

Existence of Microchimerism in Pregnant Women Carrying a Boy!

Arash Minai-Tehrani ¹, Mehdi Amini ², Kambiz Gilany ^{2*}

1- Nanobiotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran

2- Reproductive Biotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran

Corresponding author: Kambiz Gilany, Reproductive Biotechnology Research Center, Avicenna Research Institute, ACECR, Tehran, Iran, P.O. Box: 19615-1177
E-mail: k.gilany@avicenna.ac.ir

To cite this article: Minai-Tehrani A, Amini M, Gilany K. Existence of Microchimerism in Pregnant Women Carrying a Boy!. *J Reprod Infertil.* 2016;17(1):64-65.

Microchimerism is considered as the occurrence of small populations of cells with a diverse genetic setting within a person (1). Tissue microchimerism is enhanced during pregnancy and is frequently associated with female-dominant autoimmune disorders, response to injury from malignancy, and transplantation effect (2).

Recently, a group of pathologists at Leiden University Medical Center in the Netherlands carried out an experiment that seemed to be doomed to failure. They performed in-situ hybridization of the Y chromosome on paraffin-embedded autopsy samples of different organs collected from 26 women who died while pregnant or within one month after delivery of a son. In fact, the group was looking for male cells in female bodies. Surprisingly, their search was successful. They found Y chromosomes cells in each tissue samples that they analyzed. The obtained chimeras were from lung followed by spleen, liver, kidney, brain and heart (3).

In the 1990s, scientists established the first evidences that the cells of the children can get away from the uterus and they can be expanded within the mother's body. This incidence was identified as a fetal microchimerism, after the chimera, a monster in Greek mythology that consists of different parts of lion, goat and dragon.

Fetal cells do not flow and accumulate without direction. It has been reported that fetal cells that move toward heart can develop into cardiac tissue in female mice and be a part of beating heart cells eventually (2, 4).

A recent study proposes that women approximately at all times obtain fetal cells when they get pregnant. These have been noticed in the begin-

ning of seven weeks of pregnancy. Later, the cells can be disappeared, though the cells may stay for a lifetime. Chan et al. reported that Y chromosomes were present in the brains of 63 percent of 59 deceased older women. Several researches evaluated the cells left behind by sons regarding fetal microchimerism, due to ease for its discrimination from the cells of their mothers (5). It has been demonstrated that microchimerism may have an effect on woman's health. Based on the maternal health, three hypotheses regarding the role of fetal cells have been suggested: 1. fetal cells are harmful that may associate with the inflammatory response resulting in maternal tissue damage, 2. fetal cells play protective roles with fetal progenitor cells that may assist for maintenance of maternal tissues, and 3. Fetal cells are only bystanders, with no effect on maternal health (6). Furthermore, fetal cells have been proposed to produce chemicals affecting the mother's health which

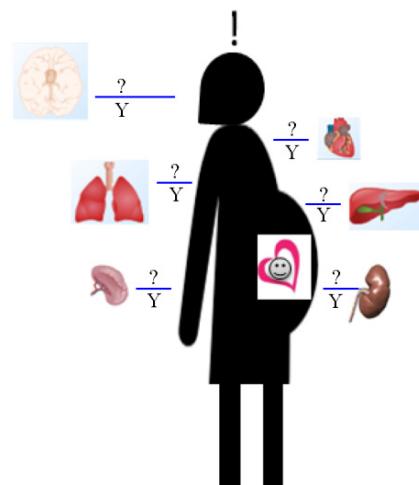


Figure 1. A pregnancy obligated present: What did the sons leave behind?

permit the fetuses to determine her biology from inside (2).

A mother's reproductive success has been indicated to be dependent on the total number of children that she raises until maturity during her life. Paying too much attention to a single child may leave her too weak to care for later children. The immune system has been illustrated to be mostly involved for clearing leftover fetal cells after giving birth. Thus, this defense may create its own dangers; women with autoimmune disorders including rheumatoid arthritis may represent relapses after pregnancy (7). Some specific experiments need to be performed for examination of these ideas. Researchers need to investigate the genes that may become active in fetal cells in special parts of the body. Next, they may look into the activity of the genes controlling a mother's physiology, such as milk production. These results are preliminary and incomplete and a number of questions about this phenomenon remain unanswered. Researchers need to consider whether the fetal cells in the brain would alter the women's behavior or not. It can be the most challenging part, while it is the part for which, at least, one study has been performed. Consequently, it may suggest a role for microchimerism in postpartum mental health.

References

1. Ford CE. Mosaics and chimaeras. *Br Med Bull*. 1969;25(1):104-9.
2. Boddy AM, Fortunato A, Wilson Sayres M, Aktipis A. Fetal microchimerism and maternal health: A review and evolutionary analysis of cooperation and conflict beyond the womb. *Bioessays*. 2015;37(10):1106-18.
3. Rijnink EC, Penning ME, Wolterbeek R, Wilhelmus S, Zandbergen M, van Duinen SG, et al. Tissue microchimerism is increased during pregnancy: a human autopsy study. *Mol Hum Reprod*. 2015;21(11):857-64.
4. Dawe GS, Tan XW, Xiao ZC. Cell migration from baby to mother. *Cell Adh Migr*. 2007;1(1):19-27.
5. Chan WF, Gurnot C, Montine TJ, Sonnen JA, Guthrie KA, Nelson JL. Male microchimerism in the human female brain. *PLoS One*. 2012;7(9):e45592.
6. Fugazzola L, Cirello V, Beck-Pecoz P. Fetal microchimerism as an explanation of disease. *Nat Rev Endocrinol*. 2011;7(2):89-97.
7. Flowers ME, Pepe MS, Longton G, