

Supplementary Materials for

Perfusion, cryopreservation, and nanowarming of whole hearts using colloidally stable magnetic cryopreservation agent solutions

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Figs. S1 to S6

Supplementary Materials

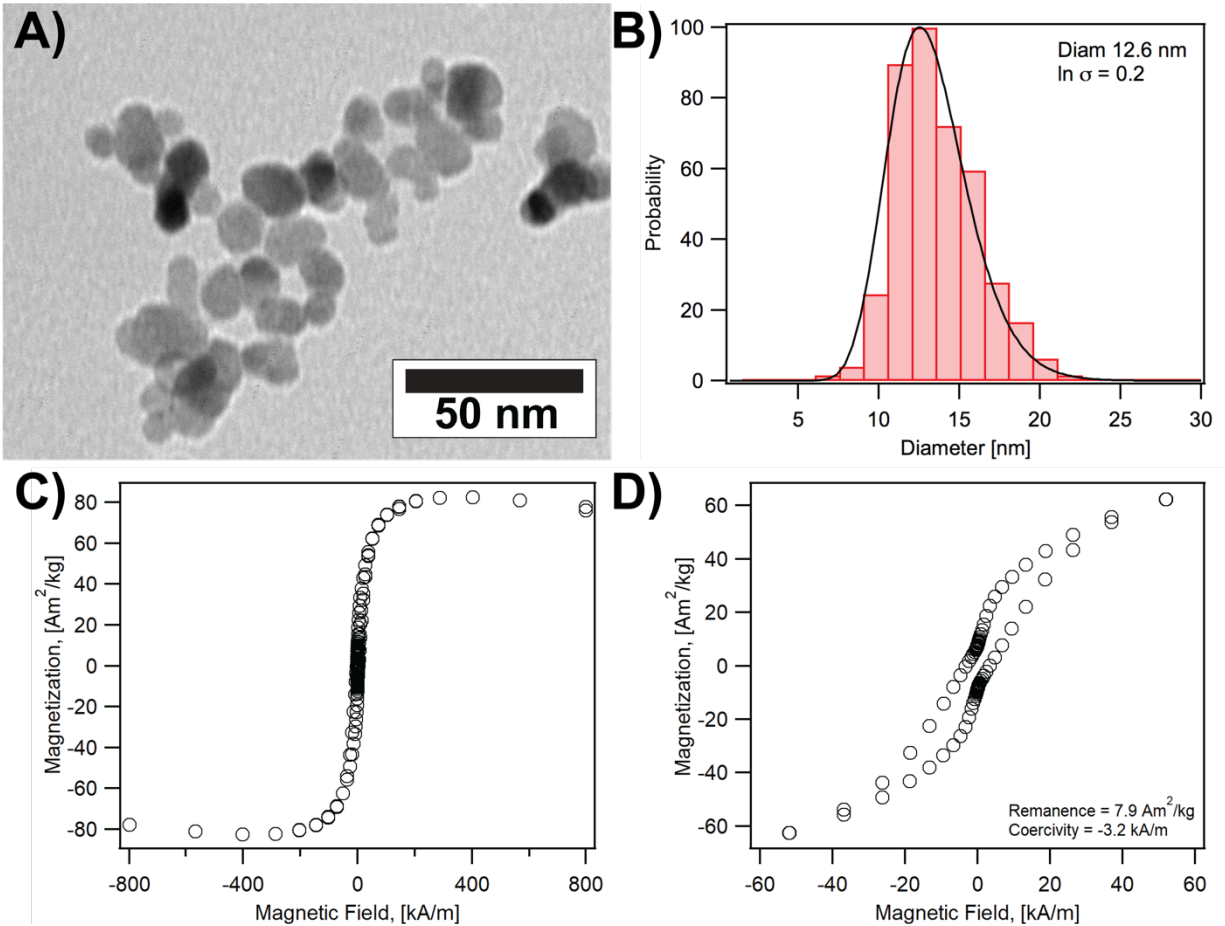


Fig. S1. Characterization of superparamagnetic iron oxide nanoparticles used to formulate magnetic cryopreservation agent (mCPA) solutions. A) Representative TEM image of particles after PEG coating. B) Core diameter distribution obtained from TEM images (N = 509 particles analyzed). C) Magnetization curve for mCPA (10 mg_{Fe}/mL in VS55) at 77 K. D) Magnetization curve at 77 K in a field range representative of the amplitude of the AMF used in nanowarming experiments, demonstrating remanence of 7.9 Am²/kg and coercivity of 3.2 kA/m.

