BANKING ON DISCORD: PROPERTY CONFLICTS IN THE TRANSPLANTATION OF UMBILICAL CORD STEM CELLS

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I. INTRODUCTION

Saving a life, particularly the life of one's child, is an opportunity few would or could pass up. An appeal of this sort forms the core of the advertising strategy employed by several new biotechnology companies.[1] When a child is born, the parents can arrange to collect and store the baby's own blood from the umbilical cord. If the child becomes ill and requires a bone marrow transplant, the costly and time-consuming search for a suitable donor may end before it begins: the child's own blood can provide the life-saving cells.[2]

Recent scientific and medical research indicates that hematopoietic stem cells[3] found in the blood of the umbilical cord at birth are effective in treating many diseases when transplanted in the same manner as bone marrow stem cells.[4] Scientists have developed methods to collect and store the blood in the umbilical cord.[5] This valuable material can thus be used at a later time for transplantation to

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1. Companies presently in business are Viacord, Inc., based in Boston, Massachusetts, and Cord Blood Registry of San Mateo, California.

2. CORD BLOOD REGISTRY, CORD BLOOD: MAKING AN INFORMED CHOICE (1997) (promotional brochure); VIACORD, INC., CORD BLOOD BANKING: A NEW OPTION FOR PROSPECTIVE PARENTS (1996) (promotional brochure).

3. Hematopoietic stem cells are those that give rise to the cells of the blood system. These cells also participate in the immune system. Stanley L. Schrier, *Hematopoiesis and Red Blood Cell Function, in* SCI. AM. MED., pt.5, ch.I, at 2 (1994). Stem cells are cells that are pluripotent: they have the potential to become a variety of mature cell types. Exposure to local biochemical signals and tissue location determines their final identity. David W. Golde, *The Stem Cell*, SCI. AM., Dec. 1991, at 2, 5.

4. Frederick R. Appelbaum, *Hematopoietic Stem Cell Transplantation, in* SCI. AM. MED., pt.5, ch.XI, at 3–4 (1996).

5. Denis English et al., *Collection and Processing of Cord Blood for Preservation and Hematopoietic Transplantation, in* BONE MARROW AND STEM CELL PROCESSING 383 (Ellen M. Areman et al. eds., 1992); D.T. Harris et al., *Collection,*

provide a patient with disease-free, functional blood and immune systems.[6] People with deficiencies or diseases of these systems, such as anemia or leukemia, are potential recipients of the lifesaving cells.[7] These patients, who may otherwise have required a bone marrow transplant, may now receive a transplant of umbilical cord blood cells. Although similar to a bone marrow transplant in overall effectiveness, a transplant derived from umbilical cord blood involves a simpler procedure to collect the cells,[8] and the transplantation appears to cause fewer serious side effects in the recipient.[9]

Commercial enterprises, capitalizing on the potential of this new medical technology, allow parents to "bank" their child's blood so that if later in life the child needs a transplant, his or her own cells will be available, thus increasing the likelihood of a successful treatment.[10] Banked cells, if suitable, could also be used by a sibling or other family member.[11] Alternatively, the parents may opt to donate the blood to a public bank from which patients may obtain matched cells from an unrelated donor.[12]

This Note will examine one of the legal issues created when this new technology is offered for sale in an open market. Once individuals are able to maintain a private and limited store of a potentially valuable substance, property disputes are certain to arise. Predicting how courts will resolve disputes over ownership and control of stored body parts could shape future offers of medical technology. Part II will examine the scientific and medical background of transplant procedures that use hematopoietic stem cells obtained from bone marrow and umbilical cord blood. The value of umbilical cord blood in transplant procedures is understood only in relation to the desperate need for suitable bone marrow donors. Part II will also examine the services offered by the new biotechnology companies. Part III will examine several cases in which the ownership of human body tissues is in question. In Part IV, a second group of cases where the control of human body tissues is at stake is considered. In these cases, the focus is not primarily on property rights but rather on the interests served in using the tissues. In Part V, an alternative proposal that could permit the

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Separation and Cryoprotection of Umbilical Cord Blood for Use in Transplantation, 13 BONE MARROW TRANSPLANTATION 135 (1994).

6. John E. Wagner, *Umbilical Cord Blood Stem Cell Transplantation, in* TECHNICAL AND BIOLOGICAL COMPONENTS OF MARROW TRANSPLANTATION 195 (C. Dean Buckner & R.A. Clift eds., 1995); John E. Wagner et al., *Successful Transplantation of HLA-Matched and HLA-Mismatched Umbilical Cord Blood from Unrelated Donors: Analysis of Engraftment and Acute Graft-Versus-Host-Disease*, 88 BLOOD 795 (1996).

7. Appelbaum, *supra* note 4, at 4.

8. English et al., *supra* note 5, at 383.

9. Wagner, *supra* note 6, at 198; Wagner et al., *supra* note 6, at 801.

10. CORD BLOOD REGISTRY, *supra* note 2; VIACORD, INC., *supra* note 2; Marc Fisher, *Baby, Baby, Baby; Just Had a Kid? Addled by Love and Sleep Deprivation? The American Baby Industry Has Something for You,* WASH. POST, Jan. 14, 1996, (Magazine), at W21.

11. CORD BLOOD REGISTRY, *supra* note 2; VIACORD, INC., *supra* note 2; Fisher, *supra* note 10, at W22.

12. CORD BLOOD REGISTRY, *supra* note 2; Wagner, *supra* note 6, at 196.

technology to be available to a wider audience is discussed as a solution to certain legal conflicts.

II. SCIENTIFIC AND MEDICAL BACKGROUND

Transplantation of umbilical cord blood cells, a treatment for disease based on new technology, is similar in result to bone marrow transplantation. Both types of procedures use the transplantation of cells critical to life, and both may cure illness and save lives. Although their respective successes are grounded in closely related scientific theories, the procedures, particularly with regard to the recipient, differ in several important ways.

A. Stem Cell Transplants for Disease Treatment

Stem cell transplantation is a procedure by which precursor cells that give rise to mature blood and immune systems[13] are supplied by a suitable donor for transfer to an ill recipient.[14] This procedure is used to treat a large variety of malignant and nonmalignant diseases.[15] Patients with diseases such as acute leukemia[16] or aplastic anemia[17] are ill because normal cells of the blood system are not functioning correctly or are not present at all.[18] Treatment involves chemotherapy or radiotherapy, which destroys aberrant cells along with some normal cells, followed by transplantation to replenish or replace the normal cells.[19]

Transplantation of hematopoietic stem cells, the precursors that can give rise to mature cell types, is essential to cure the disease.[20] A transfusion of mature

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13. The immune system provides an individual with a defense system against harmful agents. It comprises a large variety of cell types whose function is to recognize and remove foreign molecules from our bodies. John David, *Organs and Cells of the Immune System*, *in* SCI. AM. MED., pt.6, ch.I, at 2 (1994).

14. Appelbaum, *supra* note 4, at 1.

15. *Id.*

16. Acute leukemia is manifested clinically by uncontrolled proliferation of the precursor cells that give rise to white blood cells. The precursor cells, which are themselves derived from hemopoietic stem cells, become so numerous in the bone marrow and lymph tissue where they form that they then spill over into the blood stream and infiltrate body tissues. Damage to the body tissues and the imbalance of blood cell types characterize the disease state. PROFESSIONAL GUIDE TO DISEASES 132 (Springhouse Corp. ed., 1995).

17. Aplastic anemia develops when there is a decrease in the production of red blood cells that derive from hematopoietic stem cells. Red blood cells carry oxygen, providing a component essential for life. *Id.* at 1020, 1031.

18. *Id.* at 1031

19. *Id.* at 133, 1033.

20. Clinicians discuss cure rates in terms of the percentage of patients surviving disease free after hematopoietic stem cell transplantation. The survival rates for several diseases are: for aplastic anemia, the five-year disease-free survival rate is greater than 90%; severe combined immunodeficiency disease, 90%; leukemia, 15–70%, depending on leukemia type and phase; sickle cell anemia, 50–90%. Appelbaum, *supra* note 4, at 8.

blood cells can palliate the disease for the cells' limited life span[21] only. In contrast, hematopoietic stem cells are self-perpetuating and can provide a replenishing source of normal cells.[22] Transplantation can thus provide a means to permanent (or long-lasting) recovery.[23]

One important determinant of a successful transplant procedure is the degree to which the stem cells from the donor "match"[24] the recipient cells. A match, measured by human leukocyte antigen (HLA) typing,[25] identifies stem cells that are molecularly similar to the recipient's, reducing the likelihood of serious side effects. The most common of these serious side effects is graft versus host disease (GVHD), in which donor cells attack host cells, causing tissue damage leading to organ failure.[26] Identical twins have the exact same genetic information that specifies HLA types and thus exactly the same HLA proteins; GVHD does not occur when stem cells are transplanted between such syngeneic individuals.[27] Similar advantages are found when a recipient serves as a donor in autologous transplantation.[28] An individual without an identical twin and unable to provide

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21. Cells of the blood system have limited life spans in the blood. A measurement of cell life is the half-life, the time in which a known population of cells will be reduced to half the population. The half-life of white blood cells varies depending on the type of cell; for some the half-life is less than six hours while others have a half-life ranging from weeks to months. PROFESSIONAL GUIDE TO DISEASES, *supra* note 16, at 1022. The half-life of red blood cells is about 30 days. Allan J. Erslev and Ernest Beutler, *Production and destruction of Erythrocytes*, *in* WILLIAMS HEMATOLOGY 425, 430 (Ernest Beutler et al. eds., 5th ed. 1995).

22. Appelbaum, *supra* note 4, at 1.

23. *Id.*

24. Whether tissue types match is determined by human leukocyte antigens (HLA), proteins on the surface of almost all cells. There are at least 14 different HLA proteins, and each protein can vary slightly in either or both the DNA sequence (allelic variation) and protein sequence (serologic polymorphism). For example, HLA–A appears in 50 forms (alleles), which translates into 39 different antigens; HLA–B appears in 97 forms, resulting in 46 antigens; and HLA–C appears in 34 forms, resulting in 15 antigens. HLA typing determines which antigen varieties an individual carries. The diversity of antigen forms means that very few people will have the same combination and "match." Charles B. Carpenter & John David, *Histocompatibility Antigens and Immune Response Genes*, *in* SCI. AM. MED., pt.6, ch.V, at 3 (1995).

