

## Walter Schiller (1887-1960)

Walter Schiller studied the causes of diseases in the US and Austria in the early twentieth century and in 1928, invented the Schiller test, or a way to diagnose early cervical cancer in women. Cervical cancer is the uncontrollable division of cells in the cervix, or lower part of the uterus. While living in Austria until his emigration to escape the Nazis in 1937, Schiller concluded that there was a form of cervical cancer, later named carcinoma in situ, that physicians could detect earlier than when tumors start to appear. To determine whether women exhibited that early form of cancer, Schiller stained women's cervixes with a type of iodine that would stain healthy cervical tissue and not cancerous cervical tissue. Cervical cancer is more deadly to women when it is caught later in its progression, and was difficult to detect in Schiller's time. Schiller's research enabled physicians to diagnose cervical cancer early, helping women receive treatment quicker and ultimately helping to popularize annual diagnostic exams in the US.

Schiller was born on 3 December 1887 to Emma Friedman and Friedrich Schiller in Vienna, Austria. He attended the University of Vienna in Vienna, where he obtained both his undergraduate degree in 1908 and his medical degree in 1912. Following his graduation from medical school, Schiller worked as a bacteriologist in the Bulgarian Army, where he studied bacteria that cause various diseases during the Balkan Wars of 1912 to 1913. After the end of the Balkan Wars in 1913, Schiller began a training program in pathology, which is the study of the causes and effects of disease, under researcher Anton Weichselbaum, who was one of the first researchers to understand the role of bacteria in a study of infectious diseases.

Schiller worked many jobs from the 1910s to 1920s throughout Austria while he progressed through the ranks to become the director of laboratories for the Second Obstetrical and Gynecological Clinic in Vienna. During World War I, Schiller headed the medical laboratory for the Austrian army until the war ended in 1918. Later, during that same year, Schiller became a pathologist for the Second Military Hospital in Vienna, where he stayed until 1921. He left after receiving an offer to become the director of laboratories for the Second Obstetrical and Gynecological Clinic at the University of Vienna, where he conducted his research that resulted in the Schiller test. Schiller married Marie Popper in 1923, and they later had two daughters, named Esther and Eva.

While working as the director of laboratories, Schiller studied cervical cancer tumor cells under microscopes. Cancer is a disease that is the result of abnormal cell division in different parts of the body, such as the cervix. The cervix is the lowermost part of the uterus, which is an internal organ in the female reproductive system where a fetus develops during pregnancy. In 1927, Schiller discovered that a physician can diagnose cervical cancer based on the cytology, or the examination of individual cells of the cervix, prior to seeing physical invasive tumors on the cervix. He used a microscope to observe cervical cells from women and found, what he suggested to be, a type of preinvasive stage of cervical cancer. Schiller observed that at that stage, the epithelial cells of the cervix begin to grow at an exponential rate, preceding invasive cervical cancer. Epithelial cells are those that make up the epithelium, or a barrier of tissue which makes up the top layer of human skin, lining the inside of some organs, such as the intestine, uterus, or cervix. Scientists later named that form of early cervical cancer as carcinoma in situ, derived from the Latin phrase that translates to "on site."

In 1928, Schiller observed that rapidly dividing cervical cancer cells, regardless of their stage of development, exhibited a lack of glycogen. Glycogen is a substance found in the cells of organisms that stores glucose, which is a source of energy. Schiller began using iodine to stain the cervical cancer cell samples, because iodine does not stain cells that contain glycogen. After observing that

the iodine stained only the healthy cervical cells due to the glycogen present in the cells, Schiller began staining the physical cervixes on live women to determine whether the stain worked the same way inside the body on living tissues.

In 1928, Schiller invented what later became known as the Schiller test to diagnose cervical cancer in women. To do that, he used Lugol's solution, or a potassium iodide solution named after physician Jean Lugol, who invented the solution. Schiller noted that the solution stained a healthy cervix to be a temporary dark brown color, while a cancerous cervix would not take up the stain at all due to its lack of glycogen. While stating that the test was generally reliable, Schiller also noted that the test was not always completely accurate. According to Schiller, that was because previously damaged cervical tissue would not take up the stain, which typically as a sign of cancer, even if there was no cancer present, meaning the test results would be inaccurate. Therefore, Schiller recommended the test only for women whose cervixes did not have any visible damage.

Between 1928 and 1934, Schiller reported his results in papers that he published in the medical journal *Zentralblatt für Gynäkologie* (Journal for Gynecology). In 1928, Schiller published *Zur histologischen Frühdiagnose des Portiokarzinoms* (For the Early Histological Diagnosis of Cervical Carcinoma), and later in 1929, he published *Jodpinselung und Abschabung des Portioepithels* (Iodine Brushing and Scraping of the Epithelium). Despite Schiller's fluency in the English language, his wife later helped him publish those results in English-speaking journals between 1933 and 1934. For example, Schiller published "Early Diagnosis of Carcinoma of the Cervix" in the journal *Surgery, Gynecology, and Obstetrics* in 1933. Schiller's wife previously received her doctoral degree in language studies from the University of Cambridge in Cambridge, United Kingdom.

