

Parasitic Twins ^[1]

By: DeRuiter, Corinne Keywords: Fetus ^[2] Congenital disorders ^[3] Human development ^[4]

Parasitic twins, a specific type of [conjoined twins](#) ^[6], occur when one twin ceases development during [gestation](#) ^[7] and becomes vestigial to the fully formed dominant twin, called the autositic twin. The underdeveloped twin is called parasitic because it is only partially formed, is not functional, or is wholly dependent on the autositic twin. In most cases, the phenotype of parasitic twins is one normal functioning individual with extra appendages or organs, leading to questions about whether or not the additional limbs and organs are in fact another person or just a mutation of the individual's body. Researchers think that parasitic twins result from mechanisms similar to those that produce [Vanishing Twin Syndrome](#) ^[8]. On a developmental continuum with vanishing twin syndrome on one end and developmentally normal twins on the other, researchers propose that the patterns of [conjoined twins](#) ^[6] fall somewhere in the middle.

Of the many types of parasitic twins, the most common is vestigial twins, when one individual has extra limbs or organs. The extra vestigial limbs are generally harmless to the autosite. Similarly, dipygus parasitic twins have duplications of legs, but may also have extra hands, feet, or sexual organs. An epigastric parasite describes an incomplete twin with usually just a torso or legs attached to the functioning twin's abdomen. In some cases, there is also an undeveloped head imbedded in the autosite's abdomen. Craniopagus parasiticus describes an autositic twin with an additional, parasitic head attached at the head. The parasitic head may also have an underdeveloped body with no functioning organs. The least understood type of parasitic twins are [fetus](#) ^[9] *in fetu*. *Fetus in fetu* means "fetus inside fetus" and describes a condition in which one functioning twin has an underdeveloped twin inside of its body, usually in the abdomen.

Many health problems can arise in the autositic twin as a result of providing for the needs of the parasitic twin. One such condition that may arise from parasitic twinning is Twin Reversed Arterial Perfusion or TRAP sequence. This condition affects those individuals who have an extra torso or limbs. The major medical problem associated with the TRAP sequence is heart failure, because the autositic twin's heart must supply blood to both bodies.

Incomplete twinning has been proposed as a mechanism for how parasitic twins arise. Instead of one [egg](#) ^[10] separating into two eggs that give rise to two fetuses, incomplete twinning occurs when one [egg](#) ^[10] does not fully separate. Researchers have also investigated the role of the protein Sonic Hedgehog (SHH) in establishing the midline of the body during development. A deficiency of SHH during development leads to stunted midline development, and disorders such as fused eyes ([cyclopia](#) ^[11]), a brain lacking hemispherical separation (holoprosencephaly), and fusion of the legs and feet (sirenomelia). Conversely, an increase in SHH during development leads to an over-expression of midline features. In [chick](#) ^[12] embryo experiments, an increase in SHH led to larger than usual spacing between the eyes and duplication of beaks, a condition sometimes referred to as craniofacial duplication. The duplication of features associated with parasitic twinning may be caused by an over-expression of SHH rather than the result of incomplete twinning. However, because there are

so many different types of parasitic twins, discovering a single mechanism of this developmental anomaly has proven difficult.

Before scientists began looking at parasitic twin development and its associated conditions, individuals with parasitic twinning often worked in side-shows and circuses. For example, Betty-Lou Williams, born in 1932, had a parasitic twin with two legs and an arm with three fingers that extended from her torso. Williams also had an underdeveloped head imbedded inside of her torso that was discovered in an autopsy. Until she died at twenty three years-old, Williams worked for Ripley's Believe it or Not! to make enough money to send her siblings to college. Other examples include George Lippert, whose right leg branched into two, and who worked for P.T. Barnum's circus at the end of the nineteenth century, and Francesco Lentiini, who also had three legs and earned money by kicking soccer balls with them in shows during the first half of the twentieth century.

Historically, parasitic [conjoined twins](#) [6] have often been viewed as medical curiosities. Advances in understanding how [conjoined twins](#) [6] arise, including the impact of SHH expression on midline development, have resulted in a better understanding of how this medical anomaly occurs. Coupled with better surgical techniques, [conjoined twins](#) [6] with a parasite and autosite are now often able to be separated.

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Subject

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Topic

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