

Supporting Information

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SI Materials and Methods

Mouse Colonies. *ASPP2* Δ exon3 mutant mice were generated as described previously (1) and backcrossed to a BALB/c background for nine generations. *ASPP2* Δ exon3 mutant mice were genotyped as described in Vives et al. (1), using the following primers: 5'-CTCCACCCCAGGAAATTACA-3' (intron 3), 5'-CGGTTTGGGAAGTCAAAGGAA-3' (exon 3), and 5'-GGA-CCGCTATCAGGACATA-3' (neomycin resistance gene). *p53* heterozygous mice (on a BALB/c background) were generated by G.L.'s group. *p53* and *ASPP2* single heterozygous mice were crossed together to generate double heterozygotes. The latter were intercrossed to generate compound genotypes. *p53* KO mice were genotyped using the following primers: 5'-CCC-GAGTATCTGGAAGACAG-3' (exon 6), 5'-ATAGGTCGGC-GGTTTCAT-3' (exon 7), and 5'-GGACCGCTATCAGGACATA-3' (neomycin resistance gene). *p63* heterozygous mice (on a BALB/c background) were generated by F.D.M.'s group. *p63* and *ASPP2* single heterozygous mice were crossed together to generate double heterozygotes. The latter were intercrossed to generate compound genotypes. *p63* KO mice were genotyped using the following primers: 5'-TTCTCAGATGGTACC-GCTCC-3' (exon 3), 5'-GGTGCTTTGAGGCCCGGATC-3' (exon 4), and 5'-TACCCGCTTCATTGCTCAG-3' (neomycin resistance gene).

Tumor Processing and Analysis. Mice that developed visible tumors or showed signs of ill health were killed and subjected to necropsy with careful examination for tumors. Tumors and samples from other organs were fixed in 10% (wt/vol) buffered formalin and processed for histology. Sections 4 μ m thick were stained with H&E. Tumor characterization at the morphological level (macroscopic and H&E), before immunohistochemistry, was conducted by V.S., R.D.G., and F.F.

Tissue Section Staining. Rehydrated paraffin-embedded sections were microwaved in 10 mM sodium citrate buffer, pH 6, incubated in 3% (vol/vol) hydrogen peroxide in methanol, washed in PBS solution, blocked with 5% (vol/vol) goat serum in PBS solution for 1 h at room temperature (RT), and then incubated overnight (O/N) at 4 °C with the primary antibody diluted in blocking solution. Subsequently, sections were incubated with biotinylated or Alexa Fluor (1:400; Molecular Probes) secondary antibody for 30 min at RT and then washed in PBS solution. Sections incubated with fluorescent secondary antibodies were mounted and analyzed by confocal microscopy (Zeiss), whereas sections incubated with biotinylated secondary antibodies were first treated with the peroxide substrate solution diaminobenzidine (Vector), followed by dehydration, mounting, and analysis by phase-contrast microscopy. Human skin and cervical tissue samples (tumor and normal) were provided by R.D.G. Human head and neck squamous cell carcinoma (SCC) tissue samples were provided by M.T. Human head and neck tissue array was provided by H.M., G.F.H., and M.R.

Tissue Microarray Analysis. *ASPP2* expression was scored based on the intensity of staining (0, none; 1, weak; 2, moderate; 3, strong) and the proportion of cells exhibiting staining (0–100% in 5–10% increments). The overall expression is a product of these two scores [expression = intensity \times proportion (0–300)]. Statistical analysis was undertaken using SPSS Statistics software. Results were analyzed by the Kruskal–Wallis test (i.e., *H* test) with Mann–Whitney tests (i.e., *U* test) used for post hoc procedures,

and the effect size is denoted by $r = z/\sqrt{n}$ (>0.3 represents medium effect, >0.5 represents large effect). A Bonferroni correction was applied so all effects are reported at a 0.0167 (i.e., 0.05/3) level of significance.

