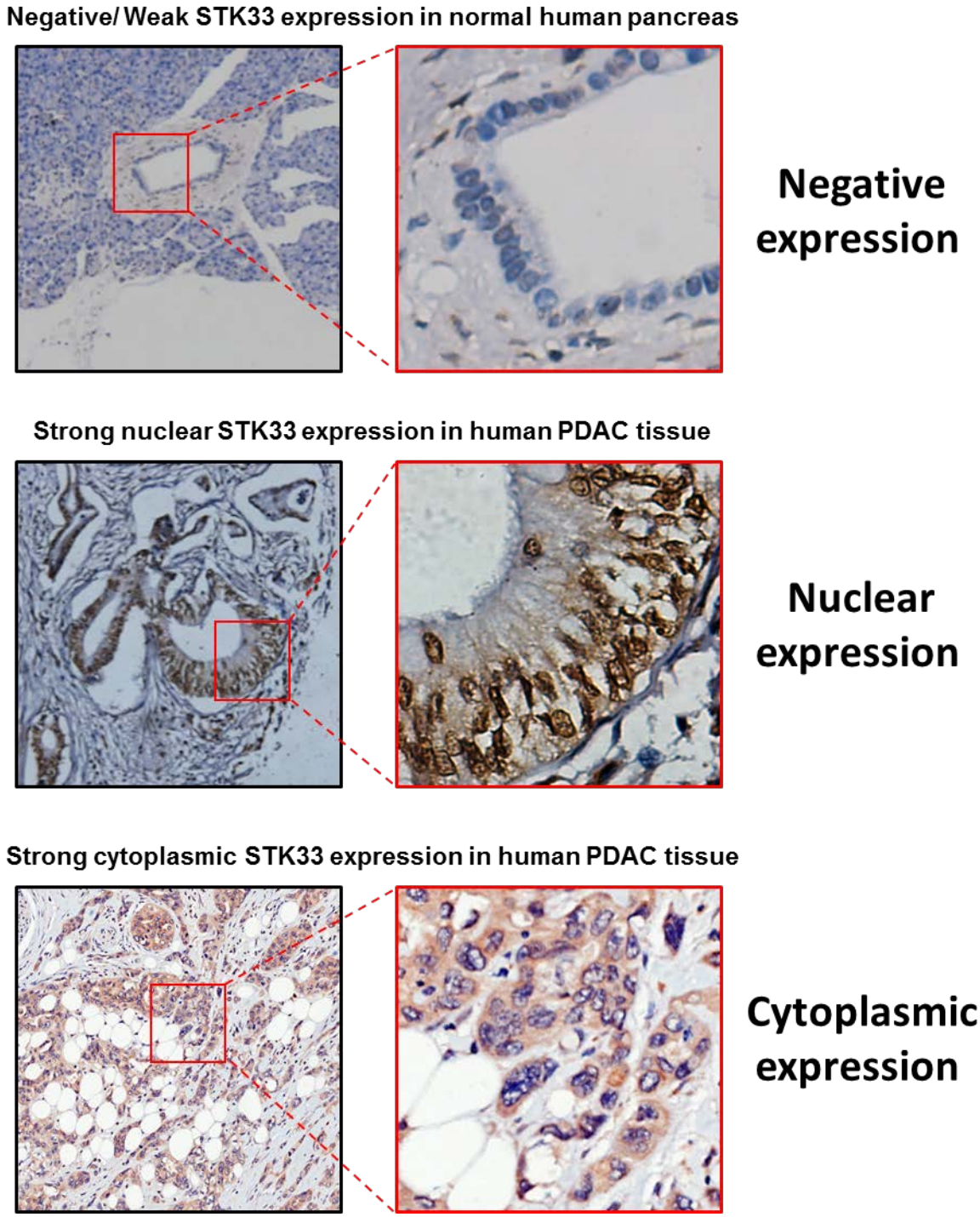
