Primary Sources

"Archives of Pathology & Laboratory Medicine." *Henrietta Lacks, HeLa Cells, and Cell Culture Contamination.* (1962): n. pag. Print. Henrietta Lacks died in 1951 of an aggressive adenocarcinoma of the cervix. A tissue biopsy obtained for diagnostic evaluation yielded additional tissue for Dr. George O Gey's tissue culture laboratory at Johns Hopkins. Researchers around the world used Hela cells. However 20 years after her death, mounting evidence suggested that Hela cells contaminated and overgrew other cell lines. Her autopsy was performed at 10:30 am on the same day as her death on October 4, 1951 at 12:15 am. The cells grew robustly, contrary to the results with previous patients, becoming the first human cancer cell line immortalized in tissue culture. Recently, Hela cells have been shown to contain human papillomavirus (HPV). Dr. Gey's roller-tube technique for tissue culture was another significant scientific contribution and was used by his colleagues. Dr. Gey supplied samples to scientists in the United States and internationally who were interested in studying the first established human cancer cell line. Hela cells proliferated in cultures around the world and as the years passed, evidence shows that hela cells have contaminated other cell lines.

Hanks, John H., and Frederik B. Bang. "In Vitro." *Society for InVitro Biology* 1971, 6.4 ed.: n. pag. Print. Dr. Gey's virology included: the differing susceptibilities of normal and malignant cells as host for eastern equine virus; the simultaneous propagation of cells and viruses over long periods of time; and viral particles in normal chick embryo cells. Dr. George O Gey 71, director of the Finney-Howell Cancer Research Laboratory at the John Hopkins Hospital, and Emeritus Associate Professor of Surgery, died of cancer on November 8, 1970. Born in Pittsburg July 6, 1899, he received his B.S. from the university of Pittsburg in 1921 and later served as instructor of Zoology.

"The Miracle of Hela." *Ebony* June 1976: n. pag. Print. She has ironically became one of the most influential people in the fight against cancer. Cancer cells divide about once every 24 hours. There is no course in the science field that does not include her contribution. Hela cells have been systematically tested- with drugs, chemicals, and environmental agents- for signs of mutation, growth, and other behavior. "There isn't a cancer research laboratory anywhere that hasn't used Hela cells."

O'Brien, Stephen J. "Cell Culture Forensics." *PNAS: Proceedings of the National Academy of Sciences of the United States of American*. Vol. 98. N.p.: National Academy of Sciences, 1980. N. pag. Print. Hela cells were unlike other primary cervical cancer explants in that they grew horrifically in culture, perhaps to aggressively. Hela were African American, ubiquitous in cancer cytology labs, and fully capable of infiltrating slower plodding primary cell cultures. Hela contaminated over 40 different human cultures, all labeled something else. Hundreds of scientific reports based on fraudulent cell lines were published well in excess of 10 million dollars. Cell contamination continues into the 21st century. Last year, it was reported that 18% of 252 new cell cultures deposited at a German cell line repository were contaminated by another cell line.

Schmeck, Harold M., Jr. "HeLa's Legacy." *New York Times* 15 June 1986: n. pag. Print. Walter Nelson-Rees was an expert in the study of human and animal cells growing in laboratory culture flasks. Mr. Nelson-Rees had the embarrassing task of telling the Soviet scientists that the cells in which their viruses were growing were not even derived from Russian cancer patients. Hela cells ruined expensive scientific studies because many research teams that thought they were studying different tissue types from many individuals were all unknowingly working with the wildfire growths derived from Mrs. Lacks’ cancer.

