**Supplementary Materials- figure legends**

**Figure S1:** Schematic overview of the different steps of the perfusion experiment

**Figure S2:** Example of the connection of the renal artery to the perfusion system.

**Figure S3:** Images from a kidney lamella after perfusion made with the clinical laparoscopic fluorescence camera showing normal kidney parenchyma.

**Figure S4:** Tissue section of normal kidney parenchyma

**Figure S5:** Overview of the second perfusion experiment.

**Figure S6:** Photograph and autoradiographic image of the second control experiment.

**Figure S7:** Antibody distribution in the control experiments.

**Movie S1:** Video made with the laparoscopic fluorescence camera during experiment #1.

Figure S1: Schematic overview of the different steps of the perfusion experiment

Figure S2: Photograph of an ex vivo tumorous kidney during a perfusion experiment. In this kidney, two renal arteries were connected to the perfusion system. During perfusion, the kidney was kept at 0-4 °C and protected from light.

**Figure S3:** Images from a kidney lamella after perfusion made with the clinical laparoscopic fluorescence camera showing normal kidney parenchyma (A): visible light image (B): corresponding fluorescence image.

Figure S4: Tissue section of normal kidney parenchyma showing the absence of CAIX-expression (A) and corresponding absence of a radioactive (B) and fluorescent (C) signal in normal tissue. In the H&E staining detail (D) normal glomeruli are present lacking CAIX-expression (E) as seen in tumor tissue.

Figure S5: Overview of the results of perfusion experiment #2. High uptake of dual-labeled girentuximab was observed in two foci (\*) of tumor thrombus in the renal vein (A, B). The central region of the tumor largely consists of necrosis, with little and inhomogeneous uptake of dual-labeled girentuximab. Histology confirms that the tumor center consists of fibrosis and necrosis (H&E staining detail, C), without CAIX expression (D).

Figure S6: Photograph (A) and autoradiographic image (B) of the second control experiment showing high uptake of Iodine-131-girentuximab-IRDye800CW in tumor tissue. The low energy gamma radiation of Iodine-125 is not visible in this autoradiography.

**Figure S7**: Biodistribution of Iodine-131-girentuximab-IRDye800CW and the irrelevant control Iodine-125-IgG-IRDye800CW in tumor and normal tissue samples**.** *Left:*first control experiment (#6). The mean tumor-to-normal-ratio for girentuximab and the irrelevant control antibody were 6 and 1, respectively. *Right:* second control experiment (#7). The mean tumor-to-normal-ratio for girentuximab and the irrelevant control antibody were 10 and 1, respectively.

**Movie S1:** Video made with the laparoscopic fluorescence camera during experiment #1.