

Frazer v. Schlegel (2007)

On 20 August 2007, in *Frazer v. Schlegel*, the United States Court of Appeals for the Federal Circuit decided that researchers Ian Frazer and Jian Zhou owned the rights to the vaccine patent for Human Papillomavirus, or HPV, instead of a research team led by Richard Schlegel. *Frazer v. Schlegel* reversed the decision that the Board of Patent Appeals and Interferences had previously made, awarding the patent to Schlegel on the basis that Frazer's patent application contained inaccurate science. However, once appealed, the Federal Circuit judges found Frazer's science to be accurate, granting him rights to the vaccine patent. In 2006, the US Food and Drug Administration, or FDA, approved the first HPV vaccine, which has since been effective in protecting women from cervical cancer by up to ninety-seven percent if they were vaccinated before contracting HPV. The Circuit's decision gave Frazer ownership of the patent for the HPV vaccine, which physicians have administered over 120 million doses of to people in the US.

In the US as of 2021, HPV is the most common sexually transmitted infection, or infection passed along from person to person during sexual encounters. Both men and women can contract and spread HPV. The Centers for Disease Control and Prevention, or CDC, estimated that forty-three million adults were living with HPV in 2018, and that almost every sexually active person will get HPV in their lifetime if they are not vaccinated. Most often, HPV appears with no symptoms. However, it may also appear as a form of genital warts in both sexes. During research he conducted in the early 1980s, German scientist Harald zur Hausen discovered that HPV caused cervical cancer in women. Since then, HPV has also been discovered to be associated with causing other cancers, such as anal and vaginal cancers. As of 2021, the CDC estimates that over forty-three thousand people each year contract HPV-associated cancer, most commonly cervical cancer in women. Scientists around the world began working to develop a vaccine to prevent men and women from contracting HPV and contracting HPV-associated cancers in the early 1990s.

Debates around the rights to the HPV vaccine were largely focused on which team of scientists was the first to understand how to develop Virus-Like Particles, or VLPs, to create the HPV vaccine. VLPs are organic structures that mimic a virus's shape and protein structure but lack the viral DNA that makes viruses infectious. Scientists can use VLPs in vaccines to trick the body into initiating an immune response without actually making the person sick. An immune response is a body's way of defending itself from foreign particles like viruses or bacteria. After the body launches an immune response against a specific type of foreign particle, it will remember the particle, or build immunity against it, which allows the body to get rid of the foreign particle faster if it encounters the particle again in the future. Thus, because VLPs resemble a virus, making vaccines with VLPs helps the body build immunity against a virus without actually having to be infected. HPV vaccines use VLPs that resemble HPV so the body can build immunity against that virus.

Scientists can use two major proteins to produce the VLPs for the HPV vaccine, the L1 and L2 proteins. L1 and L2 are proteins that naturally appear on the outer shell of HPV particles. Scientists learned to harvest and use those proteins to create VLPs that are safe for humans, as L1 and L2 proteins themselves do not carry HPV DNA that can make a person sick. In the 1990s, scientists discovered that making a VLP with those proteins could help the human body build immunity against HPV. That is because if the body's immune system recognizes L1 and L2 proteins, it will attack HPV particles, since they have L1 and L2 on their outer surface. When Frazer's team first filed a patent for the HPV vaccine, they wrote that both L1 and L2 proteins were necessary to make the vaccine. However, shortly after, Schlegel's team showed that only L1 was necessary.

Frazer's and Schlegel's teams each conducted studies that contributed to the production of the HPV

vaccine. In 1991, Frazer and his team at the University of Queensland in Queensland, Australia, conducted research that led them to figure out how to construct VLPs for HPV using both the L1 and L2 proteins. They filed an Australian patent for the technology in July of that year. Then, in 1992, Schlegel's team at the Georgetown University Medical Center in Washington, D.C., conducted research showing that antibodies in mammalian cells could protect the body from HPV infection following exposure to L1 proteins alone. Those findings meant that a vaccine could be constructed using only the L1 protein. Schlegel's team did not actually produce any VLPs in their study but claimed that their findings provided important background information for producing the vaccine. They filed a US patent application for the HPV VLP technology on 25 June 1992. Soon after, Frazer's team filed an international patent for the vaccine on 20 July 1992 and a US patent on 19 January 1994. Frazer's US patent application was placed in interference with Schlegel's, meaning that both teams were attempting to get the rights to the same technology, so the patent ownership then had to be decided in court.

Judges in previous US court cases had asserted that when scientists file patents in other countries, the United States will recognize it as a US patent as long as the science is accurate, and the scientist filed their foreign patent before their competitors filed any patent. In 1967, the United States Court of Customs and Patent Appeals heard *Schur v. Muller*. Both Milton Schur and Paul Adolf Muller were inventors who submitted patents for cigarette filters. Muller filed a patent in Switzerland for a cigarette filter, but shortly thereafter, Schur filed a US patent for the same technology. The United States Court of Customs and Patent Appeals granted the patent to Muller, since he had filed the patent first with all of the appropriate documentation. That set a precedent that the US courts would accept foreign patents as having priority in the case that the applicants filed those patents first. In *Frazer v. Schlegel*, Frazer had filed an Australian patent first. Therefore, the judges focused their decision on whether Frazer used accurate science in his Australian patent application in order to determine if his team or Schlegel's should receive the patent for the technology of the HPV vaccine.