Secondary Sources

Barone, Jennifer. "The Immortal Woman." *Science World*: n. pag. Print. For months Henrietta had felt pain in her cervix, the lower part of the uterus. Cancer develops when cells divide and grow uncontrollably. The gave lacks the usual treatment: sewn packs of radium, a radioactive element, to the tumor. Radiation can damage DNA- the genetic material in cells- so that the cells can't divide anymore. Lacks’ cells have fueled nearly 75,000 studies in genetics, cloning, vaccines, and other areas of biology. In the past 63 years, several scientists have won Nobel prizes for research on Hela cells. "It's hard to find biology labs that don't have Hela cells" says Kathy Hudson, deputy director at the National Institutes of Health, the agency in charge of the US medical research. Henrietta left behind five children, ages 16,12,4,2 and 1. 2013- the lacks family genome is published online without permission from the lacks family. The family and NIH reach an agreement for future use of the genome in research.

Conniff, Ruth. *Our Bodies, Our Cells*. N.p.: n.p., 2011. Print. Lacks’ death changed the course of her family members' lives for generations. Her doctors took samples from her as she lay dying on a John Hopkins Hospital bed. Author Rebecca Skloot uses a combination of scientific expertise, sheer doggedness, and immense compassion to pull of the huge task of writing her book. Hela's family has never been able to get the full story about their mother and her immortal cells. Skloot talks about the urban legends of African American white "night doctors" abducting black children for medical research. Skillet was born to Jewish parents and was fascinated with Nazi medical research.

Crisp, Andrew. "A Genetic Cell-ebrity." *Boise Weekly* 20 Nov. 2011: n. pag. Print. David "Sonny" Lacks was 4 years old when his mother died of cervical cancer. Henrietta felt immense pain one evening. She got in the tub and felt a small, soft lump insider her uterus. She went to the only hospital that would accept black patients, John Hopkins Hospital. The cancer spread through her body quickly, killing her nine months after she was first admitted. Her cells have been used in AIDS research, in-vitro fertilization and have been used in making chemotherapy drugs. Skloot talks about the husbands feelings when he got the call. "They way he understood it was that we have your wife, we've been experimenting on her for years, and we want to take blood samples from you and your children to see if you have cancer." Henrietta's care before her death was questionable.

"Dead, but Scientifically Immortal." *Dominion Post*: n. pag. Print. It took Rebecca Skloot 10 years to writ her book. Hela cells were employed during the Cold war to test radiation exposure on human cells. Hela cells are still valuable today for testing various anticancer compounds. They are "well-behaved"- they grow at a predictable rate in flat layers that make them easy to see under a microscope. They can be tweaked with genetic engineering to act more like other types of cells, such as heart cells or neurons. They can be sold for $250 yet neither the hospital or the Lacks’ family has received a penny.

"Dr. Gey." *Misteri*. N.p., n.d. Web. 22 Jan. 2015. <https://perdindirindina.wordpress.com/category/misteri/>. Photo of Dr. Gey who found out that HeLa cells could survive in a petri dish.

"Electrotheraphy." *Mind Disorders*. N.p., n.d. Web. 22 Jan. 2015. <http://www.minddisorders.com/Del-Fi/Electroconvulsive-therapy.html>. Photo of patients receiving electroconvulsive therapy for mental disorders.

"Eternal Life: A Mother, Lost to Her Family Years Ago, Unwillingly Left a Legacy That Changed Science." *New York Times* 7 Feb. 2010: n. pag. Print. Hela cells went viral after the word had been spread that they were in terms "immortal." The benefit almost everyone, practically anyone who has taken a pill stronger than aspirin. Scientists grow over 50 million tons of her cells in labs and you can buy them yourself starting at $350 dollars. Many scientists say they do not like thinking of Henrietta as a person because it is easier for them to do their work. Hela cells are so hardy that if just one cell lands in a petri dish it will take over.

