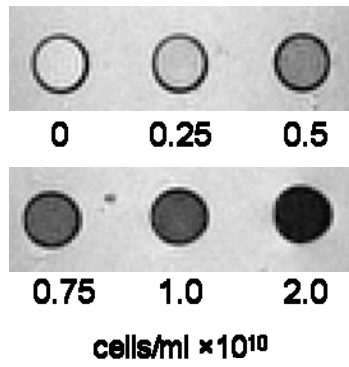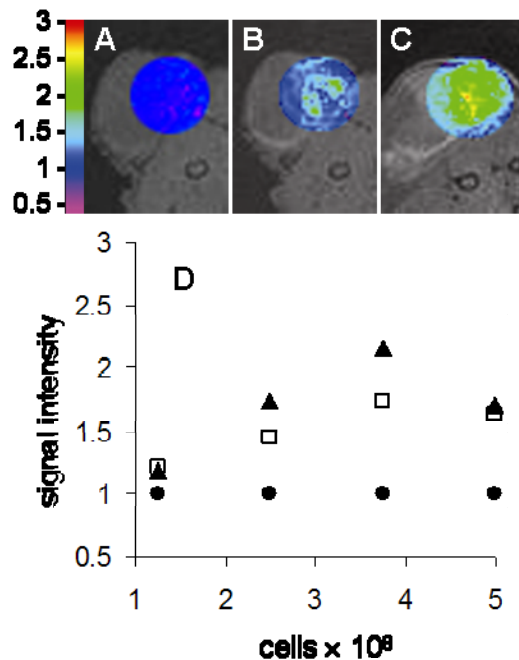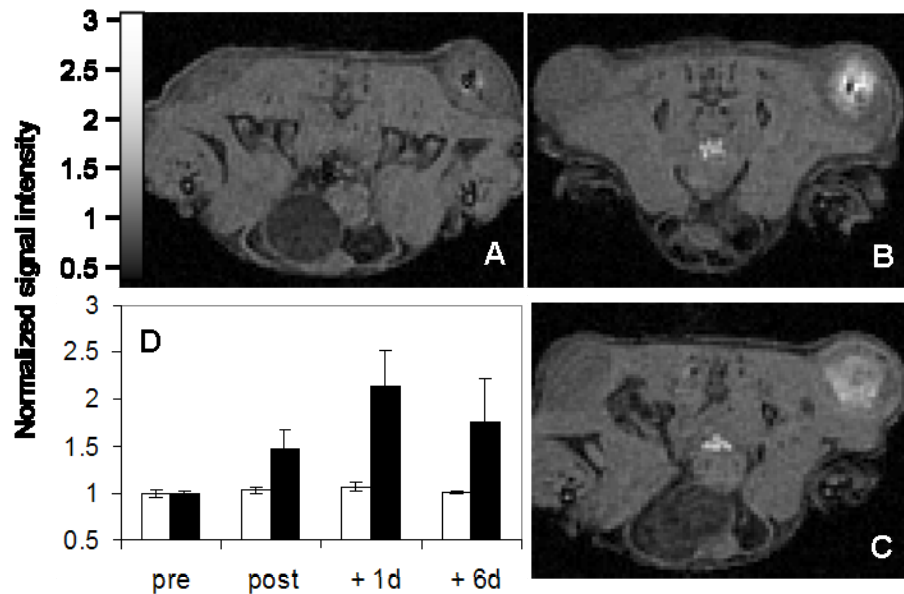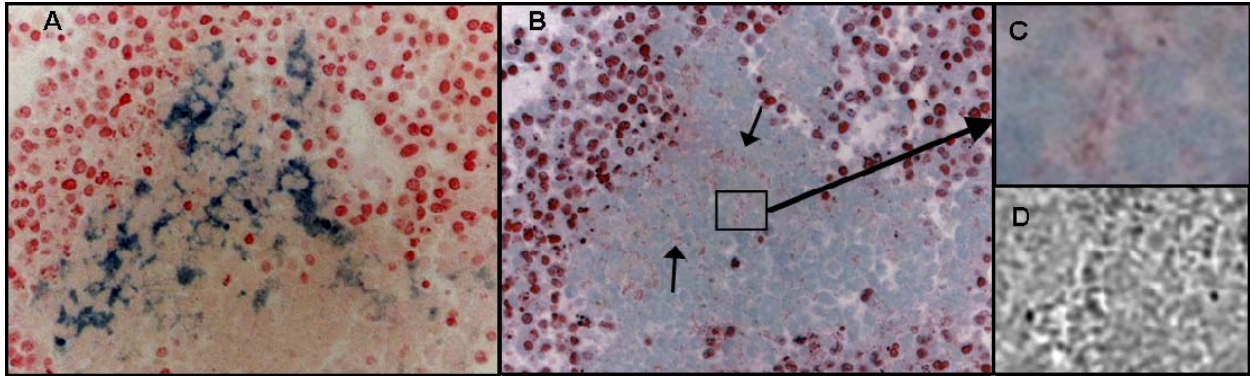**SUPPLEMENTARY FIGURES**

Supplementary Figure 1. T2-weighted MRI cross-sections of low-Fe AMB-1 (grown with FeCl$_3$) suspended in 3% gelatin at concentrations from 0 to 2×10^{10} cells/ml.

