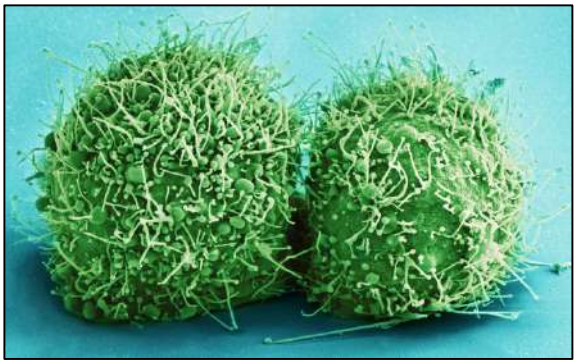
IMMORTAL CANCER CELLS

(1) Henrietta Lacks was an African American woman born on August 1st 1920 in Virginia. In 1951, while pregnant with her fifth child, she was diagnosed with cervical cancer at Johns Hopkins Hospital, which was the only hospital in her area that would treat black patients. She underwent radiation therapy for the cancer and during this time, two samples of the tumor were removed. Unfortunately, the treatment failed and she died on October 4th 1951, nine months after being diagnosed. Though Henrietta Lacks has now been dead for over six decades, her cells still live on and have proved to be one of the most important tools used in medical science.

(2) The cell samples taken from Henrietta Lacks were given to a researcher named George Gey. Gey had been trying to grow cells in culture, meaning grow them outside of the body in a nutrient-filled container, for years. None of the cells he had been working with could survive for longer then a few days before dying. Henrietta Lacks' tumor cells were different and when grown in culture they continued to divide without dying. George Gey called these "immortal" cells HeLa cells after the woman they came from. Remarkably, these HeLa cells have continued to divide, up to this day, long after George Gey himself died in 1970.

(3) Normally cells divide 40-70 times before they hit their maximum ability to divide. This is called the Hayflick limit which is named after Leonard Hayflick who first researched this phenomenon. After the Hayflick limit is reached, a cell tops dividing and goes into senescence, or "cellular old age" until it dies.

(4) The Hayflick limit exists because of telomeres at either ends of a DNA strand. Telomeres are sections of DNA that don't code for genetic traits. During cell division, DNA is replicated but the telomeres aren't fully replicated, therefore new DNA has slightly shorter telomeres than the previous DNA. As a cell continues dividing, the telomeres become shorter and shorter until they reach the part of the DNA which contains code for genetic traits. When this happens, any further shortening of the DNA can be harmful. This is when the cell stops dividing and goes into senescence; the Hayflick limit has been reached.



HeLa Cells Just After Division

(5) An enzyme called telomerase is able to reverse the process of telomere shortening. Telomerase does this by building short sections of DNA and then adding them onto the ends of the telomeres to prevent them from shortening during cell division. Embryonic cells make a lot of telomerase, allowing them to divide rapidly and go beyond the Hayflick limit. In adults, however, telomerase is not found in most cells with the exception of those that need to divide rapidly, like male germ cells that produce sperm or adult stem cells that make blood cells. Some cancer cells also produce a lot of telomerase which allows them to divide beyond the Hayflick limit and possibly divide forever. HeLa cells produce a lot of telomerase allowing them to divide indefinitely (meaning without end) and this is why Henrietta Lacks' cells are called "immortal cells".

(6) Due to their immortal nature, HeLa cells were in huge demand by medical researchers around the world. They wanted to use the cells to test the effects of different medicines and chemicals on human cells. In 1954, Jonas Salk was able to successfully develop and test the polio vaccine using HeLa cells. HeLa cells have now been used for research into treatments and cures for cancer, AIDS, and many other diseases. They are even used to test the sensitivity of human cells to certain chemicals in cosmetics and cleaners as well as radiation and toxins that come into contact with the human body. To this date, over 18 000 kg of Henrietta Lacks' cells have been grown in culture for research, though Henrietta Lacks herself probably weighed no more than 60kg. A small sample of HeLa cell culture will cost anywhere from $100 to $250 USD.

IMMORTAL CANCER CELLS

(7) Though HeLa cells are useful, they can also be tricky to use. Since they grow so well in culture and are immortal, they can easily contaminate non-HeLa cell cultures. Contamination of other cells by HeLa cells is a widely acknowledged problem and it has led to some research being invalidated once the contamination was discovered.

(8) HeLa cells were the first cells to be successfully cultured. George Gey freely donated these cells and the information needed to culture the cells to any scientist who asked for them. He saw the benefits for medical research and for humanity. Though they have been extremely useful there is a controversy around the use of HeLa cells. Henrietta Lacks never gave permission to have her cells collected or used in this way. In 1951, it wasn't customary to acquire permission from patients to harvest their cells. Even now harvested cells or body parts obtained from surgical procedures remain the property of the physician or hospital. The case of HeLa cells has raised a lot of ethical issues. Many individuals and corporations have become rich from creating different strains of HeLa cells and selling them, while the descendants of Henrietta Lacks are not provided with any financial compensation.

Article Questions

1) What was George Gey trying to accomplish with his research?

2) What makes HeLa cells different from other cells?

3) What is the Hayflick limit?

4) What happens when a cell reaches senescence?

5) What are telomeres and what happens to them during DNA replication?

6) Why does the presence of telomerase allow a cell to divide beyond the Hayflick limit?

7) Name three things that have been developed or tested using HeLa cells?

8) What is one concern about using HeLa cells in research labs?

9) What is one ethical problem with how HeLa cells have been obtained and used over the last few decades?