Cessation of blood flow during a heart attack can result in ischaemia and reperfusion (IR) injury, cardiomyocyte necrosis, and death. Exosomes isolated from in vitro cultures of stem cells have been shown to be cardioprotective. Exosomes are also present in the blood of healthy individuals, but their properties are unknown.

Aim: To characterize the circulating exosomes of healthy rats, and to determine whether they protect against IR injury in HL-1 cardiac cells and in a Langendorff isolated, perfused rat heart model.

We isolated 2.5±1.1x10^{11} per ml of rat plasma by ultracentrifugation (N=5 rats), and confirmed their identity as exosomes by their diameter of 87±2 nm measured by nanoparticle tracking analysis, their typical “cup”-shape morphology by electron microscopy, and by their expression of exosome marker proteins CD63 and HSP70. Similar results were seen with human exosomes.

After in vitro IR injury, 21±5% of HL-1 cells remained alive. Addition of exosomes increased survival to 49±6%. Control perfused rat hearts subject to IR had infarct sizes of 35±3% (N=6). Perfusion with purified exosomes significantly reduced infarct size after IR to 23±2% (N=10, P<0.01).

This is the first data showing that circulating endogenous exosomes from healthy rats are capable of conferring cardioprotection. This contrasts with data suggesting larger “microvesicles” in the blood are detrimental to the cardiovascular system. Disease states which alter exosome number might potentially alter innate cardiac resistance. Possible mechanisms will be discussed.