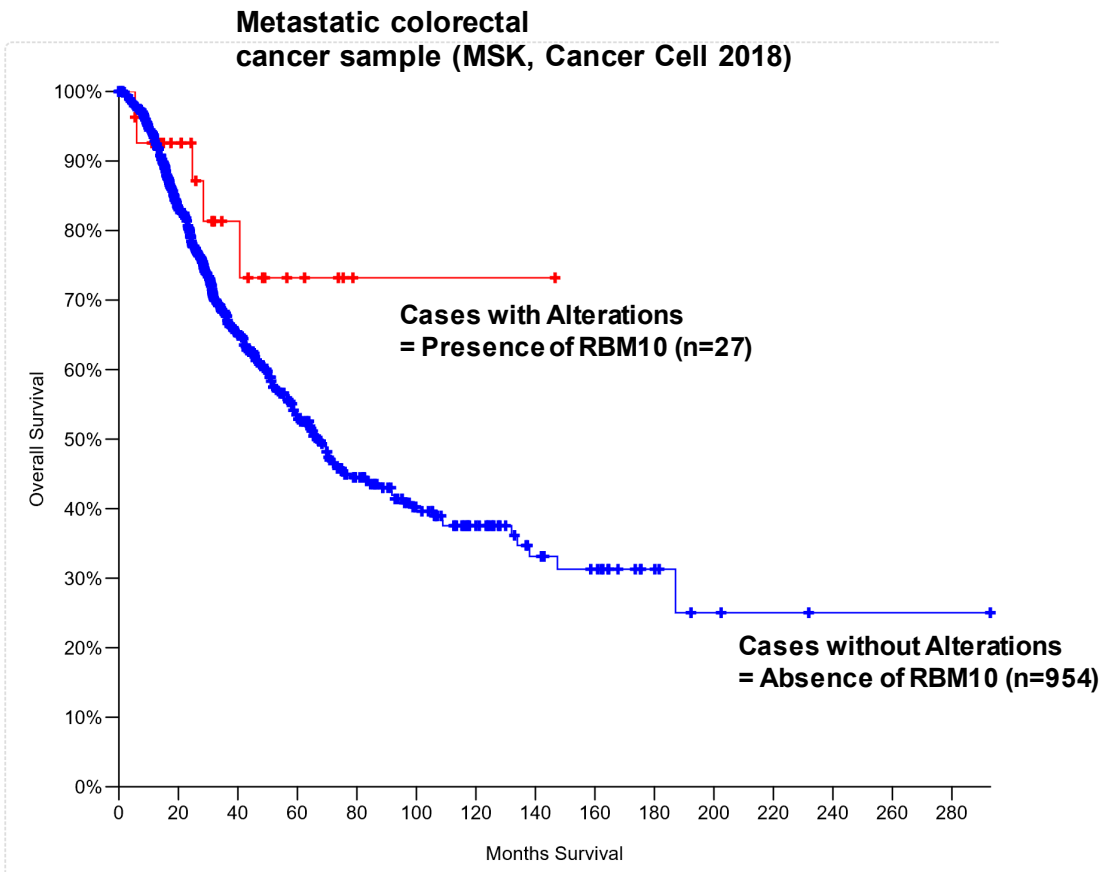
p53(Y200C), RBM10 and Flag-p53(R273H) or Flag-p53(R248W) as indicated followed by co-IP-IB assays using antibodies as indicated.

Supplementary Figure S9. RBM10 impairs the interaction between p53 and MDM2. HCT116$^{p53-/-}$ cells were transfected with combinations of plasmids encoding p53, HA-MDM2 or RBM10 as indicated followed by co-IP-IB assays using antibodies as indicated.

Supplementary Figure S10. The RRM1- and RRM2-containing N-terminus of RBM10 is required for p53 activation, but not for p53-binding. (A) HCT116$^{p53+/+}$ cells were transfected with combinations of plasmids encoding pcDNA, Flag-RBM10 (WT) or Flag-RBM10 (ΔN) and harvested 48 h post transfection for IB analysis with indicated antibodies. (B) HCT116$^{p53-/-}$ cells were transfected with combinations of plasmids encoding pcDNA, p53, Flag-RBM10 (WT) or Flag-RBM10 (ΔN) and harvested 48 h post transfection for co-IP-IB assays using antibodies as indicated.

