

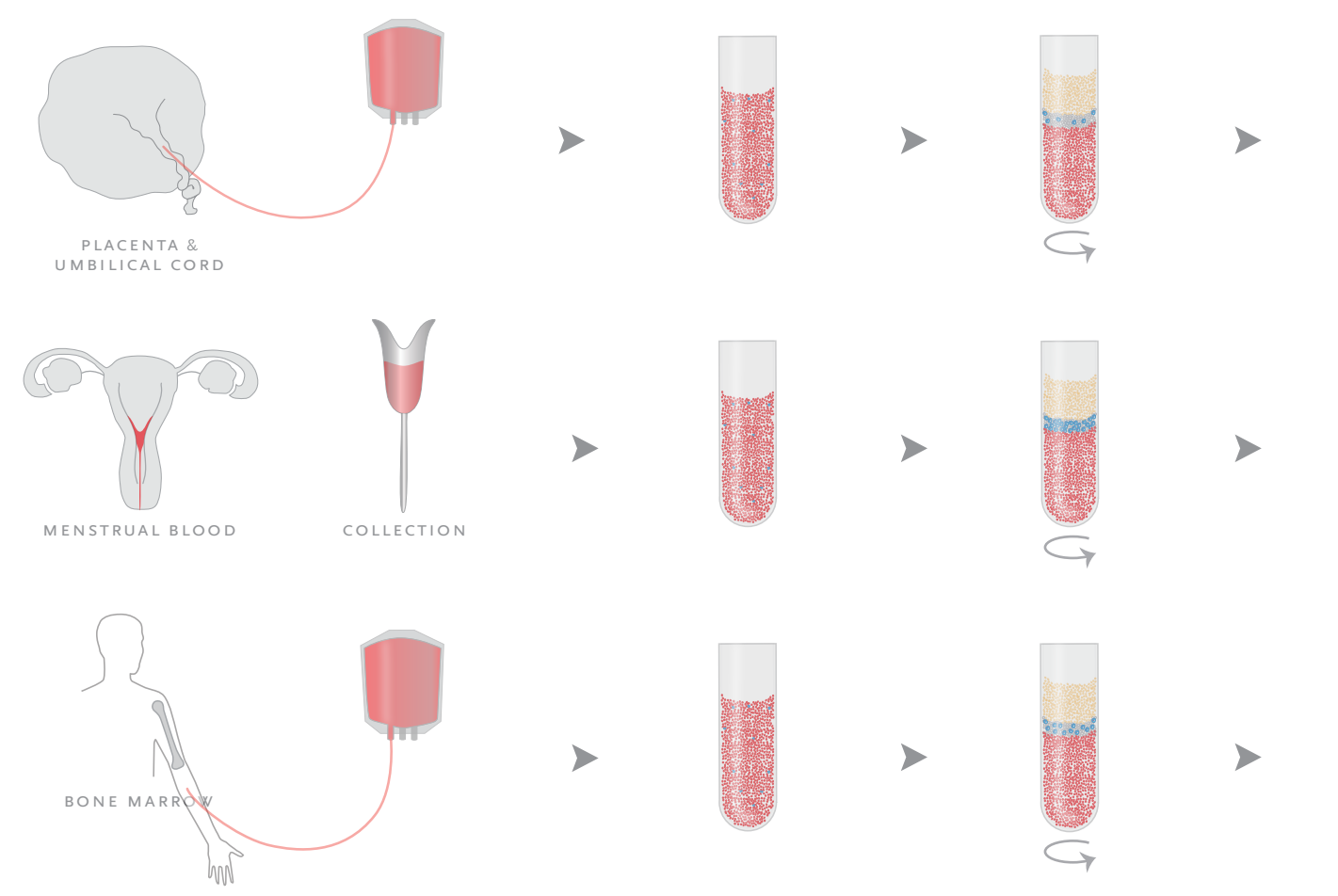
# ADULT . ADULT CELL SOURCE . *Blood Stem Cells* . Placenta & Umbilical Cord . Menstrual Blood . Bone Marrow

in vitro

STEM CELLS ACROSS THE CURRICULUM [www.stemcellcurriculum.org](http://www.stemcellcurriculum.org)  
OPINIONS EXPRESSED HERE ARE SOLELY THOSE OF THE AUTHORS AND DO NOT NECESSARILY REFLECT THOSE OF THE  
EMPIRE STATE STEM CELL BOARD, THE NEW YORK STATE DEPARTMENT OF HEALTH, OR THE STATE OF NEW YORK.

