

Supplementary Figure 1 | KRAS expression patterns of mouse and human tumour cells and lethality and myeloid inflammatory response in malignant pleural effusions (MPE) induced by Kras-mutant murine tumour cells. a, Total Kras, Kras isoform A and B, and Egfr mRNA expression of five mouse tumour cell lines relative to Actb by qPCR (n =4/group). Data are presented as mean ± SD. ns and ***: P > 0.05 and P < 0.001 for the comparison between any Kras-mutant and any Kras-wild-type cell line by one-way ANOVA with Bonferroni post-tests. b-d, EGFR, active KRAS, KRAS isoform, and total KRAS protein expression of mouse and human tumour cells relative to β -actin by immunobloting. **e.** Kaplan-Meier plot of the survival of C57BL/6 mice after intrapleural injection of 1.5×10^5 mouse tumour cells. P: overall probability value; ***: P < 0.001 for the comparison between any Kras-mutant and any Kras-wild-type cell line by log-rank test. f. Representative bioluminescent images taken 14 days after pleural tumour cells and data summary of longitudinal chest light emission measurements from total body-irradiated C57BL/6 chimeras transplanted with luminescent bone marrow from CAG.Luc.eGFP donors (n = 3/group/time-point). Data are presented as mean ± SD. P: overall probability value; ***: P < 0.001 for the comparison between any Kras-mutant and any Kras-wild-type cell line by twoway ANOVA with Bonferroni post-tests. g, Representative image of May-Gruenwald-Giemsa-stained CD11b+Gr1+ cells sorted by fluorescenceassisted cell sorting from a LLC-induced MPE, showing mixed polymorphonuclear (poly) and mononuclear (mono) morphology. Wt, wildtype: Δ. mutant: LLC. C57BL/6 Lewis lung carcinoma: MC38. C57BL/6 colon adenocarcinoma; AE17, C57BL/6 malignant pleural mesothelioma; B16F10, C57BL/6 malignant skin melanoma; PANO2, C57BL/6 pancreatic adenocarcinoma; FULA, FVB urethane-induced lung adenocarcinoma; CULA, C57BL/6 urethane-induced lung adenocarcinoma; A549, human lung adenocarcinoma; LTP A549, long-term passaged A549 cells having lost the Y chromosome; SKMEL2, human malignant skin melanoma; HT-29, human colon adenocarcinoma; HEK293T, human embryonic kidney cells.



Supplementary Figure 2 | Features of malignant pleural disease of C57BL/6 mice induced by five syngeneic tumour cell lines: association of inflammation, angiogenesis, and vascular hyperpermeability with the presence of *Kras* mutations. a, b, e, f, 1.5 x 10⁵ LLC, MC38, AE17, B16F10, or PANO2 tumour cells were delivered by direct pleural injection and the recipient C57BL/6 mice (n = 10-15/group) were sacrificed after two weeks. Cell line colour codes are as in Extended Data Fig. 1a. a, Representative pleural fluid cytocentrifugal specimens (images) and total pleural fluid cell numbers (graph; n = 8-15/group). **b**, Representative microphotographs of pleural tumour tissue CD31 immunoreactivity (images) and pleural tumour microvessel (black arrows) density (graph; n = 10-15/group). e, Representative lung explants with lungs (I) and pleural tumours (t) (images) and pleural tumour foci abundance (graph; n = 10-15/group). f, Representative microphotographs of pleural tumour tissue proliferating cell nuclear antigen (PCNA) immunoreactivity (images) and pleural tumour cell proliferation index (graph; n = 5-10/group). **c**, Images: 50 µL cell-free MPE or pleural lavage supernatants obtained from experiment shown in (a, b, e, f) were injected intradermally into the shaved rear skin of C57BL/6 mice (n =5/group) followed by delivery of 0.8 mg intravenous albumin tracer Evans' blue. Mice were sacrificed and skins were inverted and imaged after 30 min for quantification of skin extravasation areas (dashed lines). Graph: 1.5 x 10⁵ LLC, MC38, AE17, B16F10, or PANO2 tumour cells were delivered by direct pleural injection and the C57BL/6 recipient mice (n = 5-12/group) received 0.8 mg intravenous albumin tracer Evans' blue two weeks later, and were sacrificed one hour thereafter. Shown are levels of bloodstream-to-pleural space extravasated albumin-bound Evans' blue. d, Phosphate-buffered saline (PBS) or 50 µL cell-free MPE or pleural lavage supernatants obtained from experiment shown in (a, b, e, f) were placed on fenestrated chick chorioallantoic membranes (n = 5/group) and membranes were imaged after five days. Shown are representative membrane vascular networks (images; insert is PBS control) and the increase in the number of branching points relative to PBS control (graph). \mathbf{g} , 7,5 x 10³ tumour cells were placed on soft agar-containing 60 mm Petri dishes (n = 5/group) and imaged after a month. Shown are representative colonies (images) and colony numbers (graph). h, 3 x 10^3 tumour cells were placed in DMEM-containing 96-well culture dishes (*n*) = 5/group) and MTT reduction was monitored longitudinally. I, A million tumour cells were injected subcutaneously into the rear flank of C57BL/6 mice (n = 5/group) and tumour dimensions were monitored longitudinally. Data are presented as mean ± SD. ns, *, ** and ***: *P* > 0.05, *P* < 0.05, *P* < 0.01, and *P* < 0.001 for the comparison between any Kras-mutant and any Kras-wild-type cell line by one (a-g)- or two (h and i)-way ANOVA with Bonferroni post-tests. LLC, C57BL/6 Lewis lung carcinoma; MC38, C57BL/6 colon adenocarcinoma; AE17, C57BL/6 malignant pleural mesothelioma; B16F10, C57BL/6 malignant skin melanoma; PANO2, C57BL/6 pancreatic adenocarcinoma.



