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View Abstract

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TITLE: Leukoreduction System Chambers From Community Blood Centers Provide A High Volume Source Of Mononuclear Cells For Use In The Research and Manufacturing Phases of Allogeneic Cellular Therapy Development
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<p>ABSTRACT BODY:</p> <p>Background & Aim: Leukoreduction system chambers (LRSCs) are small cone-shaped attachments to tubing sets used to collect platelets on the TerumoBCT Trima Accel. LRSCs function to prevent leukocyte contamination of apheresis platelet products and are typically discarded after the procedure. When salvaged, these closed chambers are an excellent source of blood-derived mononuclear cells (MNCs). We performed a comprehensive examination of >150 LRSCs from plateletpheresis procedures performed at our community blood center. We analyzed cell count, leukocyte population and subpopulation distributions, viability before and after storage, and cell function.</p> <p>Methods, Results & Conclusion: LRSCs contained 5×10^8 to 3×10^9 MNCs (average 1.8×10^9), with less than 5% granulocyte contamination, on average. LRSCs contained an average of 5.6×10^{10} erythrocytes and 2.0×10^{10} platelets. LRSCs from procedures collecting platelets only or both platelets and plasma had more MNCs and fewer granulocytes than LRSCs from procedures collecting both platelets and red blood cells. LRSCs from "single" plateletpheresis procedures ($< 6.3 \times 10^{11}$ platelets) contained statistically fewer MNCs than procedures collecting "double" and "triple" units (6.4-9.5×10^{11} and $> 9.6 \times 10^{11}$ platelets, receptively). LRSCs from younger donors (age 18-39 and 40-64) contained statistically more MNCs than older donors (age 65-86). Lymphocytes were the most abundant leukocyte population in each LRSC, and T lymphocytes made up an average of 47% (9×10^8 cells). B cells, NK cells, and monocytes were found at 10-12% each in LRSCs. When the cells from LRSCs were eluted into plasma or cell culture media and stored at 2-6°C for up to 4 days, the cells remained >95% viable at 2 days and >90% viable at 4 days. When LRSCs were stored uneluted at 2-6°C, cells remained 96.7% viable at 2 days and 92.5% viable at 4 days, on average. T cells from LRSCs proliferated when stimulated with anti-CD3/CD28 beads or PHA and cultured in the presence of IL-2. CD14⁺ monocytes from LRSCs differentiated into CD16⁺ macrophages when cultured in a differentiation media cocktail containing insulin. Our study shows that LRSCs are an excellent source of functional MNCs and provide more MNCs than the typical buffy coat product. Non-profit community blood centers that collect apheresis platelet products have dozens of LRSCs available daily for research and development applications. The high number of T cells in LRSCs could provide a starting product for the manufacture of allogeneic CAR T cell therapies.</p>
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