Correspondence


To the Editor:

In previous correspondence to the editor, Mott and Gilkerson1 and Richman et al.2 have expanded on previous observations by Richman et al.1 and by our group3,4 concerning the possibilities and limitations of collecting stem cells from the peripheral blood. We would like to carry this discussion one step further by reporting our observations with two human subjects. These persons were serving as donors of bone marrow anduffy-coat cells for stem cell transfusion in the treatment of aplastic anemia and acute myelocytic leukemia. Of interest and pertinent to the present discussion are the following data.

As shown in Table 1, five leukaphereses with the Aminco Celltrifuge were performed. Thus it is feasible to collect, during a 4-hr leukapheresis, on the order of 10^7 mononuclear cells (MNC) and 10^5 colony-forming units in agar (CFU-C). This result is an improvement over that which Mott et al. were able to collect and better than their predictions "under optimal conditions." In addition, it is noteworthy that there was no evidence that the number of CFU-C in the blood could be exhausted by such leukapheresis. The total amount of blood leukapheresed during the 4 hr was approximately 12,000 ml. The granulocyte contamination of the collected buffy-coat cell suspension was less than 10^4.

Table 1. Procurement of Blood Mononuclear Cells (MNC) and Blood Colony-forming Units (CFU-C) from Two Normal Donors by Means of the Aminco Celltrifuge, and the Influence of Such Leukapheresis on the Number of MNC and CFU-C in the Peripheral Blood

<table>
<thead>
<tr>
<th>Donor</th>
<th>Leukapheresis No.</th>
<th>Total MNC Collected (x 10^7)</th>
<th>Total CFU-C Collected (x 10^5)</th>
<th>MNC/cu mm Blood</th>
<th>CFU-C/ml Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>10.8</td>
<td>7.4</td>
<td>2555</td>
<td>2520</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>9.7</td>
<td>11.0</td>
<td>2080</td>
<td>2001</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>17.0</td>
<td>15.8</td>
<td>2170</td>
<td>2301</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>10.6</td>
<td>11.8</td>
<td>3034</td>
<td>2380</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>15.5</td>
<td>10.7</td>
<td>1296</td>
<td>1643</td>
</tr>
</tbody>
</table>
Whether this result means that there is one homogeneous population of pluripotent stem cells or that there is a heterogeneous population of pluripotent and committed stem cells cannot be answered.

With respect to whether it is possible to increase the yield of stem cells during leukapheresis, we would like to reiterate our findings in a canine model. We have found that the peripheral CFU-C count may be increased 10–20 times in about 3 hr by intravenous administration of dextran sulfate, and the injection of this heparinoid prior to leukapheresis can result in a yield of CFU-C increased by the same order of magnitude. It should be noted that in our previous preclinical experiments in dogs, the presence of CFU-C in a suspension of leukapheresis-derived MNC was found to be indicative of the presence of pluripotent hematopoietic stem cells capable of restoring radiation-induced aplastic bone marrow to normal. Whether this will hold true in the human situation remains to be seen.

Regarding patients with nonhemopoietic tumors, Richman et al. made the interesting observation that CFU-C in blood were markedly increased 21 days after administration of specific chemotherapy. They suggested that this phenomenon could be utilized for collecting greater numbers of CFU-C for autologous stem cell transfusion as bone marrow rescue therapy. However, for normal donors one must develop different approaches, and here it would seem worthwhile to explore the use of heparinoids for increasing the number of stem cells that could be collected by leukapheresis.

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REFERENCES


Procurement of Human Blood Stem Cells by Continuous-Flow Centrifugation—Further Comment: Reply

To the Editor:

The observations of Körbling et al. further support the possibility of harvesting a bone marrow transplant “dose” of stem cells from the peripheral blood by leukapheresis. These authors have been able to collect an average of 13 x 10^6 mononuclear cells (MNC) and 11 x 10^5 granulocytic colony-forming units (CFU-C) in a 4-hr, 12-liter apheresis using continuous-flow centrifugation (Aminco Celtrifuge). We have presented data showing that 0.9 x 10^6 MNC can be obtained per 600 ml of blood processed using semicontinuous-flow centrifugation (Haemonetics model 30). By extrapolation, this result would approach 18 x 10^9 MNC for a 12-liter apheresis. Although the concentration of peripheral blood CFU-C in normal donors has a wide range (2–50 CFU-C/2 x 10^5 MNC), one could anticipate collection of between 2 x 10^5 and 4 x 10^6 CFU-C per 12-liter apheresis using this technique. Continuous- and semicontinuous-flow centrifugation thus appear to give comparable results. However, further comparative studies must be done to determine which procedure is more efficient and convenient.

The fact that the CFU-C concentration did not significantly decline during the 4-hr
Procurement of human blood stem cells by continuous-flow centrifugation - further comment [letter]

M Korbling, W Ross, H Pflieger, R Arnold and TM Fliedner

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