

Controlled Incremental Filtration for Size-Based Cell Separation: Applications in Volume Reduction, Leukoreduction, and Large/Small Platelet Studies

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Location:

Link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NTEwODU4MTQtOTk4Yy00MzAzLTg4YTItNTY1MTcxOGNiMTk1%40thread.v2/0?context=%7b%22Tid%22%3a%22170bbabd-a2f0-4c90-ad4b-0e8f0f0c4259%22%2c%22Oid%22%3a%22aec7f4f2-17de-4b8b-85ff-f2b59da9966e%22%7d

Committee Chair:

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Committee Members:

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Abstract

Platelet transfusions are critical for preventing and treating bleeding, but they often come with adverse reactions due to pro-inflammatory contaminants in the supernatant. Current methods for leukoreduction and volume reduction have limitations in effectively addressing these issues. This study introduces a novel microfluidic approach using controlled incremental filtration (CIF) to simultaneously achieve leukoreduction and volume reduction while preserving platelet quality. The CIF technology demonstrated superior performance compared to conventional centrifugation-based methods. When testing platelet-rich plasma samples, it removed ~50% of the suspending medium while maintaining 89.5±1.9% overall platelet recovery and 98.0±0.7% recovery of large (>12fL) platelets. Importantly, the device selectively removed smaller, dysfunctional platelets without significantly affecting the functionality of the recovered platelet fraction. When tested on apheresis platelet concentrates, the

CIF device achieved >99% leukocyte removal. Unlike centrifugation, CIF does not require a resting period or additional anticoagulants to prevent macro-scale platelet aggregates. This microfluidic approach offers a simple-to-use alternative for producing high-quality, low-volume platelet concentrates, particularly beneficial in pediatric settings where such products are most urgently needed.



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