Supplementary Figure S11. RBM10 is not required for p53 activation by DNA damaging or ribosomal stress agents. (A-C) HCT116$^{p53+/+}$ cells were transfected with control siRNA or RBM10 siRNA for 72 h. After transfection, cells were treated with actinomycin D (ActD), Doxorubicion (Dox), or 5-FU as indicated and harvested for WB analysis with indicated antibodies.

A



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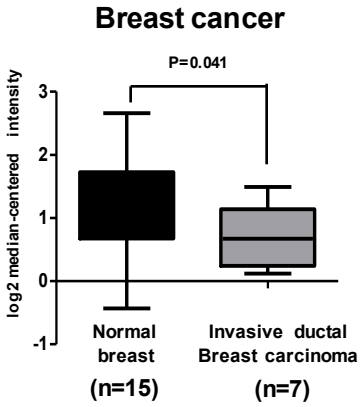

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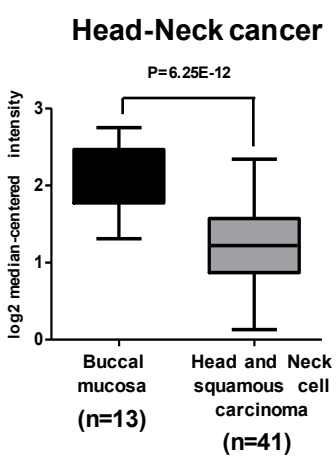
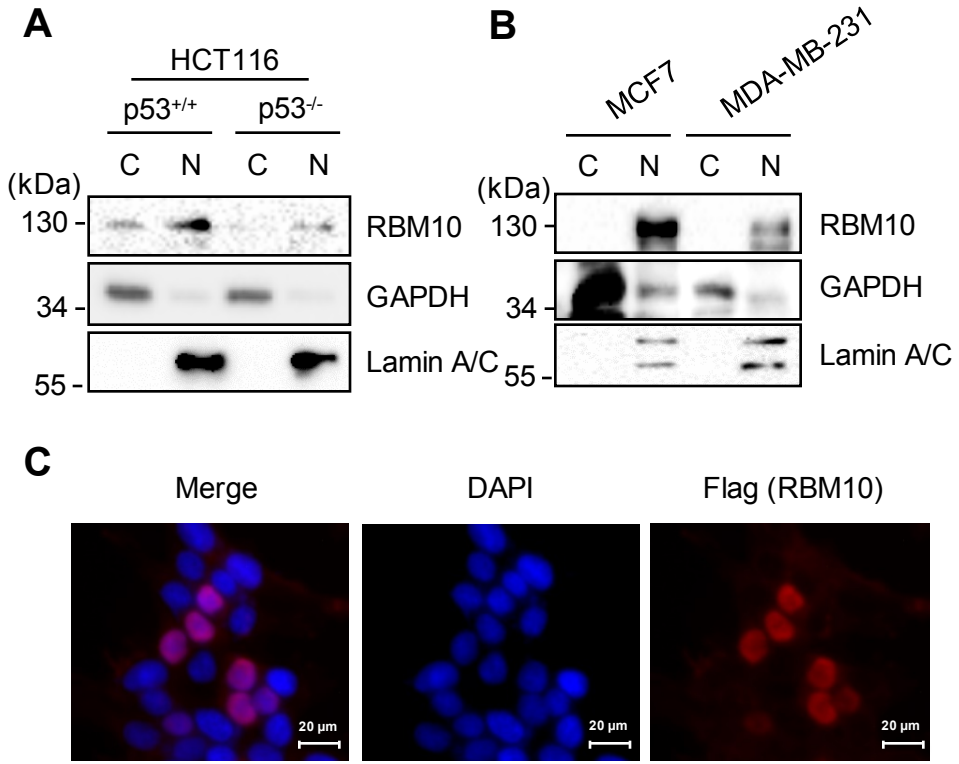