25. Donor cells "match" recipient cells when HLA types are identical. A match of six out of six antigens is considered a "match." Tissue may be used for transplantation when there is some mismatch, but usually no greater than four out of six. *Id.*

26. In graft versus host disease (GVHD), the T cells of the immune system, produced after transplantation by the donor cells, recognize the recipient or host cells as foreign and stimulate an immune system attack that can cause tissue and organ damage. GVHD occurs even when HLA types appear to match because all HLA variations cannot be identified. Transplants using stem cells from a donor who is unrelated to the recipient result in serious GVHD about 50% of the time and completely fail in 10–20% of all cases. Golde, *supra* note 3, at 6.

27. Appelbaum, *supra* note 4, at 1. Syngeneic individuals carry identical genetic information. DORLAND'S ILLUSTRATED MEDICAL DICTIONARY 1645 (28th ed. 1994).

28. Applebaum *supra* note 4, at 2. Autologous transplantation is used when a patient's stem cells are normal. Cells are removed and stored while the patient undergoes

healthy cells must find donor cells matched for HLA type.[29] Since the HLA proteins that determine a match are an inheritable trait, the best opportunity for a match is found in siblings.[30] Other family members[31] can also provide matched or mismatched cells, which when transplanted, result in a higher incidence of GVHD.[32] A patient without suitable family members must find a match elsewhere.

The large variation in HLA types and the need for a close if not perfect match intimate that finding a match in the general population will be, at best, time consuming and, at worst, impossible.[33] The National Marrow Donor Program,[34] established in 1986 under federal direction, has made possible several thousand bone marrow transplants between unrelated individuals.[35] Currently, there are close to three million persons registered as potential donors.[36] The odds of finding an unrelated donor who is HLA-matched ranges from fifty-seven to eighty-three percent.[37] Since HLA proteins are inheritable, the best possibility of finding a match is within the patient's own racial group.[38] Although the overwhelming

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chemotherapy or radiotherapy to destroy malignancies that do not involve the hematopoietic system. This therapy will also harm or destroy stem cells remaining in the patient. Later, the stored cells are returned to the donor to restore immune and blood systems. *Id.*

29. *Id.*

30. For a given patient, the probability of an HLA matched sibling is $1-(0.75)^n$, where n equals the number of siblings. Each sibling has a one-in-four chance of having the same HLA type. *Id.*

31. The percentage of patients finding a family member who can and will donate is about 30 to 40%. Sources differ on this statistic. *See, e.g.*, Claudio Anasetti, *The Role of the Immunogenetics Laboratory in Marrow Transplantation*, 115 ARCHIVES PATHOLOGY LABORATORY MED. 288, 288 (1991) (under 30%); T. Reynolds, *Growth of Marrow Registries Increase Patients' Odds*, 83 J. NAT'L CANCER INST. 98 (1991) (30%).

32. In general, a greater incidence of mismatch results in higher incidence and greater severity of GVHD and lower probability of survival. Claudio Anasetti et al., *Effect of HLA Compatibility on Engraftment of Bone Marrow Transplants in Patients with Leukemia or Lymphoma*, 320 NEW ENG. J. MED. 197 (1989).

33. Appelbaum, *supra* note 4, at 2.

34. Establishment of a registry began in 1984 when the National Organ Transplant Act was passed. Pub. L. No. 98–507, § 401, 98 Stat. 2339, 2347 (1984). Congress indicated that a national bone marrow registry should be established and directed the Secretary of Health and Human Services (HHS) to conduct a feasibility study. The Secretary of HHS recommended against funding a registry, 132 CONG. REC. S6280 (daily ed. May 21, 1986), and Congress then ordered the navy Medical Research Institute to establish its own registry. In 1986, the Navy awarded a contract to major blood banking organizations in the United States with the purpose of building a donor file and establishing a system to access suitable donors rapidly. Jeffrey McCullough et al., *Establishment of the National Bone Marrow Donor Registry*, *in* BONE MARROW TRANSPLANTATION: CURRENT CONTROVERSIES, 641, 641–43 (Robert Peter Gale & Richard E. Champlin eds., 1989).

35. National Marrow Donor Program (NMPD), Web Site (last modified Oct. 7, 1997) <http://www.marrow.org>.

36. *Id.*

37. Telephone Interview with Craig Howe, M.D., Ph.D., CEO of NMDP (Nov. 18, 1997) [hereinafter Telephone Interview with Craig Howe].

38. Appelbaum, *supra* note 4, at 2.

majority of potential donors in the registry are Caucasian,[39] the registry also includes individuals who are African American,[40] Hispanic-Latino,[41] Asian-Pacific Islander,[42] and Native American.[43]

B. Umbilical Cord Blood Hematopoietic Cells: Advantages and Disadvantages

Umbilical cord blood contains hematopoietic stem cells that will later reside in the bone marrow and manufacture mature blood and immune systems.[44] At birth, the umbilical cord is usually discarded along with the placenta, which also contains fetal blood.[45] Recent advances in biomedical research have turned a waste product of birth into a potentially valuable medical tool.[46]

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39. As of October 31, 1997, 58.3% of the potential donors listed in the registry were Caucasian. In the six-month period ending on October 31, 1997, 83.6% of Caucasian patients were successful at finding a match through the NMPD. Telephone Interview with Craig Howe, *supra* note 37.

40. As of October 31, 1997, 7.8% of the potential donors listed in the registry were African American. In the six-month period ending on October 31, 1997, 57.8% of African-American patients were successful at finding a match through the NMPD. *Id.*

41. As of October 31, 1997, 7.3% of the potential donors listed in the registry were Hispanic-Latinos. In the six-month period ending on October 31,1997, 73.0% of the Hispanic-Latino patients were successful at finding a match through the NMPD. *Id.*

42. As of October 31, 1997, 5.8% of the potential donors in the registry were Asian-Pacific Islanders. In the six-month period ending on October 31, 1997, 57.1% of Asian-Pacific Islander patients were successful at finding a match through the NMPD. *Id.*

43. As of October 31, 1997, 1.4% of the potential donors in the registry were Native Americans. In the six-month period ending on October 31, 1997, 58.3% of the Native-American patients were successful at finding a match through the NMPD. This number is subject to wide fluctuation because of the low number of patients in this category. In the six-month period prior to the one reported above, the success rate was 83%. The percentages of donors registered with the NMPD reported here and *supra* in notes 40–42 do not add up to 100 because for nearly 20% of donors registered, race is not known or was characterized as more than one. *Id.*

Both donor number and demographics in the NMPD have improved with time. For information from 1992, see Mark F. Anderson, *Encouraging Bone Marrow Transplants from Unrelated Donors: Some Proposed Solutions to a Pressing Social Problem*, 54 U. PITT. L. REV. 477, 486 (1993).

44. Appelbaum, *supra* note 4, at 3.

45. Clare Thompson, *Umbilical Cords: Turning Garbage into Clinical Gold*, 268 SCIENCE 805 (1995).

46. *Id.* The first reported transplant of umbilical cord blood was performed on a six-year-old afflicted with Fanconi's anemia using umbilical cord blood from the boy's newborn sister. At birth, the blood was collected and frozen using a newly developed protocol that would maintain viability of the cells. The frozen blood was flown to Paris where it was thawed, again according to a new protocol to maintain viability, and transplanted. The transplant was a success, and the boy was cured of his rare blood disorder. Eliane Gluckman et al., *Hematopoietic Reconstitution in a Patient with Fanconi's Anemia by Means of Umbilical Cord Blood from an HLA-identical Sibling*, 321 NEW ENG. J. MED. 1174 (1989).

The use of umbilical cord blood has several advantages compared to bone marrow.[47] Collection of blood is physically painless for both mother and child,[48] a considerable advantage compared to bone marrow donation, which is both painful and time consuming.[49] Blood that is stored will be available readily[50] and quickly.[51] Blood from newborns is less likely to contain a transmissible infectious disease such as cytomegalovirus.[52] Preliminary studies suggest that umbilical cord stem cells result in a lower risk for GVHD[53] compared with bone marrow for the same level of HLA match.[54]

Despite its promise, transplantation of umbilical cord stem cells is not yet a proven alternative to bone marrow transplantation. The volume of blood and the number of stem cells in the umbilical cord are limited and may be insufficient for transplantation into adults.[55] The majority of transplants performed to date have

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47. *See generally* Wagner, *supra* note 6.

48. *Id.* at 199–201. Numerous protocols have been tested for the collection of umbilical cord blood. The goal is to obtain maximum volume of blood with a large number of viable stem cells. All methods involve collection after the umbilical cord has been severed.

49. For the donor of bone marrow, the transplantation procedure involves a high level of commitment. A hospital stay of one to three days is required. Extensive information about the current health and medical history must be obtained to determine if the donor is free from disease. The operation to remove bone marrow can be performed under either general or spinal anesthesia. A large needle is inserted into the pelvic bone about 200 times. There is a slight risk of blood clotting or infection related to undergoing general anesthesia. The donor will experience soreness in the pelvic region for days to weeks afterwards. N.C. Briggs et al., *On Willingness to Be a Bone Marrow Donor*, 26 TRANSFUSION 324, 324–25 (1986); D. Stroncek et al., *Attitudes and Physical Condition of Unrelated Bone Marrow Donors Immediately After Donation*, 29 TRANSFUSION 317, 318 (1989).

50. *See generally* J. McCullough et al., *Development and Operation of a Program to Obtain Volunteer Bone Marrow Donors Unrelated to the Patient*, 26 TRANSFUSION 315 (1986).

51. Testing for matching HLA types involves lengthy laboratory testing, but tests could be performed on umbilical cord blood at the time of donation rather than when it is needed. *Id.*

52. Pablo Rubinstein et al., *Stored Placental Blood for Unrelated Bone Marrow Reconstitution*, 81 BLOOD 1679, 1679 (1993). Cytomegalovirus "is the most common life-threatening infection in bone marrow transplant recipients." *Id.* at 1683. It is found in about 40% to 60% of the adult population but in only one percent of newborns.

53. *See supra* note 26.

54. F. Leonard Johnson, *Placental Blood Transplantation and Autologous Banking—Caveat Emptor*, 19 J. PEDIATRIC HEMATOLOGY ONCOLOGY 183 (1977); Wagner, *supra* note 6, at 206–08. Cord stem cells appear to be less reactive to foreign proteins on the surface of recipient (host) tissues. The decreased immunoreactivity may be a result of the "naive status" of cells that have been insulated from foreign antigens in the womb. A synergistic effect of maternal cells also present in the cord blood would give rise to the changed sensitivity and would disappear as the maternally derived cells died. *Id.*

55. Thompson, *supra* note 45, at 805. From an umbilical cord, about 15×10^8 cells can be collected, which is one-tenth the amount required for an adult transfusion. One way to deal with this problem would be to enhance proliferation of the stem cells before transplantation. Scientists are experimenting to find conditions that will allow the stem cells

been on children,[56] so little data exists on adult recipients. The amount collected is sufficient for only a single transplant into one child.[57] In addition, hematopoietic cells from a newborn are an unknown commodity; there is no medical history to indicate that the infant's stem cells are normal and as valuable as desired by the recipient.

C. Commercialization of Umbilical Cord Stem Cell Transplants

The business community has recognized that umbilical cord blood cell transplant technology could yield significant financial profit. Stem cells contained within umbilical cord blood can be obtained without major cost to companies. The knowledge that cord blood transplants could be used to treat a large variety of diseases[58] has stimulated a ready market for blood storage, and several companies offering private storage now exist.[59] These profit-making enterprises have established autologous umbilical cord blood storage services, inviting parents to bank their newborn's blood for possible future use.[60] Parents receive promotional literature that offers a compelling service. The front page of one brochure reads, "Viacord: A decision for expectant parents. A choice that could save your child's life."[61] Inside, the brochure reads:

> A potentially life-saving decision.
>
> Did you know that the blood remaining in your baby's umbilical cord and placenta after delivery, called cord blood, contains special cells that are unique to your baby? If preserved, these cells may someday save your child's life, or possibly the life of a sibling or other family member.
>
> Cord blood, once discarded as useless, can now be described as priceless. Your new choice is to save your baby's cord blood for your own family's potential use or to donate it to medical

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to be maintained outside the body and encourage regenerative proliferation. Hal E. Broxmeyer et al., *Growth Characteristics and Expansion of Human Umbilical Cord Blood and Estimation of Its Potential for Transplantation in Adults,* 89 PROC. NAT'L ACAD. SCI. 4109 (1992).

56. Joanne Kurtzberg et al., *Placental Blood as a Source of Hematopoietic Stem Cells for Transplantation into Unrelated Recipients,* 335 NEW ENG. J. MED. 157 (1996); Thompson, *supra* note 45, at 805.

57. *See* Kurtzberg et al., *supra* note 56, at 165.

58. *See supra* text accompanying notes 16–23.

59. Claudia Kalb & Melinda Beck, *Seizing Nature's Lifeline: Can Umbilical-Cord Blood Provide "Biological Insurance"?,* NEWSWEEK, Apr. 29, 1996, at 75.

60. The companies send promotional literature to expectant parents prior to the birth. Parents deciding to bank their child's blood pay fees of about $1200 to $1500, which includes shipping, protection for freezing, and initial storage. Parents then pay a yearly service charge of around $100. Collection is arranged by the obstetrician or hospital staff and may involve additional charges for the parents. *Id.*

61. VIACORD, INC., A DECISION FOR EXPECTANT PARENTS (prior version of the promotional brochure cited in note 2) (1995).

research. Otherwise, it will be thrown away. Banking cord blood is a family decision.

> Viacord is dedicated to the development and success of this life-saving biomedical technology. We are one of the few organizations in the world that specialize in collecting and cryopreserving cord blood. We look forward to the day when every baby starts life with this gift. And we're ready to help make it a reality for your new baby today.[62]

Parents may decide instead to donate their child's blood to the umbilical cord blood registries that some companies are establishing.[63] Cord blood stored as a donation "will...be available as a resource for the thousands of patients each year who develop diseases treatable with stem cells."[64] Parents who donate cord blood must consent to a review of the mother's and the child's medical records, including all laboratory tests. In addition, prior to donation, extensive documents must be returned to the registry, including "Parent/Legal Guardian Informed Consent," "At Risk Screening Questionnaire," and "Attestation of Truthfulness, Recontact Statement, Maternal Blood Storage Consent Form."[65] In addition, mothers are required to take an HIV antibody test, which assesses exposure to the virus that causes AIDS, as well as other tests for infectious diseases.[66]

III: COMPETING INTERESTS IN OWNING AND CONTROLLING EXCISED AND STORED BODY PARTS

Umbilical cord blood storage provides the opportunity for individuals to bank their own body parts as "insurance"[67] in case of serious illness.[68] While

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62. *Id.* at 2.

63. CORD BLOOD REGISTRY, *supra* note 2. Cord Blood Registry is associated with the International Cord Blood Foundation, which is "dedicated to increasing the public supply of cord blood." *Id.* Parents who choose the donation option pay no fees. CORD BLOOD REGISTRY, MAKING AN INFORMED CHOICE (1996) (prior version of promotional brochure cited in note 2).

64. Letter from Larry Andreini, Executive Director, & Paul Billings, M.D., Ph.D., President and CEO of International Cord Blood Foundation, Donor and Banking Services, to expectant parents addressed as "Interested Donor" (1996) (contained in Cord Blood Registry promotional materials).

65. Information sheet sent with letter from Andreini & Billings, *supra* note 64 (contained in Cord Blood Registry promotional materials).

66. *Id.*

67. Although this technology is referred to as an insurance policy in some of the promotional literature for the companies providing the storage service and in the popular press, *see, e.g.*, Kalb & Beck, *supra* note 59, at 75, it satisfies a legal definition of insurance in a very limited manner, BLACK'S LAW DICTIONARY 802 (6th ed. 1990) ("An agreement by which one party for a consideration promises to pay money or its equivalent or to do an act valuable to other party upon destruction, loss, or injury of something in which other party has interest."). The storage companies agree, for a fee, to store and later, return umbilical cord blood when needed to replace defective stem cells.

68. Of course, the practice of blood banking has been practiced for many years. In the weeks prior to surgery, patients can make donations of their own blood, which is

umbilical cord blood, in storage and ready to use, creates the potential to cure life-threatening medical problems,[69] it raises numerous legal problems as well.

One obvious issue focuses on the question of ownership of the stored cells. The literature provided by the storage companies promotes the use of the stored umbilical cord blood primarily for the benefit of the donor infant.[70] The writings also suggest that stored blood could be used by a sibling from the same parents and by the mother.[71] Thus, within a single family that includes multiple ill members, several people may stand to benefit from the stored cells. The volume collected, however, is sufficient for only a single transplant.[72] Some may even question who, as between mother and infant, owns the cells.

Conflicts between the storage facility and the family are also likely to arise. For example, after an initial processing charge, yearly maintenance charges are assessed for storage.[73] What happens when a family fails to make its yearly payments?[74] If possession of the cells is forfeited to the company because of

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stored in the event that blood is needed during the surgical procedure. This practice became widespread during the beginning years of the AIDS epidemic when trust in the safety of the blood supply was in question. Aaron Zitner, *Blood Feud: New Rules in Battle for Donors*, BOSTON SUNDAY GLOBE, Mar. 24, 1996, at 22–23. Blood has a short storage life, ranging from about five days for platelets to about thirty-five days for red cells and whole blood. OFFICE OF TECH. ASSESSMENT TASK FORCE, BLOOD TECHNOLOGIES, SERVICES AND ISSUES 8 (1988) [hereinafter OFFICE OF TECH. ASSESSMENT].

69. Appelbaum, *supra* note 4, at 2–3.

70. CORD BLOOD REGISTRY, *supra* note 2. The use of stored cells for autologous transplantation is highly unlikely since most diseases successfully treated by transplantation require cells from an allogenic donor. The claim that "cord blood can always be used for the child from whom it was obtained" is considered by some physicians as "egregious" and "clearly false." Johnson, *supra* note 54, at 184.

71. The medical literature documents the use of umbilical cord transplants only in siblings and unrelated recipients. *See, e.g.*, Kurtzberg et al., *supra* note 56; Joan Stephenson, *Terms of Engraftment: Umbilical Cord Blood Transplants Arouse Enthusiasm*, 273 J. AM. MED. ASS'N 1813 (1995); Jeremy Sugarman et al., *Ethical Aspects of Banking Placental Blood for Transplantation*, 274 J. AM. MED. ASS'N 1783 (1995).

72. Presently, umbilical cord blood transplantation has not been performed in adults because there is not enough blood in an umbilical cord to provide enough cells. The amount collected from the umbilical cord at birth is one-tenth the amount needed for an adult transfusion. Thompson, *supra* note 45, at 805. These facts raise the possibility that the companies are committing fraud on the consumer by promoting a service that is presently impossible.

Researchers are working on methods to promote proliferation and increase the number of the stem cells in vitro. *See* Broxmeyer et al., *supra* note 55.

73. Cord Blood Registry charges a Processing and Banking Fee of $895, an Enrollment Fee of $195, and an Annual Storage Fee, guaranteed for the life of the contract, of $75. CORD BLOOD REGISTRY, *supra* note 2.

74. Viacord provides in its client agreement for the possibility that storage fees may not be paid.

> If I do not pay the fees due within thirty (30) days of the collection by any payment due date, Viacord will notify me in writing that I am in default of this Agreement. If I do not pay in full within thirty

nonpayment, does the donor family have any residual right to control a subsequent sale? One might hope that opposing claims, particularly within a family, could be settled without recourse to the judiciary, but this is unlikely. Rather, we can expect that this new technology, like others in recent years,[75] will raise questions regarding property rights in the human body.

