

# The Case of Lydia Fairchild and Her Chimerism (2002)

In 2002, after applying for government assistance in the state of Washington, Lydia Fairchild was told that her two children were not a genetic match with her and that therefore, biologically, she could not be their mother. Researchers later determined that the genetic mismatch was due to chimerism, a condition in which two genetically distinct cell lines are present in one body. The state accused Fairchild of fraud and filed a lawsuit against her. Following evidence from another case of chimerism documented in *The New England Journal of Medicine* in a woman named Karen Keegan, Fairchild was able to secure legal counsel and establish evidence of her biological maternity. A cervical swab eventually revealed Fairchild's second distinct cell line, showing that she had not genetically matched her children because she was a chimera. Fairchild's case was one of the first public accounts of chimerism and has been used as an example in subsequent discussions about the validity and reliability of DNA evidence in legal proceedings within the United States.

Chimeras are organisms that have two different sets of DNA, or the genetic material that contains instructions for the development and functioning of an organism, present in their bodies. Most organisms only have one set of DNA, which is present and identical in every cell throughout that organism's body. An organism gets approximately half of its DNA from each of its parents' gametes, or their sperm and egg cells, which carry DNA from parent to offspring. In human reproduction, one sperm typically fuses with one egg to create a fertilized egg that can develop into a fetus. However, sometimes the ovaries, which are organs in the female body that produce and store eggs, release more than one egg at a time, a phenomenon known as hyperovulation. In such cases, two different sperm can fertilize two separate eggs released during hyperovulation, creating two genetically distinct fertilized eggs that can develop into non-identical twins. However, in some cases, those two fertilized eggs may fuse together during an early stage of development, resulting in a chimera made of two genetically distinct cell lines. As a consequence, instead of having cells with identical DNA throughout their body, a chimera has different DNA present in different parts of their body so that the DNA in their blood, for example, may not be the same as the DNA in their saliva.

Human chimerism is rare but is typically marked by certain characteristics, such as two distinct red blood cell lineages or patchy skin pigmentation, though neither Fairchild nor Keegan exhibited those traits showing obvious signs of chimerism. In Keegan's case, her two different sets of DNA were found in cells throughout her body. But in other chimeras, there is a dominant set of DNA in the body, with the other set only present in certain tissues. Fairchild matched that pattern, having one set of DNA throughout most of the cells in her body, and another distinct set of DNA in her cervical tissue. Documented cases of chimerism in humans like Fairchild and Keegan are rare, and the actual incidence rate is unknown. Some researchers speculate that chimerism in humans occurs as often as instances of fraternal, or non-identical, twins. The rate of fraternal twins has been steadily increasing due to rising use of assisted reproductive technologies and fertility treatments.

Prior to 2002, Fairchild had no indication that she might be a chimera. After separating from her children's father, Fairchild applied for state assistance, a process that required both paternity and maternity tests. As part of the application, both she and Jamie Townsend, her then-estranged partner and her children's father, had to submit DNA samples in the forms of cheek swabs to establish the maternity and paternity results for the children. According to a documentary produced on Fairchild's case, "The Twin Inside Me," a social worker called Fairchild to come to her office after obtaining the maternity test results. During that visit, the social worker and a legal representative confronted Fairchild with DNA evidence that her children were not biologically related to her. They asserted she was committing welfare fraud by lying about her relationship with her children.

In Fairchild's case, DNA analysis found no match between her and her children's DNA, although there was a clear match between the children and their father, Jamie Townsend. The prosecutor's office in the state of Washington took over Fairchild's case suspecting welfare fraud. Initially, the prosecutor's office ordered that the family receive three separate cheek swab DNA tests to account for lab error. Each time, the results indicated that Fairchild was not the biological mother of the two children. Although she was able to produce photographs of her with her children throughout their lives, the prosecutor's office continued to allege that she was not being truthful about the origin of her pregnancies, and that because she had claimed her children as dependents on her application for benefits, doing so constituted welfare fraud.

In 2002, Fairchild was at the end of her third pregnancy with Townsend. Fairchild states in "The Twin Inside Me" that the prosecutor's office threatened her with a lie detector test, something Fairchild stated she would undergo if it meant proving her children were hers. Rather than sending Fairchild for a lie detector test, though, the prosecutor's office sent her a court summons to determine Fairchild's relationship with her children. According to the documentary, US courts at the time accepted DNA evidence as infallible, meaning it was seldom contested in a court of law. According to the documentary, other forms of evidence of Fairchild's maternity, including photographs of Fairchild with her children throughout their lives, Townsend stating he had witnessed both children's births, and footprint records taken from the children as neonates, were repeatedly dismissed. Fairchild states she could not convince a lawyer to represent her because they told her they would not win a case against DNA evidence.

