Stem Cell Donation - My Personal Account

By Christopher Gerry — May 25, 2018

1. Recycling My Own Blood

A few weeks ago, a nurse took six gallons of blood out of my left arm; my body only holds about a gallon and a half of blood, so I wouldn’t be here if she had decided to keep it. The blood that was continuously returning to my right arm, however, was missing an important ingredient: peripheral blood stem cells (PBSCs). Blood stem cells are the source of all of the blood cells in the body, including the white blood cells of the immune system. My PBSCs were collected and couriered to a patient to replace the ones that had given him cancer, hopefully curing his otherwise fatal disease. I don’t know who he is, but we’re connected by the cells that now course through both of our veins.

2. The Match

My PBSC donation story started in 2015 when I joined the Be The Match Registry. Unlike blood donations, which can be given to the millions and millions of people who share the same blood type, PBSC donors are carefully matched to their recipients on a one-to-one basis. To facilitate matchmaking, organizations like the National Marrow Donor Program curate lists of potential donors (like the Be The Match Registry) that doctors can check when their patient needs a blood stem cell transplant. But because this procedure is so dangerous for the recipient, it is reserved for patients with life-threatening diseases that compromise the blood, bone marrow, or immune system.
The key to finding a good match is a set of molecules called human leukocyte antigens (HLAs), which decorate the surface of PBSCs and most other cells (Figure 1). These “markers” distinguish your cells from potentially dangerous trespassers like viruses, bacteria, or cancer—it’s as if all of your cells share the same fingerprints. Every person harbors their own intricate set of HLA markers, and most of the donor’s markers have to be the same as the recipient’s to be deemed a match. There are so many possible combinations of these markers, however, that the vast majority of potential donors on the registry will never be able to donate (only about 1 out of 430 [7] will do so). Thankfully, the registries contain enough potential donors that most patients [8] find a
match—nearly 30 million people [9] are registered worldwide—but thousands still die every year [10] due to unsuccessful searches.

HLA markers may be complicated on a molecular level, but joining the registry couldn’t have been simpler. I attended a local registration drive where volunteers took my contact information and swabbed the inside of my cheek [11] a few times to get a high-level snapshot of what my HLA markers look like. About two years later, I learned that I had been flagged as a potential match; only 1 in 40 registry members ever receive that call. A subsequent blood test which took a closer look at those all-important HLA markers confirmed that I was the best possible match—I was going to donate.

3. The Preparation

As a brief aside, you might be wondering why PBSC donors register with the National Marrow Donor Program. Is PBSC donation the same as bone marrow donation? Not quite, but because bone marrow [12] is the body’s main source of blood stem cells, the two procedures are simply different ways to achieve the same goal. The P (peripheral) in PBSC simply refers to the stem cells found in the bloodstream (i.e. not trapped in bone marrow).

Blood, however, typically doesn’t contain many blood stem cells, so my body needed to make more before I could donate successfully. For five days leading up to the donation, I received injections of a drug called filgrastim [13], which is typically used to treat chemotherapy patients suffering from neutropenia (low white blood cell levels). It also causes the blood stems cells in your bone marrow to make more copies of themselves, many of which get secreted into the bloodstream where they can be collected during the donation process (Figure 2). Even though filgrastim makes many patients feel as if they have the flu, the drug has been shown to be safe [14].

My experience with filgrastim was less unpleasant than I had anticipated, but it certainly wasn’t enjoyable. The first two days were fine, and I was able to go about my day without disruption. As each day progressed, I developed a dull, achy feeling of “bone pain [15],” but it was mild and I
always woke up the next day feeling better than I did the night before (the body destroys and removes filgrastim quickly). While never serious, I experienced more intense symptoms after the third and fourth injections. The achiness increased by about two notches, especially in the bones in my head and face, and I felt much more fatigued as the day shambled on. By the morning of the fifth day, I was very much ready to get rid of those blood stem cells that my bone marrow had worked so hard to produce.

4. The Donation

"Make yourself comfortable—you’re going to be here for a while."

PBSC donation relies upon a technique called apheresis [16] that continually draws blood from a donor, collects a specific part of it, and returns the rest (Figure 3); this process is also used for donations of another type of blood cell called platelets [17], which control bleeding by forming clots. Blood is a complicated mixture of different substances, so it must be separated into its constituent parts by a technique called centrifugation [18]. This process separates materials of different densities into distinct layers by spinning them at very high speeds—a carnival ride called the Gravitron [19] is essentially a human-sized centrifuge. The apheresis machine can then collect the layer that contains the blood stem cells and direct the rest of the blood back to the patient.
Apheresis isn’t perfect, so all of the blood in my body had to pass through the machine about four times to ensure enough PBSCs would be collected for the recipient. I couldn’t bend my elbows for the entire seven-hour procedure because I had an IV line in each arm—departures left, arrivals right. Blood cools quickly when it’s outside of the body, so the tubing just before the “arrivals” needle was snaked around a heating coil to warm the blood back to ~98 °F. This setup made normally mundane tasks, such as eating a sandwich and using the restroom, much more exciting. I was grateful that my dad and girlfriend kept me company all day and made sure that I got home.
safely. Although I was the only person donating, it took a team of supporters to guarantee the procedure’s success.

Any discomfort of mine, however, likely paled in comparison to that of the recipient. Soon before PBSC transplantation, he received doses of chemotherapy and/or radiation that destroyed most or all of his bone marrow and immune system. This grueling process both kills residual cancer cells and prevents the patient from rejecting the transplant. Doctors then introduced the freshly harvested stem cells into his bloodstream, allowing them to colonize the recently vacated marrow and start producing blood cells within a few weeks (Figure 4). The most serious, and sometimes fatal, complication of this procedure is graft-versus-host disease (GVHD), in which the newly generated immune cells start to attack the patient (the “host”). Avoiding GVHD is one of the many reasons why it’s important to find a close HLA match. Conversely, just as a fresh pair of eyes can notice details that have been overlooked, a new immune system can sometimes kill residual cancer cells via a poorly understood process known collectively as the graft-versus-tumor effect. Wherever, and whoever, my recipient may be, I hope my immune system is serving him well.

5. The Aftermath

My recovery was brief and uneventful. Most PBSC donors fully recover within a week, and I felt normal just two days later. The donation procedure removed only the blood stem cells in my bloodstream, so my immune system was never compromised. Overall, my experience was extraordinarily positive, and I wouldn’t hesitate to do it again if given the opportunity.

You can find information about enrolling in the Be The Match Registry here. It’s free (if you’re between the ages of 18 and 45), quick, painless, and you’ll probably never have to think about it.
again. But if you do, it'll be because you've given someone hope when they need it most. Sounds like a good deal to me.

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