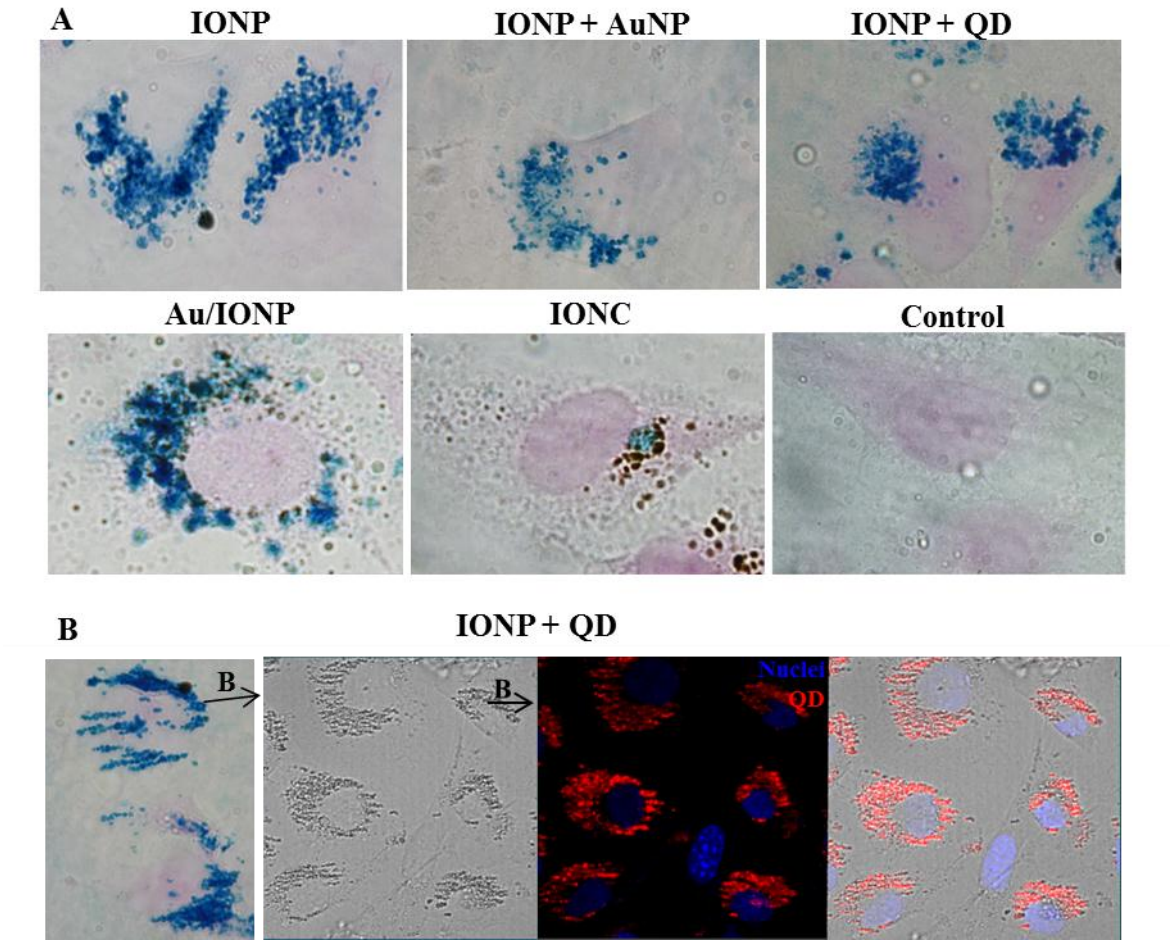

Fig. S1: Nanoparticle-loaded precursor cells. (A) Perls staining of precursor HUVEC after the internalization of IONP; IONP + AuNP; IONP + QD; Au/IONP or IONC, compared to control. (B) Perls staining of precursor HUVEC after the internalization of IONP + QD in the presence of a magnetic field inducing the alignment of nanoparticle-loaded endosomes/lysosomes (first column). Confocal images (Andor Technology plc, Belfast, Northern Ireland) in bright field (second column), fluorescence (third column) and merge (fourth collumn) showing the co-localization of IONP and QD. For such confocal microscopy imaging, precursor cells seeded on glass slide were incubated with IONP and QD for 2 hours. After 4 hours of chase, cells were fixed in 4% paraformaldehyde solution and their nuclei were counterstained by DAPI (Sigma). For both QD and DAPI fluorescence detection, excitation wavelength was 405 nm while fluorescence emission was collected by using filters at 685±18 and 445±10 nm, respectively.

