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Marmoset male caring for triplets

Chimerism: When Your Sperm Is Not Yours

Common chimerism in marmoset monkeys

Imagine that your balls or your ovaries do not produce your sperm or your eggs but those of your brothers or sisters! This is called "germ line chimerism" and as odd as it sounds, it has been found to be a norm in one of our relatives, the marmoset monkey from tropical South America! In chimerism, some of the sperm or eggs in the individual's gonads carry the genes of another sibling, not their own DNA. Marmosets (*Callithrix* species) give birth as a norm to two non-identical twins, and as much as 33 % of those represent chimeras. Genetic investigation of these twins revealed that all tissues, from skin, hair, brain, lung and muscle may harbor cells derived from the other twin. This is possible as in marmosets the placentas of the twin fetuses fuse early in development, and stem cells cross from one to another, before starting their development in different positions. A team at the University of Nebraska in Lincoln led by Corinna Ross has recently found that the stem cells are also transferred in-utero, and can enter the reproductive organs of the other twin. As a result, chimeric monkeys may not produce their own genetic offspring. The little marmosets can carry the genes of its uncle, not of its apparent father, for example. 5 out of 15 family lines analyzed by the research team by employing genetic markers displayed this situation. "In an evolutionary sense, chimerism may promote the system of social care by increasing relatedness between fraternal twins just as the increased relatedness in social insects such as ants and bees is thought to underpin their social system," said Ross. Normally, full brothers and sisters share on average 50% of their genes (theoretically from 1 to 99 %). But in the case of the chimeric siblings, the percentage of the common genes is much higher, as some of their cells bear the full DNA package of their sibling. "In many ways the marmoset social system appears similar to that of social insects, which have very complex relatedness patterns," said Ross. "It is remarkable that chimerism seems to determine the parental effort of the mother and father. Some kinds of chimerism do occur in humans, but germ line chimerism in humans usually leads to sterility. However, twins that 'vanish' in utero may not be that uncommon. Even if we do not have a living twin we may be carrying chimeric cells from our 'vanished' twin", said Gavin Dawe, who works on stem cells and brain repair at the National University of Singapore. "Marmosets provide an interesting system in which to study conflict within an individual. If the germ line is chimeric you could get sperm competition within the ejaculate of a single male", said David Haig, who works on intragenomic conflict at Harvard University in Cambridge, Massachusetts, US. Recently, a chimerism case was found in a pair of human twins in the US (see article below).