In his published articles, Schiller portrays the test as a quick and effective means to diagnose cervical cancer. He states that it was easy and quick for physicians to learn and because of the expediency of the test, physicians could administer it to up to seventy-five women per day. In his published results, Schiller also recommends that a pathologist should examine any woman's cervical cells that do not stain, indicating possible cervical cancer, under a microscope. He asserts that the best means of obtaining cells was by scraping the topmost epithelial layer of the cervix with a spoon rather than the traditional biopsy, which involves excising the tissues through surgery. Also, Schiller reports that his method previously produced 140 cervical cancer diagnoses among 533 scrapings. However, it is unclear whether Schiller tested all of those diagnoses for accuracy.

Until 1937, Schiller delivered numerous lectures around Europe and North America, advertising his test as the solution to diagnose cervical cancer in women. Then, on 25 April 1937, Schiller and his family arrived permanently in the US in Saint Albans City, Vermont, after fleeing Austria due to the rise of the Nazi political party in Germany. Between 1937 and 1938, Schiller served as the director of laboratories at the Jewish Memorial Hospital in New York City, New York. Then, in 1938, Cook County Hospital in Chicago, Illinois, appointed Schiller to be their director of pathology. At that time, the hospital received over 50,000 surgical specimens and 2,500 autopsies per year, allowing Schiller to observe and study many different tissue types.

In 1939, while working with ovarian tissue samples at his new job, Schiller described a group of ovarian tumors, which he called mesonephromas. However, what Schiller initially described was not actually the same as what scientists consider mesonephromas in recent years. As of 2021, scientists call rare types of cancers found in the female genital tract mesonephromas. Schiller actually observed two different types of tumors, which as of 2021, scientists refer to as clear cell carcinoma and yolk sac tumors. Clear cell carcinoma is a type of cancer that is the result of the uncontrollable division of cells that appear transparent under a microscope. The other type of tumor Schiller observed in ovarian tissue samples are yolk sac tumors, which are those that develop when fetuses are developing in the womb. Yolk sac tumors represent the most common cause of testicular cancer in young boys and can also cause types of ovarian cancers, which is what Schiller initially observed in the ovarian tumor samples. Schiller observed a cellular structure, later named Schiller-Duval body. Schiller-Duval bodies are present in approximately fifty percent of yolk sac tumors.

Throughout his career, Schiller published over one hundred articles about his work in pathology. For example, in 1940, Schiller and his colleagues Julius Lackner and Alex Tulsky collaborated on a study determining the effects of tuberculosis when it infects the uterus. After Schiller observed

endometrium tissue samples, he found that tuberculosis is nearly impossible to diagnose solely based on clinical evidence. Therefore, a physician needs to retrieve a tissue sample from their patient's endometrium and observe the sample under a microscope to detect tuberculosis. The research team published their findings in an article, titled "The Coincidence of Tuberculosis of the Endometrium with Tuberculosis of the Lung," in the journal *American Journal of Obstetrics and Gynecology*. Also, in 1940, Schiller published, "Concepts of a New Classification of Ovarian Tumors," in the journal *Surgery, Obstetrics, and Gynecology*, in which he reviewed previous classifications of ovarian tumors, suggested changes, and illustrated the pathological view of certain tumors.

In 1944, a physician who Schiller supported, named Hans Popper, replaced Schiller as director of pathology at Cook County Hospital. In a letter to another physician, Popper stated that replacing Schiller was unpleasant, as Schiller previously helped Popper secure a research fellowship that advanced his career. In that letter, Popper asserted that Schiller was a truly competent pathologist, calling him a world authority in gynecological pathology. It was also during this time that Ben Lichtenstein, a neuropathologist who also worked at Cook County Hospital, noticed that Schiller exhibited signs of Parkinson's disease. Parkinson's disease causes damage to the central nervous system, impairing movement and causing tremors. Following his termination, Schiller continued to direct pathology laboratories and consult physicians throughout Chicago. In 1954, Schiller collaborated with physicians on an exhibit that they presented at the Sixth American Congress on Obstetrics and Gynecology on early cervical cancer diagnosis and treatment, which won a first-place award.

Schiller maintained diverse interests throughout his career. According to physicians John Gruhn and Lawrence Roth, Schiller collected fine Chinese and Japanese porcelain and performed as a first chair violinist in weekly concerts that he and other physicians put on in Schiller's home. They also state that Schiller never learned to drive, and his wife drove him to and from work and meetings during the later years of his career. Schiller maintained active memberships in the Illinois Society of Pathologists, the Chicago Medical Society, and the Association for Cancer Research, among others. In 1959, the United States Section of the International College of Surgeons presented Schiller with a certificate of recognition for outstanding work. Throughout the mid-twentieth century, physicians used the Schiller test to identify precancerous cervical changes.

On 2 May 1960, Schiller died in Evanston, Illinois, due to complications of Parkinson's disease and pneumonia.

## Sources

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