Supplementary Figure 3 | Manipulation of mutant KRAS isoform

expression. Kras-mutant mouse tumour cell lines were stably transfected with anti-mouse random (shC) or Kras (shKras) shRNA pools. KRAS-wildtype mouse and human cell lines were stably transfected with in-house cloned eukaryotic expression vectors encoding enhanced green fluorescent protein (peGFP), eGFP in-frame with mouse mutant Kras^{G12C} transcript variant A cloned from LLC total RNA (peGFP.ΔKras2A), or eGFP in-frame with mouse mutant Kras^{G12C} transcript variant B cloned from LLC total RNA (peGFP. *AKras or peGFP. AKras2B*). **a.** Total Kras mRNA expression by gPCR relative to Gusb control (n = 5-6/group). **b**, Cytoplasmic RAS-activity as determined by binding of Raf-1-RBD coated agarose beads ELISA, relative to HeLa cytoplasmic extracts (n = 5/group). **c**, Cytoplasmic RAS-activity as determined by binding of Raf-1RBD coated agarose beads immunoblot relative to total cytoplasmic RAS. d, e, Anti-eGFP immunoblots. f, Kras isoform mRNA expression by gPCR relative to β -actin (Actb) control (n = 5/group). g, Anti-EGFR, eGFP, and KRAS isoform immunoblots relative to βactin loading control. Data are presented as mean ± SD. ** and ***: P < 0.01 and P < 0.001 for the indicated comparisons (a and b) and for comparison with the respective parental cell line by Student's t-test (a), and one (a and b)or two (f)-way ANOVA with Bonferroni post-tests. LLC. C57BL/6 Lewis lung carcinoma; MC38, C57BL/6 colon adenocarcinoma; AE17, C57BL/6 malignant pleural mesothelioma; B16F10, C57BL/6 malignant skin melanoma; PANO2. C57BL/6 pancreatic adenocarcinoma: FULA. FVB urethane-induced lung adenocarcinoma; CULA, C57BL/6 urethane-induced lung adenocarcinoma; A549, human lung adenocarcinoma; LTP A549, long-term passaged A549 cells having lost the Y chromosome; SKMEL2, human malignant skin melanoma; HT-29, human colon adenocarcinoma; HEK293T, human embryonic kidney cells.