A. Excised Cells as Property: Moore v. Regents of the University of California

When a layperson is asked if she has a right to her blood, her organs, her body in general, she would almost certainly reply in the affirmative. A lawyer would have cause to be less certain. Putting aside advances in scientific and medical research that allow body parts to be considered separately from the whole, the entire body is most often the focus of property disputes.[76] With the development of techniques for organ transplantation, for the creation of cell lines, and for artificial insemination, body parts separate from the source body, whether living or dead, became valuable.[77]

The first case to reach the courts concerning a body part taken from a living person was *Moore v. Regents of the University of California.*[78] *Moore* involved a claim by a patient who was under treatment for leukemia at the Medical Center of the University of California at Los Angeles (U.C.L.A.). Moore entered the hospital in October, 1976, shortly after learning that he had leukemia.[79] Moore's physician, David W. Golde (also a defendant in the lawsuit), took various blood and tissue samples to confirm the diagnosis. Thereafter, Golde recommended surgery to remove Moore's spleen as a necessary means of slowing the disease.[80] Moore agreed to the splenectomy and the surgery took place on October 20,

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(30) days of receiving the notice, this Agreement will terminate and *all rights to the Cord Blood will be retained by Viacord.*

VIACORD INC., CLIENT AGREEMENT 3 (1997) (emphasis added).

75. *See* York v. Jones, 717 F. Supp. 421 (E.D. Va. 1989); Moore v. Regents of the Univ. of Cal., 793 P.2d 479 (Cal. 1990); Hecht v. Superior Court, 20 Cal. Rptr. 2d 275 (Ct. App. 1993); Davis v. Davis, 842 S.W.2d 588 (Tenn. 1992).

76. *See, e.g.*, Enos v. Snyder, 63 P. 170 (Cal. 1900) (holding that although there is no property right in a dead body, next of kin have custody for the purpose of burial); Everman v. Davis, 561 N.E.2d 547 (Ohio App. 1989) (holding that while family has possessory right to body for purpose of burial, state interest in determining cause of death overrides immediate possession by family); Snyder v. Holy Cross Hosp., 352 A.2d 334 (Md. Ct. Spec. App. 1976) (granting injunction to prevent autopsy or other tampering with body denied); *see also* R.S. Guernsey, *The Ownership of a Corpse Before Burial*, 10 CENT. L.J. 303 (1880).

77. *See, e.g.*, Brotherton v. Cleveland, 923 F.2d 477 (6th Cir. 1990) (stating spouse has a "legitimate claim of entitlement" sufficient to establish a civil rights claim when coroner permitted the removal of husband's corneas without permission); *Moore*, 793 P.2d 479 (discussed *infra* in text accompanying notes 78–103); *Hecht*, 20 Cal. Rptr.2d 275 (discussed *infra* in text accompanying notes notes 120–37); *Davis*, 842 S.W.2d 588 (discussed *infra* in text accompanying notes 104–19).

78. *Moore*, 793 P.2d 479.

79. *Id.* at 481.

80. *Id.*

1976.[81] Moore, at Golde's request, returned to U.C.L.A. several times over the next seven years, traveling from his home in Seattle.[82] During each visit, further samples of Moore's tissues and blood were taken.[83] Unbeknownst to Moore, Golde, along with several medical researchers, had recognized that certain blood cells taken from Moore manifested some unusual properties that, if properly exploited, could be commercially valuable.[84] Golde and his colleagues developed a research tool called a cell line.[85] The potential for financial reward from the cell line was so great that Golde (in association with the Regents of U.C.L.A.) was able to negotiate lucrative agreements with two biotechnology companies once the cell line had been patented.[86] Moore filed a lawsuit, alleging conversion: his physician had exploited his cells without permission.[87]

The superior court dismissed the cause of action for conversion,[88] but the court of appeals reversed.[89] The California Supreme Court rejected the conclusions of the court of appeals, holding that under existing law, the tort of conversion did not give Moore a cause of action.[90] The court reasoned that "[t]o establish a conversion, plaintiff must establish an actual interference with his *ownership* or *right of possession*.... Where plaintiff neither has title to the property alleged to have been converted, nor possession thereof, he cannot maintain an action for conversion."[91] Simply put, if Moore did not "own" his cells, there could be no conversion. While Moore clearly possessed his cells while they remained a part of his body, the court viewed cells that had been removed as something other than property.

Moore retained no ownership interest in the excised cells for two reasons. First, precedent did not support such an interest.[92] Second, California law limited the rights of a patient to his cells by specifically requiring that human tissues used for scientific purposes be disposed of by an appropriate method to protect the

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81. *Id.*
82. *Id.*
83. *Id.*
84. *Id.* at 481–82.
85. *Id.* at 482 n.2.
86. *Id.* at 482.
87. *Id.* Moore stated 13 causes of action, including conversion, lack of informed consent, breach of fiduciary duty, fraud and deceit, unjust enrichment, quasi-contract, bad faith breach of the implied covenant of good faith and fair dealing, intentional infliction of emotional distress, negligent misrepresentation, intentional interference with prospective advantageous economic relationships, slander of title, accounting, and declaratory relief. *Id.* at 482 n.4.
88. *Id.* at 486–87.
89. *Id.* at 487.
90. *Id.*
91. *Id.* at 488 (quoting Del E. Webb Corp. v. Structural Materials Co., 176 Cal. Rptr. 824 (Ct. App. 1981)) (emphases added).
92. *Id.* at 489.

public.[93] In addition, Moore's allegation that he owned the cell line created from his excised cells did not succeed. The court ruled that the cell line was "both factually and legally distinct"[94] from Moore's cells. The court reasoned that a patent had been granted for the cell line; since the grant of a patent requires proof that the invention is the product of human ingenuity, the cell line is different from the raw materials, Moore's cells.[95]

The narrow holding of this case suggests it may be ill suited for resolving ownership conflicts that arise over umbilical cord blood. Absent a recognition that excised cells are property, rights of ownership may not attach. However, the court expressly and impliedly left open the possibility of finding that human tissues could be property: "while we do not purport to hold that excised cells can never be property for any purpose whatsoever, the novelty of Moore's claim demands express consideration of the policies to be served by extending liability."[96]

One policy consideration, the promotion of socially useful medical and scientific research without hindrance from potential tort claims,[97] is inapplicable to umbilical cord blood when stored specifically for transplantation. Academic and industry researchers in biotechnology depend on biological specimens to develop new technologies; cord blood actively maintained in storage is unlikely to be a source of dispute in the way Moore's cells were.[98] A second policy consideration, the "protection of a competent patient's rights to make autonomous medical decisions,"[99] also does not apply, at least with regard to the initial decision to store umbilical cord blood at birth.[100] In fact, the need to protect a patient's rights argues in favor of regarding stored umbilical cord blood as property. The blood is saved from destruction and stored with the specific intent that it be available to cure an ill patient. Without rights in the stored blood, the patient could be deprived of one medical option in the treatment program.[101]

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93. *Id.* at 491. CAL. HEALTH AND SAFETY CODE § 7054.4 (West 1997) reflects legislative concern for a public threat to safety from used hypodermic needles and other infectious waste generated during hospital care. *Moore*, 793 P.2d at 491 n.32.

94. *Moore*, 793 P.2d at 492.

95. *Id.* at 493. This line of reasoning suggests a labor theory of property, wherein a person has the right to ownership of those things that he produces or acquires through his labor. ROGER A. CUNNINGHAM ET AL., THE LAW OF PROPERTY, §1.1, at 2 (2d ed. 1993). Thus, property rights in Moore's cells were transferred to the researchers by their investment of labor.

96. *Moore*, 793 P.2d at 493 (citations omitted).

97. *Id.* at 494–95.

98. *Id.*

99. *Id.* at 493.

100. The court's concern was that a patient electing to have surgery should be fully informed about the procedure and not rely inappropriately on a physician whose medical judgment might be "tainted" by financial considerations. A physician or other health care provider with a financial interest in the umbilical cord blood storage facility would, under *Moore*, have a fiduciary duty to disclose that interest whenever she recommended the service to the patient. *Id.* at 497.

101. This discussion does not distinguish between mother and child in the use of the term "patient." While both may claim the umbilical cord blood as property, the child is

Finally, in deciding that Moore had no property interest, the court placed an emphasis on Moore's expectation with regard to his cells.[102] Once excised from his body, Moore could have no hope of possessing or controlling them under state law.[103] Without any expectation that he would retain rights to his cells, they could not be considered Moore's property.

B. Stored Cells as Property

Traditionally, a patient would not have claimed ownership of tissue or blood samples taken during medical treatment. Advances in technology, however, have changed expectations. Now, cells may be removed and stored (in a form unchanged by human ingenuity) and used weeks or years after their collection. Patients purchase the services of storage facilities with the expectation that their stored cells can be retrieved for use when needed. Two technologies where cells are stored in expectation of future use, in vitro fertilization and sperm banking, have given rise to a number of disputes that focus on the ownership of the stored cells.

1. Davis v. Davis: *Disposition of Cryogenically Preserved Preembryos*

In *Davis v. Davis*,[104] a divorcing couple turned to the courts to resolve a custody battle over preembryos.[105] Mary Sue Davis and Junior Lewis Davis, unable to conceive naturally, turned to in vitro fertilization (IVF) to become parents.[106] During the first three years that the Davises attempted IVF, Mrs. Davis underwent the preliminary procedures[107] six times.[108] Each time, the eggs retrieved from her ovarian follicles were fertilized, and all of the resulting preembryos, usually three or four, were transferred to Mrs. Davis's uterus.[109] At the time of the Davises' final attempt at IVF, the clinic was able to offer cryogenic preservation of

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the biological source. *See* HENRY GRAY, ANATOMY OF THE HUMAN BODY 51–58 (Carmine D. Clemente ed., 1985).

102. *Moore*, 793 P.2d at 488–89.

103. *Id.* at 491. Since therapeutic purposes dictated only the removal of Moore's cells and his medical treatment plan did not require saving the cells, once removed Moore could not expect them to be in his control.

104. 842 S.W.2d 588 (Tenn. 1992).

105. The process of in vitro fertilization includes the removal of eggs from the ovarian follicles of a female and the fertilization in a petri dish of the eggs with sperm. The fertilized eggs, now called zygotes, are allowed to develop in petri dishes; after undergoing division to the four- or eight-cell stage, they are called preembryos. At this point, the preembryos can be transferred into the uterus of a woman, where implantation can occur resulting in a pregnancy. The preembryos can, in addition, be frozen in nitrogen and stored for transfer at a later date if pregnancy does not result from an earlier procedure. Storage of preembryos is advantageous to the woman since the preliminary procedure to obtain and remove eggs involves numerous injections over a month-long period and is time consuming and expensive. *Id.* at 591–92.

106. *Id.* at 591.

107. *See supra* note 105.

108. *Davis*, 842 S.W.2d at 591.