"5 Reasons Henrietta Lacks Is the Most Important Woman in Medical History." *Popular Science* 2010: n. pag. Print. Together hela cells outweigh 100 empire state buildings and could circle the equator three times. Before hela cells, scientists spent more time trying to keep cells alive than actually doing research. In 1952 the worst year of the polio, hela cells were used to test the vaccine that protected millions. Tissues samples from Lacks acted different than others. Scientists learned that by isolating one of her cells and keeping it alive was the basic technique for cloning and in-vitro fertilization. Hela cells where used to determine that humans have 46 chromosomes-23 pairs- not 48 by accidentally pouring chemicals onto them. They discovered that hela cells used an enzyme called telomerase to repair its DNA allowing them and other types of cells to function when normal cells would have died. Anti-cancer drugs that work against this enzyme are being tested today.

"For Henrietta Lack's, Immortality Comes in a Test Tube." *Pittsburg Post-Gazette* 7 Feb. 2010: n. pag. Print. Hela cells are used in over 70,000 medical studies. Development of drugs for herpes, leukemia, influenza, and Parkinson's disease. Even used for lactose digestion in mosquito mating. "The cells reproduced an entire generation every twenty-four hours and they never stopped." Today there are millions, perhaps even billions, of her cells "in small vials on ice." Rebecca Skloot thinks that if the had been a white family the would have been treated differently. The family thought some part of Henrietta was alive when they told them about her cells. Having HPV and syphilis might have weakened her immune system causing her cancer to grow more rapidly which might be the cause of the cells immortality. The HPV virus happened to land  on this one location in her genome that's tight near this tumor gene that is the most volatile gene involving cancer that we know of. When that gene gets turned on, it causes incredibly aggressive cancers, so the theory is this is what made her cancer so aggressive and what made the cells grow so quickly in culture.

Gabbay, Frances H. "An American Woman and the Right to Health." *Psychiatry: Interpersonal and Biological Process* 75.2 (2012): n. pag. Print. Hela cells are "Beautiful and otherworldly-glowing green and moving like water, calm and ethereal, looking precisely like heavenly bodies might look" said Deborah Lacks. Henrietta lived a common, if difficult life, working in those tobacco fields, cooking and cleaning for her family, and worrying about what would happen to her children after she was gone. In the years since Henrietta's cells were taken, issues pertaining to informed consent have been will articulated, and institutions are inlace to implement protections. The company that got its start selling Henrietta's cells now offer Hela products that cost anywhere from $100 to nearly $10,000 per vial. Henrietta was born in 1920, “in a small shack on a dead-end road overlooking a train depot” in Roanoke, Virginia. When her mother died in childbirth four years later, Henrietta’s father sent her along with her eight siblings back to Clover, Virginia, where his family still farmed the tobacco fields on which their ancestors had worked as slaves—and on which, one might argue, Henrietta’s legacy began a hundred years before her birth. Skloot learned that Deborah died of a heart attack at the age of 59, having struggled for years with high blood pressure and diabetes and having had two strokes. Just before Deborah died, her granddaughter Erika—Henrietta’s great- granddaughter—entered a master’s program at the University of Maryland, becoming the first descendant to attend graduate school.

"Hela Cells." *Nature Cells Biology*. access, n.d. Web. 22 Jan. 2015. <http://www.nature.com/ncb/journal/v5/n2/full/ncb0203-101.html>. Photos of Hela Cells in Metaphase of Mitosis.

*Hela Cells*. *Vimeo*. N.p., n.d. Web. 22 Jan. 2015. <http://vimeo.com/9581140>. Video of HeLa cells being put into a petri dish for testing and research.

*HeLa Cells Dividing*. *Youtube*. N.p., n.d. Web. 22 Jan. 2015. <https://www.youtube.com/watch?v=wNua9E5jBa0>. Video of HeLa cells going through Mitosis.

"Henrietta, Everlasting." *Wired* Feb. 2010: n. pag. Print. Cells of her carcinoma were removed for lab testing and passed to a Dr. George Gey, head of the tissue culture research at the hospital. At that time, many scientists round the world had tried to grow human tells in the lab but to no avail. Despite chemo and radiotherapy, cervical cancer killed Henrietta in late 1951. Used for research in cancer, aids, gene mapping, the effects of radiation and toxic substances on human tissue, for cloning, in vitro fertilization, for testing human sensitivity to tape, glue and cosmetics. Biology students at Victoria University grow her cells when learning how to culture human tissue.

