

HENRIETTA LACKS AND HER IMMORTAL CELLS

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The history of Henrietta Lacks and the HeLa cells raises important issues regarding science, ethics, race, and class. It is important from scientific point of view because without this cell we cannot progress the biological research. It is important because till day scientists are struggling to find out the causes for which it is immortal. On the other hand it is originator of many social issues and controversies. It raises many questions in our mind like- science and ethics, Science and Law, etc. etc. The article will help the reader to correlate Science with Society.

Henrietta Lacks was not any genius; rather she was a black, ill-literate women from a very poor peasant family. She had not achieved anything remarkable during her lifetime so that we have to remember her. Still, the scientific world owed to her very much. Because without her it was not possible to control many diseases like polio, measles, mumps, rubella, chickenpox etc. At least, we can name 1000 of research works, which are directly or indirectly associated with her name. Though she was merely 50-55 kg by her body weight, but in laboratory till date we have prepared few hundred tons of her body cell. To be frank, there's no way of knowing exactly how many of Henrietta's cells are alive today. This is because, HeLa cell is the 1st and only human cell line which, according to most of the scientists, is an immortal cell line. The word HeLa, used to refer to the cells grown from Henrietta Lacks' cervix. *He* stands for Henrietta and *La* for Lacks. It is pronounced as hee-lah. The history of Henrietta Lacks and the HeLa cells raises important issues regarding science, ethics, race, and class.

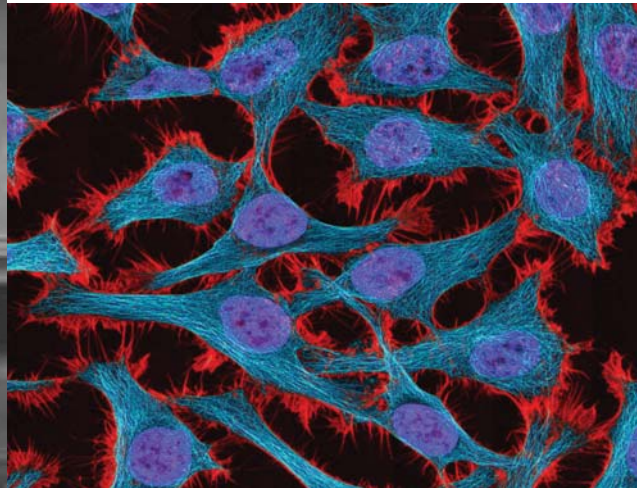
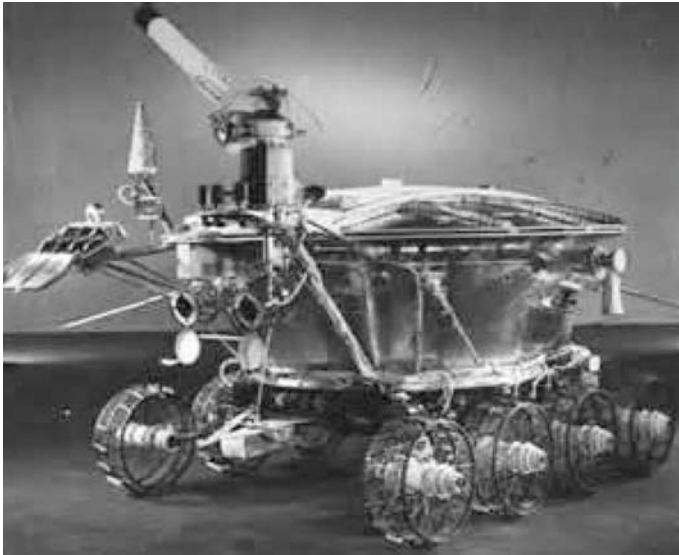
We know that - cell is the building block of life. The genetic material of each cell in the human body holds the secret to inherited diseases, such as Tay Sachs, cystic fibrosis, Alzheimer's disease, and other complex diseases like heart disease. Tissue culture was first developed in the early 1900's as a method for studying the behaviour of

cells – free of the variations that might arise in the whole organism – in response to normal and induced experimental stress. Initially, scientists used fragments of tissues, but gradually developed techniques to study the behaviour of single cells and changed the name to cell culture. It is the process by which cells are grown under controlled conditions, generally outside of their natural environment. In its simplest form, cell culture involves the dispersal of cells in an artificial environment composed of nutrient solutions, a suitable surface to support the growth of cells, and ideal conditions of temperature, humidity, and gaseous atmosphere. In such a system, a researcher can precisely measure the response of the cell's alterations in culture, test prospective drugs, the presence or absence of other kinds of cells, and viruses.

Cell culture techniques support research in virology as well. Growing viruses in cell cultures allowed us to prepare purified viruses for the manufacture of vaccines. The injectable polio vaccine developed by Jonas Salk was the first vaccine, produced using cell culture techniques. Vaccines for measles, mumps, rubella, and chickenpox are currently made in cell cultures. Novel ideas in the field include recombinant DNA-based vaccines, for the treatment of genetic diseases is based on cell culture. Beside virology it has wide application in the research arena, from biology to space science.

From the beginning of the nineteenth century, many research organizations were working heart and soul to

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Soviet satellite with HeLa Cell

develop a fruitful process for generating human cell outside of their natural environment. Johns Hopkins University of USA was one of the leading research organizations in this field. George Gey and his wife Margaret Gey were two leading scientists of that institute and devoted themselves to generate a human cell line which will be useful for the research of cancer medicine. Gey was credited for designing the roller drum, a machine to help nurture cells in culture. The roller drum consisted of various holes where tissues and their appropriate growth substances were allocated. The drum spun in order to mix the substances and once an hour allows the cultures to be exposed to the environment until the drum rolled again and re-bathed the cells in liquid. Gey is also noted to be one of the first to document cell division and growth on film. He devised a time lapse camera that stood twelve feet, built out of spare parts from a nearby junkyard, with a temperature controlled incubator.

The condition of blacks during 1950 in America was really miserable. They were the victims of many diseases; cancer was identified as a common disease among the native black women of America along with other sexual diseases in addition to malnutrition, and they never got social justice. Government has provided only a few hospitals for the treatment of black people at that time and in those hospitals also their facilities were very limited. John Hopkins was one of such hospital where black people had medical facilities. On January 29, 1951, one such black women went to Johns Hopkins Hospital because she felt a “knot” inside her and she was bleeding abnormally and profusely. Her local doctor tested her for syphilis, which came back negative, and referred her to Johns Hopkins. Her name was Henrietta Lacks.

Henrietta Lacks was born on August 1, 1920 in Roanoke, Virginia of USA. Her mother Eliza and father Johnny were farmers. Originally she was called as Loretta by her parents and family members. But nobody knows how and when her name changed from Loretta to Henrietta. She was the tenth child of Eliza and Johnny. When she was only 4 years old her mother died. After the death of her mother, Henrietta’s father felt unable to handle the children, so he distributed the children among his relatives. The four-year-old Henrietta, nicknamed Hennie, was handed over to Tommy Lacks who was her great-grandfather by relation. He used to live, in a two story log cabin, which



Henrietta Lacks

was actually the slave quarter along with many relatives. So nobody had any individual room. Henrietta shared a room with her nine-year-old first cousin David Lacks, whose nickname was Day. In 1935, at the age of 14 years Henrietta gave birth to a son, Lawrence, fathered by David Lacks. In 1939, her daughter Elsie was born. Elise was not mentally sound; she was “different”, “deaf and dumb”. On April 10, 1941 she married, “Day” Lacks. After that, at the end of 1941, their cousin Fred Garrett convinced the couple to leave the tobacco farm and managed a job for Day at Bethlehem Steel’s Sparrow’s Point steel mill. So, the family shifted to Maryland. Lacks and her husband had three other children: David Junior born in 1947, Deborah in 1949 and Joseph in 1950. Lacks’ last child was born at Johns Hopkins Hospital in November 1950. On January 29, 1951 Henrietta came to Johns Hopkins Hospital when she felt a “knot” inside of her along with the symptom of severe pain and bleeding as it was the only hospital near them where black patients were treated. When Howard W. Jones, examined Henrietta he found a lump in her cervix and experienced doctor made no mistake to identify that as a cancerous one as it was very common to these communities at that time. So Lacks was treated with radium tube inserts, which were sewn in place and a small portion of the tumor had gone to the pathology department for diagnosis as per routine work.