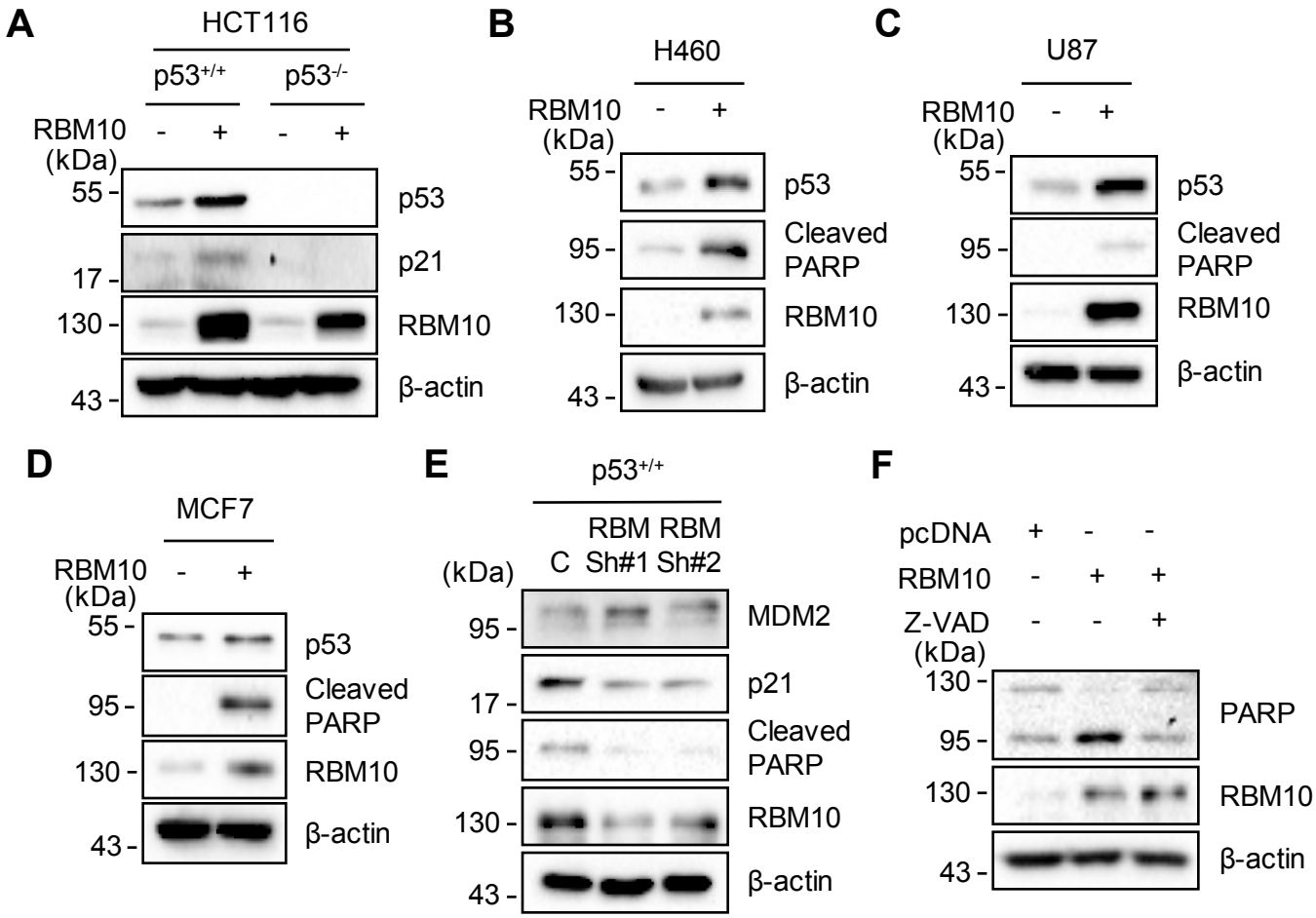
D

GeneA	GeneB	*P*-value	Log odds ratio	Source	Sample size
RBM10	TP53	<0.001	1.828	Breast invasive carcinoma (TCGA, Provisional)	963
RBM10	TP53	0.003	1.515	Breast invasive carcinoma (TCGA, Cell 2015)	816
RBM10	TP53	0.049	1.006	Uterine corpus endometrial carcinoma (TCGA, Nature 2013)	240

