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Review

Human Tissue Ownership and Use in Research: What Laboratorians and Researchers Should Know

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BACKGROUND: The use of human blood and tissue is critical to biomedical research. A number of treaties, laws, and regulations help to guide the ethical collection of these specimens. However, there are no clearly defined regulations regarding the ownership of human tissue specimens and who can control their fate.

CONTENT: This review discusses the existing regulations governing human studies and the necessary components of patient consent. Legal cases that have addressed the issue of ownership of human tissue are reviewed, including recent settlements that have led to the destruction of millions of specimens of patient tissue. The unique regulations that guide the use of tissues collected postmortem are also examined. Potential changes in the future of biomedical research that uses human tissue, including genetic material, are also discussed.

SUMMARY: The use of human tissue is directed by numerous laws and regulations. Awareness of these rules and of how and when to obtain meaningful informed consent from patients is essential for laboratorians and researchers, who should also be familiar with situations that have led to lawsuits and in some cases the destruction of valuable human tissue specimens.

The study of the human body and its tissues dates back to ancient Greece. Unfortunately, after the fall of the Roman Empire, anatomical studies came to a near standstill and in many places the use of cadavers became illegal. For many years researchers were prosecuted for postmortem dissections. It wasn't until the 15th century that researchers at medical schools in Europe were able to study the human body and its tissues without the fear of prosecution *(1)*. Human studies have come a long way since then, and tissue samples have become critical to the research enterprise.

Research specimens are obtained from the following four sources: (*a*) tissues collected prospectively for a research project; (*b*) excess tissue from samples taken specifically for clinical purposes, such as diagnosis or treatment, which are subsequently recognized as valuable for research; (*c*) cadaveric tissues; and (*d*) tissues with reproductive or "human" potential, including eggs, sperm, zygotes, embryos, and fetal tissues, which are also often collected for clinical purposes, as in (*a*). With the increased use of human tissue in medical research, researchers, research institutions, and human research participants have asked: Who gets to determine the fate of such specimens? In the US, a country that prides itself on property rights, this question has prompted another: Who "owns" human tissue specimens? This question has been at the heart of several closely watched court cases.

In this review we explore the governing treaties, laws, and regulations that guide human studies; the necessary components of informed consent; legal cases that have examined the issue of ownership of human specimens; and the unique situation of specimens obtained postmortem. We also provide a brief look into the future of research that uses human tissue.

Governing Treaties, Laws, and Regulations

To understand the court rulings in legal cases that have involved the use of human specimens, it is important to be familiar with treaties, laws, and regulations that govern human research. Most aspects of the interactions between research and human research participants are heavily controlled by federal regulation, although it is important to note that these regulations do not address the issue of ownership. The laws governing the use of human research participants have their origin in the Declaration of Helsinki, which was developed by the World Medical Association as a set of ethical principles regarding human experimentation *(2)*. The Declaration of Helsinki was the first important effort of the medical community to regulate such research. The Declaration of Helsinki is not a legally binding instrument in international law, but it has greatly influenced national legislation and regulations. The Declaration of Helsinki was originally adopted in 1964 and has since

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undergone 6 revisions. In the US, the principles set forth in the Declaration of Helsinki are embodied in the Common Rule.

The Common Rule is a set of regulations within the Code of Federal Regulations (CFR).[4] The CFR is a set of rules and regulations established by the US government to add regulatory guidance to the congressionally enacted statutes found in the United States Code. The regulation that addresses the protection of human research participants is referred to as the Common Rule. Sixteen federal agencies have adopted the Common Rule in the form set forth by the Department of Health and Human Services (HHS) in Title 45 (public welfare) part 46 (protection of human subjects) *(3)*. The federal Food and Drug Administration (FDA) has adopted a slightly different version of the Common Rule (21 CFR part 50) that allows the FDA to concurrently enforce regulations that protect human study participants in the conduct of studies generating drug, device, or in vitro diagnostic data that will be submitted to the FDA *(4)*.

