SB585 MDA LOS (2).pdf
Uploaded by: Kevin Atticks
Position: FAV

Maryland
Department of Agriculture
Office of the Secretary

Wes Moore, Governor
Aruna Miller, Lt. Governor
Kevin Atticks, Secretary
Steven A. Connelly, Deputy Secretary

Agriculture | Maryland's Leading Industry
The Wayne A. Cawley, Jr. Building
50 Harry S Truman Parkway
Annapolis, Maryland 21401
mda.maryland.gov
410.841.5885 Baltimore/Washington
410.841.5846 Fax

Maryland Department of Agriculture
Legislative Comment
Date: February 17th, 2026

BILL NUMBER: SB 585
BILL TITLE: Human-Relevant Research Fund - Collection of Contributions - Responsible Entity
MDA POSITION: **SUPPORT**

The Maryland Department of Agriculture (MDA) respectfully submits this letter in support of *Senate Bill 585 - Human-Related Research Fund - Collection of Contributions - Responsible Entity.*

This bill redirects the authority from the Maryland Department of Health to the Maryland Department of Agriculture, to collect the contributions from research facilities that qualify under an Animal and Plant Health Inspection Service Form 7023, and grants authority to the department to file civil penalties for facilities that fail to pay the contribution. These funds are redirected to the Maryland Department of Commerce to support the Human-Relevant Research Fund, and support to develop human-relevant alternatives to using nonhuman animals in medical and product testing.

Redirecting authority to the Maryland Department of Agriculture reduces administrative burden for the State by leveraging existing relationships between MDA and the research facilities in Maryland. For these reasons, MDA supports SB 585 and respectfully requests a favorable report. MDA appreciates the consideration of the above information in the Committee's deliberations.

Contact: Harrison Palmer, Chief of Staff
harrisonb.palmer@maryland.gov | (410) 980-9887

SB585 Industry Support Letter FAV.pdf
Uploaded by: Michelle Shaw
Position: FAV

The Honorable Pamela Beidle
Chair, Senate Finance Committee
The Honorable Antonio Hayes
Vice-Chair, Senate Finance Committee

February 18, 2026

Re: Support for SB 585, Human-Relevant Research Fund-Collection of Contributions-Responsible Entity

Dear Chair Beidle, Vice-chair Hayes and honorable members of the Senate Finance Committee:

On behalf of the undersigned companies, we respectfully submit this letter in strong support of SB 585 and urge a favorable report.

In 2023, the General Assembly enacted HB 626/SB 560, establishing the Human-Relevant Research Fund to provide dedicated support for scientific research grounded in human biology. That landmark legislation positioned Maryland as a national leader in advancing modern biotechnology and promoting innovative, human-based research approaches that drive medical and scientific progress.

SB 585 makes a straightforward administrative update to ensure the continued success of that initiative. Specifically, the bill transfers responsibility for collecting the Fund's revenues from the Maryland Department of Health to the Maryland Department of Agriculture. This change was requested by the Maryland Department of Health, and we appreciate Secretary Atticks' willingness to have MDA assume this responsibility to support efficient and effective implementation.

This technical correction will help ensure the Human-Relevant Research Fund operates as intended and continues to strengthen Maryland's position at the forefront of cutting-edge biomedical innovation.

For these reasons, we respectfully urge a favorable report on SB 585.

Sincerely,

Keith Murphy, Exec Chairman
VivoSim Labs
CEO, **Viscient Biosciences**

Amanda Ulrey, President
Institute for In Vitro Sciences, Inc.

James Hickman, Chief Scientist
Hesperos, Inc.

Jeff Moses, Chief Compliance Officer & Director
GATC Health Corp.

Lorna Ewart, Chief Scientific Officer
Emulate, Inc.

John Kamis, Founding Business Lead
Axiom Bio

Ellen L. Berg, Chief Scientific Officer
Alto Predict

Case Lorance, President & Founder
NEXI Biotech

SB585_Humane World_FAV.pdf
Uploaded by: Stacey Volodin
Position: FAV

Humane World for Animals

Formerly called the Humane Society of the United States

1255 23rd St. NW, Suite 450
Washington, DC 20037
202-452-1100
humaneworld.org

February 27, 2026

Finance Committee
SB 585 - Human-Relevant Research Fund-Collection of Contributions-Responsible Entity
FAVORABLE

Chair Beidle, Vice-Chair Hayes, and members of the Senate Finance Committee,

I appreciate the opportunity to submit this written testimony on behalf of Humane World for Animals, formerly called the Humane Society of the United States, and our Maryland members and supporters urging a favorable report of SB 585. Humane World for Animals was a lead advocate for the 2023 legislation (HB 626/ SB 560) that created the Human-Relevant Research Fund to create dedicated funding for scientific research that is based on human biology. The passage of this law set Maryland apart as a leader in prioritizing development and use of modern biotechnology.

SB 585 is a simple fix to that 2023 law that changes the agency responsible for collecting the funds from the Maryland Department of Health (MDH) to the Maryland Department of Agriculture (MDA). This legislative change was requested by MDH and we appreciate Secretary Atticks' willingness to have MDA take on this additional responsibility.

The 2023 law had strong bipartisan support and received favorable testimony from leading biotechnology companies developing and using non-animal approaches in Maryland and across the country including Emulate, Organovo Inc., MatTek Life Sciences, Institute for In Vitro Sciences, Inc., Propagenix Inc., and Hesperos, Inc.

Humane World for Animals urges a favorable report on SB 585 to ensure the successful implementation of the Human-Relevant Research Fund.

Thank you,

Stacey Volodin
Maryland State Director
Humane World for Animals
Svolodin@humaneworld.org

TEDCO Letter of Support SB585 HRRF - 02-27-26 (fin
Uploaded by: Troy LeMaile-Stovall
Position: FAV

Senate Bill 585 – Human-Relevant Research Fund -
Collection of Contributions – Responsible Entity

Senate Finance Committee
Support

February 27, 2026

The Maryland Technology Development Corporation (TEDCO) respectfully submits this letter of support for Senate Bill 585. TEDCO is a public instrumentality of the State of Maryland created to advance technology-based economic development, innovation, and entrepreneurship. Serving Maryland's innovation ecosystem, TEDCO discovers, invests in, and helps build Maryland-based technology companies and is dedicated to economic growth through the fostering of an inclusive entrepreneurial and innovation ecosystem.

Following the 2023 Legislative Session, CH448 (HB626/SB560) was signed into law, establishing the "Human-Relevant Research Fund" (HRRF) in TEDCO. The bill established an annual fee on all Maryland research facilities located in the State and required to submit an Animal and Plant Health Inspection Service (APHIS) Form 7023, to be collected by the Maryland Department of Health (MDH) based on the number of animals used, with payments ranging from $5,000 to $75,000. Collected funds are transferred to TEDCO and are to be used to establish a program that promotes research focused on developing alternatives to animal testing.