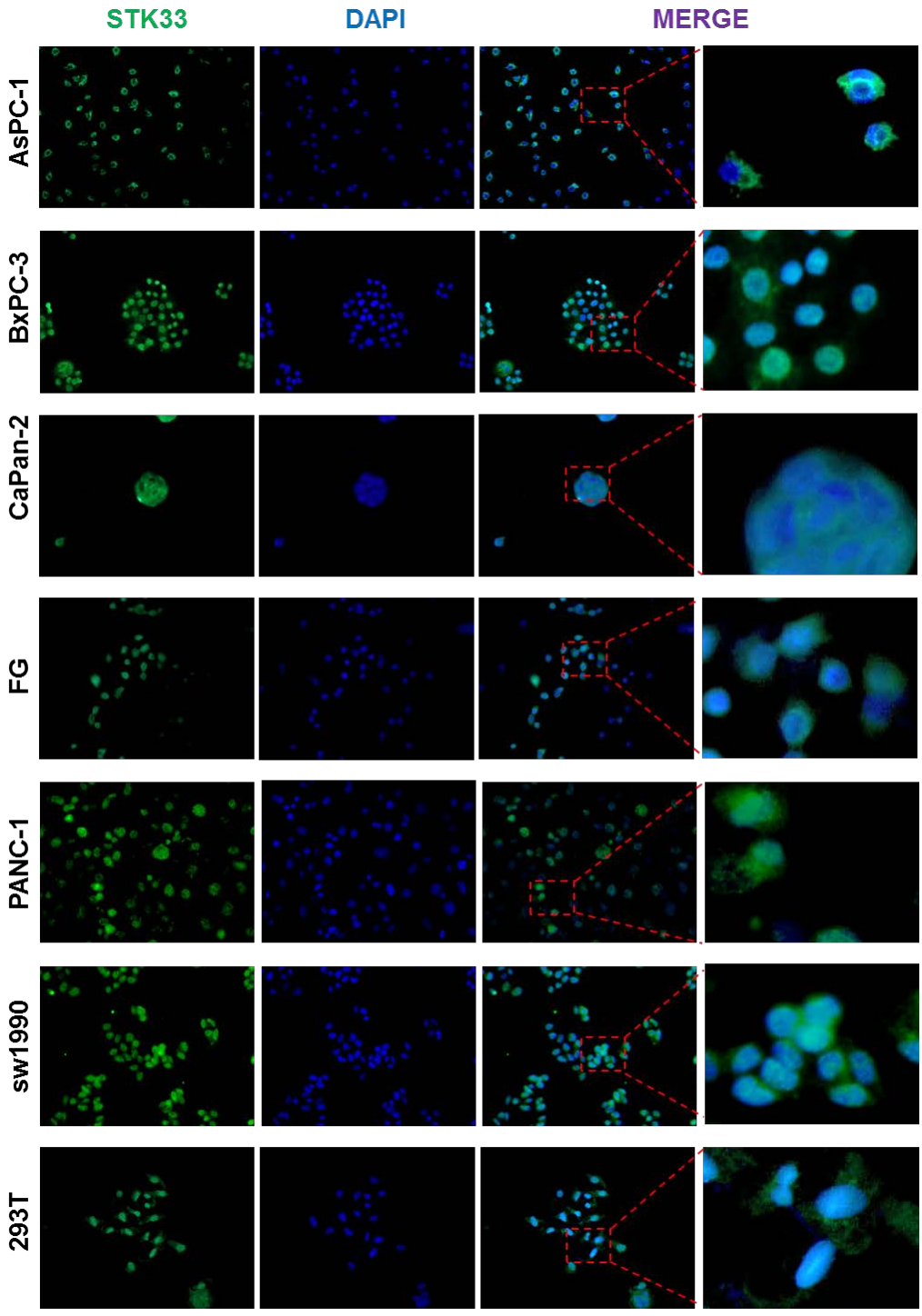


