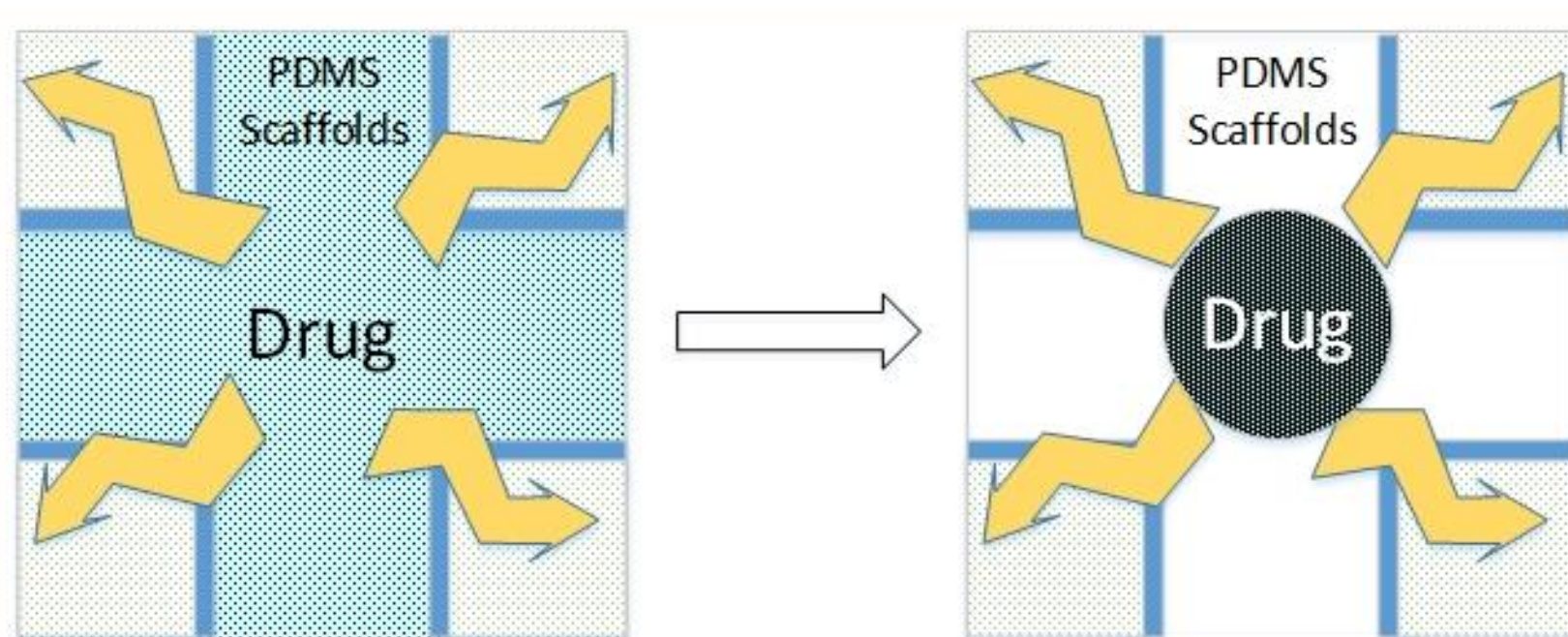


Localized Release of Corticosteroid from Macroporous Organosilicone Beads Scaffolds

