The use of fresh platelets has gained value in medicine as an essential part of wound treatments. This is not surprising since platelets contain a number of bioactive factors that contribute to the process of wound healing such as: platelet-derived growth factors (PDGF) and transforming growth factor (TGF). Fresh platelets' short shelf life limits platelet-based therapies. If platelets can be stablished in a freeze-dried form (FDP) for long-term storage and pathogen inactivation methods become possible.

Adlyfe and Oregon Freeze-Dry have been developing technologies to stabilize freeze-dried human platelets - which can be subjected to gamma-irradiation and stored for a long duration. Upon reconstitution, irradiated FDP retained growth factors PDGF-bb and TGF-β1 in quantities similar to fresh platelets as judged by ELISA. The radioblated FDP promoted new DNA synthesis and cellular proliferation of primary human dermal fibroblasts and endothelial cells (HUVECs) similar to fresh platelets. The FDP also promoted remodeling of extracellular matrix by accelerating fibroblast-mediated contraction of collagen gels and stimulated HUVECs to undergo angiogenesis and form capillary structures in vitro. Pre-clinical wound healing studies in diabetic mice indicated that FDP promoted rapid wound healing and closure in a manner comparable to fresh platelets and VEGF controls. Furthermore, wounds treated with FDP are active, granulated and saturated with blood vessels. Additional study using swine models is underway to solidify our content that FDP are safe and well-suited alternative to fresh platelets for wound healing applications.

Materials and Methods

Fibroblasts

- Collagen gels were gently detached from the plastic surface to allow contraction, 1.0 ml of starvation medium was added, and the cells were allowed to contract for 2 days.

- Starvation medium (without FBS) was added and the optical density was determined at 590 nm.

- Radioactive Cell Proliferation Assay kits were from ATCC, Walkerville, MA.

Once the cells were attached, the samples were added and incubated in a 37°C, 5%CO2 humidified incubator for 2 days.

Growth factor contents within the FDP are the same as fresh platelets and literature reported values.

Results

Conclusions

- Adlyfe’s proprietary freeze-drying process produces stabilized freeze-dried platelets that have physical and biochemical characteristics of fresh platelets.

- In vitro, freeze-dried platelets stimulate cell proliferation, tissue remodeling and angiogenesis in the same manner as fresh platelets.

- In vivo, freeze-dried platelets accelerate wound healing and promote wound closure in a similar manner as fresh platelets and VEGF control.

- Freeze-dried platelets promote angiogenesis at the wound bed in a similar manner as fresh platelets and VEGF control.

- Freeze-dried platelets can be used as a safe and well-suited alternative to fresh platelets for wound healing applications.