As we understand, the Maryland Department of Health (MDH) encountered initial challenges in the collection of the fees, given that APHIS is a form submitted to the U.S. Department of Agriculture and not a form that the Department of Health collects. As such, the Department of Health created a list of all Maryland entities that submitted Form 7023 to the USDA that is publicly available on their website. In early January, MDH sent letters, through certified mail, to all entities that submitted a Form 7023 that were listed on the USDA Annual Report Search page notifying them of the required fee. In response, approximately 1/3 of the entities noted that they are associated with the federal government and are exempt from the requirement. Several other facilities have responded that their facility does not conduct animal research but rather is a veterinary program that provides veterinary care and supports the local shelter with spay and neuter services and as such, not subject to the fee. It is our understanding that $185,000 in fees were collected in total rather than the initially anticipated amount of $915,000.

In November 2025, the funds were transferred to TEDCO, and TEDCO is in the process of contracting a Scientific Review Board and will begin promulgation of Regulations as required by

statute. By required by statute, the Scientific Review Board must review and approve the draft regulations prior to submission.

TEDCO anticipates the first HHR program Request for Proposals (RFA) to be issued around the Summer 2026.

Senate Bill 585 requires research facilities that are located in the State to submit an Animal and Plant Health Inspection Service Form 7023 to pay contributions for the Human-Relevant Research Fund to the Department of Agriculture, rather than the Maryland Department of Health. To the extent the change in fee collections from the Maryland Department of Heath to the Maryland Department of Agriculture results in improved identification of related research facilities and collection of fees, this change could result in more effective and targeted fee collection, potentially increasing the amount of available funds and programmatic awards.

For these reasons, TEDCO supports SB 585 and urges a favorable report.

David Prentice-Alternatives to Using Aborted Fetal

Uploaded by: Laura Bogley

Position: UNF

ALTERNATIVES TO USING ABORTED FETAL TISSUE FOR RESEARCH

 Tara Sander Lee, PhD  David A. Prentice, PhD

May 3, 2022

Issues: Research Ethics Stem Cell Research

Tags: Fetal Tissue Research Non-Embryonic Stem Cell Research Animal Research

Previous Page

EDITORS NOTE

This resource from CBHD is part of a larger research project entitled, *Fetal Tissue Research and Christian Bioethics: A Review of the Scientific Developments, Policy Landscape, and Ethical Considerations (2022 Edition)*.

Introduction

Many ethical human tissue alternatives that do not rely on elective abortions are available to researchers. A recent review in *Issues in Law and Medicine* highlights these alternatives showing that in scientific value, they far outweigh using aborted fetal tissue in research.[1] The alternatives discussed in this article include adult stem cells, induced pluripotent stem cells (iPSCs), humanized mice, and tissue donation from medical procedures or post-mortem individuals who die of natural causes. None of these pose the ethical concerns presented by reliance on tissue harvested from elective abortions. These alternatives exist now and are currently being used worldwide for research and clinical studies. For example, researchers have successfully used these ethical alternatives to study neurodevelopmental disorders,[2] immune response to pathogens,[3] and stroke.[4]

Numerous animal models serve as alternatives to using fetal tissue for research purposes. For example, both vertebrate (e.g., non-human primates, rodents, frogs, fish, etc.) and invertebrate (e.g., yeast, bacteria, worms, flies, etc.) animals are used widely in academic medicine to study disease. For the purposes of this article we will limit our examination to human tissue specimens that can be obtained without ethical controversy and have been used to good effect in experiments simila
fetal tissue.

Adult Stem Cells

Stem cells are cells with differentiation potential: they can give rise to many different types of specialized cells in the body. Some stem cells have more potential than others and can develop into a greater number of specialized cells. For example, epiblast cells from the early human embryo are pluripotent with great potential to give rise to all cell types present in the fully developed human body. Stem cells in the developing fetus are more tissue-specific than embryo epiblast cells, with a varying degree of differentiation depending on the tissue type and fetal age.

Adult stem cells are found in late-development fetal tissues, perinatal tissues (e.g., umbilical cord blood, amniotic fluid, or placenta) and postnatal tissues (e.g., peripheral blood, bone marrow, skin, fat, heart, liver, etc.). Present in virtually every tissue of the postnatal human body, adult stem cells are important for tissue maintenance, regeneration, and repair. They are also unique. Unlike early embryonic or fetal stem cells, adult stem cells can be either unipotent (producing only one type of differentiated cell) or multipotent (producing many different types of cells in a given tissue). This unique ability to self-renew (replicate themselves), while simultaneously dividing to produce other mature, tissue-specific cells, is the reason adult stem cells have become the standard of care in clinical medicine to treat various blood disorders and cancers. Furthermore, they can be obtained ethically from living, consenting adults, without deliberate harm or risk to the individual.

Adult stem cells from bone marrow and cord blood have saved the lives of over 1.5 million people worldwide.[5] Because of these features, adult stem cells are an ideal candidate for several therapeutic and research applications. For example, bone marrow contains multipotent hematopoietic stem cells that give rise to the different types of blood cells (i.e., red blood cells, white blood cells, platelets, etc.) in the human body. Bone marrow transplant procedures rely on "healthy" adult stem cells to replace "diseased" blood cells and treat various disorders and cancers, including treating affected individuals *in utero*.[6] In another example, cord blood from labor and delivery is a highly enriched source of adult stem cells and an important treatment option for a number of diseases, including blood disorders, diabetes, and traumatic brain injury.[7]

Mesenchymal stem cells (multipotent stromal cells, most often isolated from bone marrow, umbilical cord, and adipose [fat] tissue) are another type of adult stem cell that provides an important alternative to aborted fetal tissue in research. They are fibroblast-like, with remarkable plasticity, and have been shown to differentiate into a variety of different cell types of mesodermal (bone, cartilage, muscle), neuro-ectodermal (neurons, astrocytes, and oligodendrocytes), or endodermal (hepatocytes) origin. For this reason, mesenchymal stem cells have shown incredible potential for research and clinical applications in adult stem cell-based therapy of immune-mediated diseases, including graft-versus-host disease (GVHD), inflammatory bowel disease, liver disorders, cardiac diseases, and more.[8]

Stem cells are not inherently controversial in and of themselves; it is how the cells are obtained that determines whether their use is ethical or not. Therefore, adult stem cells (or cells that are more differentiated than embryonic stem cells, but less differentiated than adult somatic cells) obtained from an aborted fetus or from perinatal tissue obtained after an abortion are not a suitable ethical alternative to fetal tissue.