Cell Culture and Generation of Primary Cells. Mouse embryonic fibroblasts (MEFs) and mouse primary keratinocytes (PKs) were prepared and cultured as described previously (2) from *ASPP2* Δ exon3/+ mice. Undifferentiated mouse PKs and HaCat cells were differentiated by the addition of CaCl₂ in the medium to a final concentration of 1.2 mM. SCC cell lines (3) were cultured in DMEM supplemented with L-glutamine, penicillin/streptomycin, 10% (vol/vol) FCS, and nonessential amino acids (Sigma-MEM solution).

Cell Transfection and Electroporation. FuGene6 (Promega) transfection and electroporation (Amaxa) were used according to the manufacturers' protocols.

siRNAs. siRNA oligos against Notch1, NF- κ B/p65, *ASPP2*, and RISC-Free siRNA were purchased from Dharmacon. Cells were transfected with the indicated siRNA oligos at a final concentration of 35 nM using Dharmafect 1 reagent (Dharmacon) according to the manufacturer's instructions.

Immunoblotting and Immunoprecipitation. Cell lysates of the 34 SCC cell lines panel were generated as previously described (3). For all other immunoblots cells were lysed in buffer, containing 10 mM Tris-Cl (pH 8.0), 140 mM NaCl, 1 mM EDTA, 0.5 mM EGTA, 1% Triton X-100, 0.1% sodium deoxycholate, 0.1% SDS, and Complete Protease Inhibitor Mixture (Roche). Protein concentration was estimated using Bradford assay. Protein extracts were loaded onto SDS-polyacrylamide gels. Gels were transferred onto nitrocellulose membranes (Protran) and the resulting blots incubated first with primary antibody overnight at 4 °C, then with the appropriate secondary HRP-conjugated antibody (Dako). The results were visualized by enhanced chemiluminescence detection (Amersham Biosciences) using X-ray film (Fujifilm). For immunoprecipitation, cell lysates were produced in the same manner. To reduce nonspecific binding in the immunoprecipitation assay, cell lysates were precleared using Protein G Sepharose 4 Fast Flow beads (GE Healthcare Biosciences). Protein concentration was determined as before, and 0.5 to 1 mg of extracts were incubated with antibody prebound to protein G beads overnight. Immunoblots were carried out as described earlier.

Real-Time Quantitative PCR. Real-time quantitative PCR (RT-qPCR) was performed with the 7500 real-time PCR system (Applied Biosystems) using the QuantiTect SYBR Green PCR kit (Qiagen). Each reaction was performed in triplicate using 1 μ L of cDNA in a final volume of 25 μ L. The expression level of each target gene was analyzed based on the $\Delta\Delta$ Ct method, with *GAPDH* as an internal control. The following thermal cycle was used for all samples: 15 min at 95 °C; 45 cycles of 15 s at 94 °C, 30-s primer-specific annealing temperatures, 1 min at 72 °C. For each experiment, the threshold was set to cross a point at which real-time PCR amplification was linear. Previously published primers were used for all genes analyzed (Table S3 provides sequences).

Immunofluorescence Staining. Cells were washed with PBS solution and fixed in 4% (wt/vol) paraformaldehyde (Sigma-Aldrich). Permeabilization was performed with 0.1% Triton X-100

solution on ice for 4 min. Blocking solution composed of 0.2% fish gelatin (Sigma-Aldrich) was applied for 30 min, following incubation with the appropriate diluted primary antibodies for 1 h at RT. Then, cells were incubated with Alexa Fluorochrome secondary antibody (1:400; Molecular Probes) and TO-PRO (Invitrogen) or DAPI (Roche) to stain nucleic acids, for 1 h at RT. Finally, cells were mounted with Mowiol onto glass slides and samples were analyzed by confocal microscopy.