Supplementary Figure 1



Supplementary Figure 2



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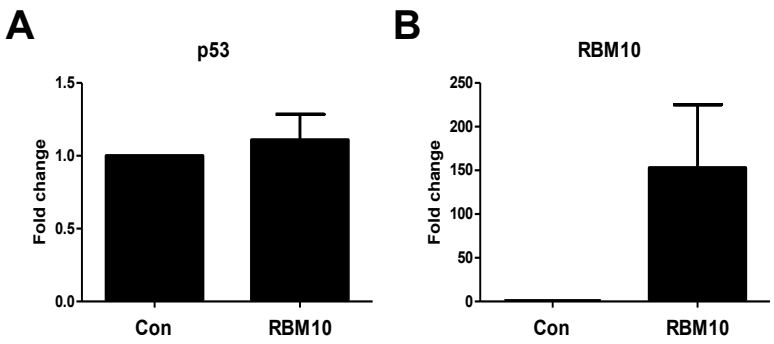

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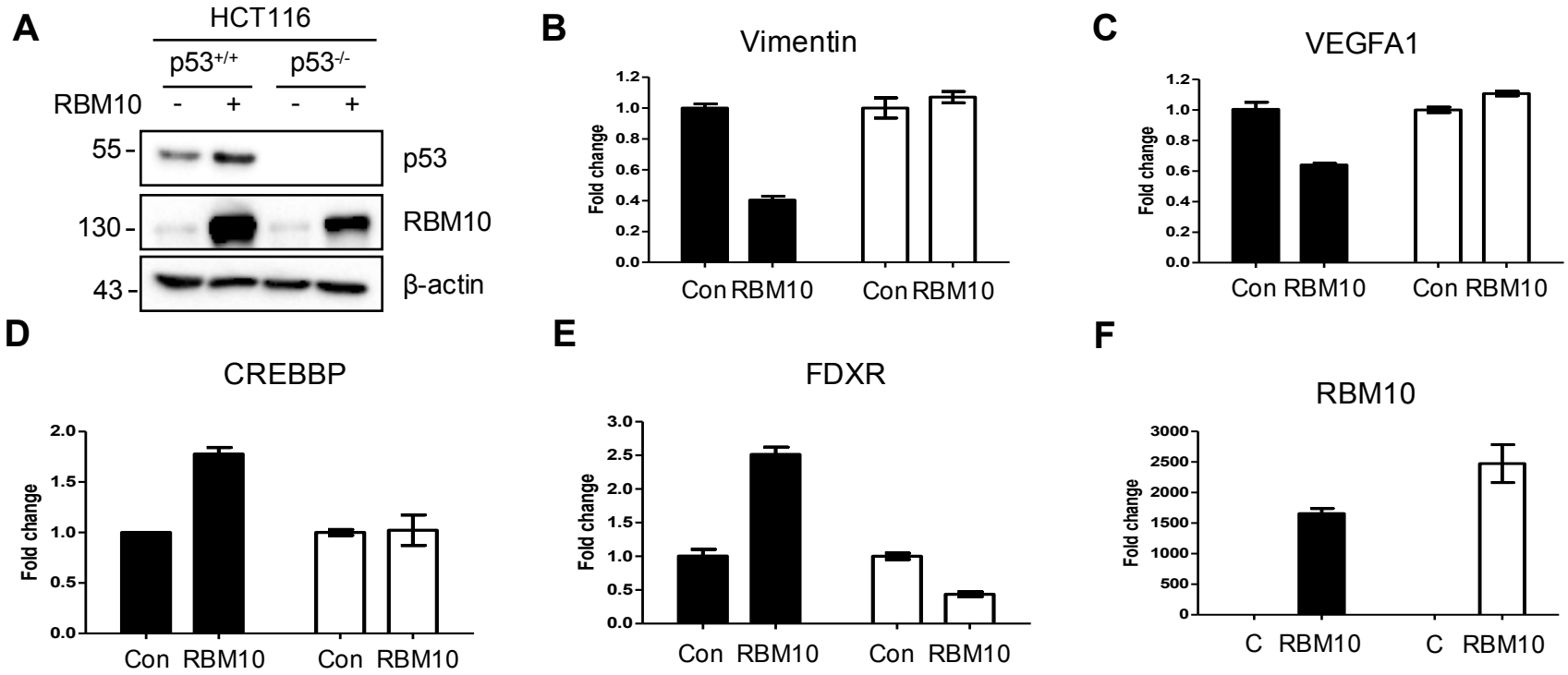
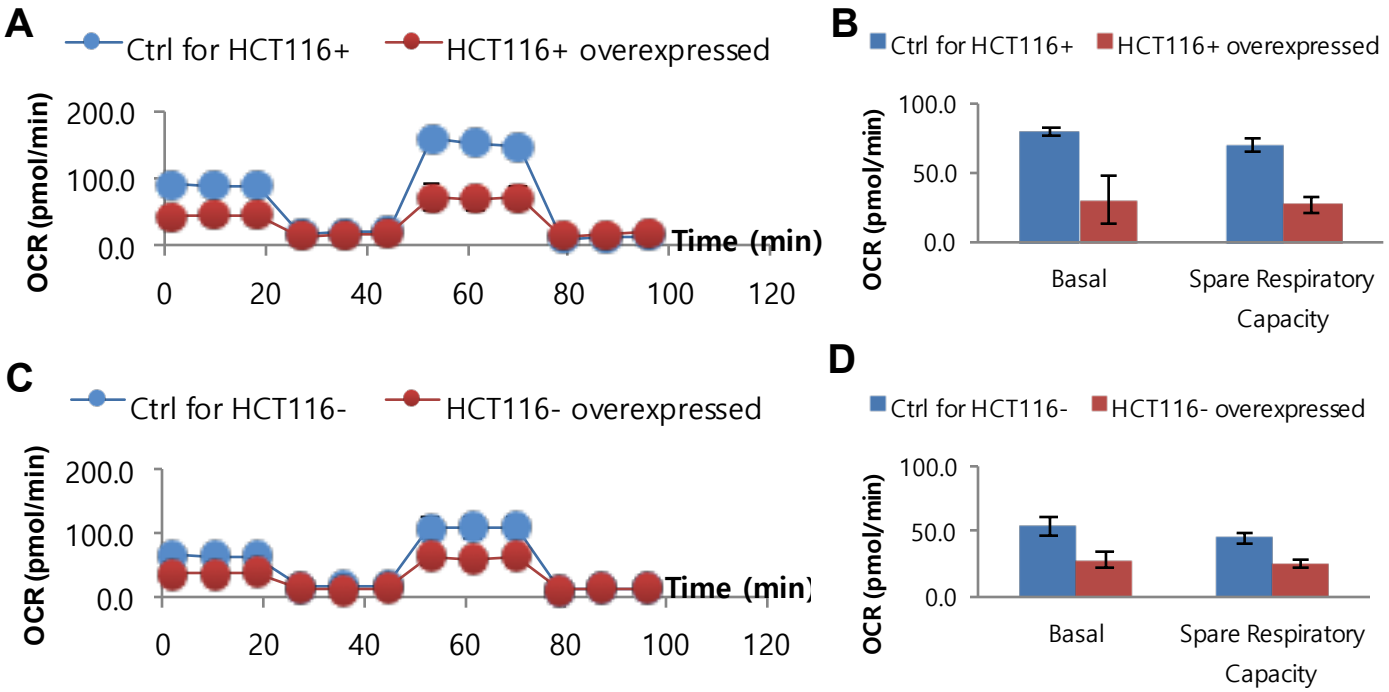
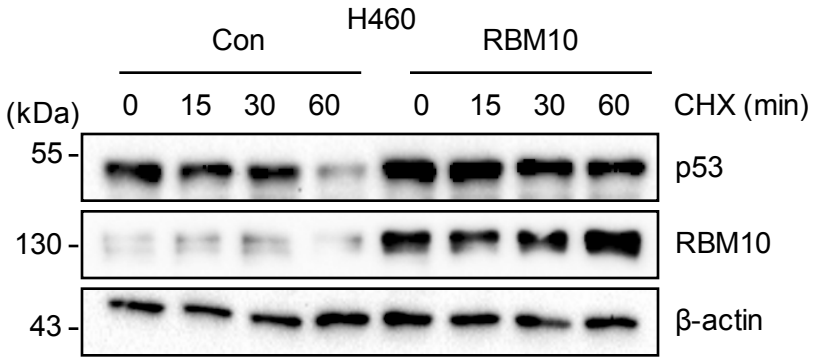