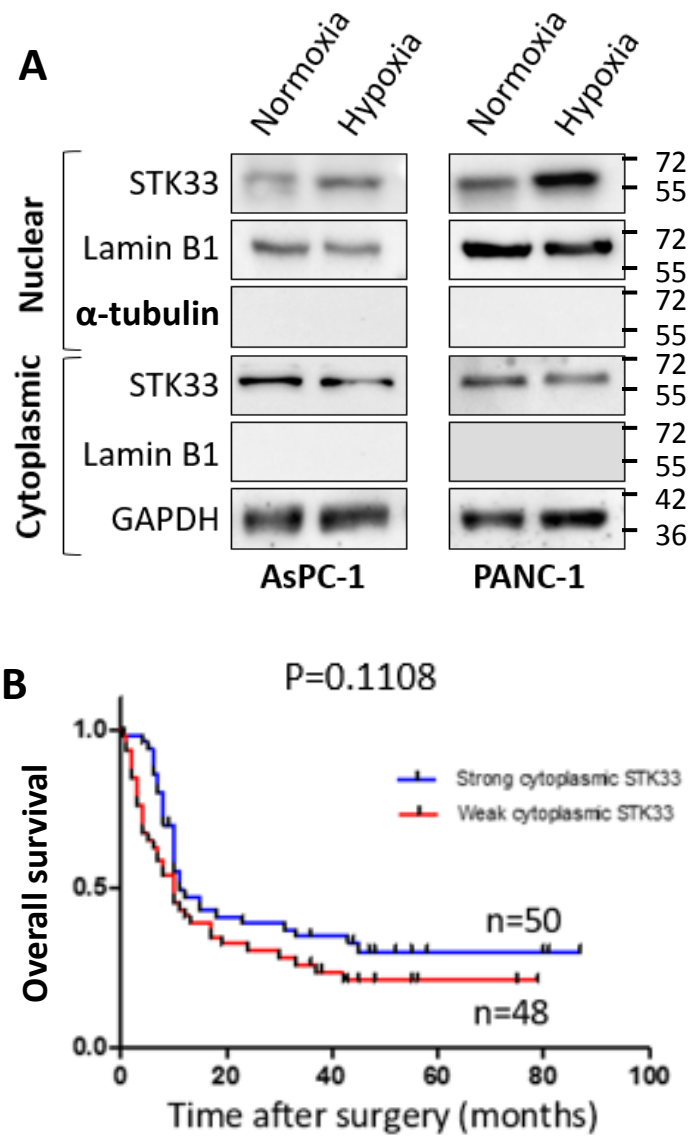
Supplementary Figure S1. STK33 expression patterns in human PDAC and adjacent normal pancreatic tissue specimens.