Supplementary Figure 4 | Effect of manipulation of mutant KRAS isoform expression on tumour cell proliferation. Kras-mutant mouse tumour cell lines were stably transfected with anti-mouse random (shC) or Kras (shKras) shRNA pools. KRAS-wild-type mouse and human cell lines were stably transfected with in-house cloned eukaryotic expression vectors encoding enhanced green fluorescent protein (peGFP), eGFP in-frame with mouse mutant Kras^{G12C} transcript variant A cloned from LLC total RNA (peGFP.ΔKras2A), or eGFP in-frame with mouse mutant Kras^{G12C} transcript variant B cloned from LLC total RNA (peGFP. Δ Kras or peGFP. Δ Kras2B). 3 x 10³ control or *KRAS*-manipulated tumour cells were placed in DMEMcontaining 96-well culture dishes (n = 5/group) and MTT reduction was monitored longitudinally. a-c. Raw MTT absorbance data presented as mean \pm SD. ns and ***: P > 0.05 and P < 0.001 for comparison with the respective control vector-transfected cell line by two-way ANOVA with Bonferroni posttests. **d**, Doubling time data calculated by least-squares fit non-linear regression presented as mean \pm 95% confidence interval. ns and *: P > 0.05and P < 0.05 for the indicated comparisons by one-way ANOVA with Bonferroni post-tests. LLC, C57BL/6 Lewis lung carcinoma; MC38, C57BL/6 colon adenocarcinoma; AE17, C57BL/6 malignant pleural mesothelioma; B16F10, C57BL/6 malignant skin melanoma; PANO2, C57BL/6 pancreatic adenocarcinoma; SKMEL2, human malignant skin melanoma.



Supplementary Figure 5 | Mutant KRAS in malignant pleural effusion development. a, Kaplan-Meier plots of survival of C57BL/6 mice that received 1.5 x 10⁵ intrapleural LLC, MC38, or AE17 cells (all *Kras* mutant) stably expressing random (shC; n = 40; grey line) or anti-Kras (shKras; n = 35; red line) shRNA. b, Kaplan-Meier plots of survival of C57BL/6 mice that received 1.5 x 10⁵ intrapleural PANO2 cells (Kras wild-type) stably expressing empty (pC; n = 8; grey line) or mutant Kras isoform 2A (p Δ Kras2A; n = 12; light green line) or 2B ($p\Delta Kras2B$; n = 23; dark green line) expression vectors. **a**, **b**, * and ***: P < 0.05 and P < 0.001 for comparison with parental lines by log-rank test. c, Representative images (top) of effusions (dashed lines), pleural tumours (t), hearts (h), and lungs (l), and representative dotplots (bottom) of CD11b+Gr1+ cells (polygon gates) from selected experiments described in Fig. 2. d, Representative bioluminescent images and data summary of chest light emission (n = 5-7/group) of total body-irradiated C57BL/6 chimeras transplanted with luminescent bone marrow from CAG.Luc.eGFP donors at day 14 after pleural injections of the indicated tumour cells. Data are presented as mean \pm SD. **: P < 0.01 for the indicated comparisons by by Student's t-test. e, f, Representative images of malignant pleural disease induced by SKMEL2 (e) and HEK293T (f) cells bearing wildtype (Wt) KRAS stably expressing empty (pC) or mutant Kras isoform 2B $(p\Delta Kras2B)$ expression vectors. Shown are representative images of effusions (dashed lines), pleural tumours (t), hearts (h), and lungs (l) and representative dotplots and gating strategy for guantification of CD11b+Gr1+ cells. A, mutant. LLC, C57BL/6 Lewis lung carcinoma; MC38, C57BL/6 colon adenocarcinoma; AE17, C57BL/6 malignant pleural mesothelioma; B16F10, C57BL/6 malignant skin melanoma; PANO2, C57BL/6 pancreatic adenocarcinoma.