"Henrietta Lacks." *Lacks Family*. Lacks Family, n.d. Web. 22 Jan. 2015. <http://www.lacksfamily.net>. Photo of Henrietta Lacks, found from the website of the Lacks Family.

*How Stuff Works*. Howstuffworks, n.d. Web. 31 Aug. 2014. <http://science.howstuffworks.com/life/cellular-microscopic/hela-cell2.htm>. This website explains how cells are supposed to work, how they grow and how they program their own death. Cancer cells have found a way to ignore those signals and that is how they survive. Cells are supposed to stop dividing after about 50 but hela cells continue to grow and are called the immortal cells. The most early known use for Hela cells was in 1950 for the creation of the Polio vaccine. Author Rebecca Skloot was the one to tell Henrietta's family about the unauthorized use of their beloveds cells.

Hudson, K. L. "Biospecimen Policy: Family Matters." *National Institute of Health*: n. pag. Print. Two of the most deeply held values in the medical-research community- Public data sharing and respect for research participants- collided when the genome of the hela cell line was published and posted in a public data base. After some controversy the NIH made a deal with the family making the Hela genomic sequence data available to scientists within certain parameters. The family is also aware that any lab with the right equipment, and non-NIH funds, could derive the full sequence from scratch at any point and post it on a non-NIH website.

"Immortal' Cells of Henrietta Lacks Live on in Labs." *Talk of the Nation (NPR)*: n. pag. Print. Henrietta had no idea what was being done to her. She did not know much about her treatment and that was normal during this time. Hopkins was a place that many poor or black people went. Black patients where not treated until much later in their disease process. They were not given the same kind of pain management as white patients got. There is a multi-billion dollar industry based on buying and selling tissues and cells and patenting genes that started with her cells. Anyone can go online and buy a vial of Hela cells for around $250.

*The Immortal Life of Henrietta Lacks*. New York, NY: Crown Group, 2010. Print. I used this book as a resource because there is much information about Henrietta's family, and how they dealt with her passing and the use of her cells. It also talks about what Henrietta did when she found out about her cancer and how she dealt with it. The author has some interviews in the middle of the book with the daughter and the other kids. I use numerous photos from this book.

Lantos, John D. *A Better Life Through Science?* N.p.: Hastings Center, n.d. Print. Vol. 40 of *The Hastings Center Report*. When the book's author, Rebecca Skloot, tracks down Lacks’ descendants in a Baltimore ghetto, they are not doing well. Zakariyya, the youngest of her children, has had the toughest life. He was born after his mother's cancer was already widespread and she died shortly after he was born. He has drifted in and out of the military and in and out of jail. A moody and violent man, he once killed a man over a girl by stabbing him in the chest with a kitchen knife. Most of his anger was really angst and pain about the wrenching loneliness of a grown-up boy who had lost his mother. The vial he was given with her cells helps him connect with his lost mother and transforms a lifetime of pain into something else.

"The Legacy of Henrietta Lacks." *Washington Post*: n. pag. Print. Hela cells in a line, or population, of cells, taken form a person and used in scientific research. Now billions and billions of Hela cells in laboratories all over the world. Lacks’ family has lived without healthcare and in poverty. Henrietta endured radiation treatment, which were done at the time by inserting tubes of radium around her cervix and sewing them into place, as well as x-ray treatments. Lacks had both the human papillomavirus and syphilis. More than 60,000 medical journal articles published about their use and at least 11,000 patents related to their use. The presence of Hela cells can overwhelm the others and ruin research. The handling of Hela cells has lead to costly errors in the medical research community. In the mid-1960's Hela cells were fused with mouse embryo cells to create the first cell hybrid, which helped researches begin the process of mapping the human genome. In the early 1950's the United States was stricken by fear of contracting the infectious, paralytic disease called polio. Outbreaks were on the rise, with about 60,000 cases in 1952, and there was a huge push to come up with a vaccine. That year researcher Jonas Salk created the vaccine, and part of the testing process used in Hela cells. Hela has also be instrumental in studying tuberculosis, HIV and medicines for cancer and Parkinson's disease.