Human Induced Pluripotent Stem Cells (hiPS

Human induced pluripotent stem cells (hiPSCs) are adult somatic cells (i.e., any cell other than reproductive cells, such as human skin cells) that have been genetically reprogrammed into pluripotent stem cells with basic biologic properties similar to human embryonic stem cells (hESCs).[9] Human iPSCs are morally superior to hESCs and aborted fetal-derived tissues and cell lines because their generation does not rely on the deliberate destruction of human embryos or fetuses. Furthermore, they can be generated from nearly any adult somatic cell type and differentiate into various types of cells. There is the real potential for use of hiPSCs in cell-based therapies, disease modeling, and regenerative medicine for a number of diseases, including macular degeneration, ischemic heart disease, diabetes, and spinal cord injury.[10] Human iPSC disease models can also be developed by reprogramming somatic cells from a patient with disease (e.g., skin cells from a Parkinson's patient), a tool researchers can use for understanding basic mechanisms of disease, performing experiments that aim to correct the disease via gene therapy, as well as high-throughput screening of compounds for drug discovery.[11] Induced PSC are a good alternative to using aborted fetal tissue for research and possibly even clinical applications, considering that previous attempts using aborted fetal tissue transplantation have failed to alleviate Parkinson's symptoms. It is important to note that hiPSCs are ethical so long as they are not made using cells isolated from aborted embryos or fetuses.

Organoids

Organoids are another useful alternative that can perform the functions of embryonic- and fetal-derived tissues. Organoids are three-dimensional cellular clusters that have been demonstrated to model normal developmental progression as well as many observed functions for a growing number of human organs and tissues, including brain, liver, pancreas, intestine, stomach, lung, kidney, and eye.[12] These unique cellular constructs can be generated from hiPSCs or adult stem cells derived from ethically donated cells and tissues. Organoid constructs have proven successful in modeling complex mechanisms, disease, and early development,[13] including hepatic (liver) development and nephrogenesis, neurodevelopmental (brain) disorders, retinal (eye) development, and cancer.[14] In one example, aggregation of hepatocytes (liver cells) into three-dimensional organoids can potentially serve as a model for liver function, as bioartificial livers for toxicity testing and possibly transplantation for liver regeneration. Hepatocytes can be produced in culture from umbilical cord blood stem cells.[15] Another example is generation of kidney organoids that contain kidney-specific cell types and structures, similar to that observed in adult kidneys.[16] Other functional human organoid examples include islet-like organoids that restore glucose homeostasis in diabetic mice,[17] hormone-producing thyroid organoids,[18] and tear duct organoids that produce tears.[19]

Cerebral (brain) organoids have been used to study Zika viral infection, test potential treatments and preventative measures, and show cellular complexity of the human cortex, including modeling of normal development.[20] More recently, organoids of the lung, liver, kidneys, and gut have been generated to study how the SARS-CoV-2 virus that causes COVID-19 infects host cells, replicates, and contributes to disease.[21]

Compared to aborted fetal organs (i.e., livers, brains, kidneys, lungs, eyes) used in research, organoids offer a direct alternative for basic observational science experiments, human development studies, testing of pharmaceuticals, and potential clinical applications in regenerative medicine. Furthermore, organoids are ethical so long as they are *not* made using embryonic stem cells,
deliberate destruction of early human embryos.

Human Immune System (HIS) Mice

Human Immune System (HIS) mice, or "humanized" mice, are generated by implanting human tissues and/or cells into an immune-compromised mouse to study infection, disease, and immune response, and to test therapeutics. Humanized mice are used to model HIV infection and test anti-HIV-1 drugs. The "BLT mouse," perhaps the most highlighted model for HIV research, is generated using fetal bone marrow/liver/thymus tissues from second trimester aborted fetuses. However, ethical alternative models exist using postnatal tissues and stem cells, with no need for fresh fetal tissue from aborted fetuses.[22]

There are several different types of HIS mouse models applicable for various studies and available commercially.[23] For example, the "hu-PBMC" or "hu-PBL" mouse uses peripheral blood mononuclear cells (PBMCs) collected from living adults. Another model is called the human hematopoetic stem cell or "hu-HSC" mouse, generated using $CD34^+$ stem cells obtained from adult bone marrow, umbilical cord blood, or peripheral blood. Genetically engineered NSG-SGM3 mice engrafted with $CD34^+$ stem cells from cord blood are also available.[24] More recently, the "NeoThy" humanized mice can be generated using surplus human thymus tissue from newborn babies (neonatal thymus) obtained during surgical procedures to repair congenital heart defects, combined with HSCs from cord blood.[25] Neonatal thymus tissue is abundant and 50 times more efficient than aborted fetal tissue for generating the same number of mouse models—an important benefit for reducing experimental variability.[26]

In general, there are limitations to all HIS mouse models, whether made from fetal tissue or not. However, humanized mice generated with aborted fetal tissue (i.e., BLT mice) tend to be more technically difficult, costly, and time consuming to make compared to other models.[27] There are several technical advantages to using alternative models (e.g., hu-HSC mice). For example, they are easier to prepare at lower cost and more animals can be generated per cohort. Some studies have also observed negligible graft-versus-host disease, longer life span, and greater longevity with chronic HIV infection.[28] HSCs from umbilical cord blood has also been reported as the better scientific and ethical source for optimal human cell engraftment compared to aborted fetal liver tissue.[29] Investigators recognize that HSCs from fetal liver can easily be replaced with HSCs from umbilical cord blood when generating HIS mice.

Post-Mortem Tissue Donation

Postmortem tissues from prenatal or postnatal deaths that occur naturally and do not involve deliberate destruction of human life are an ethical alternative to fetal tissue obtained from abortion. Furthermore, prenatal and neonatal tissues from natural death (i.e., ectopic pregnancy, miscarriage or spontaneous abortion, or stillbirth) are more widely accepted and approved for use in research, with no apparent state statutory restrictions, unlike fetal tissue obtained from elective abortions.[30] Historically, human tissues from miscarriages and full-term stillborn infants have been collected, processed, and used for various research studies dating back to the 19^{th} century.[31] These early studies examined the feasibility of using miscarriage tissue to study cell viability, disease mechanisms, and even transplantation. And while not always successful, they proved that fetal tissues could be obtained from miscarriages and cell lines could be established for experimentation. Some studies with miscarriage tissue even showed comparable results to fetal tissues from surgical abortions.[32] Later studies examining a larger number of miscarriages and ectopic pregnancies found that 63% of identifiable embryos/fetuses
viable cells and tissues from various organs (i.e., liver, thymus, splee

spinal cord, kidneys, lungs, and skin).[33] Based on this percentage, tens of thousands of miscarriages with quality tissue could be available per year in the United States.

Miscarriage tissue has been examined for suitability for transplantation studies. A 1995 *JAMA* article reported the examination of over 1,000 spontaneously aborted embryos (miscarriages) and ectopic pregnancies and found that a limited amount of miscarriage tissue would be suitable for clinical transplants.[34] Other investigators refuted these findings and reported that second-trimester miscarriages were in fact suitable for transplantation when collected and preserved properly,[35] resulting in the establishment of a small cell bank to provide hematopoietic stem cells from second-trimester miscarriages for these studies.[36] Nevertheless, these studies provide further evidence that fetal tissue from miscarriage tissue is accessible and obtainable.

