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HeLa: Immortal cell and its milestone for modern medicine

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ABSTRACT
Born in the early twentieth century, Henrietta Lacks, a black woman, played a key role in the advancement of medical science. During the 1920s and 1950s in the United States, Lacks developed an aggressive form of cervical cancer. During Lacks' treatment, a small sample of cancer cells was taken from his body without his consent or knowledge. These cells would become notoriously known as "HeLa cells." But what makes these cells so special is that unlike ordinary human cells, HeLa cells were extraordinarily immortal and could be grown indefinitely in the lab. This has allowed scientists to do in-depth research and advance in a variety of medical areas, including vaccines, gene therapy, and oncology. The accelerated growth rate of HeLa cells and their unlimited division capacity enable rapid and efficient development of tissues and cellular organs. In addition, the cultivation of these cells is relatively simple and inexpensive, which contributes to their wide use. The free distribution of the HeLa strain by the laboratory responsible for its initial cultivation has allowed important advances in several areas of medicine in the last 70 years. Objective: To address the scientific revolution through the HeLa cell. Method: This is a systematic review of the literature. It was prepared from a bibliographic survey, covering national scientific articles and books, in the last ten years. The bases used were SciELO, Google Scholar and the book The Immortal Life of Henrietta Lacks by author Rebecca Skloot. Discussion: Thus, one can correlate the advancement of genetic knowledge in the last 70 years through the unethical extraction of the biopsy in Henrietta and the research carried out later by the couple George and Margaret Grey. Conclusion: This study confirms that the discovery of the HeLa cell was an unsurpassed milestone in the advancement of medicine and that through it it was necessary to create a rigid and clear protocol, which addresses laws through ethical and moral conduct in clinical trials, research and in the doctor-patient relationship.

Keywords: HeLa cells, In vitro culture, Immortal cell, Gene therapy.

1 INTRODUCTION

The HeLa cell represents a significant historical milestone for modern medicine, having been obtained from a biopsy of a cervical adenocarcinoma of a patient named Henrietta Lacks, who died in 1951. Their cells were cultured without their consent by research couple George and Margaret Grey in the Johns Hopkins laboratory. Since then, these cells have been perpetuated in laboratories around the world, becoming a cell line widely used in medical research to this day.

2 LITERATURE REVIEW

Henrietta's cells, labeled HeLa cells from the first two letters of their first and middle names, were growing "with mythic intensity." It soon became necessary to decant them regularly to cope with the explosive volume. Soon, scientists around the world became aware of the miraculous tissue, and the demand resulted in samples of the HeLa cells being sent to researchers. (NCAYIYANA, 2011)

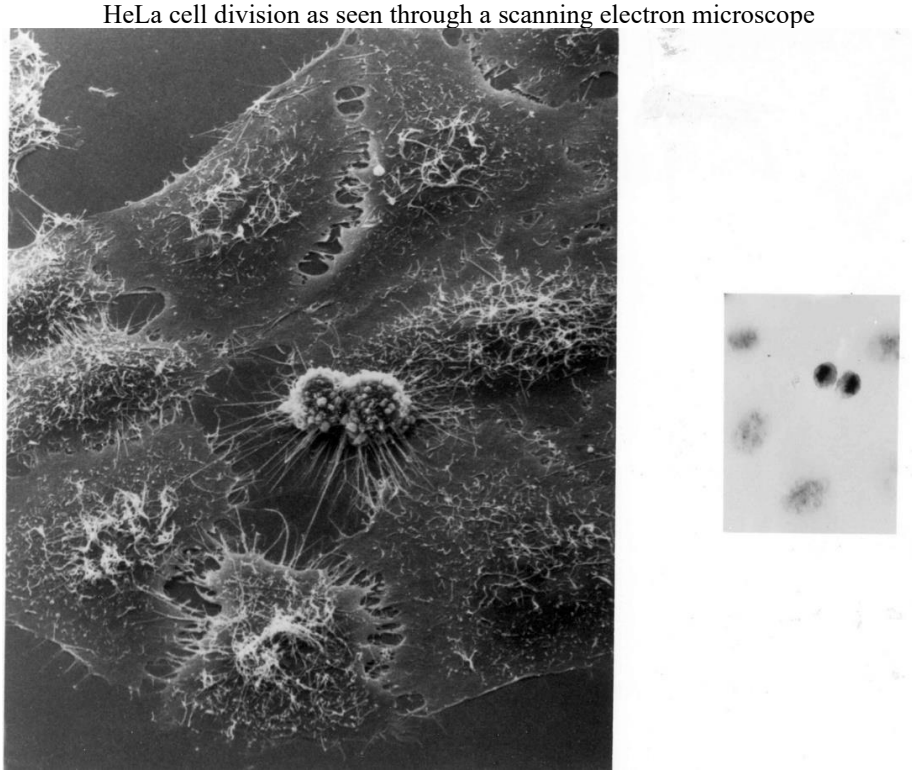
Sixty years after Henrietta's death, 50 million metric tons of her cells have been cultured and continue to populate countless laboratories in countries around the world. HeLa cells proved to be technically more suitable for testing and much less expensive and complicated than using monkeys. In addition, HeLa cells grew virtually anywhere and on any surface, including while floating in liquid. A center for mass production and distribution of HeLa was established at the Tuskegee Institute, Soon, HeLa cells made possible the first chromosome disaggregation, numerous discoveries in genetic and viral studies, the first cloning of a cell, genetic mapping, in vitro fertilization, and much, much more. (NCAYIYANA, 2011)