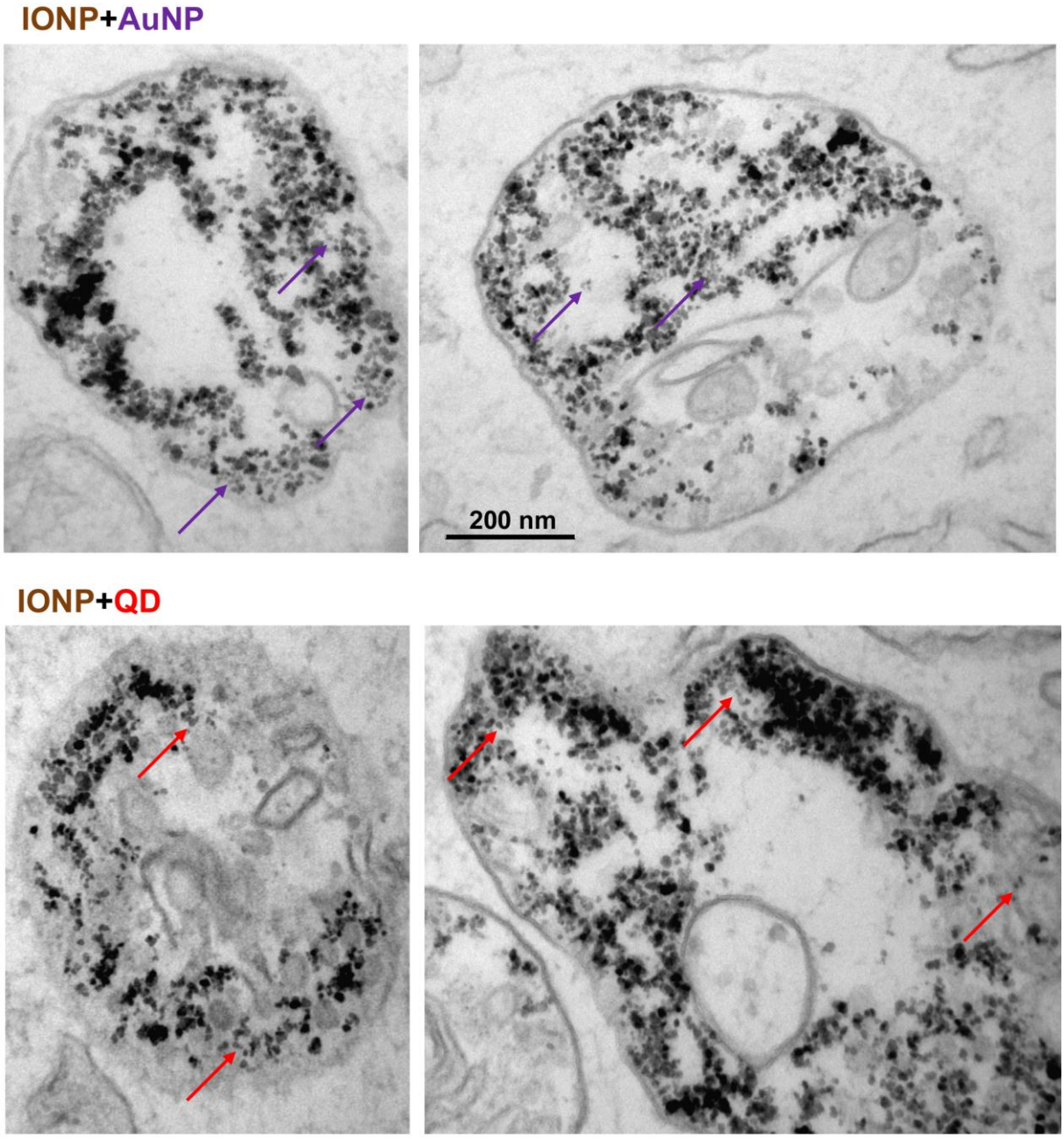

Fig. S2: Transmission electron micrographs of endosomes/lysosomes from precursor cells enclosing IONP + AuNP (yellow arrows) or IONP + QD (red arrows).