Tissue sections were stained with a specific antibody against human STK33 (Company here). Note that STK33 expression was markedly higher in tumor cells than that in cells of adjacent normal pancreatic tissue. Also shown were representative images of nuclear and cytoplasmic staining for STK33 in tissue specimens.



Supplementary Figure S2. **STK33 expression patterns in human PDAC cells.**

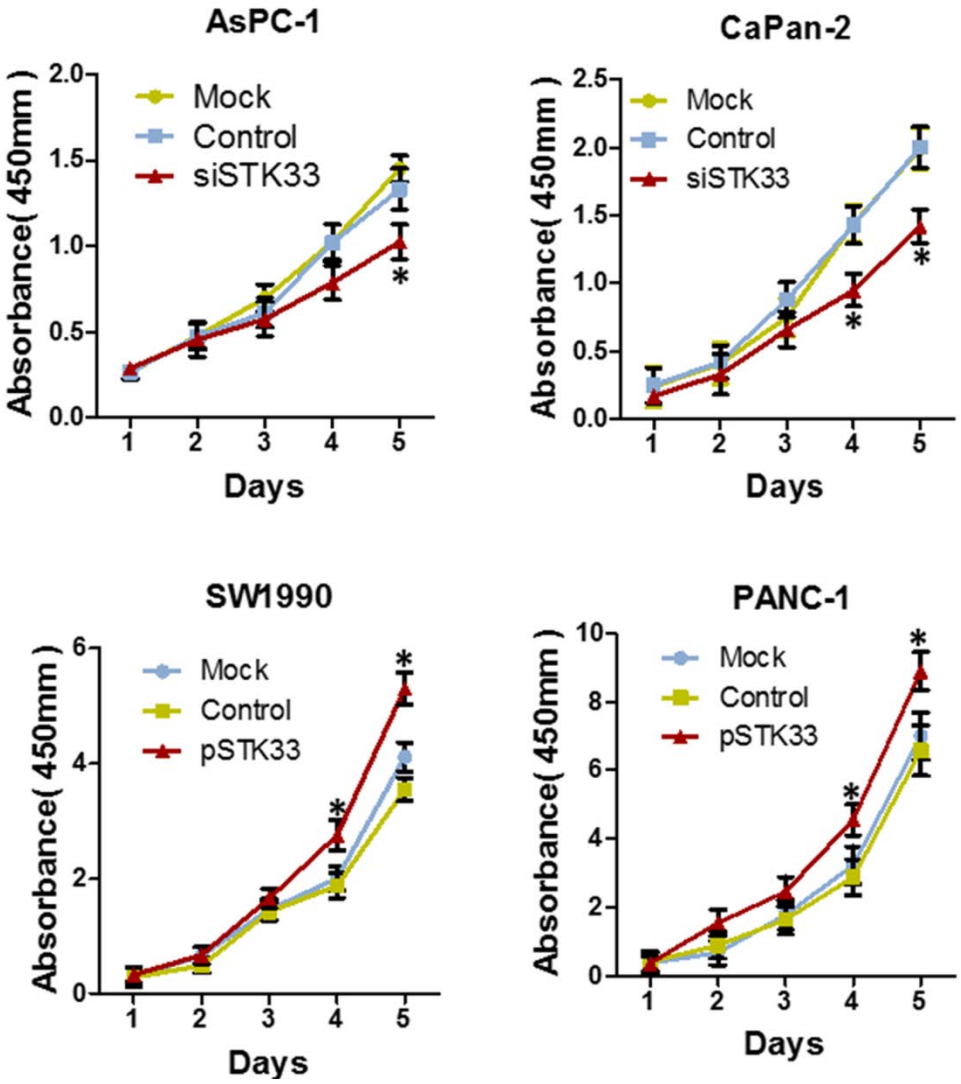
AsPC-1, BxPC-3, CaPan-2, FG, PANC-1, SW1990 and 293T cells were cultured *in vitro* and immunofluorescently stained for STK33 (green) and nuclei (DAPI, blue). Localization of STK33 expression was shown in the merged images. Note that cells exhibited predominantly nuclear STK33 expression in BxPC-3, PANC-1, SW1990 and 293T cells, whereas predominantly cytoplasmic STK33 expression in other cells.



Supplementary Figure S3. **Subcellular expression of STK33 and impact on patient OS**