The Common Rule is coordinated, interpreted, and enforced largely by the Office of Human Research Protection, which is a division of the HHS. Institutions engaged in research with human participants that is conducted or supported by HHS must submit a Federalwise Assurance to the Office of Human Research Protection stating that the institution will comply with the human research participant protection regulations of all federal agencies. Most universities have agreed to apply the Common Rule to all human research, not just studies supported by federal dollars.

The Common Rule sets forth, in detail, the composition, function, and role of institutional review boards (IRBs) in protecting human participants in research activities. The Common Rule also outlines the requirements for obtaining informed consent from human research participants. In addition, HHS has adopted additional protections for special research groups such as pregnant patients, fetuses, neonates, children, and prisoners. The Common Rule does not address the question of who owns human tissue specimens used in research. It also does not apply to tissue obtained postmortem, though the Health Insurance Portability and Accountability Act of 1996 (HIPAA) does regulate the use of information associated with those tissues.

[4] Nonstandard abbreviations: CFR, Code of Federal Regulations; HHS, Department of Health and Human Services; IRB, institutional review board; FDA, Food and Drug Administration; HIPAA, Health Insurance Portability and Accountability Act of 1996; IVF, in vitro fertilization; DSHS, Department of State Health Services; UAGA, Uniform Anatomical Gift Act.

Some states have also enacted laws governing research with human participants. A comprehensive review of state laws is beyond the scope of this article. However, it is important to know that state law may provide additional protections, and should be consulted.

Informed Consent

What are the required elements of informed consent? First, the researcher must provide the individuals who participate in research studies with an explanation of the purposes of the research and the expected duration of the individual's participation. General descriptions are not sufficient; descriptions must be specific to the study *(3, 5)*. Participants in research cannot give "informed" consent if they are not adequately informed about the intended purpose of the research. Transparency is a key element in the consent process. Study participants must be informed of all intended uses for their specimens. If the use of specimens in additional research is desired later, study participants must give additional informed consent for this new research, or specimens must be deidentified (see below). Secondary research on specimens is also permitted if the IRB waives informed consent for the secondary project. IRB waiver is more likely if, at the time of tissue collection, the study participant consented to future research.

The consent information provided to study participants must contain an adequate description of the risks and potential benefits to the participants or others, any alternatives to participation in the study, and what the participant is expected to do throughout the study (including any costs associated with the study). A statement is required that describes the extent, if any, to which confidentiality of records that identify the study participant will be maintained. For research that involves more than minimal risk, the study participant must be informed whether any compensation and medical treatments are available if injury occurs. It must be clear that participation is voluntary and that the study participant may withdraw at any time without penalty. Finally, the informed consent document must provide information on a person who can be contacted if the research participant has questions or suffers a research-related injury *(3)*.

The Common Rule does permit research without the consent of the research participant in certain circumstances. First, the Common Rule applies only to human research participants, termed "human subjects," defined as living individuals with whom the investigator interacts or about whom the investigator obtains identifiable private information *(3)*. Therefore, if research is conducted by using anonymized or deiden-

tified samples only and the researchers do not have access to patients' private information, then this research, by definition, would not be human subject research and would not require informed consent.

In addition, the Common Rule (and its informed consent requirement) does not apply to research conducted on existing pathological or diagnostic specimens, if the IRB determines that the research is exempt because the information will be recorded by the researcher in a way that does not permit identification of the research participant *(3, 6)*.

Finally, the IRB has discretion to waive or alter the informed consent requirements if the IRB finds and documents that: (*a*) the research involves no more than minimal risk to the study participants, (*b*) the waiver or alteration will not adversely affect the rights and welfare of the study participants, (*c*) the research could not practicably be carried out without the waiver or alteration, and (*d*) whenever appropriate, the study participants will be provided with additional pertinent information after participation *(3)*.