Supplementary Figure 5



Supplementary Figure 6



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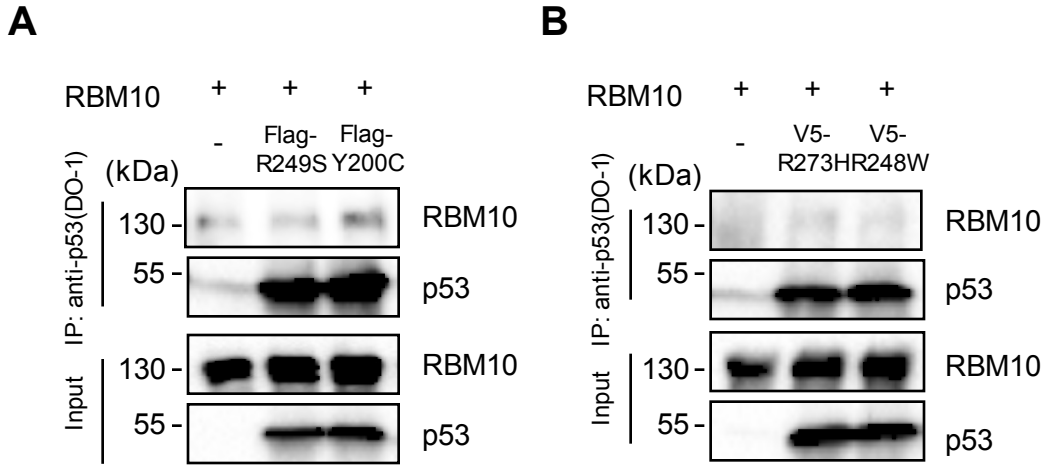
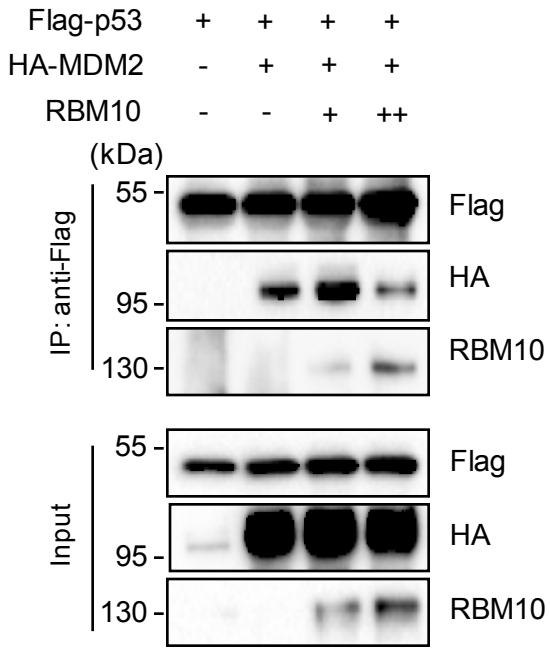
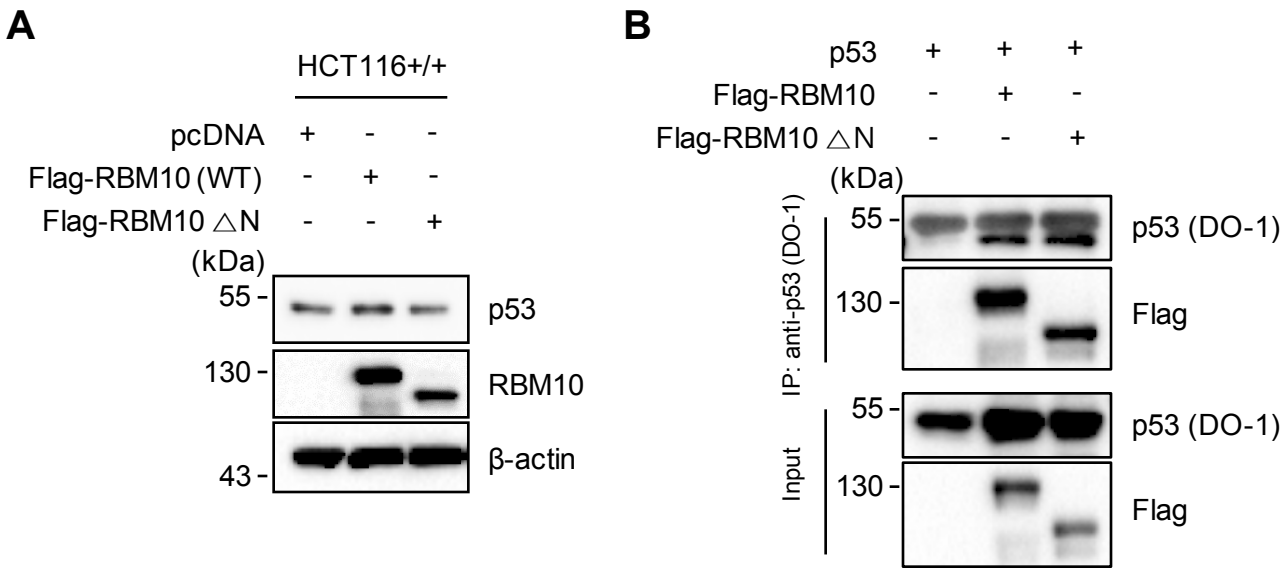