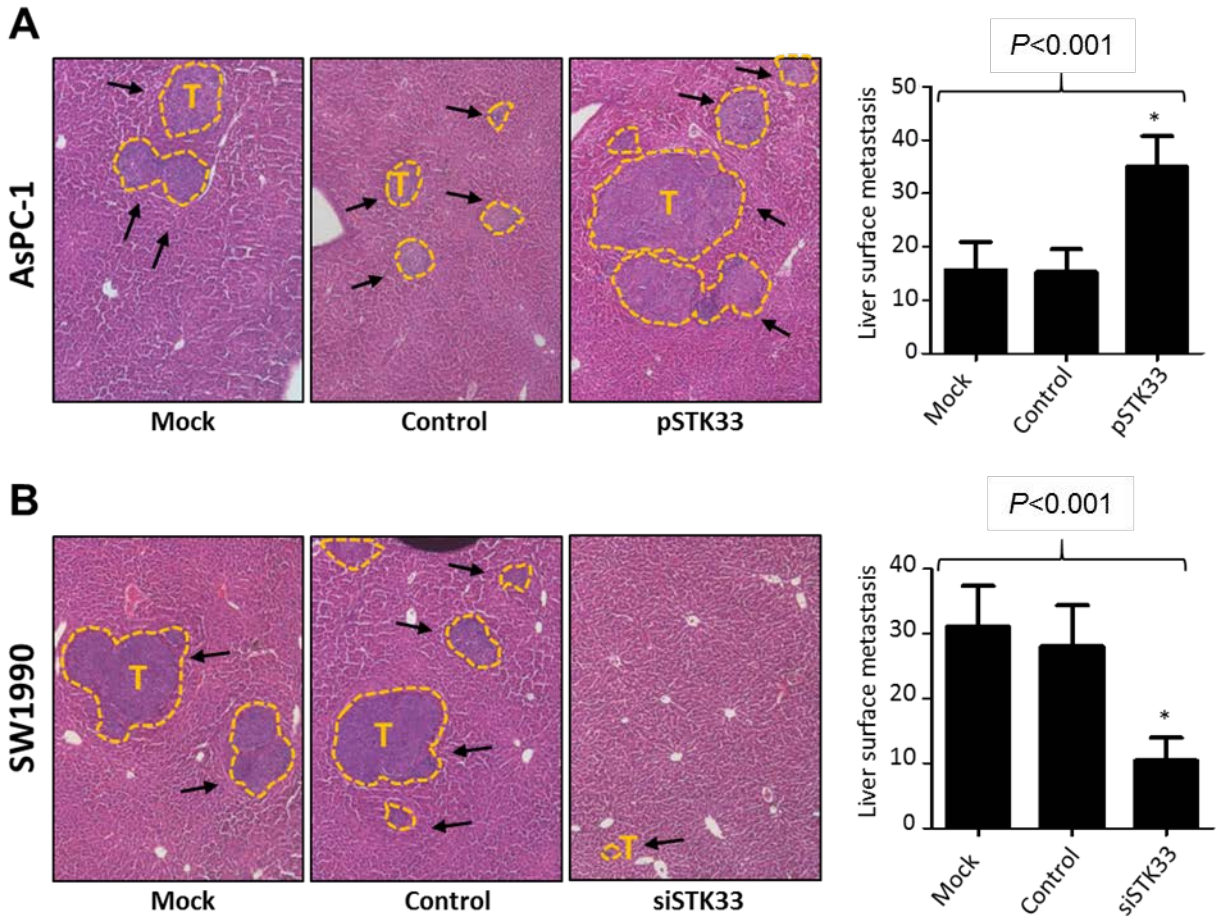
A. Influence of hypoxia on subcellular expression of STK33. Nuclear and cytoplasmic levels of STK33 were examined in AsPC-1 and PANC-1 cells that were incubated under normoxia or hypoxia for 24 hours. Lamin B1 was used as loading control for nuclear proteins. GAPDH and α-tubulin were used as loading controls for cytoplasmic proteins. Note that hypoxia induced nuclear expression of STK33.

B. Cytoplasmic STK33 was not associated with OS of PDAC patients. Majority of tissues from PDAC patients in this study exhibited cytoplasmic expression of STK33 ranging from weak to strong, and it was difficult to clearly distinguish weak from negative staining cases. Therefore, we divided all PDAC cases into strong cytoplasmic STK33 group and weak cytoplasmic STK33 groups. Note that correlation analysis showed that the expression level of cytoplasmic STK33 was not associated with OS of PDAC patients .