In 2005, the US Board of Patent Appeals and Interferences heard the case and decided that Schlegel should be awarded the HPV vaccine patent. Although Frazer had filed a patent in Australia before Schlegel filed any patent, the judges considered the science in Frazer's Australian patent to be inaccurate. The judges concluded that Frazer inaccurately believed that both the L1 and L2 proteins were necessary to create the VLP when he filed his original patent. It was only after Schlegel had filed his patent that Frazer recognized that the L1 protein alone could be sufficient, as he wrote in his international and US patent applications. Thus, they awarded Schlegel the rights to the vaccine based on the argument that Frazer had presented inaccurate science in his original patent. Frazer's team appealed that decision, and the case went to the United States Federal Circuit. On 20 August 2007, The Federal Circuit reversed the previous decision made by the US Board of Patent Appeals and Interferences to give Frazer ownership over the HPV vaccine patent.

The judges who heard *Frazer v. Schlegel* were members of the United States Court of Appeals for the Federal Circuit. Their names were Pauline Newman, a circuit judge, Randall Ray Rader, a circuit judge, and Daniel Mortimer Friedman, a senior circuit judge. Attorneys from Foley & Lardner LLP, in Washington, D.C., represented Frazer. From that firm, the lead attorney, named Beth A. Burrous, worked with fellow attorney Courtenay C. Brinckerhoff. Representing Schlegel, Elliot M. Olstein was the lead attorney, from the firm Carella, Byrne, Gilfillan, Cecchi, Stewart & Olstein of Roseland, New Jersey. Attorneys Raymond J. Lillie, Alan J. Grant, and Kenneth L. Winters worked alongside Olstein.

Schlegel's attorneys made the same argument that they had in the 2005 case. They argued that Frazer's 1991 Australian patent application was void because the science expressed therein was, according to them, not fully accurate because he said they needed both the L1 and L2 proteins to create the vaccine. Thus, Schlegel's US patent should take priority, they argued, as it was the first patent filed that had what they argued was the correct science. On the other hand, Frazer's legal team asserted that the science in his Australian patent was accurate and that his original 1991 application date should be recognized. They stated that his patent application included fully replicable instructions on how to create a VLP using the L1 and L2 proteins, and that later Frazer realized there were additional ways to create the VLP using those same proteins. Thus, Frazer's legal team stated that his original science was still applicable and therefore he should get the patent.

On 20 August 2007, the United States Court of Appeals for the Federal Circuit awarded the patent to Frazer based on the scientific merit of his original international patent application. Judge Newman wrote the opinion for the case. She stated that Frazer's application included complete details on how to create a VLP, and that Frazer later discovered that either the L1 and L2 proteins could be expressed together, or just the L1 protein could be expressed to make a VLP that would make mammalian cells act as if they are exposed to the full HPV genome. Therefore, discovering that the L1 and L2 proteins did not always have to be expressed together did not discount the fact that Frazer could still make an HPV VLP combining both proteins. Because Frazer submitted his Australian patent earlier than Schlegel, the Federal Circuit reversed the award of priority to Schlegel and granted Frazer priority for the patent.

Following the decision in *Frazer v. Schlegel*, courts began to use that precedent in other cases in the United States. For example, in *Yeda Research and Development Co., Ltd. v. Abbott GmbH & Co. KG* (2016), the United States District Court in Washington, D.C., heard a dispute between two research companies who similarly submitted patents at different times in different countries with an argued difference in the science behind those patents. The scientific disagreement also involved debate over the extent of preciseness and accuracy in the description of a tumor suppressing protein, which both companies submitted patents for. The research company Abbott GmbH & Co. had filed a patent for the technology in Germany on 9 May 1989. Nine days later, the research company Yeda Research and Development Co. filed a patent for the technology in Israel on 18 May 1989. Yeda's team claimed that the science in Abbot's patent application was incorrect. However, based on the precedent set in *Frazer v. Schlegel*, the judges of the United State District Court granted Abbott the priority filing date of the patent. Yeda appealed the case twice but was dismissed both times.

On 10 May 2011, the United States Patent and Trademark Office formally granted and published Frazer's patent application. By that point, pharmaceutical companies Merck and GlaxoSmithKline had already licensed the technology from numerous patent applicants. They had been producing and distributing vaccines for people since 2006. As of 2021, Frazer leads a laboratory at the University of Queensland that researches different types of cancers and heads a biotechnology company that works to develop new types of vaccines. Also as of 2021, Schlegel still investigates the science surrounding HPV transmission and works on developing HPV vaccines that can help lower the infection rates in developing countries. According to his staff page at Georgetown University, Schlegel claims to have developed the technology for the HPV vaccine, though the decision made in *Frazer v. Schlegel* still stands.

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