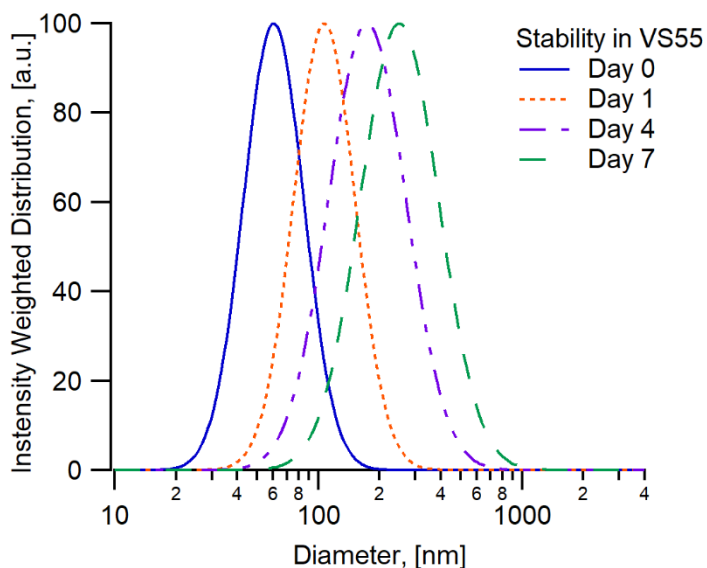


Fig. S2. Colloidal stability of PEG coated SPIONs in VS55, showing an increase in size and distribution over 7 days.

