



Extended Data Figure 9 | Ultrasound imaging of *S. typhimurium* in tumour xenografts. **a**, Diagram of tumour imaging experiment. *S. typhimurium* expressing *arg1* were introduced into the tumours of mice and imaged with ultrasound. **b**, Ultrasound images of a gel phantom containing *S. typhimurium* expressing *arg1* or the *lux* operon. Cell concentration is 10^9 cells ml^{-1} . Experiment repeated three times with similar results. **c**, TEM images of whole *S. typhimurium* cells expressing *arg1* with and without exposure to acoustic collapse pulses. At least 20 cellular images were acquired for each sample type (from one biological

preparation each) with similar results. **d**, Ultrasound images of mouse OVCAR8 tumours injected with $50\mu\text{l}$ of 3.2×10^9 cells ml^{-1} *arg1*-expressing *S. typhimurium*, before and after acoustic collapse. Experiment repeated five times with similar results. **e**, Collapse-sensitive ultrasound contrast in tumours injected with *arg1*-expressing or *lux*-expressing cells. Data are from five animals, line represents the mean. $P=0.002$ using a two-sided heteroscedastic *t*-test. Scale bars, 2 mm (**b**), 500 nm (**c**) and 2.5 mm (**d**).