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Alteration of circulating microRNAs to predict lymphoma initiation and progression via a systems biology approach

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Extensive epidemiological data have demonstrated an exponential rise in the incidence of non-Hodgkin lymphoma (NHL) that is associated with increasing age, starting from young adulthood. The molecular etiology of this remains largely unknown. We propose that there are predictable, age-dependent circulating microRNA (miRNA) signatures in the blood that influence NHL initiation and progression. To investigate this we utilized a novel murine model for spontaneous DLBCL initiation at two age groups: 2 and 15 months old. All spontaneous DLBCL mice will start to develop visible tumors starting at 15 months of age. Using systems biology techniques we determined a list of 10 circulating miRNAs present in the blood of DLBCL forming mice that are not present in the wild-type mice starting from 2 months of age. Additionally, this miRNA signature heavily impacts JUN and MYC oncogenic signaling. It was determined that there is a key miRNA signature circulating throughout a host prior to the formation of a tumor. This miRNA signature is further modulated by age and the formation of tumors. Leveraging a novel spontaneous DLBCL murine model, we were able to determine an age-based key functional circulating miRNA signature associated with NHL that occurs in the blood. This age based circulating miRNA signature can be used to predict NHL development at a young age before actual tumor formation. Furthermore, this can potentially be used as a simple biomarker at a young age to predict future lymphoma development and allow for advanced novel therapeutic strategies to prevent lymphomagenesis..

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Assessment of adhesion response to 3D printed materials for ophthalmic device development

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Introduction & Aim: Glaucoma is the leading cause of irreversible visual impairment worldwide. Glaucoma surgical devices fail due to scarring response that result in fibrous encapsulation surrounding the device preventing aqueous humor drainage. 3D printing technology has the potential to develop personalized ophthalmic devices or organs with improved cost effectiveness and productivity. Limited experimental data exists as to the biocompatibility response of 3D printed photopolymers. We performed cell adhesion and protein adsorption studies of 3D printed photopolymers compared to materials used in current ophthalmic devices (Silicone, Polytetrafluoroethylene (PTFE) and Poly (methyl methacrylate) (PMMA)) to assess 3D printed materials as a potential route for ophthalmic device development.

Methods: 3D printed materials (n=6) were developed using a high-resolution, desktop stereolithography (SLA) 3D printer and compared to materials used in current ophthalmic devices. Protein adsorption was quantified using a micro bicinchoninic acid (Micro BCA) assay and fluorescein-conjugated bovine serum albumin (FITC-BSA) adsorption. Cell adhesion (monocytes, fibroblasts) was assessed using alamar Blue, CyQUANT and Live/Dead assays. Data were compared using a two-tailed unpaired t-test.

Results: 3D printed materials demonstrated low cell adhesion and protein adsorption. Results were similar to those found with materials used in current ophthalmic devices ($P>0.05$). However it was noted that 3D printed materials demonstrated increased cytotoxicity ($P<0.05$).

Conclusion: 3D printed photopolymer materials demonstrated a similar biocompatibility response to currently used materials and may allow for the development of customizable ophthalmic devices or organs. Subsequent testing will determine the adhesion response to 3D printed materials containing anti-scarring agents.

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