Cases

Although the use of human tissue is heavily regulated by the federal government, the question of who owns excised human tissue has been analyzed under state property law. In a number of cases, courts have considered the question of whether an individual retains an ownership interest in his/her excised tissue that would authorize that person to share in the profits of any commercialization of research results, dictate who controls the samples, or determine how and if the sample will be used in future research.

In some cases, the debate has been framed as one of tissue "guardianship" (or bailment) vs "ownership" *(7)*. Bailment describes a legal relationship in which physical possession of personal property is transferred from one person (the "bailor") to another person (the "bailee"), who subsequently holds the property for the benefit of the bailor and is subject to the bailor's right to reclaim possession at any time. Bailment is distinguished from a sale or a gift of property, because bailment involves only the transfer of possession, not ownership. Property owners generally have the right to use, sell, transfer, exchange, or destroy their property as they wish, and to exclude others from doing these things; bailees do not have similar rights in bailed property. In the context of research specimens, the question is whether the transfer of excised tissue to a research institution is a gift, a bailment, or something in between.

In most cases involving tissue excised for clinical purposes and tissue donated for research, courts have concluded that patients and other research study participants do not retain ownership rights of the excised tissue. Contrary rulings have been reached in cases in which the evidence showed that there was a clear understanding that the patient would retain ownership of the excised tissue. Table 1 contains a list of important cases that have dealt with specimen ownership.

The seminal case on this question is *Moore v. Regents of University of California*, which was decided by the Supreme Court of California in 1990. In 1976, Moore underwent a splenectomy at the University of California to treat his hairy cell leukemia. Between 1976 and 1983, Moore traveled to the University of California from his home in Seattle several times. He claimed that he did so believing that he required ongoing treatment. He later learned that the university was conducting research on material obtained during his treatment and had created a cell-line using that material *(7, 8, 9)*. The cell line was subsequently patented and used by the University of California for commercial gain.

Moore asserted a variety of claims, including conversion (when a party takes away or wrongfully assumes the right to goods which belong to another) and lack of informed consent. In his conversion claim, Moore contended that he had an ownership interest in his cells, and the University of California took them unlawfully. The court dismissed the conversion claim, holding that current state law did not support a conversion claim and creating such a claim would unreasonably burden medical research *(7, 8)*. The court did, however, find that Moore could proceed on his claim that the doctors had breached their fiduciary duty to obtain informed consent because they failed to disclose their research interest and the economic benefit associated with the additional (and perhaps unnecessary) procedures they performed on him. The court drew a distinction between the privacy and dignity interests protected by the informed consent doctrines, and property rights.

These issues were addressed a decade later in *Greenberg v. Miami Children's Research Hospital Institute*. In 1987, the father of 2 children with Canavan disease worked with a researcher named Reuben Matalon to set up a registry of affected families to collect tissue from willing donors to begin studying the molecular basis of the disease. With the families' support, Matalon found a Canavan gene and developed a genetic test. In 1997, Matalon's employer, Miami Children's Hospital, obtained a patent on the gene and began licensing a test to identify Canavan mutations. Four families and 3 nonprofit organizations filed suit, alleging that Matalon and Miami Children's Hospital used the children's tissue without consent to license a patent and develop a commercial test *(10)*. They claimed, among other things, that they had an owner-

Table 1. Important cases regarding specimen ownership.