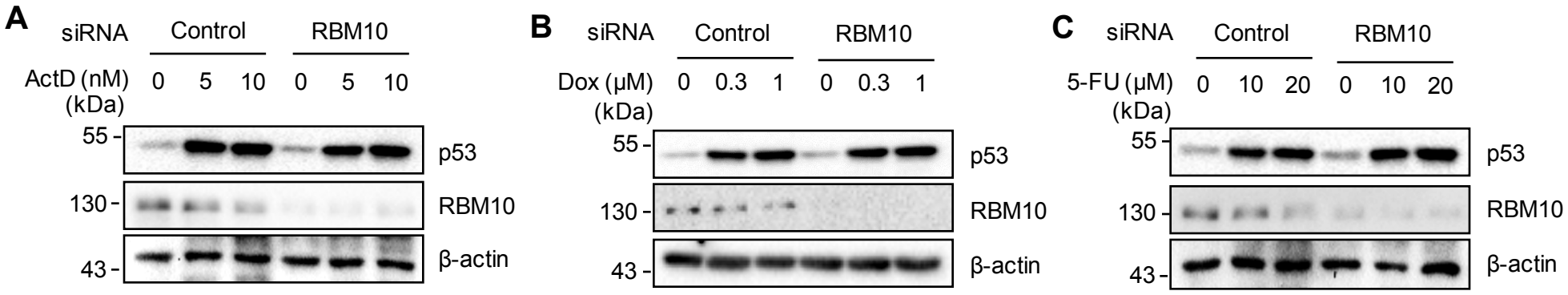
Supplementary Figure 8



Supplementary Figure 9



Supplementary Figure 10



Supplementary Figure 11