Additional reports using miscarriage tissue have demonstrated that researchers can transplant fetal bone marrow HSCs into sheep,[37] cerebrum (also known as telecephalon) can be isolated from fetal brain to detect astroglia cells,[38] and human midbrain-derived neural progenitors (hmNPCs) can be generated from fetal central nervous system tissue.[39] Finally, two different groups have isolated human neural stem cells (hNSCs) from miscarriage tissue; one of these studies even describes using these cells as a test of safety for cell therapy in a phase I trial which could then lead to later-phase clinical trials for the treatment of patients with ALS.[40]

There is some concern over genetic abnormalities as the cause of miscarriage, leading certain researchers to avoid miscarriage tissue altogether. However, the majority of genetic aneuploidies (abnormal chromosomal number) occur in the first trimester. Furthermore, the CDC reported in 2014 that only 10% of fetal deaths in the second trimester at greater than 20 weeks' gestation are attributed to congenital malformations and chromosomal abnormalities.[41] Most fetal deaths were found to be a result of physical or environmental factors rather than genetic issues, including such factors as placenta or cord complications, maternal complications, or conditions related to pregnancy.[42] In fact, the largest NIH-funded fetal tissue repository in the United States, The Birth Defect Laboratory at the University of Washington, considers tissue from both elective abortions and natural miscarriage as acceptable tissues for their bank.[43]

Finally, postnatal cadavers from deaths due to natural and unexpected causes are suitable for several research applications. In a retrospective review, Hodgetts et al. found that stem cells could be isolated after death from neonates to adults 95 years of age from various organs including eye, brain, muscle, arteries, and pancreatic islet.[44] There are other examples of postnatal cadaveric specimens collected and analyzed together with fetal tissue from elective abortions, particularly in large developmental genomic and proteomic studies.[45] For example, in 2018, Li et al. created a genomic dataset from tissues and cells collected from 60 de-identified postmortem brains ranging from five post-conception weeks (PCW) to 64 postnatal years (PY) in which 50% were postnatal cadaveric tissue collected from natural deaths. They concluded that their genomic dataset allowed them to gain "insights into human development and disease" and "insights into neurodevelopment and the genomic basis of neuropsychiatric risks."[46] The ethically alternative cadaveric tissue of infants, children, and adults that died of natural causes was considered equivalent and matched to the unethically obtained aborted tissues, thus demonstrating that post-mortem tissues from individuals who die of natural causes are a suitable and good alternative to aborted fetal tissue.

Tissue Donation from Medical Procedures

Researchers have access to ethical human tissues obtained from living, consenting individuals after medical procedures, often available through tissue banks at their own academic institution. Such human tissue specimens from medical procedures can be stored in a secure storage facility that collects, processes, and distributes discarded human tissue samples donated by patients from labor and delivery procedures (such as placenta, cord blood, and umbilical cord), as well as routine surgery and biopsy procedures that require the resection, sampling, or removal of tissues as a part of the surgical method (i.e., cardiac, neonatal thymus, abdominal artery, bladder, adipose, tonsil, liver, and tumor). Unused discards from explanted organs from organ transplant procedures are also an important source of human tissue for research.

Tissue banks are known to manage patient consent and perform collection of blood products and otherwise discarded tissue from surgeries, including bone marrow, tumor, and control tissue. Tissues may be available to researchers at no charge or, at most, reduced cost to cover storage fees. Alternatively, researchers may choose to work closely with clinical departments (i.e., surgery, pathology) at their own institution in order to establish project-specific patient consent, tissue collection, and processing procedures with proper institutional review board approval. This option is important if unique human tissue specimens are desired and not available through a repository or tissue bank.

National tissue repositories are another option to researchers. The National Marrow Donor Program (NMDP)/Be the Match is the largest repository for cord blood available to clinicians and scientists worldwide for transplantation, cellular therapy, and research.[47] The NMDP-Be the Match repository also processes and stores tissue, cells, and DNA samples from donors and recipients who are in the process of providing or receiving stem cells for transplant, of which some are available to researchers for experimentation.[48] In another example, the NIH-funded NeuroBioBank (NBB) is a national resource for investigators utilizing human post-mortem brain tissue and related biospecimens for their research to understand conditions of the nervous system.[49] The NBB also collects and stores fetal brain tissue, but a researcher can avoid these tissues and specifically request ethically obtained alternatives, such as brain tissue collected post-mortem from adults with Parkinson's Disease or major depressive disorder, as well as age-matched controls.

Commercially available cell repositories that clearly label the source of the donated cells or tissue are another option for researchers, although extra steps may need to be taken by the researcher to ensure the human-derived material indeed comes from an ethical source. Examples include American Type Culture Collection (ATCC)[50] and Coriell Institute for Medical Research (Coriell Institute) with more than 11,000 unique samples donated by different individuals for the production of cell lines and genomic DNA. [51] As mentioned previously, these vendors also provide fetal-derived cell lines from elective abortion (i.e., HEK293), but with careful analysis of the product sheet description, cell lines derived from aborted fetal tissue can be avoided. Special attention must be made to donor age at time of sampling or collection. Any age with the term "fetus" or Fetal Week (FW), without mention of a natural death (i.e., miscarriage, stillborn, neonatal death), is questionable. Databases like Cellosaurus (a knowledge resource on cell lines) and technical support staff should also be queried for additional product information when needed.[52]

Conclusion

Several ethical alternatives to abortion-derived fetal tissue are availa
and even treating, some of the most complex diseases and disorders.

stem cells, cord blood, hiPSCs, organoids, and humanized mice generated with ethical sources. The majority of scientists are focusing on these ethical tissue sources and models that work just as well as, if not better than, aborted fetal tissue. And in cases where alternatives to fetal tissue cannot be used, fetal tissue obtained post-mortem from natural deaths is a useful and ethical solution.

After over 100 years of research, no therapies have been discovered or developed that *require* aborted fetal tissue.[53] Ample scientific evidence points to numerous valuable ethical alternatives that are available, successful, and even more advanced. The utilization of these current ethical alternatives, active avoidance of aborted fetal tissue, and development of new and even better alternatives will safeguard against controversies that surround the exploitation of aborted fetuses for experimentation and clinical application.

References

[1] Tara Sander Lee et al., "Human Fetal Tissue from Elective Abortions in Research and Medicine: Science, Ethics, and the Law," *Issues in Law and Medicine* 35, no. 1 (2020): 3–61.