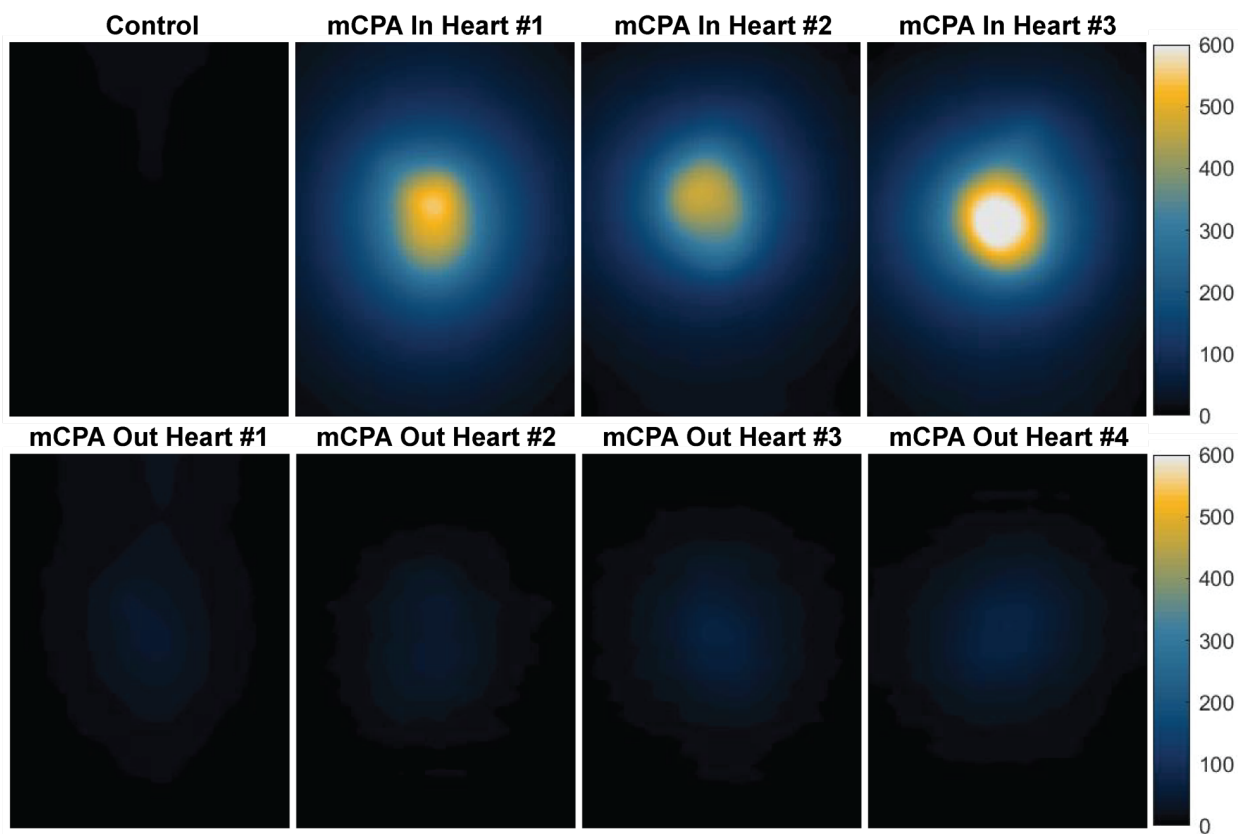
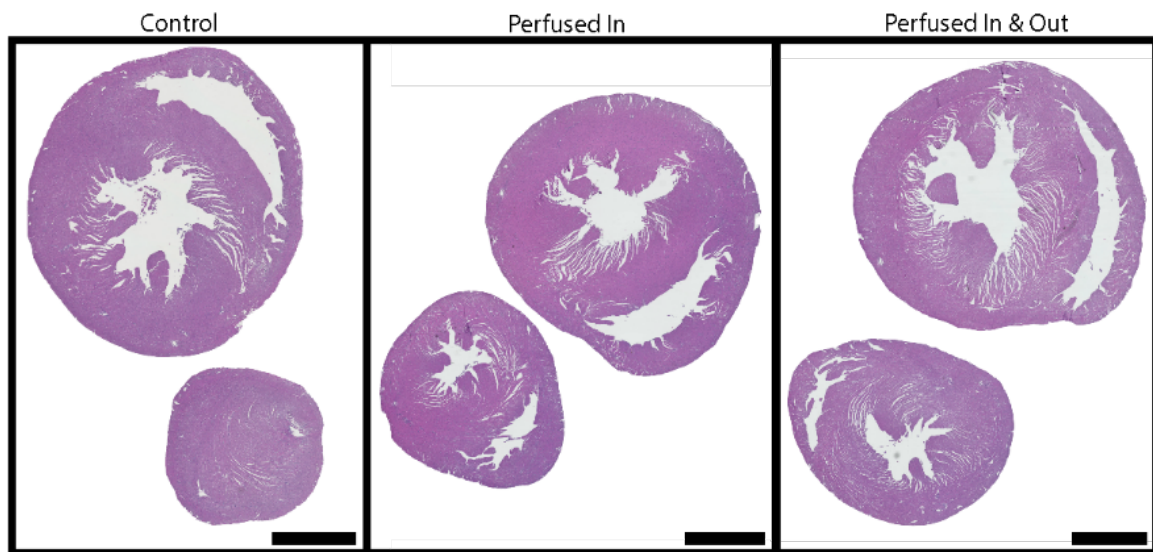
