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F19



Figure S1: Immunohistochemistry staining for FAP of fresh-frozen human adult normal tissue using the murine F19 antibody. As specific staining control epithelioid malignant pleural mesothelioma (MPM) was used.



Figure S2: Schematic presentation of re-directed T cells harboring the different scFv. A displays re-directed T cells recognizing human FAP (anti-FAP-F19- $\Delta$ CD28/CD3 $\zeta$ ) and b re-directed T cells recognizing the NY-ESO-1<sub>157-165</sub> peptide complexed to HLA-A\*02:01 (anti-NY-ESO-1-T1- $\Delta$ CD28/CD3 $\zeta$ ). Both scFv were cloned in the pBullet vector containing the human  $\Delta$ CH2/CH3 domain, a  $\Delta$ CD28 and a CD3 $\zeta$  signaling domain.



Figure S3: The polyclonal pool of anti-FAP-F19- $\Delta$ CD28/CD3 $\zeta$ CAR transduced and non-transduced CD8+ T cells was cultured with (d) and without the addition of 100 IU/ml IL-2 (e). The percentage of living CD8+ T cells are shown for transduced (circles) and non-transduced (squares) T cells (n = 2).

FAP



Figure S4: Immunohistochemistry staining for FAP of HT1080FAP-luc and HT1080PA-luc cell lines (a, b) and FAP expression levels on different target cell lines and primary fibroblasts (c-g). HT1080FAP-luc and HT1080PA-luc cells were stained with mF19 antibody to visualize FAP expression (a, b). Furthermore, MSTO-211H (c), HT1080FAP-luc (d), primary fibroblasts (e), HT1080PA-luc (f) and T2-1B (g) were analyzed for FAP expression levels by flow cytometry. The solid line represents staining of cells with the humanized F19 antibody, the dotted line shows staining with the control antibody (anti-CD20).