In fact at that time there was a heated debate over the nature of cervical cancer, and how best to treat it. Most of the experts at that time believed that cancers are of two types- carcinoma *in situ*, spread only on the surface and not dangerous and can be treated easily by radium. The

other one is invasive carcinoma that is deadly. Richard TeLinde, one senior gynecologist and cancer expert at Hopkins, believed carcinoma *in situ* was simply an early stage of invasive carcinoma, and if left untreated would eventually become deadly. So he used to treat carcinoma *in situ* aggressively, often removing the cervix and uterus. He argued this would drastically reduce cervical cancer deaths, but his critics called it extreme and unnecessary. To establish his idea, he started a study in which he used the cancer cells from patients from public wards of Hopkins as that was permitted at that time. He used to send those cells to Gey’s laboratory to study how there are growing



Salk



Dr. Gey with his Camera

in an artificial environment so that he can prepare a data sheet. During that time reports came to Howard Jones from pathology department, which confirmed that Henrietta’s lump as cancerous. On the other hand Henrietta had to come back again with a severe pain and a tumor, which is about double of the previous one, as radium treatment failed to cure her. So the doctor had to start X-ray treatments. During her radiation treatments for the tumor, two samples of Henrietta’s cervix were removed—a healthy part and a cancerous part—without her permission for research work. The cells from her cervix were given to Dr. George Otto Gey, by doctor Howard Jones as per instruction of his boss Richard TeLinde to record how they are behaving outside the body. At that time Gey and his wife were trying to grow malignant cells outside the body, hoping to use them to find cancer’s cause and cure. They were determined to grow the first “immortal” human cells, a continuously dividing line of cells all descended from one original sample that would constantly replenish

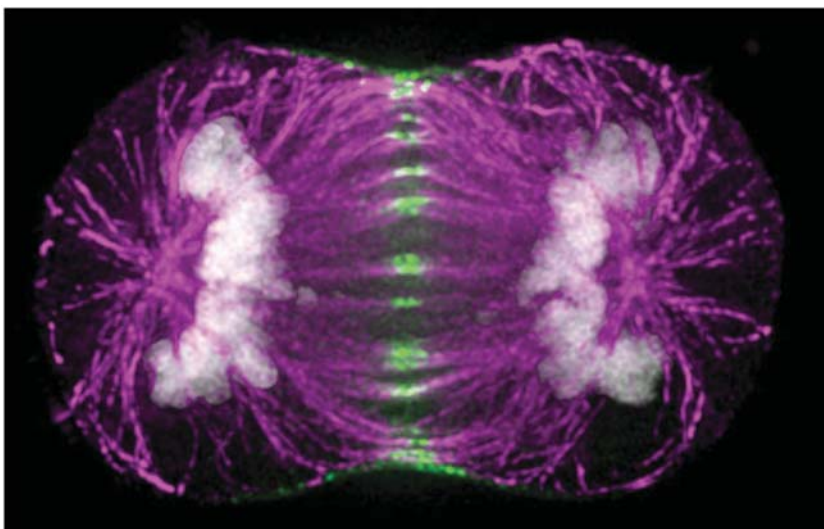
themselves and never die. The sample came to Mary Kubicek, the technician in Gey's laboratory responsible for setting up a culture of cells. When the sample was put on her bench, she as per her usual practice filled them in a test tube and wrote as HeLa - He for Henrietta and La for Lacks as the identification name of the sample and put some sample in roller drum for incubation. Next day to her surprise she found that cell is alive and perhaps increased in number. Why would this particular sample prove different from all the others she had cultivated, only to find the cells dead after hours of work? Being a worker of this famous laboratory she knew very well all cells will die after few divisions. But, contrary to Mary's expectations, the cells not only remained alive, but also divided, almost doubling their numbers in every 24 hours. Immediately Mary brought all those – observations to George Gay's notice. Gey unexpectedly got the first human immortal cell line in reality for which he and his wife devoted almost thirty years.

