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Intermittent Leukocytosis in an Asymptomatic Platelet Donor

Sandhya R. Panch, MD, MPH, Monica M. Riordan, RN, Susan J. Miranda, RN, and Susan F. Leitman, MD

Institution: Department of Transfusion Medicine, Clinical Center, National Institutes of Health, Building 10, Room 1C711, Bethesda, MD 20892-1184

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Leukocytosis refers to an increase in the white blood cell (WBC) count to greater than two standard deviations above the reference range ($4.3 - 10.0 \times 10^9$ cells/liter at our institution), or $>11.0 \times 10^9$ cells/liter. Leukocytosis due to an increase in the absolute neutrophil count (ANC) commonly accompanies infection, inflammation, stress, or certain medications.

In our plateletpheresis center, we routinely obtain a CBC with WBC count and differential immediately prior to each donation, with results reviewed within 24 hours. Components from donors whose WBC counts are greater than two standard deviations above the reference range are quarantined and the donors are contacted within 48 hours by nursing staff to obtain further history, such as symptoms of an infectious process. The history is documented and the component is either discarded or released into inventory based on this evaluation. During the course of approximately 6,000 plateletpheresis donations over the past two years, we identified three donors with leukocytosis due to increases in ANC, whose platelets had been quarantined on more than two occasions. Two donors had chronic elevations in WBC whereas the third donor had intermittent leukocytosis (Table 1 and Figure 1). Medical evaluation revealed that chronic tobacco use in donor 1 and morbid obesity (BMI 40.4) in donor 2 were the likely causes of their leukocytosis.¹⁻⁴ Donor 2 also had severe osteoarthritis, for which she received a corticosteroid injection one day prior to her highest recorded WBC count of 16.7×10^9 cells/liter. After medical review, the threshold for component quarantine was raised to 12.0×10^9 cells/liter in these two donors.

Plateletpheresis components from donor 3 had been quarantined during six of his last 14 donations due to leukocytosis. The donor stated that he felt very well before and after all donations. A rotator cuff injury 4-5 months prior to his last donation was treated with a corticosteroid injection. He denied fevers, malaise, arthritis, nausea, vomiting, or dysuria; his appetite and weight were normal; he did not use alcohol, tobacco, or recreational drugs. His only medication was an occasional ibuprofen, he had no allergies, and he worked in an office job. He reported being distressed by repeated calls from the blood center, stating that these

Corresponding Author: Sandhya Panch, MD, Phone: 301-496-4506, Fax: 301-402-1360, sandhya.panch@nih.gov.

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calls “worried his family quite a bit.” He consulted his personal physician a year ago, at which time, “all blood work was in the normal range.”

At the time of his most recent donation he appeared fit and muscular, vital signs were in the normal range, and physical exam was unremarkable. His ANC was again elevated. Upon further questioning, the donor admitted to strenuous biking and other physical exercise lasting 30 minutes to one hour, which he engaged in on several occasions 3-4 hours prior to platelet donations. He recalled exercising before his last donation in September 2012 but not before donation in August 2012. We recommended that the donor return in October and November 2012 without exercising on the day of the apheresis collection. He was subsequently found to have WBC counts of 7.32 and 6.98×10^9 cells/liter, respectively, with normal neutrophil counts on both occasions (Figure 1). The donor was reassured that the most likely cause of the elevated WBC count was recent strenuous exercise.

Leukocytosis with neutrophil predominance is well known to occur following strenuous exercise.⁵⁻⁷ An early increase in ANC to as much as 125% of normal is observed within an hour after exercise and is correlated with concomitant increases in catecholamine levels. It is also postulated that increased cardiac output and pulmonary blood flow during exercise may cause sequestered lung neutrophils to dislodge into the circulation. Delayed leukocytosis may be noted up to five hours after exercise, likely due to release of leukocytes from the marrow following cortisol increase.^{5,6} These changes are seen both with strengthening and endurance exercise.⁷ Interestingly, in the pre-G-CSF era, healthy granulocyte and blood stem cell donor donors were subjected to short bursts of intense exercise (climbing stairs or biking) prior to apheresis to optimize yields.⁸

Product quarantine and repeated donor follow-up can cause significant operational inefficiencies as well as donor anxiety. Our case report illustrates the importance of obtaining a thorough history, including questions related to strenuous exercise, in donors with asymptomatic leukocytosis.

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Figure 1. Serial Predonation WBC Counts in Donor 3

Table 1**Characteristics of Platelet Donors with Recurrent Leukocytosis**

Donor Number	Mean WBC Count (10^9 /liter)	Std Dev	Max	Min	Likely cause of leukocytosis
1	11.1	0.5	12.2	10.2	Tobacco use
2	11.4	1.8	16.7	9.65	Morbid Obesity
3	10.8	2.9	15.9	7.32	Uncertain