Supplementary Figure 6 | Mutant KRAS signals via CCL2/CCR2 to recruit CD11b+Gr1+ myeloid cells to the pleural space. a, Comparative analysis of global gene expression of five C57BL/6 mouse-derived tumour cell lines with defined Kras mutation status by Affymetrix mouse gene ST2.0. Shown is unsupervised clustering of cell lines by differentially expressed genes (ΔGE) comprising the mutant Kras signature of 25 genes described in Fig. 3a and Table 3. b, Ccl2 and Ccl7 mRNA expression by five C57BL/6 mouse-derived tumour cell lines. c, Enhanced CCL2 elaboration of Kras-mutant murine cell lines in vitro by ELISA (n = 6/group; left) and increased serum CCL2 levels of mice with MPEs induced by Kras-mutant murine cell lines in vivo by ELISA (n = 6/group; right). (b, c) Colour codes are as in Extended Data Fig. 1. **d**, *Ccl2* and Cc/7 mRNA expression by parental (white bars: cells stably expressing random shRNA or control overexpression vector) and Kras-modulated (red bars: cells stably expressing anti-Kras-specific shRNA; green bars: cells stably expressing vector encoding mutant mouse Kras^{G12C} isoform B) murine cell lines from Fig. 2 relative to *Gusb* by qPCR showing transcriptional control of Cc/2 by mutant Kras (n = 5/group). e, Serum CCL2 levels of mice bearing pleural tumours with or without MPE induced by parental and Kras-modulated murine cell lines from Fig. 2 by ELISA (n = 6/group). **f**, CCL2 secretion of HEK293T cells stably expressing empty (pC) or mutant Kras isoform 2B $(p\Delta Kras2B)$ expression vectors, assessed by ELISA (*n* = 6/group). **g**, Enhanced CCL2-elaboration of KRAS-mutant human cell lines by ELISA (n = 6/group). h. Ccr2-/- and C57BL/6 control mice received intrapleural injections of three different tumour cell lines, as described in Fig. 3c. Shown are representative histograms of pleural cell CCR2 expression by flow cytometry (n = 7/group), i, Representative dotplots of CD11b+Gr1+ cells (polygon gates) from experiment in (h).Data are presented as mean ± SD. *, **, and ***: P < 0.05, P < 0.01, and P < 0.001 for comparison with parental lines (d-f) or between any KRAS wild-type and any KRAS-mutant cell line (b, c, g) by Student's t-test (d-f) or one-way ANOVA with Bonferroni post-tests (b, c, g). CCL, C-C-motif chemokine ligand; CCR, C-C-motif chemokine receptor; Wt, wild-type; Δ , mutant. LLC, C57BL/6 Lewis lung carcinoma; MC38, C57BL/6 colon adenocarcinoma; AE17, C57BL/6 malignant pleural mesothelioma; B16F10, C57BL/6 malignant skin melanoma; PANO2, C57BL/6 pancreatic adenocarcinoma; A549, human lung adenocarcinoma; LTP A549, long-term passaged A549 cells having lost the Y chromosome; SKMEL2, human malignant skin melanoma: HT-29, human colon adenocarcinoma.



Supplementary Figure 7 | CD11b+Gr1+ myeloid cells traffic to the pleural space via the spleen to promote malignant pleural effusion

development. a, Representative whole-body bioluminescent images of mice from experiment described in Supplementary Fig. 1f showing sequential increases of the bone marrow cell-emitted signal in the left subphrenic (magenda arrows) and the thoracic (orange arrows) areas. b, Immunofluorescent detection of CCR2 and CD68 in spleens and MPE cells of experimental mice from Fig. 1 localized myeloid cells to the marginal zone (magnified area). c, d, C57BL/6 mice received sham surgery or splenectomy followed by pleural injections of MC38 or PANO2 cells expressing $p\Delta Kras2A$ or p $\Delta Kras 2B$. Shown are MPE incidence table (*n*) and Kaplan-Meier survival plot (c) and representative images of effusions (dashed lines), pleural tumours (t), hearts (h), and lungs (l), and representative dotplots of CD11b+Gr1+ cells (polygon gates) (d). ***: P < 0.001 for comparison with sham surgery by Fischer's exact test (table) or by log-rank test (survival plot). Note that even splenectomized mice harvested at late time-points (black arrow in c) did not have MPE, indicating a prolonged protective effect of the intervention. e, NOD/SCID mice received sham surgery or splenectomy followed by pleural A549 lung adenocarcinoma cells with endogenous mutant KRAS^{G12S}. Shown are data summary of effusion volume (n = 6-9/group) and representative images of effusions (dashed lines), pleural tumours (t), hearts (h), and lungs (I). Data are presented as mean \pm SD. *: P < 0.05 for the indicated comparison by Student's t-test. f-h. C57BL/6 mice received sham surgery or splenectomy followed by pleural MC38 cells after 14 days. At post-injection day 9, splenectomized animals were reconstituted with three million intravenous splenocytes (SC) from CAG.Luc.eGFP donors pre-treated 13 days earlier with pleural saline (naïve SC), control shRNA-expressing MC38 cells (MC38 shC-educated SC), or anti-Kras shRNA-expressing MC38 cells (MC38 shKras-educated SC). Shown are MPE incidence table (f), data summaries of effusion volume (n as in incidence table under f) and Luc+CD11b+Gr1+ bone marrow-borne splenocytes (n = 5/group) (g), and Kaplan-Meier survival plot (h). Data are presented as mean ± SD. ns, **, and ***: P > 0.05, P < 0.01, and P < 0.001 for the comparisons indicated by χ^2 and Fischer's exact tests (f), by log-rank test (h), or by one-way ANOVA with Bonferroni post-tests (q). SC, splenocyte; Luc, luciferase. Wt, wild-type; Δ . mutant; MC38, C57BL/6 colon adenocarcinoma; PANO2, C57BL/6 pancreatic adenocarcinoma.