109. *Id.* at 591–92.

preembryos.[110] The Davises took advantage of the storage option after their physician retrieved nine eggs from Mrs. Davis.[111] The Davises welcomed the opportunity to store the preembryos because it meant that they could make several more attempts at pregnancy without the time-consuming and difficult preliminary IVF procedures.[112] They clearly intended that the stored preembryos be used to achieve pregnancy and parenthood; they never discussed with each other, nor with the IVF clinic, the disposition of the preserved preembryos in the event of divorce.[113]

The court addressed first the issue of whether the preembryos should be considered "persons" or "property" in order to define the Davises' interests. The preembryos, consisting of four to eight cell units, were so far from a state of viability[114] that under federal law and Tennessee state law they could not be protected as "persons."[115] The court also declined to protect the preembryos as property, deciding that they "occup[ied] an interim category" between person and property.[116] Instead, the court ruled that the Davises had "an interest in the nature of ownership, to the extent that they ha[d] decision-making authority concerning disposition of the preembryos, within the scope of policy set by law."[117]

The interim category was a result of concern for potential life inherent in the preembryos.[118] The *Davis* court noted that preembryos differ from human organs and tissues in that the latter lack the potential for autonomous life; this difference entitles preembryos to greater respect.[119] The interim category allows the contributors to the preembryo to exercise the right of disposition, but the right is a limited one. Since the category is dependent on the potential of the cells to give rise to a new person, it clearly does not apply to umbilical cord blood.

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110. *Id.* at 592.

111. *Id.*

112. *Id.*

113. *Id.*

114. *See generally* Webster v. Reproductive Health Serv., 492 U.S. 490 (1989); Roe v. Wade, 410 U.S. 113 (1973).

115. *Davis*, 842 S.W.2d at 594–95.

116. *Id.* at 596–97.

117. *Id.* The court held that disputes involving the disposition of preembryos should be resolved by looking to the interests of the progenitors. When in dispute, the party wishing to avoid procreation will usually prevail. The fertility clinic, with regard to the Davises' preembryos, was "free to follow its normal procedure in dealing with unused preembryos." *Id.* at 604–05.

118. *Id.* at 596–97.

119. *Id.* The decision quotes extensively from a *Report of the Ethics Committee of the American Fertility Society*, which suggested that, as a matter of law, decision-making authority should rest with the people providing the sperm and the eggs used to produce the preembryo. *Davis*, 842 S.W.2d at 596–97.

2. Hecht v. Superior Court: *Disposition of Stored Sperm*

Hecht v. Superior Court[120] examined the right of inheritance in cryogenically preserved sperm that had been deposited in a sperm bank by the decedent. One month before his death by suicide, William Kane deposited fifteen vials of sperm with a sperm bank.[121] He signed an agreement with the sperm bank that gave instructions that in the event of his death, the sperm could be released to his girlfriend, Deborah Hecht.[122] At about the same time, he executed a will in which he stated his intent that Hecht, if she desired, use the stored sperm samples.[123] Kane also wrote a letter to his two adult children indicating that affection for his "children" would encompass his "posthumous offspring" should Hecht decide to become impregnated with his sperm.[124] Kane's will bequeathed a substantial portion of his estate to Hecht, giving the two living children a parcel of land.[125] Both children contested the will.[126] Hecht and the children reached an agreement that gave each enumerated portions of the estate.[127] The agreement, however, left all other assets (including the sperm, although it was not specifically mentioned) to the administration of the decedent's estate. The parties agreed on a plan for division with Hecht receiving twenty percent and the children each receiving forty percent.[128] When Hecht attempted to claim the sperm, the sperm bank refused to release it to her.[129] The estate administrator filed a request for the court to determine the disposition of the stored sperm, requesting that the court choose one of four alternatives ranging from destruction of all vials to partial distribution to Hecht and the children.[130] The court ordered the sperm destroyed, and Hecht filed a petition to vacate the order.[131]

Kane's adult children, as real parties in interest, urged the court of appeals to uphold the probate court's ruling that the sperm be destroyed.[132] They argued that under the rationale of *Moore*, their father could not have a property interest in any body part after its excision.[133] The court found this argument "self-defeating" since, if the decedent had no property interest in the sperm, then the probate court could not have jurisdiction over its disposition.[134] The court, in support of its decision that Kane had retained property interest in his sperm, distinguished *Hecht* from *Moore* by recognizing that Kane expected to retain control of the sperm after

120. 20 Cal. Rptr.2d 275 (Ct. App. 1993).
121. *Id.* at 276.
122. *Id.*
123. *Id.* at 277.
124. *Id.*
125. *Id.*
126. *Id.*
127. *Id.*
128. *Id.*
129. *Id.* at 278.
130. *Id.* at 279.
131. *Id.* at 280.
132. *Id.* at 279.
133. *Id.* at 280–81.
134. *Id.*

its removal from his body and had declared his intentions towards its use,[135] whereas Moore had no intention or expectations for his spleen after its removal.[136] Thus, Kane's planned use for his sperm was important in deciding that "at the time of his death, decedent had an interest, in the nature of ownership, to the extent that he had decision-making authority as to the use of his sperm for reproduction. Such interest is sufficient to constitute 'property' within the meaning of [the] Probate Code."[137]

3. Does Expectation Help Resolve Umbilical Cord Blood Ownership?

Hecht and *Davis* are useful in two areas in thinking about the ownership problems that are likely to arise from stored umbilical cord blood. Unlike *Moore*, both recognized that people have limited property rights in human tissues after removal from the body. In addition, both cases emphasized the expectations of the parties who provided the tissues. The wishes of the donors are not dispositive of the outcome and do not sustain ownership rights but support a narrow property right: decision-making authority.

However, these opinions may be of limited use in resolving property issues regarding other types of human cells or tissues because, unlike most cells, preembryos and sperm have the potential to create autonomous human life. Sperm, as reproductive tissue, is a "unique type of property."[138] The value of the preembryos "lies in the 'potential to become, after implantation, growth and birth, *children.*'"[139] Both the *Hecht* and *Davis* courts viewed the stored tissues in the shadow of the conceivable person. In contrast, umbilical cord blood can save the life of an already existing person but cannot create new life. Its property value is defined by the life that could be saved.

IV. MODEL DONATIONS: KIDNEYS AND BONE MARROW FROM INCOMPETENTS AND MINORS

An alternative legal model for resolving conflicts over umbilical cord blood may be found in cases that involve the performance of surgical procedures on incompetents.[140] Individuals in these cases were incompetent to consent to an invasion of their personal autonomy by reason of mental illness or age, thus

135. *Id.* at 281. Kane's will was explicit with regard to the stored sperm: "It being my intention that samples of my sperm will be stored at a sperm bank for the use of Deborah Ellen Hecht, should she so desire...." *Id.* at 276. In an agreement Kane signed with the sperm bank, a provision authorized the sperm bank to release his sperm to Hecht. *Id.*

136. *Id.* at 280 n.4.

137. *Id.* at 283.

138. *Id.*

139. Davis v. Davis, 842 S.W.2d 588, 598 (Tenn. 1992) (emphasis added).

140. Hart v. Brown, 289 A.2d 386 (Conn. Super. Ct. 1972); Curran v. Bosze, 566 N.E.2d 1319 (Ill. 1990); Strunk v. Strunk, 445 S.W.2d 145 (Ky. 1969); *In re* Richardson, 284 So. 2d 185 (La. Ct. App. 1973); New York *ex rel.* Doe, 481 N.Y.S.2d 932 (App. Div. 1984); Little v. Little, 576 S.W.2d 493 (Tex. Civ. App. 1979); Lausier v. Pescinski (*In re* Pescinski), 226 N.W.2d 180 (Wis. 1975).

requiring a parent or guardian to petition the court for authorization of consent. The procedures at issue, the removal of a kidney and a sample of bone marrow, were not meant to benefit physically the incompetent individual. The single goal of these procedures was to provide donor tissue in an attempt to save the life of a fatally ill sibling.

These cases suggest parallels with some potential problems in allocation and use of stored umbilical cord blood. Both procedures may trigger conflicts between the interests of parents and children, as well as risks and benefits to the donor, the recipient, and the family unit. A parent or guardian seeking approval for a transplant from one child to another may not be able to balance fairly the rights of the healthy child against the desperate, immediate needs of an ill child. Further, emotional circumstances surrounding serious illnesses make it difficult for a parent or guardian to protect one child when the unity of the whole family is at risk.

The donation of a kidney places the donor in a situation different from that prior to donation. There are similar consequences to the donor infant after its stored umbilical cord blood is donated to another. A resolution to donate a kidney, while living, can be made just once. Similarly, the volume of umbilical cord blood collected from each birth is enough for only a single transplant.[141] For both types of donors, giving up a part of oneself to save the life of a sibling can confer enormous emotional benefits.[142] Both types of donor have one less resource available in the event of their own illness. The kidney donor has the extremely small but perpetual risk that the remaining kidney will fail, requiring the donor to become a recipient. The umbilical cord blood donor stricken with a blood disease treatable by a stem cell transplant[143] will not have the opportunity to use his own stored cells.[144]

A. Is Donation in the Best Interests of the Donor?

Parents generally can give consent to medical interventions for their children,[145] but when a treatment medically does not benefit the child, consent by a parent may not be sufficient for physicians to proceed.[146] In that situation, the parents or guardian must petition the court for authority to proceed with the surgery. Courts first examine whether they have jurisdiction to act on behalf of one

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141. *See* Thompson, *supra* note 45.

142. In *Curran* for example, the testimony of a physician summarized the psychological benefits of donation to the donor. "'The major benefits of donating bone marrow are two: One, the altruistic benefit of having the opportunity to save another person's life; and secondly, depending on the relationship of the donor and recipient, the advantage of having that person to grow up with.'" *Curran*, 566 N.E.2d at 1338.

143. *See supra* notes 16–17.

144. *But see* Johnson, *supra* note 54, at 184 (arguing that autologous transplants are unlikely to be useful in most circumstances).

145. John C. Williams, Annotation, *Power of Court or Other Public Agency to Order Medical Treatment for Child over Parental Objections Not Based on Religious Grounds*, 97 A.L.R. 3D 421 (1980).