Within the ten months after diagnosis, Henrietta's body was filled with rapidly growing tumors, there was no improvement. She was told to be admitted immediately. She remained at the hospital until the day of her death. She received treatment and blood transfusions, but died of uremic poisoning on October 4, 1951 at the age of 31. A subsequent partial autopsy showed that the cancer had metastasized throughout her entire body. On the same day in a television show George Gay with two vials filled with HeLa cell declared that he has invented an immortal human cell line which will be immensely helpful for the research of virology including cancer. Johns Hopkins University is ready to supply those cells to all the research laboratories free of cost on request. Perhaps it was an unconscious tribute to that black woman, Henrietta by the white scientist

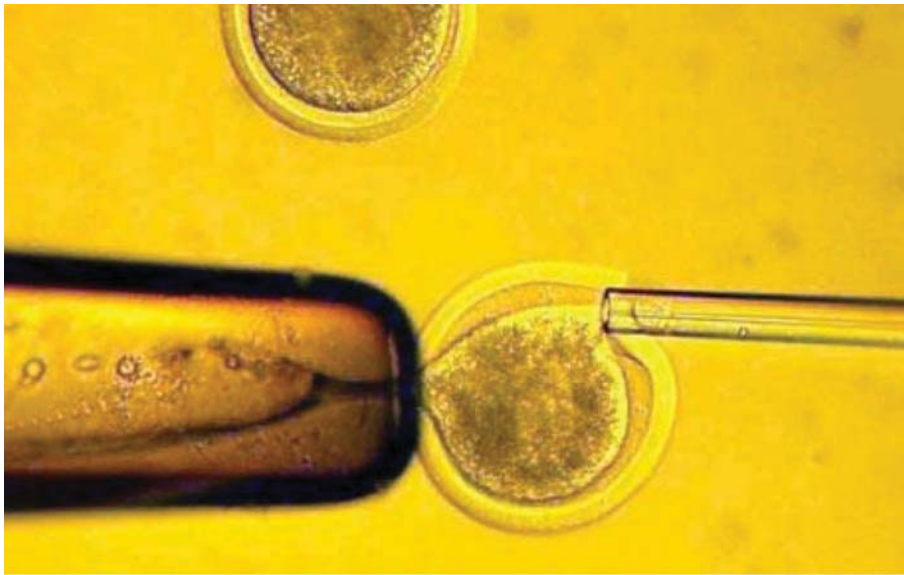
George Gay on that day. Soon, other scientists became interested and George Gey sent vials to their labs all over the globe. Lacks' body was buried without a tombstone in a family cemetery in Lackstown, a part of Clover in Halifax County, Virginia though her cells remain alive in different labs throughout this world. Her exact burial location is not known, although the family believes it is nearer of her mother's gravesite. For decades, Henrietta Lacks' mother had the only tombstone in the cemetery in Lackstown, and Henrietta's own grave was unmarked. In 2010, however, Dr. Roland Pattillo of the Morehouse School of Medicine donated a headstone for Lacks after knowing about her. The headstone, which is shaped like a book, reads:- "Henrietta Lacks, August 01, 1920-October 04, 1951. In loving memory of a phenomenal woman, wife and mother who touched the lives of many. Here lies Henrietta Lacks (HeLa). Her immortal cells will continue to help mankind forever".

Now the question will come why HeLa cell is immortal? That's still a bit of a mystery. Scientists know that Henrietta's cervical cancer was caused by HPV, and her cells have multiplecopies of the HPV genome in them. By all cancerous cells are not immortal. Henrietta also had syphilis, which may suppress the immunesystem and cause cancer cells to grow more aggressively. But many people had HPV and syphilis both. In 1989 - a Yale researcher published that the cancerous HeLa cells contain an enzyme called telomerase which prevents cells from dying. But to be honest science till date could not answer this question properly.