Case	Year	Reason for case	Decision/settlement
Beleno v. Tex. Dept. of State Health Servs., No. SA-09-CA-188-FB, United States District Court for the Western District of Texas	2009	Parents sued state for use of leftover blood samples that were collected for newborn blood screening and were used in research for which parents had not given consent.	Case settled out of court. State destroyed all existing leftover specimens.
Adams v. King County, 192 P. 3d 891 (Wa. 2008)	2008	Organ donor's organs were sent to medical research institute for research. Family sued, contending that donor's consent was limited to transplantation.	Court held that family had a claim based on their interest in proper treatment of body; not a property interest.
Washington University v. Catalona, 490 F 3d 667 (8th Cir. 2007)	2007	Washington University refused to relinquish custody of tissue obtained for research purposes when one of the investigators (and some of the donors) requested that the samples be transferred to another institution.	Court held that donors made a gift of their samples and did not retain a right to direct that they be transferred elsewhere.
Havasupai Tribe v. Arizona State University, Case No. CV2005-013190, Superior Court of Arizona, Maricopa County	2004	Native American tribe filed lawsuit claiming samples given to local universities for diabetes research were used for studies on inbreeding, schizophrenia, metabolic diseases, alcoholism, and population migration.	Case settled out of court. The University of Arizona's Board of Regents to pay $700,000 to the tribe members, provide other forms of assistance to the impoverished Havasupai, and return the blood samples.
Greenberg v. Miami Children's Hospital Research Institute, 264 F. Suppl. 2d, 1064 (SD Fl. 2003)	2003	Plaintiffs donated samples for research, which led to development of new diagnostic test. Plaintiffs sued after learning that research institution was licensing the test.	Patients have no property right in tissue voluntarily donated for medical research.
Mansaw v. Midwest Organ Bank, 1998 U.S. Dist. LEXUS 10307 (W.D. Mo. 1998)	1998	Father sued for rights to control the removal of tissue and organs from his deceased son's body.	Court acknowledged father's property interest, but held that it was minimal.
York v. Jones, 717 F. Suppl. 421 (E.D. Va. 1989)	1989	Couple signed agreement regarding procedures for freezing their fertilized eggs, and permitting use for research if they no longer desired to initiate a pregnancy. Later the couple sought to have the prezygote transferred to another medical school for implantation.	Court ruled that the relationship was that of bailee/bailor and the couple did have property rights and could repossess the prezygote.
Moore v. Regents of University of California, 793 P.2d 479 (Cal. 1990)	1990	Patient's cells were used for research without his knowledge or consent. Patient sued after learning that research institution had developed cell line and realized economic benefit.	Court held that patient did not have property right in excised tissue, but could pursue a breach of fiduciary duty claim.

ship interest in the excised tissue and that the defendants "converted" the tissue for their own economic benefit. The court found that the tissue was given voluntarily for research without any expectation of return, and therefore the plaintiffs had no ownership interest in the tissues, or the research performed using the tissue *(7, 10)*. The court noted that a contrary rule would cripple medical research because it would "bestow a continuing right for donors to possess the results of any research conducted by the hospital."

More recently, William Catalona, a urologic surgeon from Washington University School of Medicine, sought a court order directing the university to send the contents of a tissue repository to him at his new employer. The repository contained more than 100 000 serum samples, 3500 prostate tissue samples and 4400 DNA samples that had been collected (via an informed consent process) over a 20-year period from volunteers, including patients of Catalona and his colleagues in the urology division *(9, 11)*. The donated material was made available for Catalona and other colleagues for the purpose of conducting research on prostate cancer. When Catalona decided to leave Washington University in 2003, he wrote a letter to the sample donors asking that they sign a form to "release" the samples to him. Approximately 6000 study participants signed the form. However, Washington University refused to transfer the samples, arguing that they were the

property of the university. The US District Court for the Eastern District of Missouri considered the informed consent documents signed by the donors at the time of tissue donation, the testimony of witnesses, and relevant federal guidelines, and concluded that the samples legally remained the property of Washington University. The US Court of Appeals for the Eighth Circuit affirmed the decision, holding that whatever interest the sample donors might continue to have by virtue of the specific language in the consent documents (such as a right to request that the samples be destroyed) or by virtue of the Common Rule (such as the right to withdraw participation from research), they could not ask that the samples be transferred to a different facility *(7, 8)*. The court noted that the samples could not legally be returned to the donors under laws governing the proper handling and disposal of biological waste—a fact that significantly undermined the donors' claim of ownership.