[2] Madeline A. Lancaster et al., "Cerebral Organoids Model Human Brain Development and Microcephaly, *Nature* 501, no. 7467 (2013): 373–79, https://doi.org/10.1038/nature12517; Daniela Virgintino et al., "Astroglia-Microvessel Relationship in the Developing Human Telencephalon, *The International Journal of Developmental Biology* 42, no. 8 (1998): 1165–68, http://www.ijdb.ehu.es/web/paper/9879715/astroglia-microvessel-relationship-in-the-developing-human-telencephalon#; Abed AlFatah Mansour et al., "An In Vivo Model of Functional and Vascularized Human Brain Organoids," *Nature Biotechnology* 36, no. 5 (2018): 432–41, https://doi.org/10.1038/nbt.4127; Missy T. Pham et al., "Generation of Human Vascularized Brain Organoids," *Neuroreport* 29, no. 7 (2018): 588–93, https://doi.org/10.1097/wnr.0000000000001014; Yangfei Xiang et al., "Fusion of Regionally Specified hPSC-Derived Organoids Models Human Brain Development and Interneuron Migration," *Cell Stem Cell* 21, no. 3 (2017): 383–98, https://doi.org/10.1016/j.stem.2017.07.007; Chongyuan Luo et al., "Cerebral Organoids Recapitulate Epigenomic Signatures of the Human Fetal Brain," *Cell Reports* 17, no. 12 (2016): 3369–84, https://doi.org/10.1016/j.celrep.2016.12.001; Vira lefremova et al., "An Organoid-Based Model of Cortical Development Identifies Non-Cell-Autonomous Defects in Wnt Signaling Contributing to Miller-Dieker Syndrome," *Cell Reports* 19, no. 1 (2017): 50–59, https://doi.org/10.1016/j.celrep.2017.03.047; Rômulo Sperduto Dezonne et al., "Derivation of Functional Human Astrocytes from Cerebral Organoids," *Science Reports* 7, no. 45091 (2017): https://doi.org/10.1038/srep45091; Marina Bershteyn et al., "Human iPSC-Derived Cerebral Organoids Model Cellular Features of Lissencephaly and Reveal Prolonged Mitosis of Outer Radial Glia," *Cell Stem Cell* 20, no. 4 (2017): 435–49, https://doi.org/10.1016/j.stem.2016.12.007.

[3] Matthew E. Brown et al., "A Humanized Mouse Model Generated Using Surplus Neonatal Tissue," *Stem Cell Reports* 10, no. 4 (2018):, 1175–83, https://doi.org/10.1016/j.stemcr.2018.02.011; Ryoji Ito, Takeshi Takahashi, and Mamoru Ito, "Humanized Mouse Models: Application to Human Diseases," *Journal of Cellular Physiology* 233, no. 5 (2018): 3723–28, https://doi.org/10.1002/jcp.26045; Patricia P. Garcez et al., "Zika Virus Impairs Growth in Human Neurospheres and Brain Organoids," *Science* 352, no. 6287 (2016): https://doi.org/10.1126/science.aaf6116; Momoko Watanabe et al., "Self-Organized Cerebral Organoids with Human-Specific Features Predict Effective Infection," *Cell Reports* 21, no. 2 (2017): 517–32, https://doi.org/10.1

et al., "High-Content Screening in hPSC-Neural Progenitors Identifies Drug Candidates That Inhibit Zika Virus Infection in Fetal-Like Organoids and Adult Brain," *Cell Stem Cell* 21, no. 2 (2017): 274–83, https://doi.org/10.1016/j.stem.2017.06.017.

[4] Gary K. Steinberg et al., "Clinical Outcomes of Transplanted Modified Bone Marrow-Derived Mesenchymal Stem Cells in Stroke: A Phase 1/2a Study," *Stroke* 47, no. 7 (2016): 1817–24, https://doi.org/10.1161/strokeaha.116.012995; Daniel T. Laskowitz et al., "Allogeneic Umbilical Cord Blood Infusion for Adults with Ischemic Stroke: Clinical Outcomes from a Phase I Safety Study," *Stem Cells Translational Medicine* 7, no. 7 (2018): 521–29, https://doi.org/10.1002/sctm.18-0008.

[5] Dietger Niederwieser et al., "One and Half Million Hematopoietic Stem Cell Transplants (HSCT): Dissemination, Trends and Potential to Improve Activity by Telemedicine from the Worldwide Network for Blood and Marrow Transplantation (WBMT)," *Blood* 134, suppl. 1 (2019): 2035, https://doi.org/10.1182/blood-2019-125232; Alois Gratwohl et al., "One Million Haemopoietic Stem-Cell Transplants: A Retrospective Observational Study," *Lancet Haematology* 2, no. 3 (2015): 91, https://doi.org/10.1016/s2352-3026(15)00028-9; "Fact Sheet: Adult Stem Cell Research and Transplants," Charlotte Lozier Institute, November 21, 2017, https://lozierinstitute.org/fact-sheet-adult-stem-cell-research-transplants/.

[6] David A. Prentice, "Adult Stem Cells: Successful Standard for Regenerative Medicine," *Circulation Research* 124 (2019): 837–39, https://dx.doi.org/10.1161/CIRCRESAHA.118.313664; Niederwieser et al., "One and Half Million Hematopoietic Stem Cell Transplants (HSCT)," 2035; Gratwohl et al., "One Million Haemopoietic Stem-Cell Transplants"; Jennifer Couzin-Frankel, "The Savior Cells?" *Science* 352, no. 6283 (2016): 284, https://doi.org/10.1126/science.352.6283.284; Dario O. Fauza, "Transamniotic Stem Cell Therapy: A Novel Strategy for the Prenatal Management of Congenital Anomalies," *Pediatric Research* 83, no. 1–2 (2018): 241–48, https://doi.org/10.1038/pr.2017.228; Justin D. Klein et al., "Amniotic Mesenchymal Stem Cells Enhance Normal Fetal Wound Healing," *Stem Cells and Development* 20, no. 6 (2011): 969–76, https://doi.org/10.1089/scd.2010.0379; Diana Farmer, "Placental Stem Cells: The Promise of Curing Diseases before Birth, *Placenta* 59 (2017): 113–15, https://doi.org/10.1016/j.placenta.2017.04.022; Julia Di Bernardo et al., "Paracrine Regulation of Fetal Lung Morphogenesis Using Human Placenta-Derived Mesenchymal Stromal Cells, *The Journal of Surgical Research* 190, no. 1 (2014): 255–63, https://doi.org/10.1016/j.jss.2014.04.013.

[7] "National Cord Blood Program," New York Blood Center, accessed January 21, 2022, http://www.nationalcordbloodprogram.org/qa/what_is_treated.html.

[8] Rupal P. Soder et al., "A Phase I Study to Evaluate Two Doses of Wharton's Jelly-Derived Mesenchymal Stromal Cells for the Treatment of De Novo High-Risk or Steroid-Refractory Acute Graft Versus Host Disease," *Stem Cell Reviews and Reports* 16, no. 5 (2020): 979–91, https://doi.org/10.1007/s12015-020-10015-8; Vladislav Volarevic et al., "Ethical and Safety Issues of Stem Cell-Based Therapy," *International Journal of Medical Sci*ences 15, no. 1 (2018): 36–45, https://doi.org/10.7150/ijms.21666.

[9] Jiho Choi et al., "A Comparison of Genetically Matched Cell Lines Reveals the Equivalence of Human iPSCs and ESCs," *Nature Biotechnology* 33, no. 11 (2015): 1173, https://doi.org/10.1038/nbt.3388; Kazutoshi Takahashi et al., "Induction of Pluripotent Stem Cells from Adult Human Fibroblasts by Defined Factors," *Cell* 131, no. 5 (2007): 861–72, https://doi.org/10.1

al., “Induced Pluripotent Stem Cell Lines Derived from Human Somatic Cells,” *Science* 318, no. 5858 (2007): 1917–20, https://doi.org/10.1126/science.1151526.