1. Vives V, et al. (2006) ASPP2 is a haploinsufficient tumor suppressor that cooperates with p53 to suppress tumor growth. *Genes Dev* 20(10):1262–1267.
2. Notari M, et al. (2011) Inhibitor of apoptosis-stimulating protein of p53 (IASPP) prevents senescence and is required for epithelial stratification. *Proc Natl Acad Sci USA* 108(40):16645–16650.

Statistical Analysis. Comparisons between the genotype frequencies were performed by using the χ^2 test. The log-rank (Mantel–Cox) test was used to determine the statistical significance of differences in tumor-free survival studies. The Wilcoxon rank-sum test was used in Fig. S4I, whereas the *t* test was used for all other measurements. Differences were considered significant at a value of $P \leq 0.05$. ImageJ software was used to quantify gel bands from immunoblots.

3. Wu Z, et al. (2011) Quantitative chemical proteomics reveals new potential drug targets in head and neck cancer. *Mol Cell Proteomics* 10(12):M111.011635.

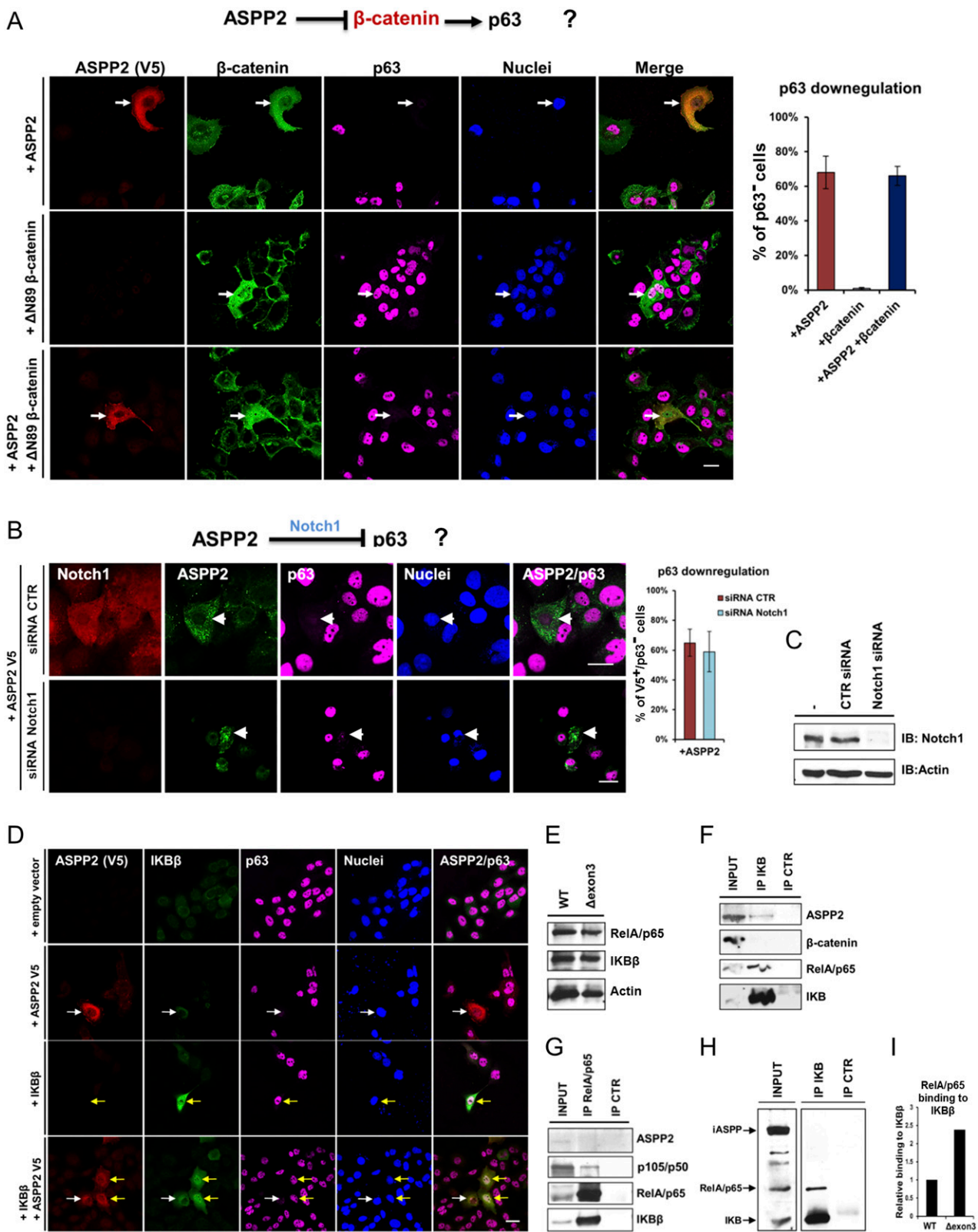


Fig. 55. (A) Triple IF staining of UPCI-SCC-040 cells to detect transfected ASPP2-V5 (red) and/or Δ N89 β -catenin (green) with endogenous p63 (magenta), using anti-V5 (goat), anti- β -catenin (rabbit), and anti-p63 (mouse) antibodies. Transfected cells are labeled by white arrows. The graph represents the percentage of ASPP2-V5⁺ and/or β -catenin⁺ cells that have down-regulated p63 compared with the empty vector-transfected cells. (B) Triple IF staining of UPCI-SCC-040 cells using anti-Notch1 (goat), anti-V5 (rabbit), and anti-p63 (mouse) antibodies. Cells were previously treated with Notch1 siRNA or control siRNA (CTR) and then transfected with an ASPP2-V5 expression vector. ASPP2-V5-transfected cells are labeled by white arrows. The graph represents the percentage of ASPP2-V5⁺/p63⁺ cells in cells treated with siRNA-Notch1 vs. control siRNA. (C) Immunoblot analysis of Notch1 protein levels in cells transfected with Notch1 siRNA, compared with control siRNA (CTR).