Taken together, these court rulings suggest that patients and other human research participants do not retain ownership interests in their excised tissue. The tissue donors cannot benefit economically from research performed on that tissue and they cannot require the receiving institution to transfer the tissue to a site of their choosing. Courts have been reluctant to burden medical research in these ways. At the same time, it is clear that the tissue donor does retain certain rights in the tissue. For example, depending on how the informed consent documents are structured, some donor "property"-like rights may be reserved, such as the ability to direct destruction of the donated tissue after the donation is made. And nothing in these cases obviates the researcher's obligation to obtain informed consent from the tissue donor, in cases in which informed consent is required, before the use of information that personally identifies the donor in subsequent research on donated samples.

The outcomes of these cases also demonstrate that the ownership question does not depend on whether a patient consented to the use of his/her excised tissue for research. Although the Moore court did not condone the physician's failure to obtain informed consent, and permitted Moore to assert a claim against his physician based on that failure, these facts did not alter the court's determination that Moore had no ownership interest in the excised tissue. This approach is consistent with the commonplace practice of using leftover material obtained during routine medical or diagnostic procedures for future research purposes. Such material is usually stored according to guidelines from the College of American Pathologists and the Joint Commission. These guidelines include distinctions between leftover serum samples, which are usually disposed of in a short, predetermined amount of time after collection, and paraffin-blocked tissues, which are often retained for years and are considered by some to be part of the patient's medical record. For instance, according to the College of American Pathologists, leftover urine should be stored for 24 h; serum, plasma, and cerebrospinal and other body fluids for 48 h; and peripheral blood smears for 7 days, whereas paraffin blocks, wet tissue, and fine-needle aspiration specimens on slides are to be stored for 10 years. This stored material is often used in medical research. State laws also exist that dictate how long diagnostic material must be stored by the laboratory as "guardian" *(12)*.

Currently, no laws or regulations exist regarding ownership of these leftover materials. Many bioethicists consider leftover diagnostic tissues to be "abandoned" by patients, and conclude that the patient has relinquished any property rights over the material. The basis of this concept is that the donor has no further property interest in the leftover material, particularly if it is diseased or no longer necessary for human functions *(6)*. This argument is especially applicable to excess blood specimens or tissues that would normally be discarded if they were not put to an alternate use. Even if the donor has no continuing property right, the laboratory must abide by ethical and legal guidelines if this material is to be used for research.

The Common Rule authorizes the use of such materials if the information is recorded in a manner that it does not permit identification of the individual from whom the material was obtained, either directly or through the use of identifiers that are linked to the patient *(3)*. Utilization of these leftover materials for research requires IRB approval, and the IRB has authority to waive patient consent when appropriate. In addition, federal law and HIPAA guidelines must be followed to ensure that these materials are deidentified and/or the patients' protected health information remains secure.

A different analysis has been applied when the patient has a continuing use for the excised tissue. In *York v. Jones* (1989), a couple entering into an in vitro fertilization (IVF) program signed a cryopreservation agreement for the freezing of their fertilized eggs *(7)*. Later, the couple sought treatment at another hospital and asked that their prezygotes be transferred to that facility. The defendants argued that under the agreement, the Yorks' property rights were limited to implantation, donation to another infertile couple, donation for approved research, or thawing, and that interinstitutional transfer was not an option. The court disagreed, noting that the agreement consistently referred to the prezygotes as the Yorks' "property" and that the contractual limitations on the Yorks' rights were only applicable if they no longer desired to initiate a pregnancy *(7)*. The property issues in this case are

distinctive because, unlike leftover blood or tissue, the primary intent of an IVF program is to return the prezygote to the couple via an IVF procedure. It is also clear that a variety of factors influence the determination of legal ownership of bodily tissues, including the particular terms of informed consent documents and other agreements.