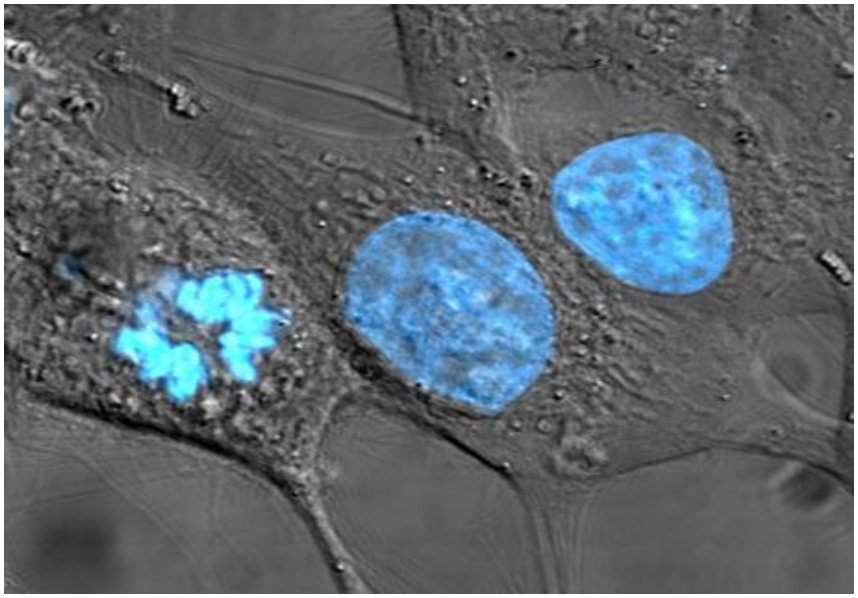
HeLa is one of the oldest and most commonly used cell lines in biomedical research. Due to the ease with which they can be effectively synchronized by various methods, HeLa cells have been widely used for cell cycle studies. Here we describe several protocols for synchronization of HeLa cells from different phases of the cell cycle. Synchronization in phase G_1 can be achieved with the HMG-CoA reductase inhibitor lovastatin, in phase S with a dual thymidine blocking procedure, and in phase G_2 with the CDK inhibitor RO3306. Cells can also be enriched in mitosis by nocodazole treatment and mechanical agitation. The release of cells from these blocks allows researchers to track gene expression and other events throughout the cell cycle. (MA; POON, 2011)

One of the first applications of HeLa cells was in the testing of the polio vaccine, because in that same year, the world was experiencing the largest epidemic in history and there was a longing for a vaccine. The vaccine had just been discovered by Jonas Salk, and its application in children could only be offered after it had been tested on a large scale, because, if it worked, the serum would block the virus and protect the cells. Otherwise, the virus would infect the cells and the child would be infected. The tests on the HeLa cells were a success and, in a short time, the vaccine was distributed to the population. Researchers then began to use them in the most varied types of experiments: exposing them to viruses, contributing to an immeasurable advance in the field of virology; subsequently, subjecting them to freezing processes, in which the most diverse steps could be mapped during the process of cell multiplication, for example, the exact identification of the number of chromosomes, contributing to the detection of disorders such as Down syndrome. In addition, the cells were subjected to high radiation, to analyze the impacts of nuclear bombs, and pressure, to understand the impact in extreme conditions of underwater diving or spaceflight. They tested the effects of

steroids, chemotherapy drugs, hormones, vitamins, environmental stress, and did the first cell cloning exercises. (VILLAR, 2012)

HeLa cell division as seen through a scanning electron microscope





(WIKIPEDIA)

3 FINAL THOUGHTS

All in all, it is evident that the HeLa cell has played a key role in modern medicine, contributing significantly to scientific advancement. Its status as an "immortal cell", due to its ability to perpetuate itself through multiple cultivations since 1951, has made it a constant presence in research today, consolidating its existence and usefulness for more than 70 years.

Finally, it is important to emphasize the ethical and moral importance of using HeLa cells, since their initial collection was done without the informed consent of Henrietta Lacks or her family. This story also highlights that it was necessary to reflect on the need to establish ethical guidelines and regulations for the use of biological materials in medical research.

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