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control siRNA-transfected cells and untransfected cells (–). Actin was used as a loading control. (D) Triple IF staining of UPCI-SCC-040 cells to detect transfected ASPP2-V5 (red) and/or I κ B β (green) with endogenous p63 (magenta), using anti-V5 (goat), anti-I κ B β (rabbit), and anti-p63 (mouse) antibodies. Cells expressing transfected ASPP2-V5 and low (white arrow) or high levels of transfected I κ B β (yellow arrows) are labeled. (E) Immunoblot analysis of RelA/p65 and I κ B β protein levels in *ASPP2*^{+/+} (WT) and *ASPP2* ^{Δ exon3/ Δ exon3} (Δ exon3) MEFs. Actin was used as a loading control. (F) Lysates from *ASPP2* WT MEFs immunoprecipitated by using a mouse monoclonal anti-I κ B β (IP I κ B β) or mouse IgG (IP CTR) antibody and immunoblotted using rabbit anti-ASPP2, β -catenin, RelA/p65, and I κ B β antibodies. (G) Lysates from *ASPP2*^{+/+} MEFs were immunoprecipitated by using a rabbit polyclonal anti-RelA/p65 (IP RelA/p65) or rabbit IgG (IP CTR) antibody, then immunoblotted using mouse anti-ASPP2, p105/p50, RelA/p65, and I κ B β antibodies. I κ B β and p105/p50, but not ASPP2, were found to be coimmunoprecipitated with RelA/p65. (H) Lysates from *ASPP2* WT MEFs immunoprecipitated using a mouse monoclonal anti-I κ B β (IP I κ B β) or mouse IgG (IP CTR) antibody and immunoblotted using rabbit anti-iASPP, RelA/p65, and I κ B β antibodies. (I) ImageJ quantification of the immunoblot in Fig. 5E, comparing the amounts of RelA/p65 immunoprecipitated with I κ B β in *ASPP2* WT vs. Δ exon3 MEFs. RelA/p65 levels were normalized by the amount of I κ B β immunoprecipitated in each sample before comparison. In A, B, and D, DAPI was used to visualize the nuclei. (Scale bars: 10 μ m.) Bar graph values are the mean \pm SD from three different experiments.