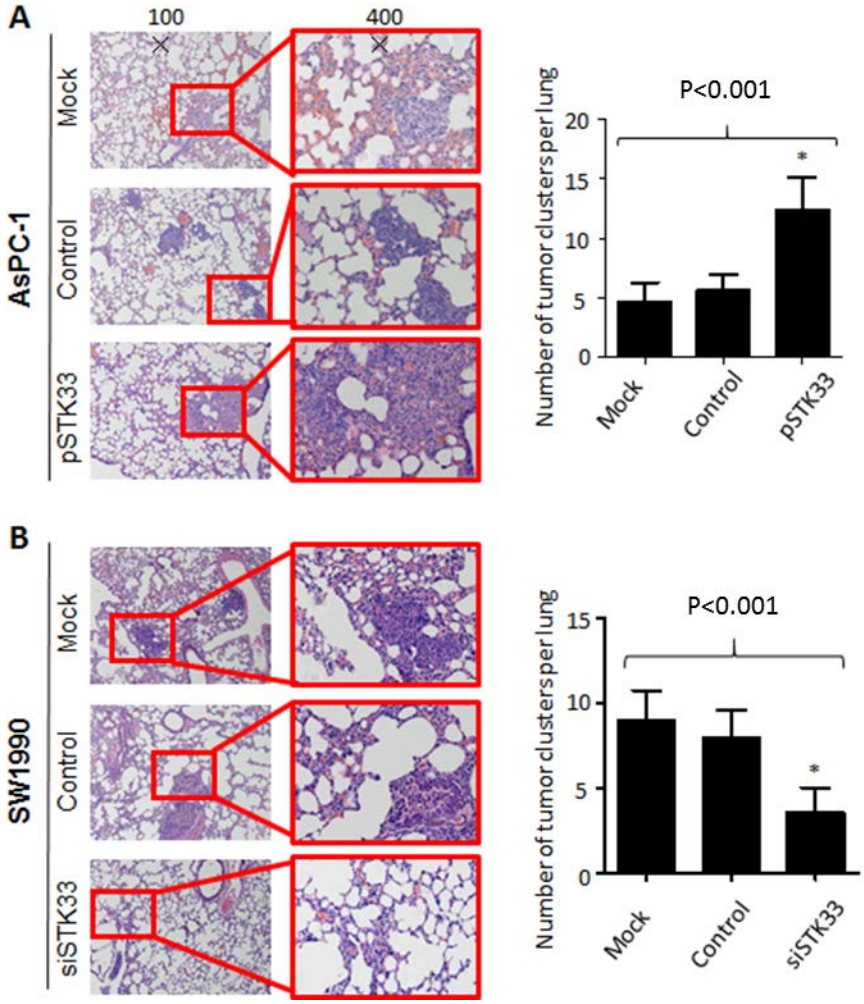
Supplementary Figure S4. **Impacts of altered STK33 expression on cell proliferation.**

AsPC-1 and CaPan-2 cells were transfected with siSTK33 or control siRNAs, while SW1990 and PANC-1 cells were transfected with pSTK33 or control vectors. The effects of increased or reduced expression of STK33 on PDAC cell proliferation were determined by using CCK-8 assays at the indicated time points. *P<0.05 as determined Student t test. Note that increased STK33 expression promoted PDAC cell proliferation *in vitro*, whereas reduced STK33 expression did the opposite.



Supplementary Figure S5. STK33-promoted PDAC cell metastasis *in vivo.*

AsPC-1 cells with STK33 overexpression (**A**) or SW1990 cells with knockdown of STK33 expression (**B**) were injected intravenously into the ileocolic vein of nude mice (5×10^5 cells per mouse, five mice per group). Thirty-five days after injection, mice were killed and livers were removed and processed for histological examination. Shown were hematoxylin- and eosin-stained sections of livers obtained from the mice (arrows indicated metastatic nodules, and tumor areas were outlined with dashed lines; T, tumor); and the numbers of liver surface metastases were determined (right panels). Note that increased STK33 expression promoted liver metastasis of PDAC cells, whereas reduced STK33 expression did the opposite. *P<0.05.