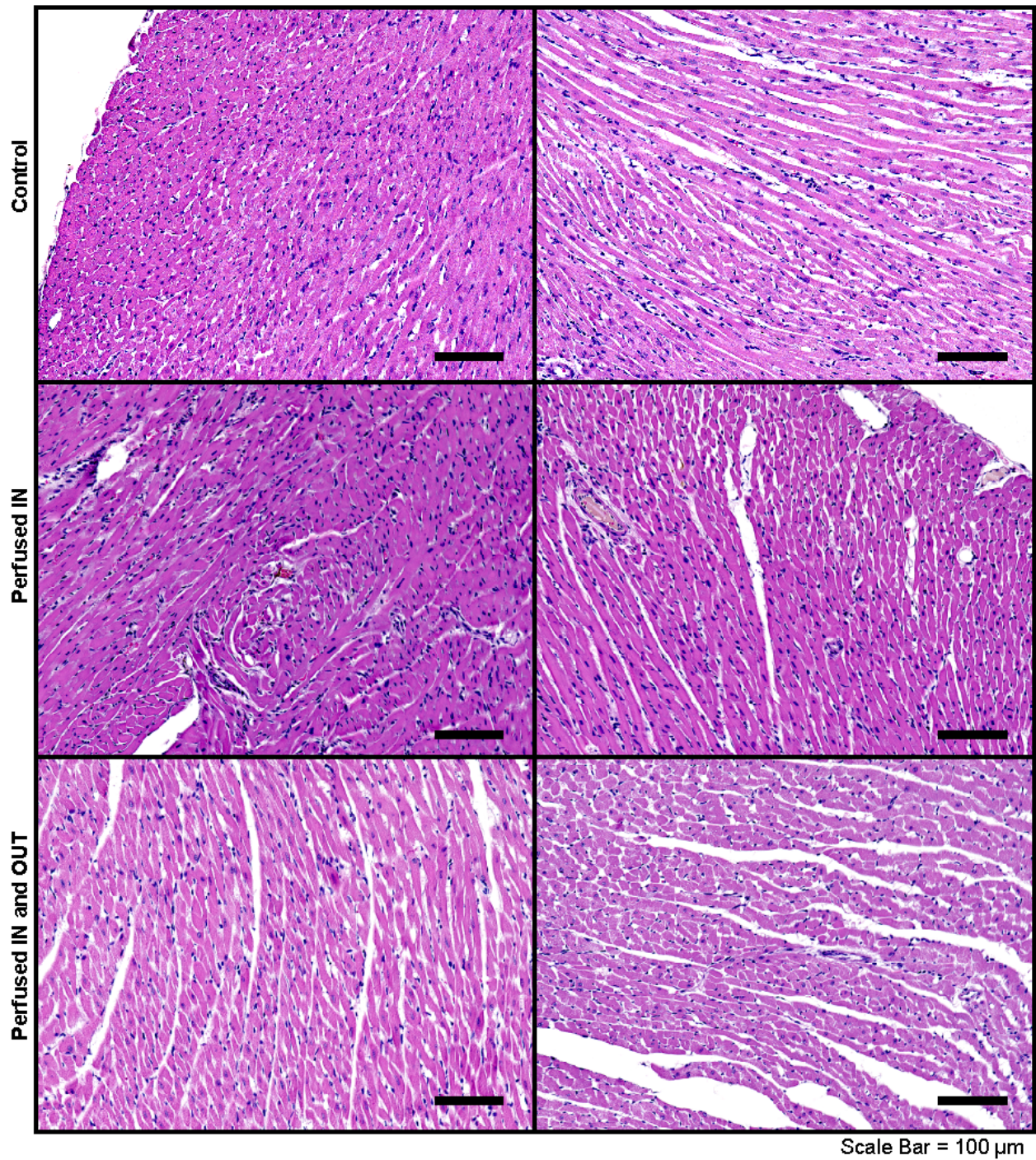