Table S1. Primary antibodies

Antigen	Name	Source	Applications
Actin	C-2	Santa Cruz	WB
ASPP2	S-80	Rabbit polyclonal	IHC
ASPP2	S-32	Rabbit polyclonal	IHC, WB
ASPP2	DX54.10	Mouse monoclonal	IHC, WB
ASPP2	LX50.13	Mouse monoclonal	WB
Envoplakin	M-20	Santa Cruz	WB
iASPP	LX49.3	Mouse monoclonal	IHC, WB
I κ B β	C-20, D-3	Santa Cruz	ICC, WB
Keratin-1	AE1	Abcam	IHC
Keratin-4	5H5	Sigma	IHC
Keratin-14	PRB-155P-100	Covance	IHC
Keratin-18	C-04	Abcam	IHC
Loricrin	PRB-145P	Covance	WB
Notch1	C-20	Santa Cruz	WB, ICC
p63 (total)	4A4	Santa Cruz	IHC, ICC, WB
p63 (total)	—	Abcam	IHC, ICC
p63 (TA isoform)	Poly6189	BioLegend	IHC, WB
p63 (Δ N isoform)	Poly6190	BioLegend	IHC, WB
P105/p50	E381	Abcam	WB
V5-tag	SV5-Pk1	Serotec	ICC
V5-tag	—	Abcam	ICC
Vimentin	RV202	Abcam	IHC
β -Catenin	6B3	Cell Signaling	WB
β -Tubulin	TUB 2.1	Abcam	WB

ICC, immunocytochemistry; IHC, immunohistochemistry; WB, Western blot.

Table S2. Plasmids

Name	Vector	Information	Tag	Source
ASPP2	pcDNA3.1	Human ASPP2	V5, His	S. Llanos UCL, London, UK
iASPP	pcDNA3.1	Human iASPP	V5, His	S. Llanos UCL, London, UK
I κ B β	pcDNA3	Human I κ B β	—	N. Rice NCI-FCRDC, Frederick, MD
Control plasmid	pcDNA3.1	Empty vector	V5, His	Invitrogen
GFP	pEGFP-C1	GFP	—	Clontech
Δ N89 β -catenin	pCAN	Human active β -catenin	—	P. Polakis Genentech Inc., San Francisco, CA

Table S3. Primers for RT-qPCR

Name	Sequence (5'-3')
<i>mGAPDH</i> F	TGTCAGCAATGCATCCTGCA
<i>mGAPDH</i> R	TGTATGCAGGGATGATGTTC
<i>mΔNp63</i> F	ATGTTGTACCTGGAAAACAATG
<i>mΔNp63</i> R	GATGGAGAGAGGGCATCAAA
<i>mTAp63</i> F	AGACAAGCGAGTTCTCTCAGC
<i>mTAp63</i> R	TGCGGATACAATCCATGCTA
<i>hGAPDH</i> F	AATCCCATCACCATCTTCCA
<i>hGAPDH</i> R	TGGACTCCACGACGTACTCA
<i>hΔNp63</i> F	CAGACTCAATTTAGTGAG
<i>hΔNp63</i> R	AGCTCATGGTTGGGGCAC
<i>hTAp63</i> F	ATGTCCCAGAGCACACAG
<i>hTAp63</i> R	AGCTCATGGTTGGGGCAC
<i>hSP100</i> F	TCCATGACAAATTGCCTCTCC
<i>hSP100</i> R	GAGATGGGGAACCCGAAGG

Primers in the table were purchased from Eurofins. Primers for human ASPP2 and human iASPP were purchased from Qiagen (sequences available from Qiagen). F, forward; R, reverse.