Uncropped blots of Supplementary Figure 1C; dashed lines indicate portion shown in composite Figure



Uncropped blots of Supplementary Figure 1D; dashed lines indicate portion shown in composite Figure Uncropped blots of Supplementary Figure 1B; dashed lines indicate portion shown in composite Figure





Supplementary Figure 8 | Full blots shown in Supplementary Figure 1.

Uncropped blots of Supplementary Figure 3C; dashed lines indicate portion shown in composite Figure



Uncropped blots of Supplementary Figure 3E; dashed lines indicate portion shown in composite Figure



Uncropped blots of Supplementary Figure 3D; dashed lines indicate portion shown in composite Figure



Supplementary Figure 9 | Full blots shown in Supplementary Figures 3ce.





Supplementary Figure 10 | Full blots shown in Supplementary Figure 3g.

| Method ^a | Primer | Sequence | Amplicon (bp) |
|---------------------|-----------|-----------------------------------|--------------------------|
| Seq | mKrasF | CCATTTCGGACCCGGAG | 005 |
| Seq | mKrasR | CTTTAGTCTCTTCCACAGGCA | 905 |
| Seq | mEgfrF1 | GCCTGATAACTGGACTGACCT | F1/R1 1673 |
| Seq | mEgfrR1 | AGAATCAACTCTCGGAACTTTGG | F2R2 2261 |
| Seq | mEgfrF2 | CTCCTCTTCTTCCCGCACTG | F2/R 2073 |
| Seq | mEgfrR2 | AGAATCTGAGACCTCTGGCTG | 1S1/R1 1174 |
| Seq | mEgfrR | GCATAGGTGGCAGACATTATTGG | 1S2/R1 672 |
| Seq | mEgfr1S1 | ACAACTGCATCCAGTGTGCC | 1S1/R2 1759 |
| Sea | mEafr1S2 | GGCCATCAAGGAGTTAAGAG | 1S1/R 1571 |
| Sea | mEafr2S1 | AGAGAATCCCTTTGGAGAACC | 2S2/R2 1256 |
| Sea | mEafr2S2 | CCACCACTCATGCTGTACAACC | 252/R 1068 |
| Sea | mEafr2S3 | GTCGTTGGCCTGAACATCAC | 200/RZ / 01 202/D 5/2 |
| Sea | mPik3caF1 | ATTCTGACTCCATAAGGCGG | 200/11 040 |
| Sea | mPik3caR1 | GAACCAATCAAACTCCAACTC | 1493 |
| Sea | mPik3caF2 | GCTGAACCCTATTGGTGTTACTG | |
| Sea | mPik3caR2 | GCTCAAGTCCTAATGTTGTTCCT | 1958 |
| Seq | mBrafF1 | CGCTGTCTTCGGAAATACCA | |
| Seq | mBrafR1 | | 1551 |
| Seq | mBrafF2 | GGCGGGTTCCAGAGGTG | |
| Seq | mBrafR2 | | 2066 |
| Seq | hKRASE | TCCCAGGTGCGGGAGAGAG | |
| Sea | hKRASR | GCTAACAGTCTGCATGGAGCAGG | 722 |
| PCR | MycoF | GGGAGCAAACAGGATTAGATACCCT | |
| PCR | MycoR | TGCACCATCTGTCACTCTGTTAACCTC | 270 |
| aPCR | mEfartv1F | ATCAAAGTTCTGGGTTCGGG | |
| aPCR | mEfartv1R | CATCACATAGGCTTCGTCAAGG | 156 |
| aPCR | mEfartv2F | AACTGTACCTATGGATGTGCTG | |
| qPCR | mEfgrtv2R | GGATTTGGAAGAAACTGGAAGG | 154 |
| qPCR | mKrasF | CGCCTTGACGATACAGCTAAT | 100 |
| qPCR | mKrasR | TGACCTGCTGTGTCGAGAAT | 132 |
| qPCR | mKras2AF | AGATGTGCCTATGGTCCTGG | |
| qPCR | mKras2AR | GCATCCTCCACTCTGTCT | 144 |
| qPCR | mKras2BF | ACTCTGAAGATGTGCCTATGGT | 4.40 |
| qPCR | mKras2BR | TCGTCAACACCCTGTCTTGT | 148 |
| qPCR | mCcl2F | CTACAAGAGGATCACCAGCAG | 445 |
| qPCR | mCcl2R | TTCTGATCTCATTTGGTTCCGA | 145 |
| qPCR | mCcl7F | CATCCACATGCTGCTATGTCA | 106 |
| qPCR | mCcl7R | CTTCCATGCCCTTCTTTGTCT | 120 |
| qPCR | mGusbF | TTACTTTAAGACGCTGATCACC | 165 |
| qPCR | mGusbR | ACCTCCAAATGCCCATAGTC | 105 |
| qPCR | mGapdhF | TGTGTCCGTCGTGGATCTGA | 150 |
| qPCR | mGapdhR | TTGCTGTTGAAGTCGCAGGAG | 100 |
| CL | mKrasF | GGAGATCTATGACTGAGTATAAACTTGTGGTGG | |
| CL | mKras2AR | GGGAATTCTTACATTATAACGCATTTTTTAATT | 526 |
| CL | mKras2BR | GGGAATTCTCACATAACTGTACACCTTGTCCTT | 583 |