*National Geographic*. National Geographic, n.d. Web. 31 Aug. 2014. <http://news.nationalgeographic.com/news/2013/08/130816-henrietta-lacks-immortal-life-hela-cells-genome-rebecca-skloot-nih/>. Now that the Lack's genome is available, does the family deserve some privacy or at least a role in deciding how the information will be used? She died at the age of 31. Hela cells became a bedrock of biomedical research around the world. Rebecca Skloot the author of the book "The Immortal Life of Henrietta Lacks" has gotten incredibly close to Henrietta's family. She was the one that helped the family find out about the cells and help the figure out what her cells have impacted. The NIH director has come to the agreement with the Lack's family that their genome will only be used for research only under the controlled access.

Neville, Anne. "Famous in the Afterlife." *Buffalo News* [New York, NY] 3 Aug. 2010: n. pag. Print. Until decades after they buried her body in an unmarked grave in the town of Clover, Va did the family realize there mother's cells were still alive. Questions haunted the family. Was Lacks herself still alive in some sense? Did she feel pain when her cells were infected, tested or killed? Deborah who was just a year old when her mother died became deeply involved in Skloots research as she pieced together the story of what happened to lacks and her family after her death. Oprah Winfrey and Alan Ball, creator and executive producer of HBO's "True Blood," have committed to make "The Immortal Life of Henrietta Lacks" into an HBO movie. Some of Lacks' family have chronic illnesses and cannot afford health care. Johns Hopkins has not compensated the relatives and Skloot has doubts that they ever will.

Rosamund, Urwin. "Why We All Owe a Huge Debt to Henrietta." *Evening Standard* 10 June 2010: n. pag. Print. Hela became the ultimate research tool, sent around the world, spewing a multibillion dollar industry. For 22 years they family had no idea that there Mother had gained a Petri dish immortality. Henrietta was described as a warm and glamorous woman with painted red nails who loved to dance. She had a philandering husband and one of her five children was sent to the hospital for the Negro insane. While her cells were being taken, white doctors were performing horrifying experiments on black patients. Dr. Gey insensitively referred to her cells as his "precious babies". Her cells are still helping to advance science. Areas of discovery are: Virology, Vaccines, Antiviral therapies, bioweapons, polio vaccine, Live cell transport, cryogenics, frozen embryos, genetic medicine, discovery of genetic links to diseases like down syndrome, amniocentesis for genetic disease testing, in vitro fertilization, stem cell isolation, space biology, development of cancer drug Herceptin, blood type identification, salmonella, HPV, HIV, Animal cloning and gene mapping.

Schulman, Ari N. *What is the Body Worth*. N.p.: n.p., n.d. Print. The injustice of Henrietta's story pales in comparison to be outright atrocity of her daughter's sad tale. Elsie Lacks was considered by her family to be "deaf and dumb." In fact, she had epilepsy and an inherited hearing impairment—the latter common in her family—though apparently no effort was ever made to correct the impairment or to teach her sign language. About a year before her mother began treatment for cancer, Elsie was committed to an institution once known as the Hospital for the Negro Insane, with a diagnosis of "idiocy." There Elsie lived in wretched conditions, subject to neglect, abuse, and involuntary experimentation. Elsie died a few years later at the age of fifteen, from causes that are left unclear in the book—though she apparently suffered from neurosyphilis and self-induced vomiting, and was quite likely subjected to, among other research, the medically unnecessary experimental testing of pneumoencephalography—a procedure in which a hole is drilled in the skull and the fluid around the brain drained and replaced with gas, so that the brain will show up more clearly on x-rays. The family did not know of these conditions until Skloot uncovered them. A larger point of the book is about the danger of placing too much authority in the hands of doctors and scientists—especially when that means seeing individuals solely under the abstractions of patient or subject and so overriding the respect and autonomy they are owed in making decisions about their own bodies.