[10] Kazutoshi Takahashi and Shinya Yamanaka, “A Decade of Transcription Factor-Mediated Reprogramming to Pluripotency,” *Nature Reviews Molecular Cell Biology* 17, no. 3(2016): 183–93, https://doi.org/10.1038/nrm.2016.8; Frank Soldner and Rudolf Jaenisch, “Stem Cells, Genome Editing and the Path to Translational Medicine,” *Cell* 175, no. 3 (2018): 615–32, https://doi.org/10.1016/j.cell.2018.09.010.

[11] Soldner and Jaenisch, “Stem Cells, Genome Editing and the Path to Translational Medicine.”

[12] Saba Habibollah, Nico Forraz, and Colin P. McGuckin, “Application of Umbilical Cord and Cord Blood as Alternative Modes for Liver Therapy,” in *Regenerative Medicine: Using Non-Fetal Sources of Stem Cells*, ed. Niranjan Bhattacharya and Phillip George Stubblefield (London: Springer-Verlag, 2015), 223–41, https://doi.org/10.1007/978-1-4471-6542-2_22; Aliya Fatehullah, Si Hui Tan, and Nick Barker, “Organoids As an *In Vitro* Model of Human Development and Disease,” *Nature Cell Biology* 18, no. 3 (2016): 246–54, https://doi.org/10.1038/ncb3312. For review: Kai Kretzschmar and Hans Clevers, “Organoids: Modeling Development and the Stem Cell Niche in a Dish,” *Developmental Cell* 38, no. 6 (2016): 590–600, https://doi.org/10.1016/j.devcel.2016.08.014.

[13] Takanori Takebe and James M. Wells, “Organoids by Design,” *Science* 364, no. 6444 (2019): 956–59, https://doi.org/10.1126/science.aaw7567.

[14] Beatrice Xuan Ho, Nicole Min Qian Pek, and Boon-Seng Soh, “Disease Modeling Using 3D Organoids Derived from Human Induced Pluripotent Stem Cells,” *International Journal of Molecular Science* 19, no. 4 (2018): 936, https://doi.org/10.3390/ijms19040936; Hans Clevers, “Modeling Development and Disease with Organoids,” *Cell* 165, no. 7 (2016): 1586–97, https://doi.org/10.1016/j.cell.2016.05.082.

[15] Habibollah, Forraz, and McGuckin, “Application of Umbilical Cord and Cord Blood as Alternative Modes for Liver Therapy.”

[16] Minoru Takasato et al., “Kidney Organoids from Human iPS Cells Contain Multiple Lineages and Model Human Nephrogenesis,” *Nature* 526, no. 7574 (2015): 564–8, https://doi.org/10.1038/nature15695.

[17] Eiji Yoshihara et al., “Immune-Evasive Human Islet-Like Organoids Ameliorate Diabetes,” *Nature* 586, no. 7830 (2020): 606–11, https://doi.org/10.1038/s41586-020-2631-z.

[18] Vivian M. L. Ogundipe et al., “Generation and Differentiation of Adult Tissue-Derived Human Thyroid Organoids,” *Stem Cell Reports* 16, no. 4 (2021): 1–13, https://doi.org/10.1016/j.stemcr.2021.02.011.

[19] Marie Bannier-Hélaouët et al., “Exploring the Human Lacrimal Gland Using Organoids and Single-Cell Sequencing,” *Cell Stem Cell* 28, no. 7 (2021): 1–12, https://doi.org/10.1016/j.stem.2021.02.024.

[20] Silvia Velasco et al., “Individual Brain Organoids Reproducibly Form Cell Diversity of the Human Cerebral Cortex,” *Nature* 570, no. 7762 (2019): 523–27 https://doi.org/10.1038/s41586-019-1289-x; Aaron Gordon et al., “Long-Term Maturation of Human Cortical Organoids Matches Key Early Postnatal Transitions,” *Nature Neuroscience* 24, no. 3 (2021): 331–42, https://doi.org/10.1038/s41593-021-00802-y; Garcez et al., “Zika Virus Impairs Growth in Human Neurospheres a
al., “Self-Organized Cerebral Organoids with Human-Specific Featu

Combat Zika Virus Infection"; Bradley R. Groveman et al., "Human Cerebral Organoids as a Therapeutic Drug Screening Model for Creutzfeldt–Jakob Disease," *Scientific Reports* 11, no. 1 (2021): 5165, https://doi.org/10.1038/s41598-021-84689-6.

[21] Smriti Mallapaty, "Mini-Organs Reveal how the Coronavirus Ravages the Body," *Nature* 583, no. 7814 (2020): 15–16, https://doi.org/10.1038/d41586-020-01864-x; Mart M. Lamers et al., "SARS-CoV-2 Productively Infects Human Gut Enterocytes," *Science* 369, no. 6499 (2020): 50–54, https://doi.org/10.1126/science.abc1669.

[22] Ito, Takahashi, and Ito, "Humanized Mouse Models: Application to Human Diseases"; Seint T. Lwin, Claire M. Edwards, and Rebecca Silbermann, "Preclinical Animal Models of Multiple Myeloma," *BoneKEy Reports* 5, no. 772 (2016):1–9, https://doi.org/10.1038/bonekey.2015.142.

[23] "Humanized Mice Solutions," The Jackson Laboratory, accessed February 19, 2020, https://www.jax.org/jax-mice-and-services/in-vivo-pharmacology/humanized-mice.

[24] Eva Billerbeck et al., "Development of Human CD4+FoxP3+ Regulatory T Cells in Human Stem Cell Factor-, Granulocyte-Macrophage Colony-Stimulating Factor-, and Interleukin-3-Expressing NOD-SCID IL2Rγ^{Null} Humanized Mice," *Blood* 117, no. 11 (2011): 3076–86, https://doi.org/10.1182/blood-2010-08-301507.

[25] Brown et al., "A Humanized Mouse Model Generated Using Surplus Neonatal Tissue."

[26] Brown et al., "A Humanized Mouse Model Generated Using Surplus Neonatal Tissue."

[27] Liang Cheng et al., "Humanized Mice Engrafted with Human HSC Only or HSC and Thymus Support Comparable HIV-1 Replication, Immunopathology, and Responses to ART and Immune Therapy," *Frontiers in Immunology* 9, no. 817 (2018): https://doi.org/10.3389/fimmu.2018.00817.

[28] Ramesh Akkina et al., "Improvements and Limitations of Humanized Mouse Models for HIV Research: NIH/NIAID 'Meet the Experts' 2015 Workshop Summary," *AIDS Research and Human Retroviruses* 32, no. 2 (2016): 109, https://doi.org/10.1089/aid.2015.0258.