CONTENT & CONTENT FLOW: KATYOUN CHAMANY AND LIANNA SCHWARTZ-ORBACH  
DESIGN: ART DIRECTION, INFORMATION DESIGN & ILLUSTRATIONS BY JULIA WARGASKI  
SUPPORTED BY NYSTEM & THE NEW SCHOOL © 2013 JULIA WARGASKI AND KATYOUN CHAMANY

THE  
NEW  
SCHOOL  
NYSTEM  
CC  
SCAC

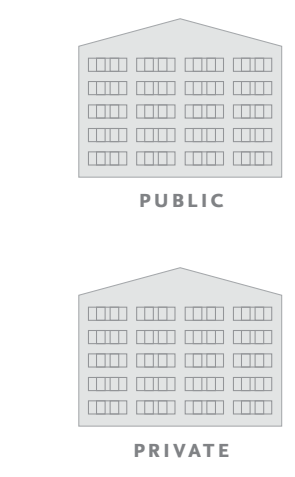


## COLLECTION OF BLOOD STEM CELLS

Blood stem cells are collected from regenerative tissues in the body (*in vivo*). In the 1950s, bone marrow was identified as a source of stem cells to treat blood and immune-related disorders as well as replenishing the immune system of cancer patients post-chemotherapy. These mesenchymal stem cells (MSCs) were obtained by drilling into bone marrow, but today, most bone marrow stem cells are collected via a peripheral blood draw. Placenta, umbilical cord blood (UCB), and menstrual blood contain blood stem cells that are collected post-birth in a hospital or during menstruation at home, respectively. Important differences regarding the concentration, regenerative power, pluripotency, and immunogenicity of these stem cells are contested. Attitudes about these three sources differ, with menstrual, umbilical cord, and placenta considered waste, and bone marrow considered a commodity.

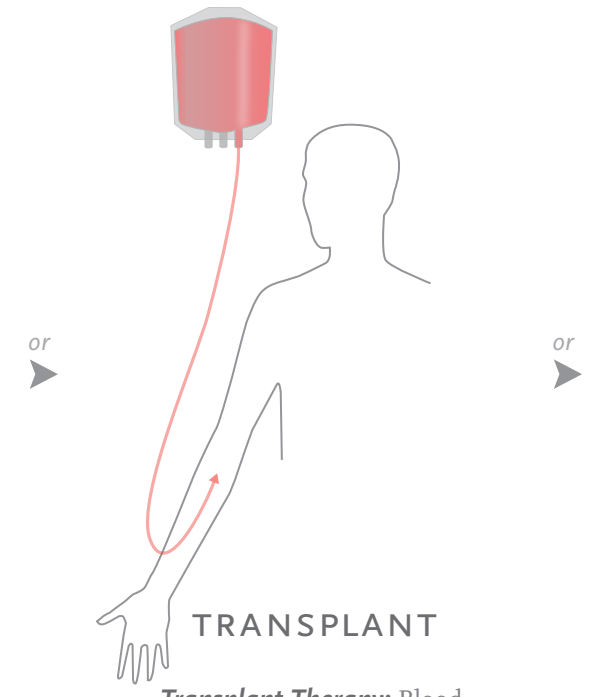
## PROCESSING

Samples are spun to separate the many components in blood, and stem cells, highlighted in blue above, are isolated from the white blood cell layer. Collections are often treated with anticoagulant and antibiotic prior to storage. Even within these processed stem cell samples, the stem cell types differ and vary in their “stemness” potential.



## BLOOD BANKS

**Stem Cell Banking:** Blood stem cells may be expanded to increase numbers and stored cryogenically at -80°C. Because there is no international registry of banked blood samples, immunological matching for those with mixed ethnicity proves challenging. Low donation rates and lack of diversity, led to a decision in *Flynn v. Holder* to allow for non-cash compensation for donations. In addition to no-cost public banking, commercialized private banking allows individuals to bank stem cells for family use, at \$1400–2500 plus annual storage fees of ~\$150.



## TRANSPLANT

**Transplant Therapy:** Blood stem cell transplants can treat blood disorders and replenish immune systems. Families have conceived children, or “savior siblings”, to obtain blood stem cells that are an immunological match for a sibling living with a rare genetic disease, or to reestablish the immune system in children recovering from chemotherapy. A contested type of experimental therapy has emerged wherein bone marrow derived stem cells are used for enhanced biological healing in athletes and the FDA has initiated investigations into the safety and efficacy of this approach.

## RESEARCH

**Stem Cell Lines:** Blood stem cells have an endodermal lineage and are considered multipotent, giving rise to many different types of blood cells. The hematopoietic stem cell (HSC) are the most common stem cell line, and placenta derived stem cells (PDSCs) the least immunoreactive. Due to the heterogenous nature of the blood collected, some scientists claim that endometrial regenerative cells (ERCs) in menstrual blood can adopt cell fates of all three germ lineages.