146. Lisa K. Gregory, Annotation, *Propriety of Surgically Invading Incompetent or Minor for Benefit of Third Party*, 4 A.L.R. 5TH 1000 (1992); 61 AM. JUR. 2D *Physicians, Surgeons and Other Healers* §§ 178–79 (1981).

who is not competent to protect himself.[147] Then, the court examines the specific facts of the case to determine if authorization for surgery should be granted.[148]

The facts of each case, even when presented in the terse language of court opinions, have the emotional impact desired in a best-selling novel. For example, in *Strunk v. Strunk*, twenty-eight-year-old Tommy Strunk was married, employed, and a part-time college student. He "suffer[ed] from ... a fatal kidney disease [and was] being kept alive by frequent treatment on an artificial kidney, a procedure which [could not] be continued much longer."[149] Tommy's only and best hope for a transplant was his brother Jerry, who unlike all other relatives tested, had a compatible blood and tissue type.[150] Jerry was twenty-seven years old but had the mental age of a six-year-old and was committed to a state institution for the feebleminded.[151] He was legally incompetent to consent to the donation of one of his kidneys to save the life of his brother.[152]

In other cases, healthy siblings were incompetent because of age rather than mental infirmity. In *Hart v. Brown*, the potential donor was the seven-year-old identical twin of the fatally ill donee.[153] In *Curran v. Bosze*, identical twins, aged three and one-half years, were potential bone marrow donors for their twelve-year-old half brother, who suffered from a rare form of leukemia.[154]

In all of these cases, the courts determined whether to authorize consent by examining the best interests of the healthy donor child.[155] They employed a balancing test that weighed the harms of the surgical invasion against the benefits resulting from the surgery to the *healthy* child or incompetent.

Surgery and the resultant loss of a kidney confer no physical benefit on the donor.[156] In fact, a young child or mentally disabled individual is less able than

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147. Hart v. Brown, 289 A.2d 386, 387 (Conn. Super. Ct. 1972); Strunk v. Strunk, 445 S.W.2d 145, 148 (Ky. 1969); Lausier v. Pescinski (*In re* Pescinski), 226 N.W.2d 180, 181 (Wis. 1975).

148. *Hart*, 289 A.2d at 387; *Strunk*, 445 S.W.2d at 148; *Pescinski*, 226 N.W.2d at 181.

149. *Strunk*, 445 S.W.2d at 145.

150. *Id.* at 146.

151. *Id.*

152. *Id.*

153. *Hart*, 289 A.2d at 386–87.

154. Curran v. Bosze, 566 N.E.2d 1319, 1320–21 (Ill. 1990).

155. *Hart*, 289 A.2d at 390; *Curran*, 566 N.E.2d at 1344–45; *Strunk*, 445 S.W.2d at 149. The courts started their analysis in some cases by looking to the doctrine of substituted judgment. *See infra* text accompany notes 181–200. However, whatever description each court gave its method, all decided whether surgery should be performed using a best interests test.

156. An individual with one kidney may appear to be in a precarious situation if she develops kidney disease or another illness with debilitating effects on the remaining kidney. However, this risk is small. *Hart*, 289 A.2d at 389. The court in *Hart* noted that:

> [m]edical testimony indicated that the risk to the donor is such that life insurance actuaries do not rate such individuals higher than those with two kidneys. The only real risk would be trauma to the one remaining kidney, but testimony indicated that such trauma is extremely rare in

a competent adult to understand the stresses associated with a stay in an unknown hospital environment and the pain of surgery. Psychological benefits of the transplant therefore become the most important factor.[157] Often, the courts view the transplant as a family issue, and the benefits to the family are imputed to the donor.[158]

A compelling factor in the analysis is the strength of the family relationships.[159] Most opinions review the relationships in the donor's nuclear family and then focus on the affinity between the donor and recipient.[160] When the relationship between donor and recipient is strong emotionally, there are substantial benefits to the donor resulting from the surgery. For example, in *Strunk* the court devoted a substantial portion of the opinion to quotations of passages from an amicus curiae brief filed by the Department of Mental Health, caretaker of the incompetent brother, which described the strong sense of identity that the incompetent brother derived from his ill brother.[161] Similar testimony in *Hart*[162] and in *Little*,[163] regarding the close relationship between seven-year-old twins in the former and teenage siblings in the latter, supported the decisions of both courts to authorize the procedures.[164]

Practical benefits, such as when the recipient acts as an advocate for the incompetent, weigh in favor of the best interests of the donor.[165] The burden on the state may be reduced when a family member is able to act for the incompetent. In *New York ex rel. Doe*, the court noted that the procedure was in the best interests of the incompetent since "[t]he petitioner is the sole family member to have become involved in placement and treatment decisions for the incompetent in the past and will likely continue to do so."[166]

Absent strong relationships between donor and recipient, an opposite result is likely. In *Lausier v. Pescinski* (*In re Pescinski*), the court refused to authorize surgery for the potential donor brother, who suffered from a mental

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civilian life.

Id.

157. *See Curran*, 566 N.E.2d at 1332–42. The testimony of six physicians is included in the opinion. Even those doctors who are not psychiatrists testified to the psychological aspects of surgery. *Id.*

158. *Id.* at 1335–36.

159. *Curran*, 566 N.E.2d at 1343; *Strunk*, 445 S.W.2d at 146–47; Little v. Little, 576 S.W.2d 493, 498–99 (Tex. Civ. App. 1979).

160. *Curran*, 566 N.E.2d at 1343; *Strunk*, 445 S.W.2d at 146–47; *Little*, 576 at 498–99.

161. *Strunk*, 445 S.W.2d at 146–47.

162. Hart v. Brown, 289 A.2d 386, 389 (Conn. Super. Ct. 1972).

163. *Little*, 576 S.W.2d at 498-99.

164. *Hart*, 289 A.2d at 386; *Little*, 576 S.W.2d at 499.

165. New York *ex rel* Doe, 481 N.Y.S.2d 932, 933 (App. Div. 1984).

166. *Id.* This factor, however, did not persuade the court in *In re Richardson*. The plaintiff argued that the transplant was in the best interest of Roy, an incompetent, since, if successful, Roy would be taken care of by his recipient sister (after the death of his parents). The court found "[s]uch an event...not only highly speculative but, in view of all of the facts, highly unlikely." *In re* Richardson, 284 So. 2d 185, 187 (La. Ct. App. 1973).

disease described as "a flight from reality."[167] Although "he was in contact with his environment there was marked indifference in his behavior," suggesting that the incompetent had no emotional attachment of any kind with his dying brother who needed a kidney.[168] Similarly, the court in *Curran* found that it was not in the best interests of three-year-old twins to submit to surgical intervention because the recipient, although a half-brother, was not known to the twins as family.[169] This court summarized the approach taken by saying, "[o]nly where there is an existing relationship between a healthy child and his or her ill sister or brother may a psychological benefit to the child...realistically be found to exist."[170]

Another factor given consideration in the best interest analysis is the effect on the family.[171] A successful transplant ensures an intact family, at least temporarily. This benefit to the family flows to the donor and supports donation as being in her best interest. A psychiatrist in *Hart* testified that:

> if the expected successful results are achieved they would be of immense benefit to the donor in that the donor would be better off in a family that was happy than in a family that was distressed and in that it would be a very great loss to the donor if the donee were to die from her illness.[172]

The interests of the incompetent donor are linked to and dependent on those of her family.[173]

Family interactions are highly valued in the best interest analysis. When there are beneficial interactions between a donor and her family, particularly the recipient, authorization is more likely to be granted. Despite this emphasis on the family, courts are reluctant to base their decisions solely on the judgment of the family, even when it is presented as a substitute for the incompetent's own judgment.

B. Are Body Parts All the Same?

These cases provide one paradigm with which to evaluate opposing claims for stored umbilical cord blood. The similarities between kidney or bone marrow transplants and umbilical cord blood transplants are multiple and obvious.[174] The

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167. 226 N.W.2d 180, 181 (Wis. 1975).

168. *Id.*

169. Curran v. Bosze, 566 N.E.2d 1319, 1344 (Ill. 1990). The twins were illegitimate children of Bosze, who was also the father of the twelve-year-old. The children had different mothers and did not know that they were half-siblings. They lived in different countries and had met on only two occasions. *Id.* at 1320.

170. *Id.* at 1388.

171. *Id.* at 1343; Strunk v. Strunk, 445 S.W.2d 145, 146–47 (Ky. 1969); Little v. Little, 576 S.W.2d 493, 498–99 (Tex. Civ. App. 1979).

172. Hart v. Brown, 289 A.2d 386, 389 (Conn. Super. Ct. 1972); *see also Little*, 576 S.W.2d at 498.

173. This emphasis on the family, however, diminishes interests specific to the incompetent, such as personal autonomy.

174. *See supra* text accompanying notes 13–54, 140–44.

living tissue is available only for a single surgery. The donor could be in a worse position for having donated in the rare event that she develops a serious illness. The transplant has a high likelihood of success[175] and may be the best course of action for the recipient.[176] She is likely to be a close genetic relation of the donor; whether the donor and recipient have a close *emotional* relationship would be a fact for a court to determine.[177] Given a close relationship between donor and recipient, a successful outcome for the recipient would serve the interests of both the donor and the family.[178]

The similarities between donation of a kidney and use of stored umbilical cord blood suggest that similar outcomes would obtain. Thus, once authority for making a decision to authorize use of stored umbilical cord blood is found, the court would balance the harms to the donor infant resulting from the loss of the stored cells against the benefits to the donor infant of allowing the cells to be used. In circumstances where a strong familial bond between donor and recipient is demonstrated, one could expect the benefits of saving a sibling life would outweigh the loss of the possibility to use the cells. Then, the court is likely to find in favor of a sibling claiming use of the stored cells.

Umbilical cord blood transplants differ from organ transplants in at least one crucial way that further supports the likelihood that a sibling or other family member would be permitted to use stored cells. The donor tissue is no longer part of the body, thus diminishing some of the concerns expressed by courts in the transplant cases.[179] The donor need not undergo surgery in order to donate the umbilical cord cells;[180] the donor therefore bears no risk of harm during surgery nor the pain from surgery. The donor also bears no emotional stress as would occur when undergoing a surgical procedure. Thus, when asking what is in the best interest of the infant, donor surgery does not figure into the equation. A court unwilling to permit a kidney donation may therefore be willing to permit the donation of stored umbilical cord blood cells.