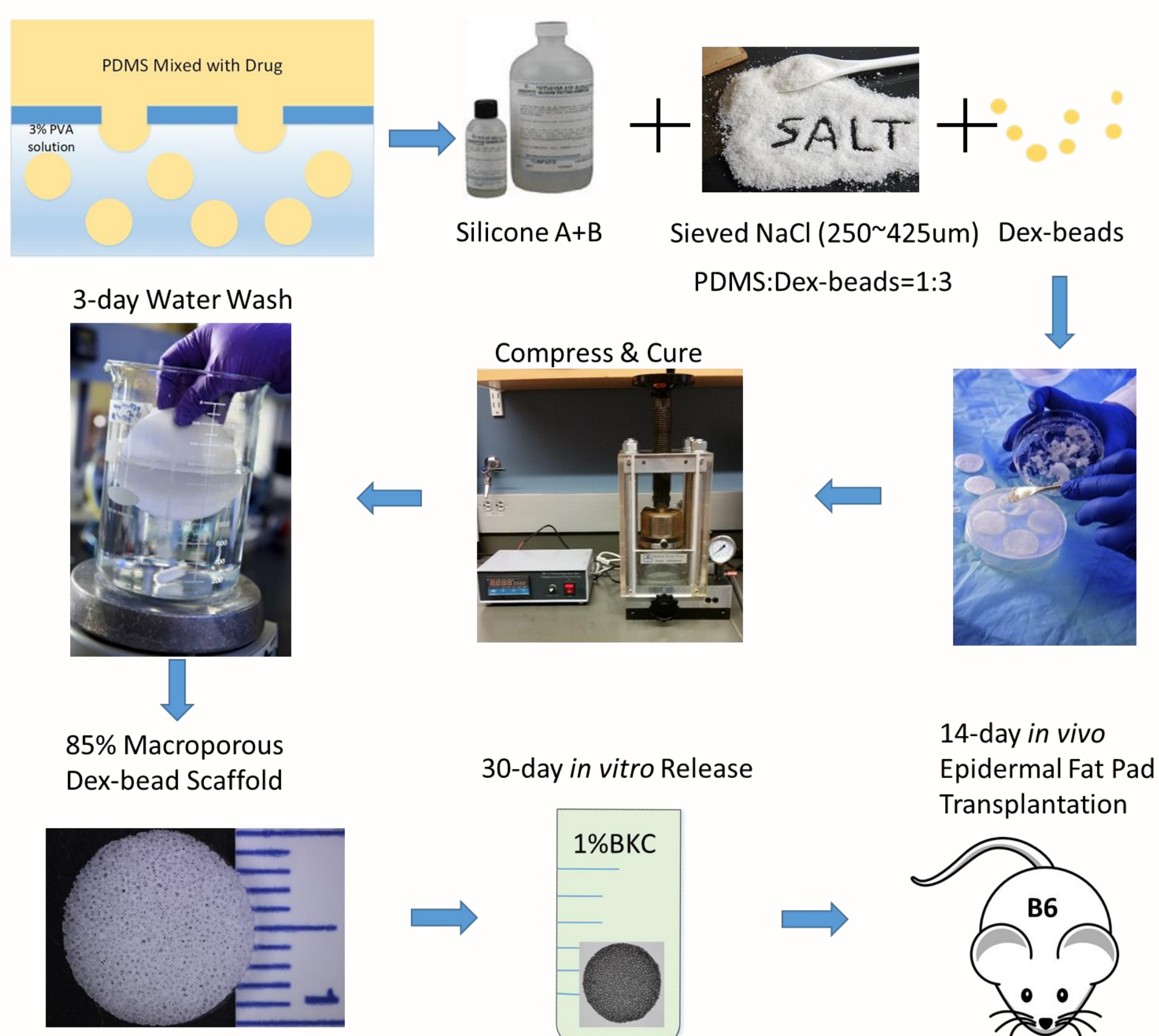
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Background

Mitigating transplant-associated inflammatory responses should significantly improve implant efficacy, particularly when transplanting cells susceptible to inflammatory stress, such as pancreatic islets. The localized delivery of anti-inflammatory agents provides a promising approach for this cause, while minimizing the detrimental side effect associated with systemic delivery. The delivery profile, however, needs to be carefully designed to ensure the stable release of the agent in a range that dampens inflammatory responses while avoiding deleterious effect to the graft. In our laboratory, we have engineered a highly porous polydimethylsiloxane (PDMS)-based scaffold platform to house pancreatic islets for cell therapy of Type 1 Diabetes. This multi-functional platform can be utilized for local drug delivery by loading drug (e.g. dexamethasone) within PDMS directly to fabricate the scaffolds (regular scaffolds) [1]. To achieve more controlled and extended drug release than the regular scaffolds, beads scaffolds were fabricated by embedding drug encapsulated beads into the structure.

