Stories of Science: Henrietta Lacks and the HeLa cells

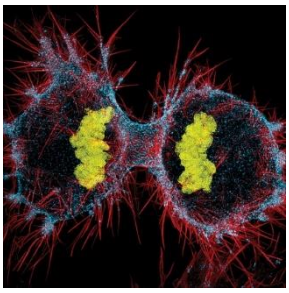
The story about the poor black woman who was the source of the first immortal cell line

Henrietta Lacks was born on August 1st 1920, in the US state of Virginia. Her mother died giving birth to her tenth child, when Henrietta (known to her family as Hennie) was just four years old. Henrietta's father distributed her and her siblings between relatives – Henrietta ended up with her grandfather and her nine year old cousin, David.

Starting at age 14, she worked as a tobacco farmer. At age 14, she gave birth to her first child, Lawrence, and four years later, her second, Elsie. Elsie was described as having severe developmental disabilities, being both deaf and dumb. Both children were fathered by David. Henrietta and David were married in 1941. They then moved to the state of Maryland, so that David could work in the steel works. The couple had a further three children.

Her last child, Joseph, was born in 1950. Around the same time, Elsie was placed in the Hospital for the Negro Insane, where she later died in 1955. In January 1951, not long after the birth of their fifth child, Henrietta visited John Hopkins Hospital complaining of vaginal bleeding. She was admitted to the 'coloured' ward of the hospital. She was examined by highly regarded gynacologist Dr Howard Jones, who discovered a large malignant tumour. During her treatment for this disease, cell samples were taken from Henrietta without her knowledge or permission – one sample was of healthy tissue, the other from the cancerous tumour. The samples were given to George Otto Gey, a cancer researched based at the hospital. Henrietta died in excrutiating pain in October 1951. An autopsy of her body showed that the cancer had metastisised throughout her entire body. She was buried in an unmarked grave in Virginia. While the location of the grave has since been lost, in 2010 money was donated for a headstone dedicated to Henrietta to placed near the grave of her mother. However, this is not the end of her story.

The Cells That Would Not Die



George Otto Gey began to study the cell samples he had been given. He noticed that they were unique in that they reproduced at a very high rate. In addition, whereas cells cultured in a laboratory survive only a few days at most, Henrietta's cells lasted longer. This extra time allowed more in-depth examination, and permitted a number of tests to be performed that would not otherwise have been possible. Henrietta's cells had become cancerous due to a HPV-18 infection. This was the cause of the cervical cancer. In normal cells, there is a limit to mitosis – a maximum number of times a cell can divide before it dies – known as the Hayflick limit. Gey discovered that this did not seem to apply to Henrietta's cancerous cells, and thus they were dubbed 'immortal'. The reason for the Hayflick limit is that the ends of chromosomes contain protective sections called telomeres. As cells divide, the telomeres shorten. When there are no telomeres left, the cell can no longer divide. However, in cancerous cells, an enzyme called telomerase prevents the telomeres shortening. By taking an individual cell and dividing it many times, Gey and other scientists were thus able to conduct a range of experiments on identical cells. The cells became known as the HeLa cells, due to Gey's method of naming samples – the first two letters of the patient's forename and surname.

Scientific Advances

In 1954, Jonas Salk used a sample of HeLa cells to develop a vaccine for polio. Later, a virologist named Chester Southam injected the HeLa cells into cancer patients, prison inmates and healthy individuals, while researching whether cancer could be transmitted, and whether immunity could be developed. Henrietta's cells were the first human cells to be cloned (1955). The use of HeLa cells were vital in the development of IVF techniques. HeLa cells were in high demand, and were put into mass production. They were used in countless fields of research, from cancer to AIDS to the effects of radiation and toxic substances. They have also been used to test sensitivity to glue and cosmetics. It is estimated that since the first samples were taken, 50 million tons of Henrietta's cells have been grown in laboratories. In addition, there are over 11,000 patents involving HeLa cells.

At first it was claimed the HeLa cells belonged to a 'Helen Lane'. However, due to their aggressive nature, in the 1970s, HeLa cells contaminated a number of other cell cultures. This resulted in researchers contacting the Lacks family requesting blood samples, so that they could identify which cells were HeLa cells and which were not. Confused, they began to ask questions.

Ethics and Legality

It then came to light that the HeLa cells had been taken from Henrietta without her knowledge or permission, nor that of her family. The hospital defended itself by saying, at the time, this was normal procedure – permission was typically not requested. The case sparked a discussion about patient rights and the ownership of biological material that continues to this day. In 1990, the Supreme Court of California declared that a person's discarded cells and tissues are not their property. In early 2013, the entire genome sequence of the HeLa cells was released for public access. Her family questioned the ethics and legality of this, given what Henrietta's genome sequence could also infer about them.

To this day, there are still discussions about the use of 'discarded' biological samples. While Gey used the HeLa cells primarily for research purposes, others have had different motiations. Several people have become very wealthy from production, sale and use of the HeLa cells. The results of this have been numerous important scientific advances, some of which are mentioned above. The family's lawyer has described

the HeLa cells as "literally the foundation of modern medical science". Yet the family remains poor, unable to acquire medical insurance, and unable to gain any sort of financial compensation for Henrietta.

From a black woman who was born and died in poverty at a time of severe racial segregation, came one of the most important, yet unheard of, scientific discoveries in modern history. Here's to you, Henrietta.

Comprehension and Reflection Questions

1. Is cancer a communicable or non-communicable disease? Why?

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2. What is the difference between a malignant and a benign tumour?

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3. Why are malignant cancers more dangerous? (use the correct word from the story)

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4. How do tumours grow? Describe the steps involved in the cellular process.

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5. What do you think is the importance of the Hayflick limit?

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6. Do you think it is ethical for researchers to take/use biological samples (cells) without the donors permission? Explain your answer as fully as you can, considering both sides.

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7. Do you think the family of Henrietta Lacks are entitled to financial compensation? Explain your answer as fully as you can, considering both sides

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Extension Activities

Ideas for things to do next:

Imagine taking your phone out of your pocket, unlocking it, and passing it to a total stranger. How would this make you feel? Who has a right to examine the contents of your phone? Does this change if the contents of your phone could save your life, save the life of a stranger? Does the right to the contents of your phone change if you're dead?

Now consider your cells and tissues? Who owns your cells? Did you know that if you blow your nose, drink from a glass or get a paper cut, you're likely leaving your cells lying about all over the place. Who owns cells you've discarded?

Further Reading

Ideas for things to read next:

https://en.wikipedia.org/wiki/Henrietta_Lacks

https://en.wikipedia.org/wiki/HeLa

https://www.theguardian.com/world/2010/apr/04/henrietta-lacks-cancer-cells

https://www.nytimes.com/2015/12/30/opinion/your-cells-their-research-your-permission.html

https://www.washingtonpost.com/local/henrietta-lackss-family-wants-compensation-for-her-cells/2017/02/14/816481ba-f302-11e6-b9c9-e83fce42fb61_story.html?noredirect=on&utm_term=.0f7cab949b23