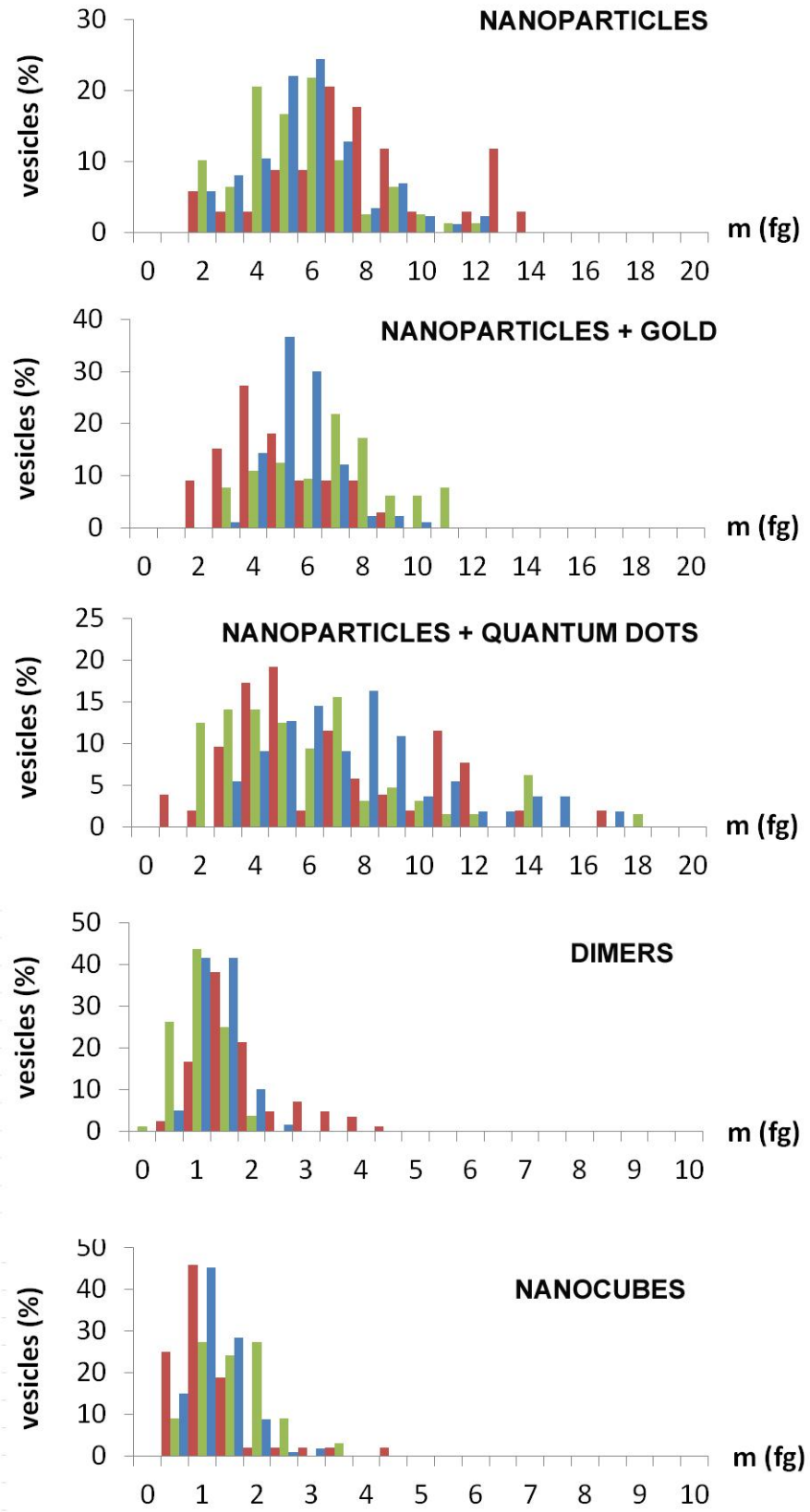

Fig. S3: Intra-vesicle iron mass distribution computed from the magnetophoretic mobility of vesicles loaded with IONP; IONP + QD; IONP + AuNP; IONC or Au/IONC. Each distribution (different