Supplementary Figure 2. Correlation between AMB-1 cell number and T1-weighted positive contrast in mouse tumors. *A-C*, T1-weighted axial-slice images of a tumor pre-injection (*A*), immediately post (*B*) and 1 day post-injection (*C*) with 3.75×10^8 AMB-1 cells. The colored gradient maps highlight the location of the i.t. injection; the corresponding scale bar illustrates the normalized signal intensity. *D*, normalized signal intensities from T1-weighted MR images of mouse tumors injected i.t. with increasing concentrations of AMB-1 cells: pre-injection (●), immediately following the injection (□), and 1 day post-injection (▲). Note that immediately post-injection, the number of bacterial cells in tumors is the same as the number injected because the injected bacteria remain localized to the tumor for several hours (e.g., see Supplementary Fig. 5). For the injections with 5×10^8 cells, the signal was reduced by the competing T2-effect, similar to the highest concentration *in vitro* samples (Fig.1).
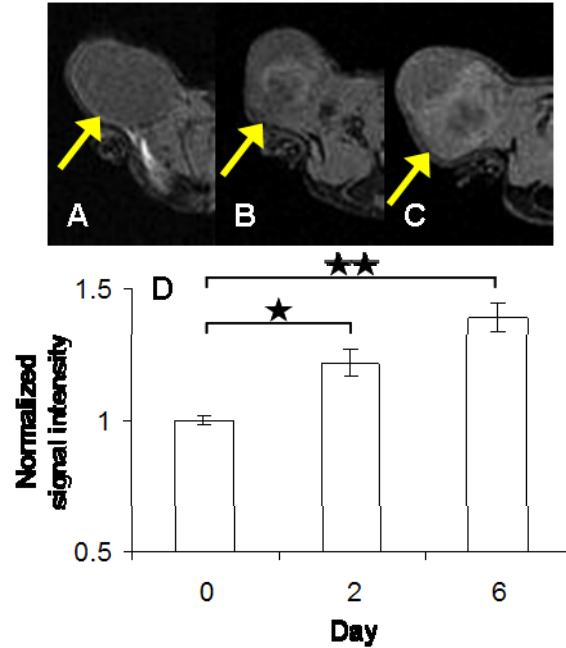
Supplementary Figure 3. Grayscale version of Fig. 3. AMB-1 cells show positive contrast in mouse tumors. T1-weighted axial-slice MR images (*A-C*) show enhanced signal in tumors after i.t. delivery of AMB-1 (right tumor) but not in the control tumor injected with MSGM (left); immediately post-injection (*A*), 1 day later (*B*), and 6 days later (*C*). *D*, mean (±1 SD) tumor signal intensities normalized to pre-injection controls for control (white bars) or test tumors (black bars).

Supplementary Figure 4. Iron and bacterial staining indicate that AMB-1 remain in tumors for 7 days. 400× magnification images of tumor sections stained with Prussian blue for iron (*A*, blue) and Gram stain for bacteria (*B*, clumps of small pink cells pointed out). *C*, highlighted section from *B* enlarged to show gram negative bacteria (pink). *D*, 1000× magnification black-and-white image from the same section as *C* showing individual bacteria (black spots).
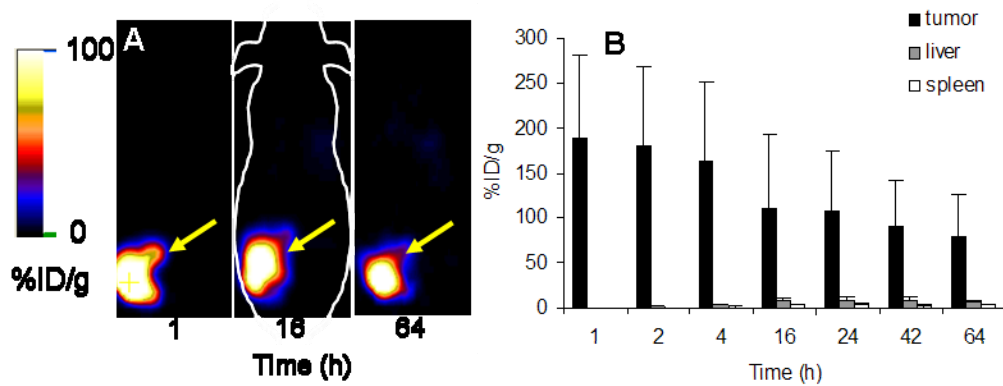
Supplementary Figure 5. For ^{64}Cu-PTSM labeled AMB-1 delivered i.t., the bacteria largely remain in the tumor. *A*, decay-corrected coronal-slice images at three times post-injection (arrows point to the tumor location; an outline of the mouse is traced in the 16 h image for anatomical reference). *B*, mean %ID/g (+1 s.d.) for the tumor, liver and spleen.

Supplementary Figure 6. Grayscale version of Figure 6, with arrows pointing to tumors. AMB-1 produce positive contrast in tumor xenografts following systemic delivery. T1-weighted axial-slice MR images of a mouse tumor prior to injection (*A*), as well as 2 (*B*) and 6 days post-injection (via tail-vein with 1×10^9 AMB-1 suspended in 100 μl MSGM). *D*, the signal increased 1.22-fold after 2 days (★ *p*=0.003) and 1.39-fold (★★ *p*=0.0007) after 6 days (n=4).