An Innovative Cell-Based Therapy for Ischemic Vascular Disease: Direct Isolation and Infusion of CD31$^+$ Cells From Bone Marrow

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Value Proposition

- Highly angiogenic/vasculogenic bone marrow-derived cells for the treatment of ischemic vascular diseases
- Novel use of known cell surface marker: CD31
- Yields therapeutic quantities of cells enabling direct infusion back into the patient
- Potentially reduced toxicity
- Device-based business model
- Unique, disruptive cell-based therapy
Background

• Formation of new blood vessels
  – Vasculogenesis: de novo development of blood vessels from endothelial progenitor cells (EPCs)
  – Angiogenesis: reorganization of endothelial cells from preexisting blood vessels
• EPCs found in peripheral blood and bone marrow (BM)
• EPCs isolated via physical properties (adherence, morphology, etc.)

Unmet need: No specific marker exists for identifying highly enriched angio-vasculogenic cells from BM
CD31: A Marker to Identify Highly Angio-Vasculogenic Cells From Bone Marrow

Nude Mice

CD31+

CD31−

PBS

Doppler Perfusion

Limb salvage (%)

Perfusion ratio (Ischemic/Nonischemic limb, %)

(n=7)

(n=3)
Proposed Business Model: Autologous CD31⁺ Cell Therapy

1. Bone marrow removed from patient
2. CD31⁺ cells isolated with extractor onsite
3. Direct infusion of CD31⁺ cells into patient
# Competitive Analysis

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<td>Osiris Therapeutics</td>
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<td>Various ES Companies</td>
<td>Differentiated and expanded prior to infusion</td>
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Potential Indications

• Critical Limb Ischemia
  – Affects at least 600,000 people in the U.S.
  – Leads to over 160,000 major limb amputations/year in U.S.

• End-Stage Ischemic Heart Disease
  – 3,000,000 persons in the U.S. suffer from congestive heart failure due to coronary artery disease
  – 50% five-year survival rate

• Post-Acute Myocardial Infarction
  – Approximately 700,000 individuals in the U.S. each year experience their first heart attack
"Therapeutic Use of CD31 Expressing Cells"
- U.S. national stage utility application pending (filed 4/2009)
- Compositions and Methods of Use

Potential to strengthen IP position through development of CD31+ cell extractor device
Competitive Advantage

• Proprietary marker (CD31) for identifying highly angio-vasculogenic cells from bone marrow
• High cell yield enables direct infusion
• May overcome toxicity (expansion/heterogeneity)
• Utilizes off-the-shelf technology (antibody conjugated magnetic beads, FACS)
• Sustainable business model
  – Cells prepared onsite via device with disposables
  – Target initial indications with severe unmet need
Future Plans

- Demonstrate proof-of-principle in cardiac ischemia animal model
- Perform additional experiments to examine toxicity and safety of CD31^+ cells
- Commercialization plan: start-up vs. established co.
- If start-up route, obtain seed funding to develop cell extraction device