[29] Christin M. Lepus et al., "Comparison of Human Fetal Liver, Umbilical Cord Blood, and Adult Blood Hematopoietic Stem Cell Engraftment in NOD-*scid*/γc$^{-/-}$, Balb/c-*Rag1*$^{-/-}$γc$^{-/-}$, and C.B-17-*scid*/bg Immunodeficient Mice, *Human Immunology* 70, no. 10 (2009): 790–802, https://doi.org/10.1016/j.humimm.2009.06.005; Takuya Matsumura et al., "Functional CD5^{+} B Cells Develop Predominantly in the Spleen of NOD/SCID/γc^{null} (NOG) Mice Transplanted Either with Human Umbilical Cord Blood, Bone Marrow, or Mobilized Peripheral Blood CD34^{+} Cells, *Experimental Hematology* 31, no. 9 (2003): 789–97, https://doi.org/10.1016/s0301-472x(03)00193-0. Also reviewed in Ito, Takahashi, and Ito, "Humanized Mouse Models: Application to Human Diseases."

[30] Lynn Borgatta et al., "Applications for Research Concerning Fetal or Placental Tissue and Expected Institutional Review Board Responses," *Journal of Empirical Research on Human Research Ethics* 12, no. 3(2017): 150–60, https://doi.org/10.1177/1556264617703893.

[31] Jenna M. Dittmar and Piers D. Mitchell, "From Cradle to Grave via the Dissection Room: The Role of Foetal and Infant Bodies in Anatomical Education from the Late 1700s to Early 1900s," *Journal of Anatomy* 229, no. 6 (2016): 713–22, https://doi.org/10.1111/joa.12515; Courtney Pendleton and Alfredo Quinones-Hinojosa, "Tissue and Progenitor Cell Transplantation fo
Disorders: From Harvey Cushing to the Next Frontier," in *Human F*

Bhattacharya and Phillip Stubblefield, eds. (London: Springer, 2013), 179–80, https://doi.org/10.1007/978-1-4471-4171-6_13; Andre Boue et al, "Cytological and Chromosomal Studies of Cell Strains from Aborted Human Fetuses," *Experimental Biology and Medicine* 122, no. 1 (1966): 11–16, https://doi.org/10.3181%2F00379727-122-31037.

[32] Boue et al, "Cytological and Chromosomal Studies of Cell Strains from Aborted Human Fetuses."

[33] W. C. Low et al., "Human Fetal Tissue from Spontaneous Abortions as Potential Sources of Donor Tissue for Cell Transplantation Therapy," *Transplantation Proceedings* 26, no. 6 (1994): 3500.

[34] D. Ware Branch et al., "Suitability of Fetal Tissue from Spontaneous Abortions and from Ectopic Pregnancies for Transplantation," *JAMA* 273, no. 1 (1995): 66, https://doi.org.10.1001/jama.1995.03520250082038.

[35] Maria Michejda, "Spontaneous Miscarriages as a Source of Fetal Stem Cells," *The National Catholic Bioethics Quarterly* 2, no. 3 (2002): 401, https://doi.org/10.5840/ncbq20022330; Ai Guo Wu et al., "Analysis and Characterization of Hematopoietic Progenitor Cells from Fetal Bone Marrow, Adult Bone Marrow, Peripheral Blood, and Cord Blood," *Pediatric Research* 46, no. 2 (1999): 163, https://doi.org/10.1203/00006450-199908000-00006.

[36] Michejda, "Spontaneous Miscarriages as a Source of Fetal Stem Cells," 401.

[37] G. Noia et al., "Source of Cell Injected Is a Critical Factors for Short and Long Engraftment in Xeno-Transplantation," *Cell Proliferation* 41, suppl. 1 (2008): 41–50, https://doi.org/10.1111/j.1365-2184.2008.00481.x.

[38] Virgintino et al., "Astroglia-Microvessel Relationship in the Developing Human Telencephalon."

[39] Jisook Moon et al., "Preclinical Analysis of Fetal Human Mesencephalic Neural Progenitor Cell Lines: Characterization and Safety *In Vitro* and *In Vivo*," *Stem Cells Translational Medicine* 6, no. 2 (2016): 576–88, https://doi.org/10.5966/sctm.2015-0228.

[40] Letizia Mazzini et al., "Human Neural Stem Cell Transplantation in ALS: Initial Results from a Phase I Trial," *Journal of Translational Medicine* 13, no. 17 (2015): https://doi.org/10.1186/s12967-014-0371-2; Pan Yang et al., "Icariin Promotes Cell Proliferation and Regulates Gene Expression in Human Neural Stem Cells *In Vitro*," *Molecular Medicine Reports* 14, no. 2 (2016): 1316–22, https://doi.org/10.3892/mmr.2016.5377.

[41] Donna L. Hoyert and Elizabeth C. W. Gregory, "Cause of Fetal Death: Data from the Fetal Death Report, 2014," *National Vital Statistic Report* 65, no. 7 (2016): 1–25, https://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_07.pdf.

[42] Hoyert and Gregory, "Cause of Fetal Death."

[43] Select Investigative Panel of the Committee on Energy & Commerce, "Final Report," H. R. Rep. 114–A (April 2017), https://www.govinfo.gov/content/pkg/CPRT-114HPRT24553/html/CPRT-114HPRT24553.htm.

[44] Stuart I. Hodgetts et al., "Long Live the Stem Cell: The Use of Stem Cells Isolated from Post Mortem Tissues for Translational Strategies," *The International Journal of Biochemistry & Cell Biology* 56 (2014): 74–81, https://doi.org/10.1016/j.biocel.2014.09.028.

[45] Mingfeng Li et al., "Integrative Functional Genomic Analysis of Human Brain Development and Neuropsychiatric Risks," *Science* 362, no. 6420 (2018): https://doi.org/10.1126/science.aat7615; Min-Sik Kim et al., "A Draft Map of the Human Proteome," *Nature* 509, no. 7502 (2014): 575–81, https://doi.org/10.1038/nature13302.

[46] Li et al., "Integrative Functional Genomic Analysis of Human Brain Development and Neuropsychiatric Risks."

[47] "Be the Match Registry," Be the Match, accessed February 19, 2020, https://bethematch.org/about-us/how-we-help-patients/be-the-match-registry/.

[48] "Research & Science," Be the Match, accessed February 19, 2020, https://bethematch.org/about-us/careers/career-opportunities/research-and-science/; "Research: Advancing Transplantation Science," Be the Match, accessed February 19, 2020, https://bethematch.org/about-us/how-we-help-patients/research--advancing-transplant-science/.

[49] "About the NIH NeuroBioBank," NIH, accessed January 24, 2022, https://neurobiobank.nih.gov/about/.

[50] "Homepage," American Type Culture Collection, accessed January 24, 2022, https://www.atcc.org.

[51] "Homepage," Coriell Institute for Medical Research, accessed January 24, 2022, https://www.coriell.org.

[52] Amos Bairoch, "The Cellosaurus, a Cell-Line Knowledge Resource," *Journal of Biomolecular Technique* 29, no. 2 (2018): 25–38, https://doi.org/10.7171/jbt.18-2902-002.

[53] Tara Sander Lee et al., "Human Fetal Tissue from Elective Abortions in Research and Medicine."