It is increasingly clear that although donors of research specimens do have continuing rights regarding the use and secondary use of their samples, they do not own those samples or control their disposition. Interestingly, however, 2 recent court cases arising from disputes about researchers' use of samples have led to the destruction of patient specimens. The first case, *Baleno et al. v. Texas Department of State Health Services*, involved more than 5 million leftover dried blood-spot samples collected for newborn screening by the Texas Department of State Health Services (DSHS). According to a lawsuit filed by 5 plaintiffs, the state had been retaining these samples since 2002 for use in research. The plaintiffs claimed that defendants had violated plaintiffs' rights under the Fourth Amendment to the US Constitution to be free of unreasonable searches and seizures, because consent was not obtained for indefinite storage and undisclosed research, and the defendants had effectively made the samples their own property. Plaintiffs also claimed that the blood spots contained deeply private medical and genetic information, and defendants' retention and use of the samples violated plaintiffs' rights to privacy and liberty under the 14th Amendment. In response to the lawsuit, the Texas legislature enacted a law governing the collection of newborn blood samples. The law states that the Texas DSHS may retain the leftover material for research as long as parents are given an opportunity to "opt out" by filling out a "destruction directive." Shortly thereafter, the lawsuit was settled, and DSHS agreed to destroy the remaining specimens in their bank, although the 10–12 000 blood spots already released to some 35 research projects could continue to be used *(13)*. As a result of this case the American College of Medical Genetics released a "Position Statement on Importance of Residual Newborn Screening Dried Blood Spots." In this statement the college underscores the value of these specimens and urges states to save them with the utmost respect for privacy and confidentiality *(14)*.

In the second recent case, members of the Havasupai tribe in Arizona sued Arizona State University. The plaintiffs alleged that, in 1990, they had consented to use of their blood samples for diabetes research. However, their DNA was also being used for studies on schizophrenia, metabolic disorders, alcoholism, inbreeding, and population migration *(15)*. Plaintiffs alleged a host of claims, including breach of fiduciary duty, lack of informed consent, and conversion. Recently, the Arizona State University Board of Regents agreed to pay $700 000 to the tribe members, provide other forms of assistance to the impoverished Havasupai tribe, and return the blood samples *(16)*.

In both of these cases, the plaintiffs' chief complaint was that the researchers were not transparent about what they intended to do with these patient specimens and did not obtain proper consent. Because the cases were settled privately before court rulings, we do not know how a court would have ruled on the plaintiffs' allegations. It is possible, however, that with greater transparency these lawsuits would have been avoided.

Specimens Obtained Postmortem

A different question can arise when researchers use tissue obtained postmortem. That is, the question of whether family members have an ownership interest in the decedent's body. The Common Rule does not apply to tissues donated postmortem because that regulation applies only to the research participation of living individuals. The Uniform Anatomical Gift Act (UAGA) gives individuals the right to execute documents that provide for donation of their own organs for transplantation and or their bodies for use in the study of medicine *(17)*. The UAGA also provides that in the absence of such a document, a surviving spouse, or if there is no spouse, a hierarchical list of specific persons, can make the gift. The law also seeks to limit the liability of healthcare providers who act on good faith representations that a deceased patient indicated the intention to make an anatomical gift. All states have adopted some version of the UAGA. Nearly 40 states have enacted the most recent (2006) revisions or have legislation pending to do so.

Like the Common Rule, the UAGA does not address the question of ownership, and different courts have reached different conclusions on the question of whether a family member has an ownership interest in a relative's cadaver. For example, in *Mansaw v. Midwest Organ Bank*, a father claimed that his property rights were violated when a hospital harvested his son's organs without his consent *(18)*. The UAGA required only the consent of 1 parent, and the mother had agreed to the donation. The court concluded that the father and mother were coowners of their son's body. However, that property right was minimal, and the UAGA provision permitting a single parent (and just 1 of the coowners) to dispose of the "property" did not violate the father's rights. Alternatively, in *Adams v. King County*, under a different set of circumstances, the court came to a different conclusion on the property

issue *(19)*. In that case, the family of a 21-year old organ donor, Jesse Smith, sued the King County Coroner's office when the family learned that instead of being made available for transplantation, their son's brain, liver, and spleen had been removed and sent to the Stanley Medical Research Institute in Baltimore, Maryland. Smith's brain was used in a schizophrenia study. According to Smith's family, Smith had never expected his donated organs to be used for anything other than organ transplantation. The court permitted the family to assert a claim against the research institute based on the family's interest in proper treatment of the body and the mental suffering caused by misuse of the body. However, the court disagreed with *Mansaw v. Midwest Organ Bank*, and specifically stated that the family's interest was not a property interest.

