

296f Quadrupole Magnetic Separation (Qms) of Porcine Islets of Langerhans

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Diabetes is the most prevalent hormonal disease, affecting 6% of the US population and surpassing \$92 billion in direct costs to the economy as well as untold human suffering. Even meticulous insulin therapy is inferior to the feedback response of healthy patients; kidney damage, lower limb ischemia, and vision loss are all common symptoms of chronic diabetes. Pancreas transplants are 72% to 84% effective but are fraught with complications including 5% mortality.

Alternatively, human clinical trials since the 1990's have investigated the feasibility of transplanting purified pancreatic islets instead of the whole organs. Recent advances in islet transplantation and immunosuppression reversed diabetes in up to 90% of cases with relatively minor complications. However, a great number of islets do not survive transplantation and standardized density gradient purifications recover less than half of available islets. Multiple donor organs are therefore required to guarantee successful islet transplantation. Magnetic islet purification offers two important advantages over the density gradients:

- Magnetic purification would subject islet cells to less mechanical and chemical stress. This should increase the number of islets that survive transplantation.
- Magnetic purification has already demonstrated high yields in rodent models. I am confident that magnetic purification can succeed in porcine or human models as well.

Both of these advantages allow each donor organ to treat a greater number of diabetic patients; a very important gain given the universal shortage of organ donors.

Briefly, a suspension of 4.5 μm Dynal Dynabeads® is infused into the main artery of the splenic lobe of a porcine pancreas. Dynabeads® become physically lodged in the islets and remain there following enzymatic digestion. Dynabead®-infused islets are purified both by density gradient and QMS. Preliminary results indicate that Dynabeads® are not detrimental to islet function or vitality. Islets purified by QMS have comparable respiratory function compared to density gradient-purified islets. Our 1.5 Tesla Quadrupole Magnetic Separator (QMS) has recovered as many as 60% of islets, though inconsistently, from infused pancreas digests. Studies are underway to optimize Dynabead® uptake by islets as well as to increase the purity of recovered islets. Islets of significant purity from the QMS will be transplanted into diabetic mice for direct comparison with density gradient-purified islets.