Fetal Tissue Fact Sheet

Talking Points: Only Fetal Tissue Will Do

- Fetal tissue is the gold standard of biomedical research because of the cells' flexibility, ability to replicate quickly, and decreased probability of being rejected by a host. Without it, scientists would be deprived of a crucial method from which to study human cells and their response to various medicines, diseases, and treatments.
- The Center for Disease Control estimates that from 1994-2013, vaccines from fetal tissue research prevented 322 million deaths, 21 million hospitalizations, 732,000 childhood deaths, and saved $1.38 trillion dollars.
- Fetal tissue is obtained ethically, legally, and with consent.
- The use of donated fetal tissue was re-authorized in 1993 by President Clinton and a bipartisan Congress.
- Alta Charo, a bioethicist at the University of Wisconsin, Madison, says fetal tissue research has benefited "virtually every person in this country."[1]
- The available alternatives, including fetal tissue from miscarriages and stem cell technology, are scientifically unusable in most cases because of the abnormalities associated with miscarriages.[2]

Zika Virus: A Perfect Example of Fetal Tissue's Indispensability

The Zika virus can infect fetuses, causing birth neurological defects, such as microcephaly. As of now, there is no vaccine or medicine for Zika. However, advances in science have brought scientists closer to a potential vaccine for the debilitating disease. Scientists know that that AXL, a protein, allows Zika to enter the human body through skin cells. Using fetal tissue, researchers at the University of California, San Francisco conducted further studies into AXL and learned that the protein is also involved in the formation of neurons. This means that Zika could be causing microcephaly by disrupting the process through which the brain is formed. Researchers can now use these critical discoveries to better understand Zika and create a preventative vaccine.

Although some have argued that scientists can use organoids or animal models in place of human fetal tissue, researchers say that these replacements are imperfect because they cannot perfectly replicate human development. As University of Pittsburgh virologist Carolyn Coyne said in a *Nature* article, "It is absolutely essential to study Zika infection in human fetal tissue. These types of studies need to extend to all stages of pregnancy."[3]

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[1] "How Fetal Tissue Is Used in Medical Research." *The Week*, 24 Oct. 2015, theweek.com/articles/584576/how-fetal-tissue-used-medical-research.
[2] Ibid
[3] Hayden, Erika Check. "Zika Highlights Role of Controversial Fetal-Tissue Research." *Nature*, vol. 532, no. 7597, 2016, pp. 16–16.

Clinical Applications of Fetal Tissue

Several important medicines and techniques are based on innovative fetal tissue studies.

- Amgen's Enbrel battles rheumatoid arthritis.
- Genentech's Pulmozyme helps children with cystic fibrosis to clear the thick mucus that clogs their lungs.
- Nuwiq, made by Octapharma, treats boys and men with hemophilia, a life-threatening bleeding disorder.[4]
- In 2014, a company called Neuralstem in Germantown, MD, in collaboration with scientists at the University of California, San Diego, launched a trial in which stem cells from fetal spinal cord were implanted to treat spinal cord injuries.[5]
- Based on fetal tissue research, medical providers can now do the following to protect fetal and maternal health: diagnose genetic and metabolic diseases in the fetus before birth; detect and treat Rh incompatibility (an immune system mismatch between the mother and fetus); assess developmental problems, including fetal lung immaturity; develop better techniques for obstetrical anesthesia; and treat maternal hypertension, heart disease, and diabetes.[6]

Diseases Studied Using Fetal Tissue

These are just some examples of the many ways that fetal tissue has enhanced the study of diseases and led to potentially life-saving treatment.

I. Alzheimer's Disease

i. Lawrence Goldstein, a professor of cellular and molecular medicine at the University of California, San Diego, in testimony given before the House Investigation on Infant Lives, described how he uses fetal tissue in his research on Alzheimer's disease. To make a model of the brain disease in a lab dish, researchers need a type of brain cell called an astrocyte, which helps support other brain cells. Astrocytes release growth factors and other substances that keep nerve cells healthy and allow brain cells to make connections. Fetal astrocytes are the "gold standard" for this type of research. Scientists can "make" astrocytes from stem cells; these astrocytes don't have all the properties of fetal astrocytes, so for now, fetal astrocytes are irreplaceable.