"Science Calls Her HeLa." *Psychiatry* [New York] 2012: n. pag. Print. The pathology lab confirmed that Henrietta had malignant epidermoid carcinoma of the cervix stage 1. On the day Henrietta died, George Gey appeared on national television with a vial of her cells and said, “It is possible that, from a fundamental study such as this, we will be able to learn a way by which cancer can be completely wiped out.” We learn about HeLa cells and their importance to science, the life of Henrietta in an era when many hospitals would not treat black patients, the ethics of cell donation and commercialization, and the impact of Henrietta’s cells on the Lacks family, particularly her daughter, who was consumed with questions about the mother she never knew.

"Second Opinion: A Lasting Gift to Medicine That Wasn't Really a Gift." *New York Times* 2 Feb. 2010: n. pag. Print. The John Hopkins Hospital showed the daughter, Deborah Lacks-Pullum, thousands of vials, each holding millions of cells descended from a bit of tissue that doctors had taken from her mother. Ms. Lacks-Pullum gasped "Oh God, I can't believe that's my mother." When the researcher handed her a vial she whispered "she's cold" and blew on the tube to try and warm it. "you're famous" she whispered. Henrietta was admitted in January of 1951 and within months her body was full of tumors leaving her to die in excruciation pain that October. Hela cells where used in the first polio vaccine, launched into space for zero gravity tests, and helped produce drugs for numerous diseases including Parkinson's, leukemia and the flu. The family only found out about their loved ones cells by accident when the met someone from the National Cancer Institute  who recognized the surname and said she was working with cells from someone named "Henrietta Lacks."

Silberman, Steve. *The Woman behind HeLa*. N.p.: n.p., 2010. Print. In the segregated ward of Johns Hopkins University hospital in Baltimore, Maryland, a gynecologist discovered a lesion on Lacks’ cervix that was “as big as a 25-cent piece ... raised, smooth, glistening, and very purple.” Richard TeLinde, thought that such lesions were a harbinger of invasive cervical cancer. Hela cells grow continuously because they don't have the mechanisms that limit the number of times a cell can divide before dying. 

Skloot, Rebecca. "Cells That save Lives Are a Mother's Legacy." *New York Times* 17 Nov. 2001: n. pag. Print. Dr. George Gey was the doctor to take the cells from Henrietta Lacks. He was the head of the tissue culture research at Hopkins. He spent 30 years collecting cancerous human cells and trying to make them grow. Rumors went around after word of Hela cells got out the HeLa stood for Helen Lane. When a few colleagues of Dr. Gey tried to correct this error, the Lacks family was thrown into a world they could not even comprehend.

Tierney, Jacob. "A Mother's World-Changing Legacy Remembered at Clarkson." *WaterTown Daily Times* [New York] 27 Aug. 2012: n. pag. Print. David Lacks told students that he never knew his mother. He was only 4 when she died. His family did not know her cells had been taken until the 1970's. The news conjured a whole range of feelings. The family was angered that they did not at least ask for permission. "Without experiments you won't get cures for disease" says David.

Weise, Elizabeth. *Immortal Cells of an Angel*. N.p.: n.p., 2010. Print. The pap smear had been developed in the 1940's so the doctors were taking cells out of every woman who walked in. George Gey's lab assistant, Mary Kubicek, took the cells and cultured them. A factory was set up to mass-produce them at the Tuskegee Institute in Alabama. Her family was used in research years later without their consent. Her husband got a phone call and what he first thought was that his wife was still alive and being experimented on. Her family is still very poor and does not have access to health care.