When Fairchild went to court, she represented herself, bringing photos from her two previous pregnancies and pictures of her with her children as infants. The court suggested placing her two children in separate foster homes while the case was contested to monitor the children's wellbeing, since officials assumed that Fairchild was being fraudulent about her relationship with the children. Fairchild appeared in court on a Friday. Her doctors were scheduled to induce labor of her third pregnancy the following Monday. Because of the induction date, Fairchild requested that the court postpone the case until after they tested the DNA of her third child. The judge then ordered a court officer to be present at the birth. That officer later witnessed the neonate being delivered from Fairchild's body and watched as doctors drew blood from both Fairchild and the infant. After two weeks, the court received results that there was no genetic match between Fairchild and her infant. Although there had been a witness for the birth and blood samples, the judge maintained his statement that Fairchild was being deceitful about the pregnancies in some way. However, with the new evidence that an infant Fairchild had undeniably delivered did not match her DNA, a lawyer, Alan Tindell, agreed to represent her. In the documentary, Tindell stated that the DNA evidence against Fairchild was odd enough that it intrigued him, convincing him to take the case.

As Tindell surveyed the evidence against Fairchild, he discovered the article "Disputed Maternity Leading to Identification of Tetragametic Chimerism," published on 16 May 2002 in The New England Journal of Medicine, in which doctor Neng Yu and a team of researchers presented the case of Karen Keegan, a woman who had needed a kidney transplant. Keegan's family members, including her husband and two of her three sons, submitted DNA to see if they would be a match to donate a kidney to her. After discovering Keegan's two sons were not a genetic match for her, a group of researchers suggested chimerism as the potential explanation. Those researchers then tested Keegan's third son, who had not originally been tested because he was a child at the time and would be unable to donate a kidney. After testing Keegan's son, the researchers discovered that he was a genetic match to Keegan. The research team then received a grant from the National Institutes of Health to further study Keegan and her family, and found that Keegan had evidence of two distinct sets of DNA throughout her body. In "The Twin Inside Me," researchers speculate that Keegan and Fairchild were both chimeras, resulting from the fusion of two independently fertilized eggs at a very early stage of development.

The researchers, led by Yu, published the results they found with Keegan's case in 2002, the same year that Fairchild's investigation began. According to the documentary, that evidence was crucial in the court determining that Fairchild could also be a human chimera. After taking hair, cheek, skin, and blood samples from Fairchild's body, the court-appointed lab technicians could only find one DNA lineage. However, once they took a sample from Fairchild's cervix, the narrow tube that

connects the vagina to the uterus, they finally found a second DNA lineage that matched those of her children. Once Fairchild's mother submitted her DNA in comparison, matching as the maternal grandmother of the children, the judge dismissed the case, admitting he was wrong. In the documentary, *Townsend*, the father of the three children, states that if the third infant had not exhibited the same contradictory DNA results, he believes that the couple would have lost their children permanently.

Fairchild's case prompted new concerns about the reliability of DNA evidence in the United States legal system. In the documentary, Fairchild's lawyer, Tindell, suggested that DNA may not be as infallible as previously thought. Fairchild's case showed that DNA evidence could actually lead to an incorrect conclusion, which in her case was that Fairchild was not the mother of her children. In 2012, Sheldon Krinsky, policy professor at Tufts University in Medford, Massachusetts, and Tania Simoncelli, who at the time of publication worked as Senior Advisor in the Office of the Commissioner of the US Food and Drug Administration, published the book *Genetic Justice: DNA Databanks, Criminal Investigations, and Civil Liberties*, in which they stated that human chimerism could potentially upend the US court system's reliance on DNA evidence, citing Fairchild and Keegan as case studies. The use of DNA in courts relies on the belief that there is a direct connection between a DNA sample and the person it is taken from. But Fairchild and Keegan, as human chimeras, show that DNA may not always accurately identify an individual or biological relationships. Krinsky and Simoncelli also stated that potentially every human being could exhibit some trait of chimerism, which they claim may impact the way that forensic scientists collect and utilize DNA in crime scene investigations.

In response to that book, legal professor David H. Kaye published the article, "Chimeric Criminals," in the *Minnesota Journal of Law, Science, and Technology* in 2013, in which he asserts the basis of Krinsky and Simoncelli's book was completely unfounded. Kaye acknowledges that human chimerism should be a consideration in DNA testing, given its unknown frequency, but rejects the statement that it is a significant obstacle to its use in forensic investigation. Kaye states that Krinsky and Simoncelli's point that any human could display some trait of chimerism is only true because there are numerous ways someone could be considered a chimera. One is maternal-fetal microchimerism, a phenomenon that occurs during typical human gestation involving a transfer of cells between the fetus and pregnant woman. Since every human undergoes gestation, every developing fetus would have some cells from its gestational carrier in addition to its own cells, technically making it a chimera. However, Kaye states that those forms of chimerism would not affect how DNA is left in crime scenes. Kaye also asserts that chimerism in the cases of Fairchild and Keegan are the exception and should not change how the public views DNA evidence. That is due to the fact that Fairchild and Keegan exhibit two DNA lines only in very specific areas of their bodies, and only at a microscopic level.

The Fairchild case of chimerism prompted many questions about the reliance on DNA evidence in the US justice system and how common chimerism might be in the general population. The documentary "*The Twin Inside Me*," which first aired in 2006, documents a firsthand account from Fairchild and her family. It examines the extent of the legal and biological questions raised by an example of legal guardianship being threatened by genetic evidence in the case of a chimeric woman.

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