C. The Doctrine of Substituted Judgment and the Allocation of Property

Courts focus on the risks of surgery and the short-term emotional impact in delineating the harm to donors in the "kidney cases," and property rights are considered only obliquely. In these cases the courts are granting authority to

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175. *See Hart*, 289 A.2d at 372–73. In kidney donations between identical twins, there is a 100 % chance that the twins will live out a normal life. *Id.* at 373.

176. *See In re* Richardson, 284 So. 2d 185, 187 (La. Ct. App. 1973).

177. *See supra* text accompanying notes 157–64.

178. *See supra* text accompanying notes 171–73. See also JOANNA H. FANOS, SIBLING LOSS (1996), for a detailed study about the multiple, serious effects that the death of a child from a chronic illness can have on a family.

179. The courts view intrusions and stress due to surgery as harm to the donor. *Hart*, 289 A.2d at 390; Strunk v. Strunk, 445 S.W.2d 145, 148–49 (Ky. 1969); Little v. Little, 576 S.W.2d 493, 499 (Tex. Civ. App. 1979).

180. See *supra* note 5 for descriptions of collection methods used in obtaining umbilical cord blood cells. The procedure, performed after the infant is delivered, is completely painless to both infant and mother.

deprive individuals of something tangible and undeniably in their possession. If "possess" is defined as "to have and hold as property,"[181] surely a kidney is one's property. The courts recognize this property aspect in obtaining their authority through the legal fiction called the doctrine of substituted judgment.[182]

The traditional use of substituted judgment applies when an incompetent person possessed of substantial property is unable to use or consent to the use of the property.[183] A court authorizes the use of funds from an incompetent's estate to support the incompetent and her family.[184] This determination is based on what the incompetent person would have done under the circumstances if she were able to make her own decisions.[185] The *Strunk* court significantly extended the doctrine when it applied it to instances of informed consent.[186] The right of the court to act "is broad enough not only to cover property but also to cover all matters touching on the well-being of the ward."[187]

The application of the doctrine to informed consent to surgical procedures may be inappropriate.[188] First, the doctrine is not a reliable means of finding out what the individual might have desired.[189] This would be particularly true when the judgment of a child or perpetual mentally incompetent individual is in question. Neither can provide a judgment: the former has no history of intentions or desires, and the latter has never been competent. Second, the use of substituted judgment analogizes body parts to property. While body parts are, in some cases, gifted to another, informed consent is not meant to protect property but personal integrity.[190] Despite the anomaly of substituting a judgment that does not exist, the doctrine is frequently used as a means of providing the authority for depriving an individual of a kidney or bone marrow.[191]

While courts sometimes justify their authority to make decisions in these cases based on the doctrine of substituted judgment, they never apply the doctrine to the main issue in these cases. Substituted judgment is used narrowly to justify jurisdiction over an incompetent. To resolve the issue of whether surgery on the

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181. BLACK'S LAW DICTIONARY 1162 (6th ed. 1990).

182. See Louise Harmon, *Falling Off the Vine: Legal Fictions and the Doctrine of Substituted Judgment*, 100 YALE L.J. 1 (1990), for a provocative discussion of the historical origins and current uses of the doctrine of substituted judgment.

183. Annotation, *Power of Court of Guardian to Make Noncharitable Gifts or Allowances Out of Funds of Incompetent Ward*, 24 A.L.R. 3D 863, 871–75 (1969).

184. *Id.*

185. *Id.*

186. Strunk v. Strunk, 445 S.W.2d 145, 148 (Ky. 1969). *See generally* Harmon, *supra* note 182, at 32–54.

187. *Strunk*, 445 S.W.2d at 148.

188. Harmon, *supra* note 182, at 63.

189. *Id.* at 64.

190. *Id.* at 66–67.

191. Hart v. Brown, 289 A.2d 386, 388, 391 (Conn. Super. Court. 1972); *Strunk*, 445 S.W.2d at 148–49; Little v. Little, 576 S.W.2d 493, 497–98 (Tex. Civ. App. 1979).

incompetent should occur, the courts then discard substituted judgment and continue their analysis based on the best interest standard.[192]

The use of substituted judgment is sometimes rejected completely when deciding transplant cases. In *Curran*, the court presented a lengthy historical analysis of the doctrine's historical use and found it inapplicable when three-and-one-half-year-old twins were the potential donors:

> Under the doctrine of substituted judgment, a guardian of a formerly competent, now incompetent, person may look to the person's life history, in all of its diverse complexity, to ascertain the intentions and attitudes which the incompetent person once held.... Since it is not possible to discover that which does not exist...the doctrine of substituted judgment is not relevant and may not be applied in this case.[193]

Two courts reject entirely the use of substituted judgment because of the substantial impact on the property rights of the incompetent individual.[194] Without discussing whether the incompetent made or could have made any decision previously, the courts found that they had no authority to make any decisions. For instance, in *In re Richardson* the court denied authority to remove a kidney from a seventeen-year-old mentally incompetent individual for the benefit of his older sister who was suffering from almost total loss of kidney function.[195] The Louisiana court analogized the donation of the kidney to the donation of a minor's property and cited several state statutes that prohibit a minor from making any donation of his property while he is alive.[196] The court completed its analogy by noting:

> [s]ince our law affords this unqualified protection against intrusion into a comparatively mere property right, it is inconceivable to us that it affords less protection to a minor's right to be free in his person from bodily intrusion to the extent of loss of an organ unless such loss be in the best interest of the minor.[197]

The *Pescinski* court reached a similar result using different reasoning. It found that it had no state statutory power to authorize the operation and declined to apply the doctrine of substituted judgment for that authority because it would be too far reaching.[198] The doctrine of substituted judgment could be used to invade personal decision making and should not be used even if the person were incapable of making her own decisions. "If applied literally, it would allow...this court, to change the designation on a life insurance policy or make an election for an

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192. *Hart*, 289 A.2d at 390, 391; *Strunk*, 445 S.W.2d at 148–49; *Little*, 576 S.W.2d at 497–98; *cf.* Curran v. Bosze, 566 N.E.2d 1319, 1331 (Ill. 1990); Lausier v. Pescinski (*In re* Pescinski), 226 N.W.2d 180,182 (Wis. 1975). *See supra* text accompanying notes 155–73.

193. *Curran*, 566 N.E.2d at 1325–26.

194. *In re* Richardson, 284 So. 2d 185, 187 (La. Ct. App. 1973); *Pescinski*, 226 N.W.2d at 182.

195. *In re Richardson*, 284 So. 2d at 186.

196. *Id.* at 187.

197. *Id.*

198. *Pescinski*, 226 N.W.2d at 182.

incompetent widow...."[199] Despite the rejection of substituted judgment, the court suggested that authority could be found if there were evidence that the transplant was in the incompetent's interest.[200] This indicates that taking from an incompetent would not be warranted unless there was clear benefit to the incompetent.

Courts that find it appropriate to administer an incompetent's estate may view use of the stored umbilical cord cells as just one more piece of property. The cells are more like a trust fund than an internal organ. There is no invasion of personal autonomy to cloud the issue. For those courts that derive their authority from the doctrine of substituted judgment, a vial of frozen cells may more comfortably fit within the definition of property than does a kidney, still functioning within a human body. If the donation is viewed as a property issue, some courts may find in favor of protecting an incompetent's estate.[201]

V. AN ALTERNATIVE TO PRIVATE OWNERSHIP

The new technology enabling umbilical cord blood storage and use could provide a life saving treatment for certain fatally ill individuals. The commercialization of the technology by private companies makes it available to a vast, if select, audience. That these enterprises give rise to legal conflicts should not surprise any observer of health care or business in the United States today. The courts as well as the commercial enterprises can address these problems in diverse ways.

Prophylactic measures and post hoc resolutions may protect some property interests when the technology reaches a large audience. For example, parties to an umbilical cord blood storage agreement can specify by contract a plethora of contingency plans for eventual use of the blood. A contract may specify that only the infant donor be permitted use of the stored cells, or the possible users may include the donor's siblings or relatives within a specific degree of relationship. Consumers who recognize the potential value to others of their stored cells and who understand the low probability that they will need to claim the cells for their own use[202] may wish to establish a mechanism to sell their stored cells. Cells forfeited voluntarily or through nonpayment of fees could be used by others for therapeutic purposes and would command a high price in a market with limited inventory. It is uncertain if such contracts to market body parts would be legal[203] or enforceable, particularly when the subject of the contract may not be considered property and susceptible of ownership.

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199. *Id.*

200. *Id.*

201. *See In re Richardson*, 284 So. 2d 185; *Pescinski*, 226 N.W.2d 180.

202. *See* Johnson, *supra* note 54, at 185.

203. 42 U.S.C. § 274e(a) (1994) provides: "It shall be unlawful for any person to knowingly acquire, receive, or otherwise transfer any human organ for valuable consideration for use in human transplantation if the transfer affects interstate commerce." The term "human organ" as defined in 42 U.S.C. § 274e(c)(1) (1994) does not specifically include blood but does include bone marrow.

In addition to the potential for ownership disputes, medical data and social policy suggest that private storage of umbilical cord blood may not best serve individual interests. Private banks promote storage primarily for autologous use.[204] Furthermore, an information sheet provided by one company states:

> According to the Journal of the National Cancer Institute, there are approximately 100,000 new cases of hematopoeitic malignancies (i.e. Leukemias, Lymphomas and Myelomas) diagnosed each year. This means that in any one year, the odds of one individual are approximately 1 in 2,500.... Over the course of a lifetime, obviously, these odds go up, and when you include both mother and siblings, the odds of utility increase again. This number is also increased during the ages of 1–14, when, according to the American Cancer Society, "cancer is the leading cause of death by disease."[205]

However, current medical data suggests that the use of umbilical cord blood to treat disease is likely only in extremely rare circumstances.[206] In fact the likelihood that a family will need to use their stored cells is near zero.[207] One study estimated that:

> if 200,000 placental blood units are stored for the exclusive use of the baby from whose birth the placental blood was obtained, at most, 74 units (and this is very likely a gross overestimate) might 'possibly' be used and 199,926 would be taken out of circulation for use by patients who require an allogenic transplant.[208]

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204. One promotional brochure notes that "[t]he cells are a perfect match for your child with no risk of rejection." CORD BLOOD REGISTRY, *supra* note 2. Another company promotes its service "to preserve and bank your newborn's cord blood for the child's own or another family member's potential use. For the child, these stem cells are a perfect match and potentially may be an acceptable match for another family member." VIACORD, INC., *supra* note 2.