Fig. S3. Evaluation of SPION distribution in hearts using magnetic particle imaging. Image of each heart and the signal intensity from MPI scaled to the same range. Hearts that were not perfused shows no signal. Hearts perfused in with mCPA shows high signal from the particles, a bright yellow signal. Hearts in which mCPA was perfused out, signal is low, faint blue color.



Scale bar = 2.5 mm

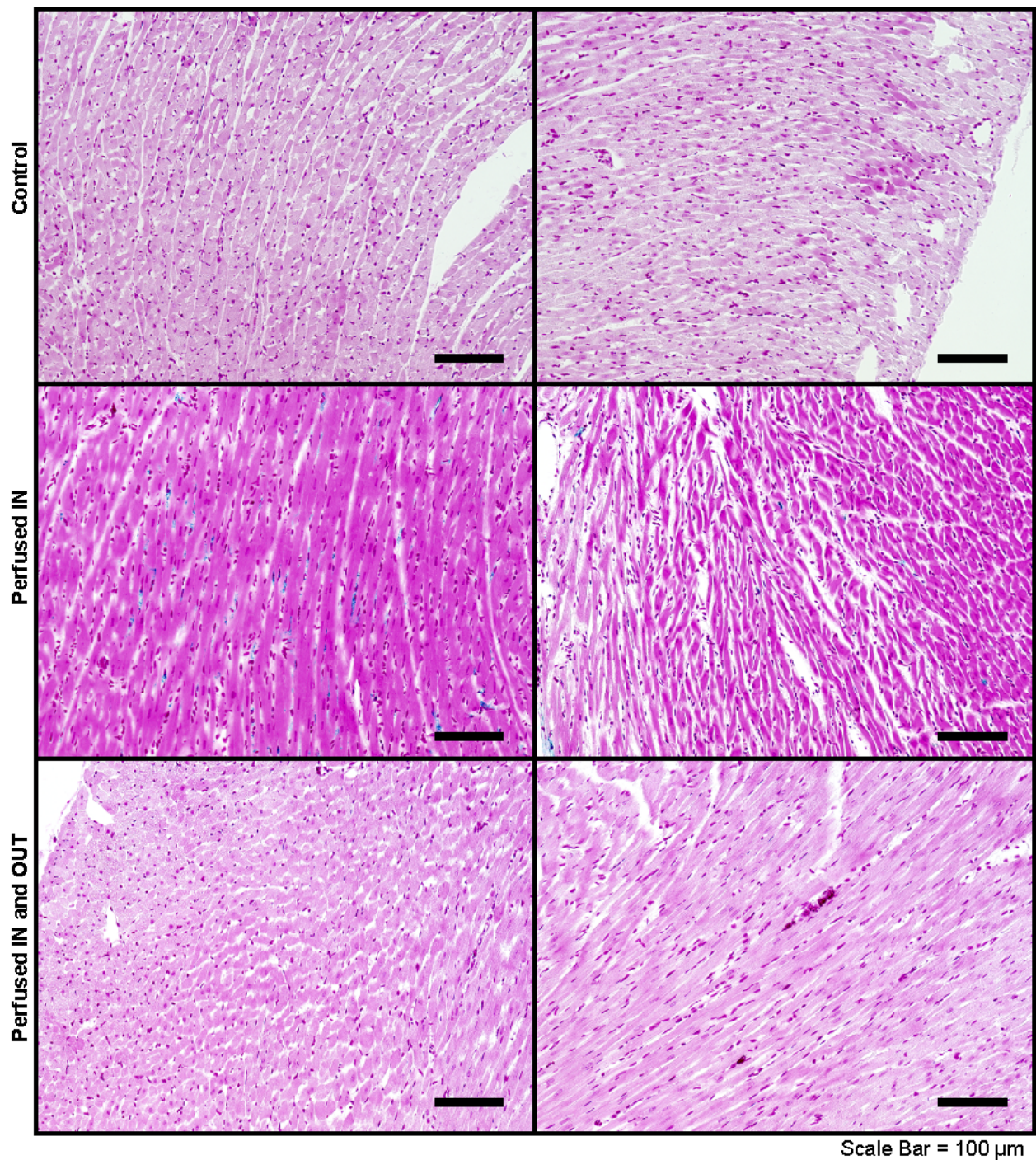
Fig. S4. Histological evaluation of gross tissue damage due to perfusion with mCPA. Representative H&E images of whole transversal cross-sections from the center and bottom of rat hearts from control, perfused in, and perfused in & out group. H&E shows similar cytoarchitecture texture of the myocardium across all groups.



Scale Bar = 100 μ m

Fig. S5. Histological evaluation of rat hearts after perfusion with mCPA.

Representative H&E images at a higher magnification of different areas of the transversal cross-section of the center and bottom of the control, perfused in, and perfused in and out rat hearts. The cytoarchitecture texture of the myocardium of the rat hearts that are perfused in and perfused in and out appear to be similar to the normal rat heart.



Scale Bar = 100 μ m

Fig. S6. Histological assessment of SPION distribution in rat hearts after perfusion with mCPA. Representative Prussian blue images at a high magnification of different areas of the transversal cross-section of the center and bottom of the control, perfused in, and perfused in and out rat heart. No blue stain is observed as expected in the control heart since it was not perfused with particles. Blue stain is observed at various locations within the interstitial space of the perfused in heart and no blue stain is observed as expected in the perfused in and out heart since the particles were perfused out with Custodiol® HTK.