II. Autism

i. Independent studies have shown that some mothers of children with autism have circulating antibodies that target the fetal brain. These antibodies do not appear in mothers of children without autism. Further studies of these antibodies and how they react with fetal brain cells could shed important light on the development of autism.[7]

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[4] Meredith Wadman. 5 Jan. 2017 , 6:00 PM. "Fact-Checking Congress's Fetal Tissue Report." *Science,* AAAS, 5 Jan. 2017.
[5] Wadman, Meredith. "The Truth about Fetal Tissue Research." *Nature News,* Nature Publishing Group, 7 Dec. 2015.
[6] Institute of Medicine (US) Conference Committee on Fetal Research and Applications. "Fetal Research and Applications." *National Center for Biotechnology Information,* U.S. National Library of Medicine, 1 Jan. 1994.
[7] Goines, Paula, and Judy Van de Water. "The Immune System's Role in the Biology of Autism." Current Opinion in Neurology, U.S. National Library of Medicine, Apr. 2010.

III. Cancer

i. Fetal tissue helps researchers understand how cells make proteins, via their genetic instructions, and become different cells for specific organs or for tumors. When tumors develop, they often start making proteins (biomarkers) that are not found in healthy adults but normally found in fetal life. A professor of genetic medicine, biological chemistry, oncology or pathology would use fetal tissue to help identify biomarkers for early detection of cancers. The trick is to find these proteins because if researchers can test for them in adults, they might signify the presence of cancer.[8]

IV. Eye Development & Disease

i. The National Institutes of Health has funded research using fetal tissue to study eye development and disease. Many eye diseases, such as age-related macular degeneration, result from damage to the retinal pigment epithelium (RPE), a single layer of cells at the back of the eye. In the 2000s, scientists designed new ways to create cell cultures with RPE dissected from fetal tissue, allowing scientists to study the function of these cells in a dish.[9]

V. HIV/AIDS

i. Fetal tissue is critical to study the HIV/AIDS virus because its flexibility, adaptability, and wealth of stem cells have allowed scientists to derive mice with humanized immune systems. Of these mice, the most prominent is the bone marrow-liver-thymus (BLT) mouse created in 2006. Studies using the BLT mouse were able to determine that prophylactic drugs may prevent vaginal HIV infection. This method is now in late-stage clinical trials on humans.[10]

VI. Human Development

i. Scientists use fetal tissue to study how the human body develops to better understand and solve developmental abnormalities such as Down syndrome or malformation of organs, the causes of miscarriages or sudden infant death syndrome.

VII. Mental Health

i. Scientists at the University of Texas Southwestern Medical Center are using fetal cells to help answer why some mental disorders are more common in men than women.[11]

VIII. Parkinson's Disease

i. The Harvard Stem Cell Institute reported in 2014 that neuronal stem cells extracted from fetal tissue and transplanted into the brains of people with Parkinson's helped patients remain healthy and functional for about 14 years. Clinical trials are currently taking place in Europe.

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[8] McDaniels, Andrea K., and Meredith Cohn. "Scientists Say Fetal Tissue Important in Research." *Baltimore Sun*. 15 Aug. 2015.
[9] Wadman, Meredith. "The Truth about Fetal Tissue Research." Nature News, Nature Publishing Group, 7 Dec. 2015.
[10] Ibid.
[11] McDaniels, Andrea K., and Meredith Cohn. "Scientists Say Fetal Tissue Important in Research." *Baltimore Sun*. 15 Aug. 2015.

IX. Spinal Cord Injuries

i. A 2002 study in the *Journal of Neuroscience Research* found that fetal-derived neural cells could function as potential expendable sources of graft material for transplantation aimed at repairing a damaged central nervous system (CNS), which is composed of the brain and spinal cord. This research can be done by using a relatively small amount of fetal CNS tissue that has been transformed into aggregates called neurospheres.[12]

X. Stroke

i. An article published by the American Heart Association and American Stroke Association found that neural stem/progenitor cells cultured from fetal tissue could be grafted to tissue surrounding the area affected by the stroke. The fetal tissue cells could then survive, differentiate, and enhance functional recovery.[13]

[12] Ogawa, Y, et al. "Transplantation of In Vitro-Expanded Fetal Neural Progenitor Cells Results in Neurogenesis and Functional Recovery After Spinal Cord Contusion Injury in Adult Rats." Wiley Online Library, Journal of Neuroscience Research, 2002.
[13] Bliss, Tonya, et al. "Cell Transplantation Therapy for Stroke." *Journal of the American Heart Association*, 2007.