205. CORD BLOOD REGISTRY, COMMONLY ASKED HEALTH CARE QUESTIONS (1996) (information sheet included with promotional materials).

206. Johnson, *supra* note 54, at 184. Other physicians criticize statistics in promotional literature from Viacord stating that "nearly 30% of childhood cancers are leukemia, which may be treated with stem cell transplants." One notes that the company does not mention:

> that the estimate provided is disproportionately high and that nearly 80% of leukemia in children is acute lymphocyte leukemia for which fewer than 20% of patients would ever need a transplantation. The statement also does not acknowledge that the value of autologous UCB [umbilical cord blood] transplantation is speculative, and even if a child were to need a transplantation, other alternatives to an autologous UCB approach should be considered.

Jeremy Sugarman et al., *Consensus Statement: Ethical Issues in Umbilical Cord Blood Banking*, 278 J. AM. MED. ASS'N. 938, 941 (1997).

207. Johnson, *supra* note 54, at 185; Sugarman et al., *supra* note 206, at 941.

208. Johnson, *supra* note 54, at 185.

Patients in need of a stem cell transplant without their own store of umbilical cord blood and unable to find a bone marrow match are ill served by a system composed entirely of privately maintained cells. While some families have a clear need for private storage, for example, when a child is born into a family in which there is a child with leukemia, most are asserting a property right over blood that has little likelihood of ever being used by the family.

One proposal to eliminate some of these problems is to create public umbilical cord blood banks. Public registries could provide administration and storage services, collecting blood at hospitals at virtually all births[209] to provide an enormous registry of potential donations. With a continuing large supply, stored cells would be retrieved briskly, thus minimizing the problem of "aged" cells. A large-scale operation would allow health professionals involved in collecting the blood to establish standardized techniques to insure that the cells stored were viable and free from contamination.[210]

Umbilical cord blood collected from diverse populations all over the country would provide a ready source of transplant material to all who need it. All minorities and ethnic mixes would be represented in the supply since it would reflect the current births nationwide.[211] Since the costs of participating in a private scheme may limit participation to those families with financial means,[212] public banks would allow all individuals access to stored cells.

In addition to serving those who need cells, public banks also serve those who donate. Allowing individuals to contribute to a public bank provides an opportunity to donate to a public good. Giving a gift to a stranger can "affirm the solidarity of the community over and above the depersonalizing, alienating forces of mass society and market relations."[213] People feel an obligation to give to those

209. Umbilical cords are considered "garbage" after birth and are disposed of by the hospital. Thompson, *supra* note 45, at 805.

210. Collection of umbilical cord blood is not a standard procedure in hospital delivery rooms, and thus most health care personnel are untrained in the procedure. One health care provider encourages nurses to "remain independent from the process," and urges hospitals to write policies that protect nurses from liability for blood collection. Margaret P. McMillan, *Banking on Cord Blood*, 25 J. OBSTETRICS, GYNECOLOGY, AND NEONATAL NURSING 115 (1996).

211. A diverse registry based on births nationwide should result in demographics superior to those of the National Marrow Donor Program. *See supra* notes 39–43.

212. *See supra* note 60.

213. Thomas H. Murray, *Gifts of the Body and the Needs of Strangers*, HASTINGS CENTER REP., Apr. 1987, at 30, 35. Richard Titmuss, writing about nonumbilical cord blood donation argues that a gift of blood, for which no return gift is expected, could be a way of "enriching life for anonymous others." RICHARD M. TITMUSS, THE GIFT RELATIONSHIP 21 (1971).

in need,[214] and when blood is the gift, it symbolically emphasizes kinship and bonds with strangers.[215]

Several models for public banks exist. The American National Red Cross, a federally chartered corporation created by an act of Congress,[216] collects and distributes almost half of the blood products used in the United States.[217] The not-for-profit agency obtains blood at 2500 blood centers nationwide[218] from volunteer donors who do not receive compensation and then sells it to hospitals throughout the country.[219] The National Marrow Donor Program operates a registry of close to three million individuals willing to donate bone marrow.[220] The successes of the Red Cross and the National Marrow Donor Program indicate that large numbers of individuals would donate body tissues without compensation. In addition, both operate nationwide centers that recruit individuals and process tissue donations.

Bone marrow and blood, and the public banks that coordinate their collection, differ from umbilical cord blood in several ways that could affect the success of a public umbilical cord blood bank. The National Marrow Donor Program does not maintain donated tissue; rather, it maintains records containing information describing those willing to be donors. The Red Cross, dealing in blood, which has a short shelf life,[221] does not store donations for more than brief periods. And both tissue types donated through these programs are replenishable, not a rare commodity over which one might more eagerly assert property rights.

The experience of one program suggests that a majority of mothers would donate umbilical cord blood cells to a nonprivate bank.[222] The Placental Blood

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214. Murray, *supra* note 213, at 36 (citing ALAN W. DRAKE ET AL., THE AMERICAN BLOOD SUPPLY (1982)).

215. *Id.* Titmuss describes blood as "a bond that links all men and women in the worlds so closely and intimately that every difference of colour, religious belief and cultural heritage is insignificant beside it." TITMUSS, *supra* note 213, at 15.

216. 36 U.S.C. §§ 1–9 (1994).

217. Lisa Scott, *Red Cross Touts Its Broad Restructuring,* MOD. HEALTHCARE, Nov. 13, 1995, at 10.

218. Lisa Scott, *Red Cross to Centralize Control of Blood Centers,* MOD. HEALTHCARE, May 2, 1994, at 8.

219. The Red Cross blood organization is not without problems. *See, e.g.*, S.G. v. American Nat'l Red Cross, 938 F.2d 1494 (1st Cir. 1991), *rev'd*, 505 U.S. 247 (1992) (plaintiff claimed local division of Red Cross supplied contaminated blood); *Injunction Gives FDA Broad Power over Red Cross,* DEP'T JUST. ALERT, May 1993, *available in* Westlaw, 3 No. 5 DOJ Alert, at *13 (discussing injunction giving FDA control over the Red Cross in an attempt to improve the safety of the blood supply); Katherine Eban Finkelstein, *Blood Money: Liddy Dole's Red Cross Runs Amok,* NEW REPUBLIC, Aug. 12, 1996, at 17 (suggesting that the Red Cross sever its charitable disaster relief activities from its blood operations, which appear to be run as a for-profit business).

220. *See supra* text accompanying notes 34–43.

221. *See* OFFICE OF TECH. ASSESSMENT, *supra* note 68.

222. Pablo Rubenstein et al., *Unrelated Placental Blood in Bone Marrow Reconstititution: Organization of the Placental Blood Program,* 20 BLOOD CELLS 587, 589 (1994). Financial support from the National Heart, Lung, and Blood Institute (NHLBI), a

Project of the New York Blood Center was established to evaluate the practical feasibility of umbilical cord blood transplantation on a large scale.[223] In the program, umbilical cord blood is collected from the placenta after it is delivered following delivery of the infant.[224] Afterwards, researchers visit the mother to explain the procedure and its purpose and to request consent to use the collected umbilical cord blood.[225] The mothers also are requested to give informed consent to an interview to ascertain their medical history and ethnic background, to a review of the hospital chart of both mother and child, and to collect a blood specimen from the mother for HLA and infectious disease testing.[226] At the same time, the mother is "informed of her right to direct [the researchers] to discard the [collected umbilical cord blood]."[227] Ninety to ninety-five percent of all mothers give their consent and during the time covered by this report—six months—none requested that the umbilical cord blood be discarded.[228]

Public banks could eliminate legal issues that focus on ownership of umbilical cord blood but will almost certainly generate a different set of conflicts. The problems associated with contaminated blood distributed by the Red Cross[229] suggest that confidence in a safe and viable umbilical cord blood supply will be a primary concern. Consumers will want to be certain that the cord blood they obtain will be free from disease and the best possible match. If the public banks are organized by a government entity, equal access to matched blood will be another important issue for consumers. In addition, donors and recipients will have possibly conflicting interests with regard to whether a donor's identity is linked to a banked sample.[230] The extensive testing of the blood could provide the infant donor with information about health risks. The donor may not want to be identified with the blood, however, the recipient may seek out the donor for a later bone marrow donation should the umbilical cord blood transplant fail.

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government agency, established a pilot program in 1992. Eliot Marshall, *Clinical Promise, Ethical Quandry*, 271 SCIENCE 586, 586 (1996).

The NHLBI has invested over thirty million dollars to establish a multicenter study "designed to show whether cord blood transplantation is a safe and effective alternative to bone marrow transplantation for children and adults with a variety of cancers, blood diseases, and genetic disorders." National Institutes of Health, *NHLBI Cord Blood Transplantation Study Begins* (Oct. 3, 1996) <http://www.nih.gov/news/pr/oct96/nhlbi-03.htm>. Three hospital facilities and a coordinating center will participate in collecting and storing the cord blood, and seven hospital facilities are designated transplant centers. *Id.* While the stated goal does not include establishing public cord blood banks, the information resulting from the study could be a sound starting point for that plan.

223. The program is designed to assess all aspects of transplantation including blood collection, testing and storage, data management, and effectiveness when used in unrelated transplantation. Rubenstein et al., *supra* note 223, at 587.

224. *Id.* at 588.

225. *Id.* at 589.

226. *Id.*

227. *Id.*

228. *Id.*

229. *See supra* note 219.

230. See Sugarman et al., *supra* note 206, at 939, for an engaging discussion of issues surrounding linkage of donor identity with donated umbilical cord blood.

VI. CONCLUSION

Few would deny that technology has made possible healthier and longer lives. The new technology of using stored umbilical cord blood for transplants will most certainly prove to be useful in the fight to save lives. The technology is also certain to give rise to legal conflicts particularly in the area of property. Some of these conflicts could be avoided by astute contract agreements. Parties engaged in umbilical cord blood storage can make express agreements as to blood disposition; this is especially necessary if the courts continue to differ on how human body parts should be treated. Another solution, reducing the technology in private control by establishing public banks, would reduce the number of conflicts over ownership. A public scheme would also have the advantage of providing valuable technology to many more people, a clear bonus when lives are at stake.