colors) correspond to an independent experiment.

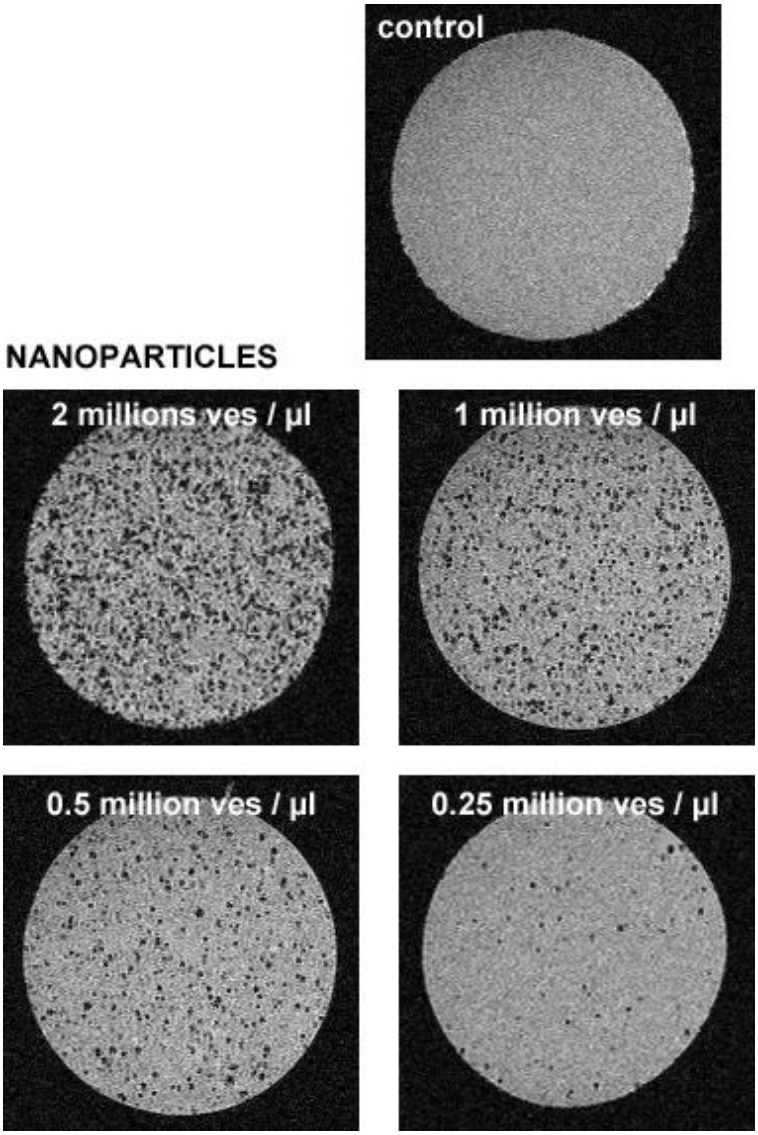

Fig. S4: High-resolution MRI scans of agarose phantoms either vesicle-free (control) or containing IONP-loaded vesicles in descending concentration order.