Supplementary Table 1 | Oligonucleotide primers used in this study.

^aApplication: Seq, sequencing; RT, reverse transcriptase-polymerase chain reaction; PCR, DNA polymerase chain reaction; qPCR, quantitative (real-time) PCR; CL, cloning.

| Method ^a | Target | Provider ^b | Catalog # | Dilution/Dose | Conjugate د |
|---------------------|----------------------------|-----------------------|----------------|---|-----------------|
| WIB | KRAS2A | Santa Cruz | sc-522 | 1:200 | - |
| WIB | KRAS2B | Santa Cruz | sc-521 | 1:200 | - |
| WIB | β-Actin | Santa Cruz | sc-47778 | 1:200 | - |
| WIB | eGFP | Santa Cruz | sc-9996 | 1:200 | - |
| WIB | α-Tubulin | Sigma | T5168 | 1:4000 | - |
| WIB | EGFR | Abcam | ab52894 | 1:10000 | - |
| WIB | Goat anti- mouse IgG | Southern Biotech | 1030-05 | 1:8000 | HRP |
| WIB | Goat anti- rabbit IgG | Southern Biotech | 4030-05 | 1:8000 | HRP |
| HIS | CD31 | Abcam | ab124432 | 1:1000 | - |
| HIS | PCNA | Santa Cruz | sc-56 | 1:50 | - |
| FC | CD45 | eBioscien ce | 11-0451 | 0.1 μg/10 ⁶ cells | FITC |
| FC | CD11b | eBioscien ce | 12-0112 | 0.1 μg/10 ⁶ cells | PE |
| FC | Gr1 | BD | 552093 | 0.1 μg/10 ⁶ cells | PerCP- Cv5.5 |
| FC | Gr1 | eBioscien ce | 25-5931- 82 | 0.1 μg/10 ⁶ cells | PÉ-Cy7 |
| FC | Luciferase | Abcam | ab16466 | 0.5 µg/10 ⁶ cells | |
| FC, IF | CCR2 | R&D | FAB5538 A | 1 µL/10 ⁶ cells, 1:500 | APC |
| IF | CD68 | Serotec | MCA1957 | 1:500 | - |
| IVN | CCL2 | Janssen R&D | C1142 | 50 mg/Kg intraperitoneally every three days | - |

| Supplementary Table 2 An | tibodies used in this study. |
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|----------------------------|------------------------------|

^aApplication: WIB, Western immunoblotting; HIS, histology; FC, flow cytometry; IF, immunofluorescence; IVN, *in vivo* neutralization.

^bProviders: Santa Cruz Biotechnology, San Diego, CA; Sigma Aldrich, Taufkirchen, Germany; Abcam, Cambridge, UK; Southern Biotech, Birmingham, AL; eBioscience, San Diego, CA; AbD Serotec, Kidlington, UK; R&D Systems, Minneapolis, MN; Oncology Discovery Research, Janssen R&D LLC, Spring House, PA.

^oConjugates: FITC, <u>fluorescein isothiocyanate</u>; PE, phycoerythrin; PerCP, peridinin-chlorophyll protein; Cy, cyanine; APC, allophycocyanin; HRP, horse radish peroxidase.