

In the Womb: Identical Twins, by National Geographic (2009)

National Geographic's documentary *In the Womb: Identical Twins* focuses on the prenatal development of human identical twins. Director Lorne Townend uses three-dimensional (3D) and four-dimensional (4D) ultrasound imaging and microscopy to depict twin development, genetic and epigenetic variations in the fetuses, and methods of fetal survival in the confines of the womb. Artist renditions of scientific data fill in areas of development inaccessible to the imaging tools. The 50-minute film describes the lives twins live after birth and describes new research that identical twins might not be as identical as once thought. *In the Womb: Identical Twins* is a sequel to the 2005 National Geographic film *In the Womb*.

At the start of the documentary, the narrator asks the central question of the film: why are there so many differences between identical twins if they are the only natural human clones on earth? Researchers have increasingly found that epigenetic factors, or inherited changes that occurred without DNA change, can lead to significant physical, behavioral, and psychological differences in identical twins.

The documentary then introduces four different sets of identical twins, each with distinct differences. Dennis and David, the first set, were raised in the same family and brought up in the same socioeconomic environment. The second set of twins, Daphne and Barbara, were separated at birth and not introduced to one another until middle age. Of the third set, Jake and Tom, one twin had a genetic disorder and the other did not. The fourth set of twins, Jesus and Celso, were featured for their difference in sexual identity.

After introducing the lives of each different set of identical twins, the narrator leads viewers into the beginning stages of development. Identical twins are conceived, like every other human, through the fertilization of an egg by a sperm, but the moment that the blastocyst divides to create identical twins was unknown and unseen until 2007. Scientists caught this key moment as they observed a blastocyst preparing for implantation. The trophoblast folded in on itself and the inner cell mass divided into two sets of cells. If these cells were to continue developing, they would have become identical twins.

The next stage of the documentary focuses on three potential epigenetic events—DNA methylation, limited growing space, and hormonal secretion—that would lead identical twins to develop differences. DNA methylation inhibits or promotes the expression of certain genes, which explains why identical twins can have identical DNA and not exhibit the same traits. Limited space inside the womb can create a fight for room between the two fetuses, as their size and need for space increases dramatically in the last trimester. Hormonal fluid secretion is one of the most controversial factors in prenatal development because it relates to the question of whether or not sexuality is determined before birth.

The documentary uses Jake and Tom as an example of how DNA methylation may explain why one twin developed a genetic disorder and the other did not. The twins developed within the same conditions but developed differently—Jake weighed five and a half pounds and Tom weighed one and a half pounds at birth. Their shared environment has led scientists to point to DNA methylation as the cause for their crucial differences in gene expression.

The documentary also reveals the consequences to the fetus of small quarters in the womb, pointing to this factor as a trigger for early behavioral traits in the fetus. Ultrasound imaging showed identical twins' fight for space. Some sets of twins were said to exhibit introverted and extroverted

tendencies in reaction to one another as early as fifteen weeks. Ultrasound images also revealed that when one twin would kick or move the other twin for more space, the twin forced to move would curl up or hold its umbilical cord.

The documentary also examines prenatal hormonal fluid secretion, which some scientists believe may influence individuals' sexual orientations. The film showcases the difference in sexual identities between twins Celso and Jesus. In the sixth week of pregnancy, fetuses with the male Y chromosome begin developing testes, and during the eighth week, testosterone releases throughout the body. Testosterone masculinizes the body, the brain and the hypothalamus. Some scientists argue that the more testosterone is introduced to the hypothalamus, the more a man will likely be attracted to women. When a male fetus produces less testosterone, or the brain absorbs less, some scientists suggest that the fetus's likelihood of preferring people of the same sex is increased.

Sources

1. In the Womb. DVD. Directed by Toby Macdonald. National Geographic Channel, 2005, USA: Time Warner Home Video. Accessed October 10, 2011.
2. In the Womb: Identical Twins. DVD. Directed by Lorne Townend. National Geographic Channel, 2009, USA: Dolby Laboratories. Accessed October 25, 2011.