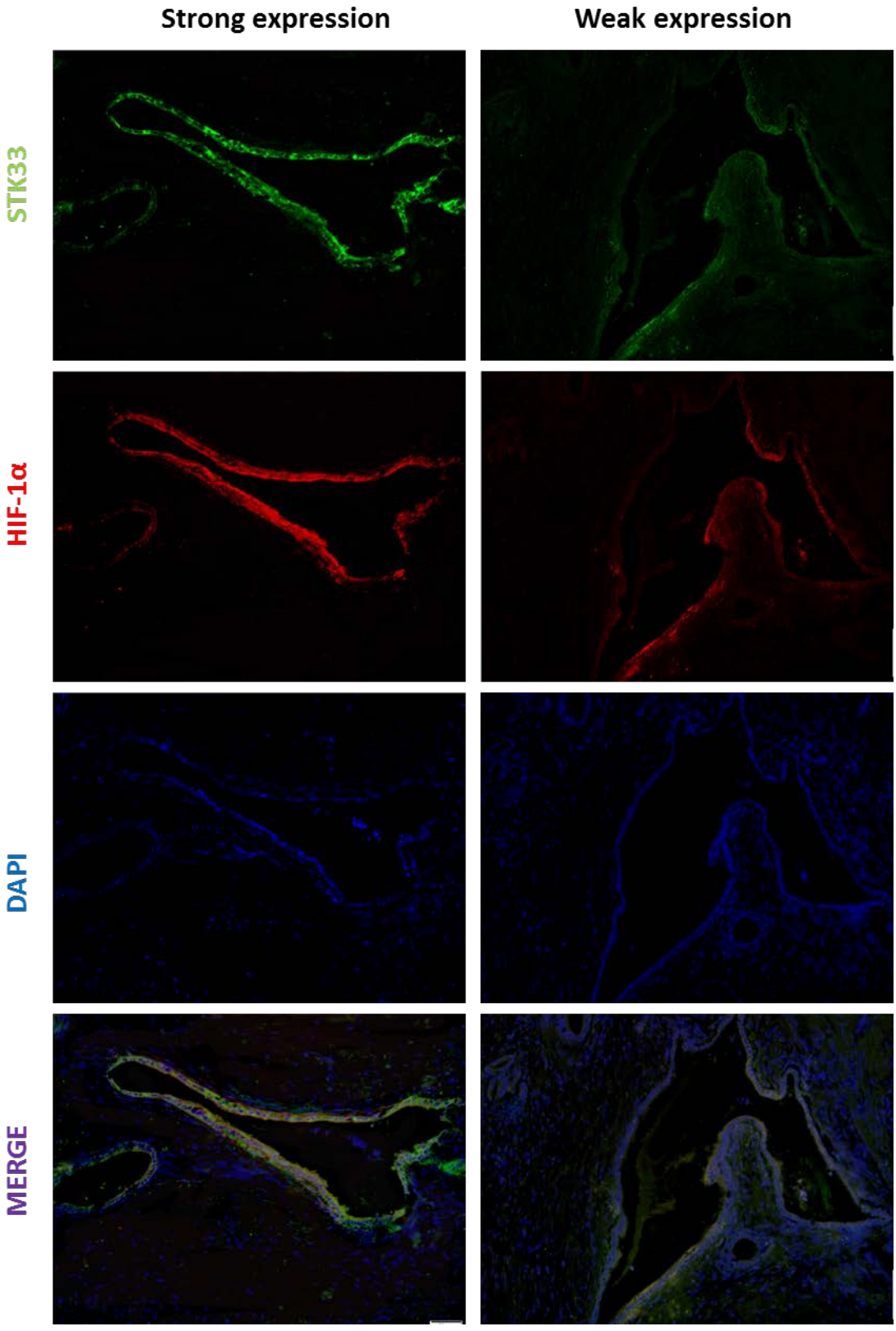


Supplementary Figure S6. **STK33 promoted PDAC lung metastasis *in vivo*.**

A, AsPC-1 cells were transfected with pSTK33 or control vector. The cells ($5x10^5$/per mouse) were intravenously injected into groups of nude mice (n=10). Mice were killed 35 days after tumor injection and lungs were harvested and processed for metastasis evaluation.