Table 2. What laboratorians and researchers should do before conducting research on human tissue specimens.

1.	Understand and be in compliance with state and federal laws.
2.	List the components of a quality consent form [see Mello and Wolf *(20)* for different approaches to the informed consent].
3.	Inform research participants as much as possible about how their specimens will be used now and in the future.
4.	Have protocols and consent forms reviewed and approved by an IRB committee.
5.	If additional uses are identified, additional consent should be obtained, specimens should be deidentified, or an IRB waiver of consent should be obtained.

Future Considerations

The law regarding donor control over excised tissue samples is still evolving. The cases have generally rejected claims that patients and other human research participants retain property interests in excised tissue. There are ongoing efforts, however, to address questions about the donors' right to control the future use of that tissue. There is much discussion regarding how to obtain informed consent. Several different approaches have been proposed, including specific consent, tiered consent, general permission, and presumed consent *(20)*. Each approach has advantages and disadvantages. Researchers will need to decide which type of consent is best for their needs. The reader is directed to a recent discussion of these approaches by Mello and Wolf *(20)*.

Mello and Wolf suggest that 2 key questions remain: First, could a 1-time general (also called blanket or global) consent to all future research be used? It is not clear, however, if this type of consent would comport with HIPAA because HIPAA requires project-specific consent for use of the patient's protected health information in research, unless the IRB has made a specific determination to the contrary. Second, does removal of an individual's indentifying information from tissue samples really alleviate the risk and ethical obligations to that individual *(20)*? Just because samples are deidentified does not necessarily mean that the donor does not object to the proposed research.

State legislatures may also address these issues. California has new funding regulations that require researchers to honor the donor's requests regarding the types of regenerative manipulations that can be done to tissue—even if the tissue has been anonymized *(8)*. These regulations impose obligations greater than those imposed by the Common Rule, which does not require informed consent for research on anonymized samples.

Charo has argued that if one's body is property then uninvited removal of specimens or even the uninvited use of specimens could constitute theft or trespassing *(8)*. This uninvited removal or use could also be considered an injury and a "deprivation of liberty." In an interesting perspective piece, Hakimian and Korn *(18)* pointed out that if specimens are treated as property many new questions are raised. Is a person entitled to sell their specimens and organs? Do their specimens and organs become the property of their heirs and could they profit from their sale? Or, should bodies and tissues be viewed as part of a "common heritage of humanity, to be used for the collective good"? This approach would suggest that (assuming patient privacy is protected and their liberties are not deprived) that the public has a right to excised specimens. In fact, the American Medical Association and the HHS Advisory Committee on Organ Transplantation have considered a "presumed consent" system for organ donation *(19)*. This would assume that everyone can be considered an organ donor unless they "opt out" and explicitly express their option not to donate. A number of European countries already operate on this opt out system. These types of programs certainly operate on the premise of collective good and public rights. Other authors *(21)* have argued that biospecimen banks should be set up as charitable trust agreements, in which the donors transfers their property rights to the trust. In this model the general public acts as the beneficiary and hospitals act as stewards rather than brokers. Perhaps models such as these will minimize the legal battles over human tissue use in biomedical research.