In 1952 the demand for HeLa cell increased to such a level that Gey and his Johns Hopkins University were not in the position to fulfill the demands. Because, they had to supply those living cells in foiled pack which were again packaged in ice and cardboard. They used to send a booklet, giving careful instructions for feeding and handling of those cells and then shipped around the world within a fixed time. Gey and his colleagues soon showed that HeLa cells were more sensitive to polio than some primate cells then used for testing the vaccine. Almost immediately, the National Foundation for Infantile Paralysis established facilities at the Tuskegee Institute for the mass production and distribution of HeLa cells, some 600,000 cultures which they shipped around the country. But that was just the beginning. So the Tuskegee Institute opens the first



Cell Division of HeLa Cell



HeLa Cell Fusion

“HeLa factory,” to supply HeLa cell. Initially, it was operating as a nonprofit organization, but within a few years, a company named Microbiological Associates would begin selling HeLa for profit. The initial importance of the HeLa cells became clear very quickly. As they grow easily and abundantly, they became the model system to use for the isolation of poliovirus. In 1953, HeLa cells became the first cells ever cloned. On the same year researcher discovered that a stain called hermatoxylin makes HeLa cell chromosomes visible. It is really bring a revolution in genetic research. In 1960, HeLa was packed into a Soviet satellite and sent into space before any astronaut. NASA also includes HeLa in the first manned US, discovering that cancer cells grow faster in space. In 1965 HeLa cells were fused with mouse cells, creating the first animal-human hybrid cells. Now HeLa cell is used as a tool that would help to uncover the secrets of cancer, viral growth, protein synthesis, the human genome and so on so on.... the list goes on. Cosmetic companies bought HeLa cells by the millions to test their products for side effects. And though Henrietta never traveled farther than the day she left her native Virginia for Baltimore, her cells sat in nuclear test sites from America to Japan and multiplied in a space shuttle far above Earth.

With time, many social and ethical questions arise with HeLa cell. The first controversy started with Dr. Chester Southam, a doctor cum Virologist of USA. From 1954 onwards he began to conduct experiments without patient consent to see whether or not injections of HeLa cells could cause cancer. At this time, cancer was really a mystery. He assumed there was a valid risk of causing cancer, and as a cancer researcher, he wanted to know for

sure. Southam went on with his experiments, mostly with black people (?) . He tested a mixture of cancer patients, gynecology patients at the Sloan - Kettering Institute and many other places for Cancer Research and others by injecting them with the cancerous HeLa cells. They did not know they were receiving cancer cell injections. Southam did not want to frighten them. In addition, as he was not their Doctor he did not feel he needed to disclose this information. But in 1963, when he was doing a study on cancer at the Jewish Chronic Disease Hospital, the doctors of that hospital refused to inject the patients with HeLa

cell without having their consent. They reported all the incidences to the Regents of the University of the State of New York with an appeal for investigation. During the investigation Dr. Southam defended by saying that he believed the patients faced no risk of harm. He justified his actions stating they were standard practice. He believed his tests would be beneficial for future medical knowledge. He was not alone in this belief; some prominent doctors supported his view. However, in 1965 the Board of Regents of the University of the State of New York found him guilty of unprofessionalism and deceit. They suspended his medical license for one year.

In 1970 George Gey died from pancreatic cancer. In a tribute to Gey in 1971 for the first time Johns Hopkins University published that the source of HeLa cell is Henrietta Lacks. The Lacks family learnt for the first time that Henrietta’s cells were still alive. In 1973 researchers from Johns Hopkins took samples from Henrietta’s children to further HeLa research, without informed consent. As per statement of the Hela family, they came to know, the first time that Henrietta’s cells have been commercialized from the article “Rolling stone” published by Michael Rogers. If so , really it is an ethical issue. In the 1980s, family medical records were published without family consent. In March 2013, German researchers published the DNA code, or genome, of a strain of HeLa cells without permission from the Lacks family. Henrietta’s family members are asking questions “whether her soul is at peace in the heaven, when a lot of research work is going on with her cell on this earth?” Henrietta is immortal among us in all way, and science has given her that immorality. □