UNFAVORABLE.SB585.HB625.LauraBogley.MDRTL.pdf
Uploaded by: Laura Bogley
Position: UNF

UNFAVORABLE

SB585/HB625 Human-Relevant Research Fund- Collection of Contributions – Responsible Entity

Laura Bogley-Knickman, JD
Director of Legislation, Maryland Right to Life

We Oppose Testing Using Embryonic or Fetal Human Beings

On behalf of the Board of Directors of Maryland Right to Life, we urge your UNFAVORABLE report on HB625/SB585 to prohibit the further funding and unethical use of human beings in their embryonic or fetal stages of life, for the purpose of biomedical or commercial research and testing.

The Human-Relevant Research Fund should remain under the management of the Maryland Department of Health and not be transferred to the Department of Agriculture. Human beings are not plants. The health of human beings, including biomedical or commercial research on human beings, must be under the oversight of the U.S. Department of Health and Human Services and the Maryland Department of Health.

While made legal in Maryland, and suggested as the more humane alternative to testing on "non-human animals", the vast majority of people oppose public funding for testing on human remains derived through abortion violence and federally prohibited human organ harvesting.

There are ethical forms of testing, including ethical forms of human-relevant research that can spare both human and non-human animals from inhumane treatment and destruction. These ethical methods should be adopted as the preferred methods by the State of Maryland and all contractors receiving public funding through the State.

REVIEW INVESTIGATIVE FOOTAGE OF PLANNED PARENTHOOD PROFITING FROM ABORTED BABY BODY PARTS.

Federal Defunding of Unethical Research

The U.S. Department of Health and Human Services (HHS) and the National Institutes of Health (NIH) have recently **ended federal funding** for research using human fetal tissue derived from elective abortions.

This bill seeks to circumvent or evade federal oversight on harvesting and testing on aborted human fetal remains imposed by the United States Department of Health and Human Services by reassigning management of Human-Relevant Research Fund from the Maryland Department of Health to the Maryland Department of Agriculture. If enacted, this political shell game will likely be addressed by HHS and jeopardize additional federal funding for research and other purposes in Maryland.

Unethical Methods Human-Relevant Research

We strongly object to any "Human-Relevant" testing methods that use embryonic or fetal cells or tissue derived from aborted human beings. In "human relevant" research—science designed to study human systems directly rather than using animal models—fetal tissue is prized because it contains unique progenitor cells that have not yet "committed" to a specific role.

Researchers use aborted fetal tissue to create "humanized" models in a variety of unethical ways:

- **Humanized Mouse Models:** Researchers transplant fetal immune cells or liver tissue into mice with "deleted" immune systems. This creates a mouse that grows a **human-like immune system**. This method is in demand for HIV research.
- **Neurodevelopment:** Fetal brain tissue is the "gold standard" for understanding how the human brain maps its connections. It is used to validate **organoids** (lab-grown mini-brains) to ensure they actually mimic real human development.
- **Vaccine Production:** While most modern vaccines use cell lines from babies aborted decades ago (like baby "Adam", identified by science only as "Human Embryonic Kidney, experiment number 293 (HEK-293) and baby "Eve", aborted in 1985 and identified only as PER.C6), new research uses primary fetal cells to study how emerging pathogens cross the placental barrier.

Ethical Options for Human-Relevant Research

Because of the ethical controversies and new legal restrictions, government agencies and the scientific community have pivoted toward technologies that are considered more "human relevant" without the need for fetal tissue:

- **Organoids:** "Mini-organs" grown from adult stem cells. (Unethical if embryonic/fetal cells used.)
- **Tissue-on-a-Chip:** Microchips that mimic the mechanics and physiological response of human organs.
- **Induced Pluripotent Stem Cells (iPSCs):** Adult skin or blood cells that are "reprogrammed" to act like embryonic stem cells.
- **Ethical Tissue Donation:** resulting from natural miscarriage or stillbirth, as opposed to abortion.

Human Embryo Testing is Unethical

Embryonic stem-cell research is routinely touted by supporters as having the potential to cure a number of diseases and medical conditions. However, the procedure for obtaining embryonic stem cells is fraught with ethical and scientific pitfalls and, importantly, such research has yet to yield an effective treatment for any disease or condition.

Living human beings in embryonic stage are killed in embryonic stem-cell research and human cloning. Specifically, embryonic stem-cell research is done by taking a days-old embryo that has grown to the several hundred-cell stage, breaking it apart, and taking the cells from the embryo's inner mass. These unspecialized cells are then grown and used for research, including by implantation in animals and resulting animal-human hybrid abominations that disregard the dignity of each human life.

Embryonic Testing is Unsuccessful

More than 15 years after the first isolation of embryonic stem cells, there is not a single disease that these cells can cure, regardless of whether the embryonic cells are created through the fusion of a human sperm and egg or through cloning. In fact, Geron Corporation, the company that received governmental approval for the first clinical trials using stem cells derived from human embryos, discontinued "further stem cell work" after "a strategic review of the costs… timelines and clinical, manufacturing and regulatory complexities associated with the company's research and clinical-stage assets."[1]

Conversely, there are proven, ethical alternatives to research using stem cells from human embryos. One important source is umbilical cord blood—a very rich source of stem cells. Another is adult stem cells, which can be obtained from various organs. For example, researchers know that bone marrow cells can form into fat, cartilage, and bone tissue. A third promising source is neural stem cells. These stem cells have been successfully isolated and cultured from living human neural tissue and even from adult cadavers.

Moreover, since 2007, research breakthroughs are opening the door for the "reprogramming" of adult stem cells into the embryonic state—without the use or destruction of human embryos.

In Conclusion

In sum, any alleged "therapeutic" purposes for destructive human embryo research have proven to be speculative, while simultaneously crossing ethical boundaries and taking human life. <u>As such, states should prohibit this ethically problematic research that has proven unnecessary, including unethical methods of human-relevant research that uses embryonic or fetal cells or tissues instead of adult cells.</u>

For legislators and policy makers, it is vitally important that careful attention be exercised to avoid some types of research (especially in the area of cloning) that are ineffective or that create incentives or demand for researchers to destroy preborn human life and increase the demand for aborted fetal tissue including late term, fully developed human organs. The State must enforce laws and regulations intended to prevent abortionists from profiting off the harvesting and sale of aborted babies.

For these reasons we urge your unfavorable report to ensure that any testing methods licensed or funded by the State of Maryland are ethical and prohibit the use of cells or tissues obtained from aborted embryonic or fetal human beings. The state instead should encourage the development of ethical alternatives, including ethical human-relevant research methods utilizing adult cells.

For more information about ethical human-relevant research methods, please refer to the attached research article *Fetal Tissue Research and Christian Bioethics: A Review of Scientific Developments, Policy Landscape and Ethical Considerations* (David Prentice, PhD, 2022).

[1] *See* M. Smith, *Geron Move Shows Embryonic Stem Cell Research Not Successful*, LifeNews (Nov. 15, 2011), *available at* http://www.lifenews.com/2011/11/15/geron-move-shows-embryonic-stem-cell-research-not-successful/ (last visited June 26, 2017).