Conclusions

The likelihood that a patient will make claims against researchers who are using tissues that would normally be discarded is probably low. However, as studies on genetic material become more prevalent, the frequency of lawsuits may increase. A list of what laboratorians and researchers should do before conducting research on human tissue specimens is given in Table 2. Researchers should strive for transparency in what they intend to do with donated human tissue and should protect the privacy of tissue donors. Informed consent should be obtained from individuals who provide tissue specimens whenever required. If new studies are undertaken on specimens, IRB approval should be obtained for each new study to ensure that the new research is covered by the intent of the original signed consent. Researchers should avoid using specimens for research that was not outlined in the consent form. In cases for which consent is not required, maintaining the privacy and confidentiality of the tissue donors is of the utmost importance. Finally, as the guardians of tissue obtained both prospectively for tissue repositories and "abandoned" samples obtained during treatment, clinical laboratorians and surgical pathologists should be cognizant of any local laws governing use of that tissue.

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References

1. Malomo AO, Idowu OE, Osuagwu FC. Lessons from history: human anatomy, from the origin to the renaissance. Int J Morphol 2006;24:99–104.
2. World Medical Association (WMA). WMA Declaration of Helsinki: ethical principles for medical research involving human subjects. http://www.wma.net/en/30publications/10policies/b3/index.html (Accessed August 2010).
3. US HHS. Code of Federal Regulations. Title 45: Public Welfare. Part 46: Protection of human subjects. http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.htm (Accessed August 2010).
4. US HHS. Code of Federal Regulations. Title 21. http:// www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRsearch.cfm?CFRPart=50 (Accessed August 2010).
5. Wendler D. One-time general consent for research on biological samples. Arch Int Med 2006; 166:1449–52.
6. Lazzarini Z, Case P, Thomas CJ. A walk in the park: a case study in research ethics. J Law Med Ethics 2009:93–103.
7. Andrews L. Who owns your body? A patient's perspective on Washington University v. Catalona. J Law Med Ethics 2006:398–407.
8. Charo RA. Body of research: ownership and use of human tissue. N Engl J Med 2006;355:1517–9.
9. Glantz L, Roche P, Annas GJ. Rules for donations to tissue banks—what next? N Engl J Med 2008; 358:298–303.
10. Marshall E. Genetic testing: families sue hospital, scientist for control of Canavan gene. Science 2000;290:1062.
11. Kaiser J. Biomedical research: court decides tissue samples belong to university, not patients. Science 2006;312:346.
12. Dry S. Who owns diagnostic tissue blocks? Lab Med 2009;40:69–73.
13. Doerr A. Newborn blood spot litigation: 70 days to destroy 5+ million samples. Genomics Law Report 2010. http://www.genomicslawreport.com/index.php/2010/02/02/newborn-blood-spot-litigation-70-days-to-destroy-5-million-samples/ (Accessed August 2010).
14. American College of Medical Genetics. Position statement on importance of residual newborn screening dried blood spots. http://www.acmg.net/StaticContent/NewsReleases/Blood_Spot_Position_Statement2009.pdf (Accessed August 2010).
15. Andrews L. The Havasupai case: research without patient consent. http://www.whoownsyourbody.org/havasupai.html (Accessed August 2010).
16. Harmon A. Indian tribe wins fight to limit research of its DNA. New York Times 2010 Apr 21. http://www.nytimes.com/2010/04/22/us/22dna.html (Accessed September 2010).
17. The National Conference of Commissioners of Uniform State Laws. Uniform anatomical gift act. http://www.anatomicalgiftact.org/DesktopDefault.aspx?tabindex=1&tabid=63 (Accessed August 2010).
18. Hakimian R, Korn D. Ownership and use of tissue specimens for research. JAMA 2004;292:2500–5.
19. Cooper S. Informed consent and malformed consent. American Thinker. http://www.americanthinker.com/2007/06/informed_consent_and_malformed.html (Accessed August 2010).
20. Mello MM, Wolf LE. The Havasupai Indian tribe case: lessons for research involving stored biologic samples. N Engl J Med 2010;363:204–7.
21. Winickoff DE, Winikoff RN. The charitable trust as a model for genomic biobanks. N Engl J Med 2003;349:1180–4.