



Umbilical Cord Stem Cell Collection



Delayed Umbilical Cord Clamping

- Timing
 - For babies > 37 weeks → 30-60 seconds
 - For babies < 37 weeks → 60 seconds or more (more research needed based on meta analysis of multiple studies published in 2023)
 - Milking the cord versus delaying clamping → some studies suggested this may cause more harm than good
 - The WHO recommends 2-3 minutes to delay however recent meta-analysis in 2023 does not support this recommendation
- Benefits
 - Placental transfusion increases blood volume by as much as 30% decreasing need for transfusion or developing iron deficiency over the first 3-6 months of life
 - In preterm babies the above applies but studies also show a decrease in rates of IVH (brain hemorrhage) and NE (necrotizing enterocolitis)
- Clamping right away
 - Baby needs immediate resuscitation
 - Mom is bleeding or has another issue that needs to be attended to emergently



Stem Cell Collection (hematopoietic stem cells)

- History
 - Research began in the mid 1980's (Indiana University)
 - First transplant in 1988 in Paris for Fanconi anemia (newborn girl's umbilical blood transplanted into her 5 year-old brother.
 - Banking started in 1992.
 - Since there have been 35k+ transplants worldwide.



Stem Cell Collection (hematopoietic stem cells)

- Process
 - Kit is obtained by parents from company during their prenatal care and brought to the delivery room when admitted for labor.
 - Some hospitals have kits on hand for emergency collections
 - For public donation the equipment would be supplied by the hospital
 - After cord clamping
 - blood is collected via placing a 16-gauge needle into the umbilical vein
 - the blood via gravity drains into a sterile bag with citrate-based anticoagulant
 - plastic tubing to bag is tied in two knots and the needle cut off
 - Mother's blood is collected
 - All samples are collected by a courier and sent to bank



Stem Cell Collection (hematopoietic stem cells)

- Process at Bank
 - Maternal blood sample is tested for infections (HIV, Hep B and C, syphilis, HTLV, CMV, malaria, Chagas disease, West Nile virus)
 - Stem cell sample
 - Manipulated to remove plasma and RBCs to yield unit volume and weight, TNC count, CD34+ cell count.
 - Tested for Blood type and Rh, HLA classes
 - Tested for infections above
 - Hemoglobin electrophoresis performed
 - Unit is cryo-preserved until needed and then shipped to transplant facility
 - Shelf-life 10-23 years
 - Sooner the use the better
 - Amount needed
 - Ideally 60 cc or greater
 - Desired cell numbers 1×10^9 TNC (total nucleated cells)



Stem Cell Collection (hematopoietic stem cells)

- Usage
 - Research (donor = autologous)
 - Odds for use of sample by patient
 - Published rates 1/400 - 1/2500 across lifetime with some as low as 1/200K
 - Research
 - Cerebral Palsy (improves motor function)
 - HIE (Hypoxic Ischemic Encephalopathy)
 - Type 1 Diabetes
 - Crohn's disease and other autoimmune disorders
 - Cardiomyopathy
 - Spinal cord injury



Stem Cell Collection (hematopoietic stem cells)

- Approved uses (relative or other matches = Allogenic)
 - Blood cancers
 - Leukemias, Lymphomas, Multiple Myeloma, Myelodysplastic Syndromes
 - Bone marrow failure
 - Aplastic Anemia, Fanconi Anemia, Paroxysmal Nocturnal Hemoglobinuria
 - Immune Deficiencies
 - SCID, Wiscott-Aldrich Syndrome, DiGeorge Syndrome, Omenn Syndrome
 - Inherited Metabolic Disorders
 - Hurler Syndrome, Krabbe Disease, Leukodystrophies, Lysosomal Storage Diseases
 - Hemoglobinopathies
 - Sickle Cell Anemia, Thalasemias



Stem Cell Collection (hematopoietic stem cells)

- Private versus public banks
 - Private
 - 1992 Cryo-Cell
 - 1993 ViaCord
 - 1995 CBR- Cord Blood Registry
 - Costs for private banking
 - Avg 2K up front and then annual storage fee avg 125\$
 - Companies have programs where relatives and friends can donate to costs
 - Public
 - Hospital needs to partner with public bank
 - 19 states with public banks
 - NMDP (National Marrow Donor Program) has list
 - If not available in your state may participate through a mail-in donation program
 - Register between 28-34 weeks



Stem Cell Collection (hematopoietic stem cells)

- Society Statements (ACOG and AAP)
 - Public banking recommended due to ethnic disparities
 - Known relative with condition that would respond to transplant
 - Do not bank for “insurance” reasons
- The Stem Cell Therapeutic and Research Act of 2005
 - C. W. Bill Young Cell Transplantation Program through HRSA (Health Resources and Services Administration under HHS)→NBMD operates registry and matching program→cord blood banks
 - NCBI created (National Cord Blood Inventory)



If tissue and umbilical cord blood are not collected or donated the following can happen to the placenta and umbilical cord:

- Incinerated
- Sent to hospital pathology department
 - Poor APGAR scores or baby sent to NICU unexpectedly
 - Mom had a malignancy
 - If infection suspected the placenta is cultured and also sent to pathology
 - Samples from the umbilical or placental arteries are sent for pH testing
- Patients can take home for encapsulation
- Donation of placenta through BTPOs (Birth Tissue Procurement Organizations) for research

Resources

1. Seidler AL, Libesman S, Hunter KE, et al.; iCOMP Collaborators. Short, medium, and long deferral of umbilical cord clamping compared with umbilical cord milking and immediate clamping at preterm birth: a systematic review and network meta-analysis with individual participant data. *The Lancet*. 2023 Dec 9;402(10418):2223–2234. DOI: [10.1016/S0140-6736\(23\)02469-8](https://doi.org/10.1016/S0140-6736(23)02469-8)
Seidler AL, Aberoumand M, Hunter KE, et al. Deferred cord clamping, cord milking, and immediate cord clamping at preterm birth: a systematic review and individual participant data meta-analysis. *The Lancet*. 2023 Dec 9;402(10418):2209–2222. DOI: [10.1016/S0140-6736\(23\)02468-6](https://doi.org/10.1016/S0140-6736(23)02468-6)
2. UpToDate – Collection and storage of umbilical cord blood for hematopoietic cell transplantation (last updated 11/2025)
https://www.uptodate.com/contents/collection-and-storage-of-umbilical-cord-blood-for-hematopoietic-cell-transplantation?search=collection%20and%20storage%20of%20umbilical%20cord%20blood%20for%20hem&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1&searchCorrelationId=44e24ce5-a403-4268-b7a0-14bff80b8812&searchCorrelationTerm=collection%20and%20storage%20of%20umbilical%20cord%20blood%20for%20hem#H3967635
3. Umbilical Cord Blood Banking Committee Opinion 771 ACOG
<https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2019/03/umbilical-cord-blood-banking>