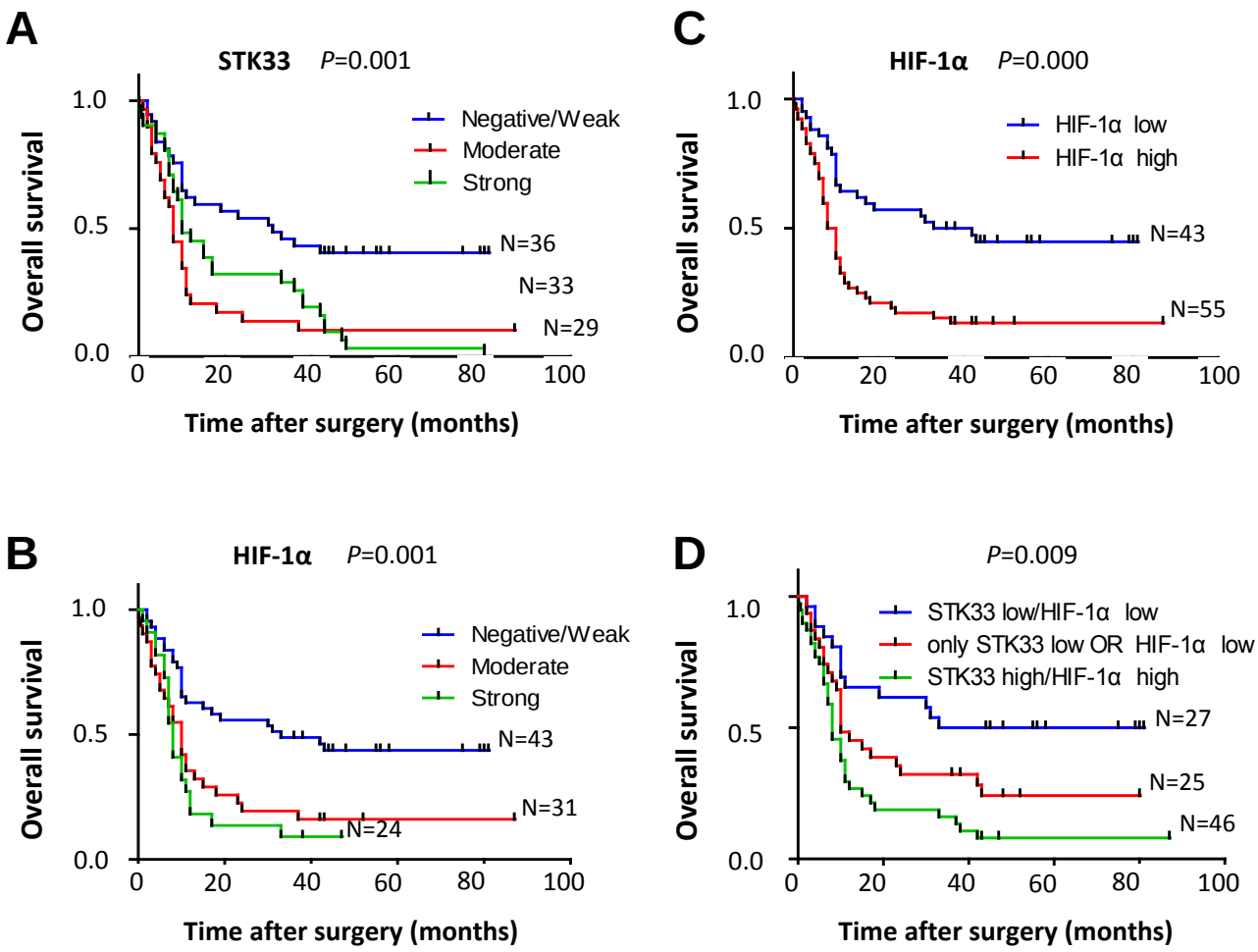
B, SW1990 cells were transfected with siSTK33 or control siRNA. The cells ($5x10^5$/per mouse) were intravenously injected into groups of nude mice (n=10). Mice were killed 35 days after tumor injection and lungs were harvested and processed for metastasis evaluation.

Shown were representative hematoxylin and eosin staining images of mouse lung tissue sections from 3 groups as indicated (magnification: ×100, ×400; left panels) and the numbers of lung metastatic foci revealed by hematoxylin and eosin staining were calculated microscopically (right panel). *P<0.05.



Supplementary Figure S7. Co-expression of STK33 and HIF-1α in PDAC tissue.

Double fluorescence staining of STK33 (Green) and HIF-1α (Red) expression in PDAC tissue sections was presented with either high or low expression of STK33. Co-localization of STK33 and HIF1 α expression was shown in the merged images.



Supplementary Figure S8. Impact of STK33 and HIF-1α expression on PDAC patient survival.

Patients were placed in three groups according to STK33 expression scores ("strong", "moderate", and "negative") or two groups according to expression levels ("high" and "low"). **A**, OS durations of PDAC patients with different levels of STK33 expression. **B**, OS durations of PDAC patients with different levels of HIF-1α expression. **C**, OS durations of patients with high or low STK33 expression. **D**, OS durations of PDAC patients with different combinations of STK33 and HIF-1α expression. Note that the combination of high STK33 and high HIF-1α expression increased the probability of a poor prognosis.