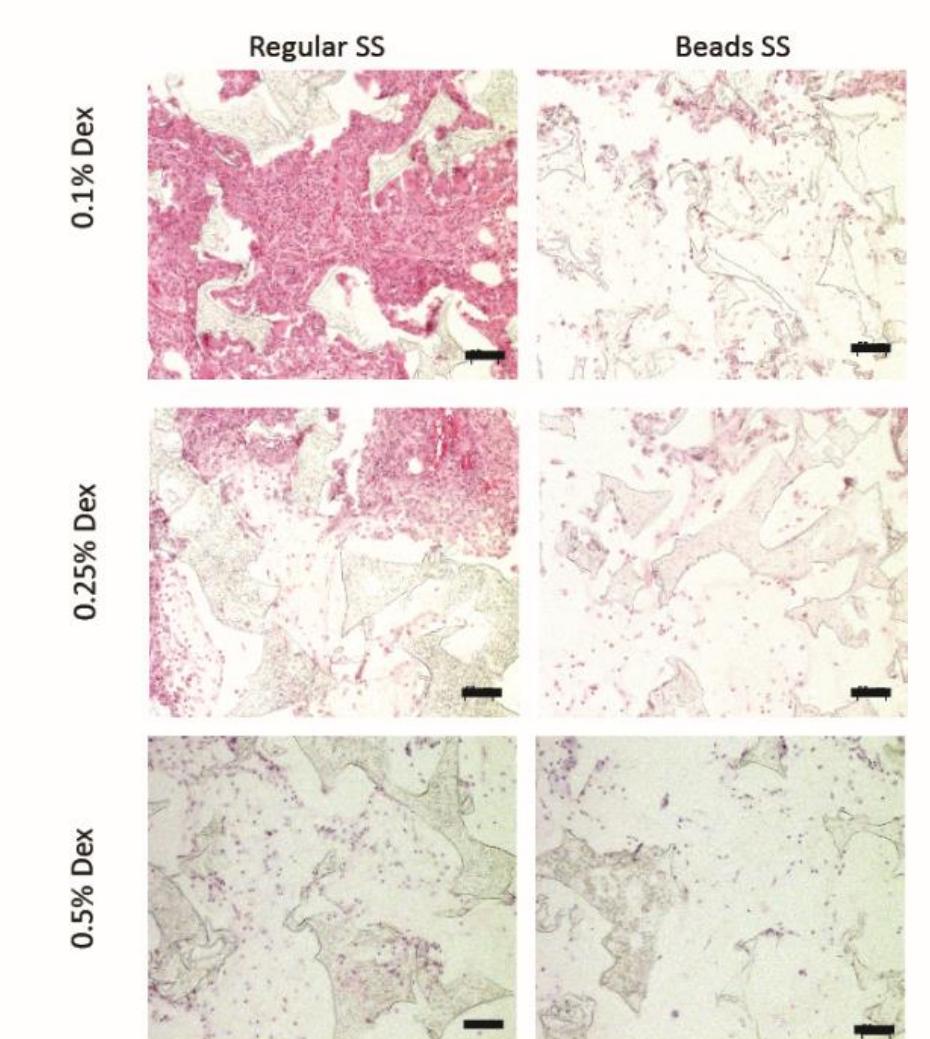
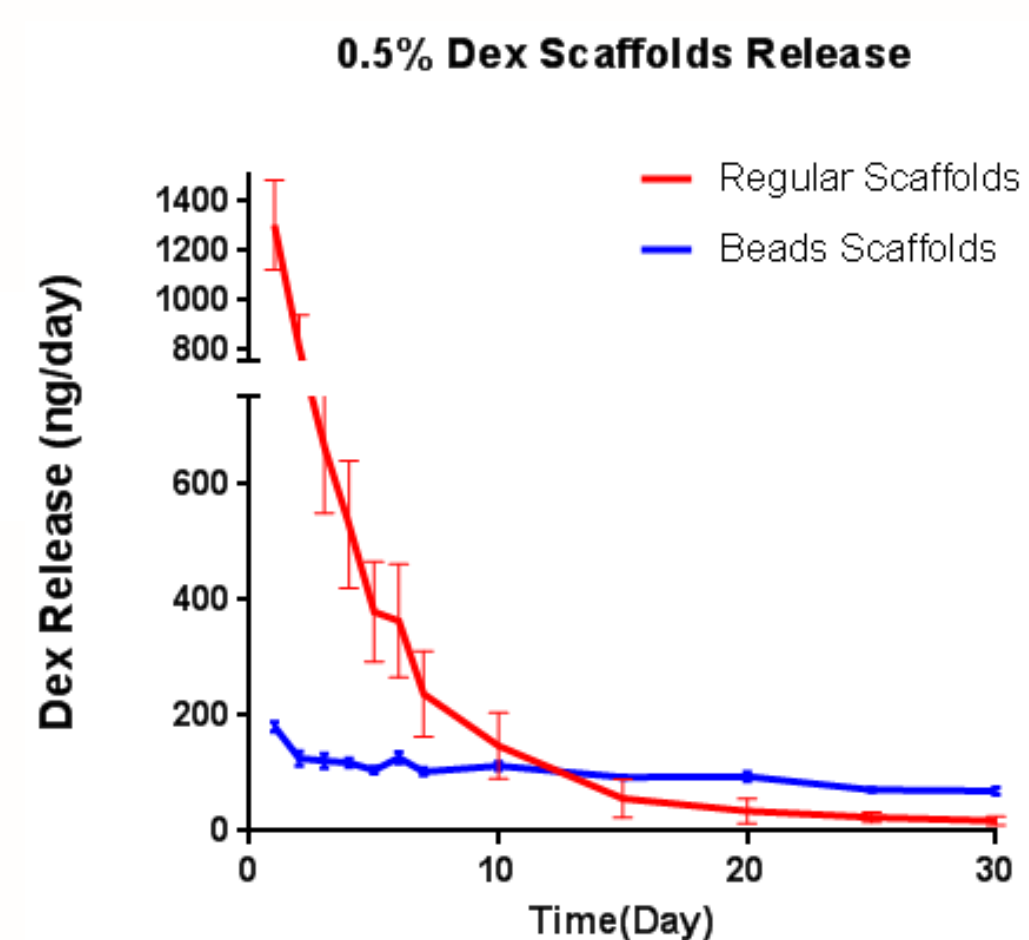
