

## ***“Phosphonate coating of commercial iron oxide nanoparticles for nanowarming cryopreserved samples”***

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New preservation technologies may allow for organ banking similar to blood and biomaterial banking approaches. Using cryoprotective agents (CPAs), aqueous solutions with organic components such as DMSO, propylene glycol, and added salts and sugars, organs can be used to vitrify and store organs at  $-140\text{ }^{\circ}\text{C}$ . When needed, these organs can be rewarmed in a rapid and uniform manner if CPAs are supplemented with iron oxide nanoparticles (IONPs) in an applied radiofrequency field. Speed and uniformity of warming are both IONP concentration and CPA suspension dependent. Here we present a coating method of small molecule phosphonate linker (PLink) and biocompatible polymer (*i.e.* polyethylene glycol PEG) that tunes stability and increases the maximum allowable concentration of IONPs in CPA suspension. PLink contains a phosphonate 'anchor' for high irreversible binding to iron oxide and a carboxylic acid 'handle' for ligand attachment. PLink-PEG removes and replaces the initial coating layer of commercially available IONPs (EMG1200 (hydrophobic) and EMG308 (hydrophilic) Ferrotec, Inc., increasing colloidal stability and decreasing aggregation in both water and CPAs.