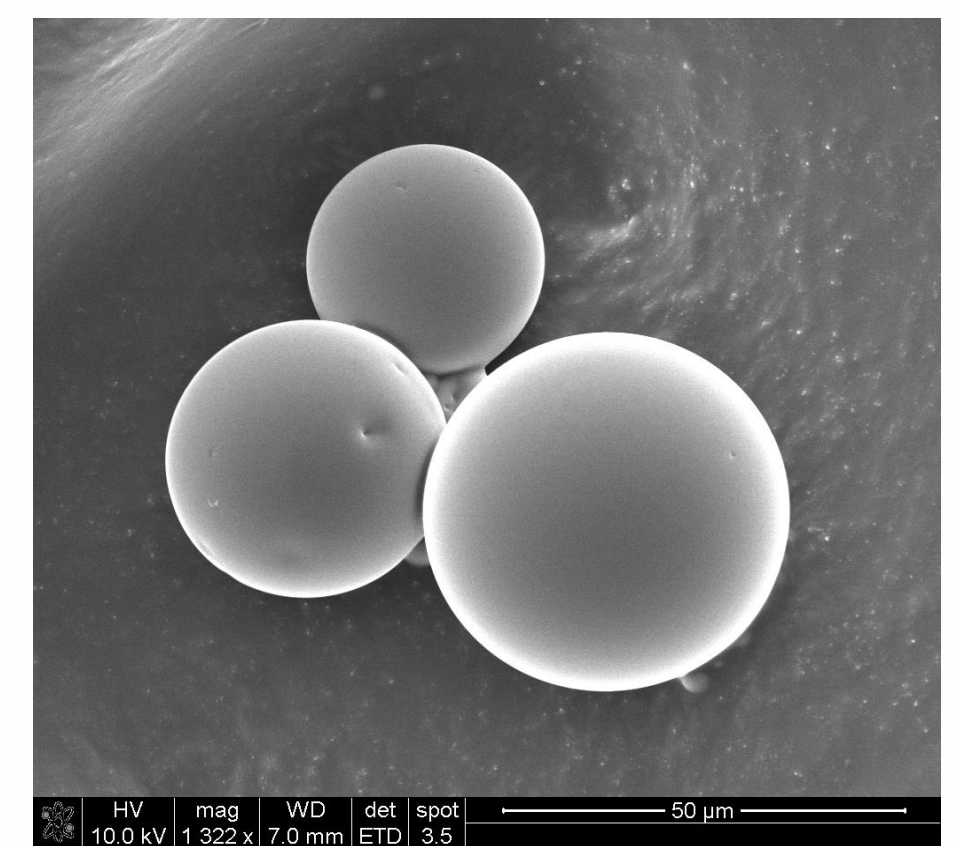
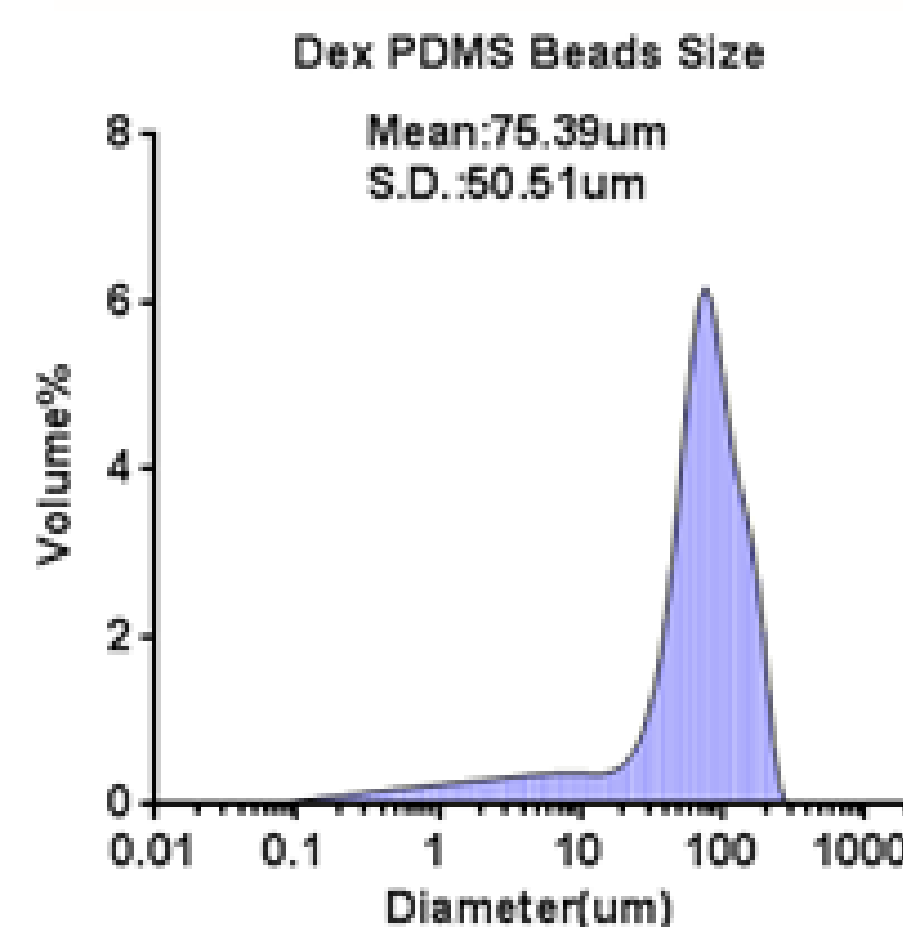


Materials and Methods



Results and Discussion

Resulting Dex-PDMS beads exhibited a bead diameter of $75.39 \pm 50.51 \mu\text{m}$ (A). SEM images confirmed the spherical shape and size of the microbeads (B). The kinetic release of dex from PDMS bead scaffold loaded with 0.5% drug was found to be stable for over 30 days within the range from 50ng/mL to 150ng/mL, while the majority of the drug was released from the regular scaffold within the first 10 days (burst followed by plateau) (C). Bead scaffold exhibited greater drug release than regular dex loaded scaffold after 15 days. The Day 14 biocompatibility explant histology results confirmed the *in vitro* stable release profile, since the bead scaffold groups had reduced infiltration when compared to the regular scaffold groups (D).



(A) Micro-beads Sizes by Coulter LS13320. (B) Micro-beads Image by SEM-FEI NOVA 430. (C) 0.5% (w/v) Dex Beads Scaffolds 30-day *in vitro* Release Profile. (D) Day 14 Biocompatibility Explants H&E Staining Images (Scale Bar = 50 μm)

Conclusions and Future Work

PDMS bead scaffold system presented the ability for stable release of dexamethasone within desired range. However, *in vivo* results indicated that dexamethasone might require a combination with another pro-angiogenic drug to improve the delayed revascularization condition. Therefore, various pro-angiogenic drug candidates will be investigated in the future.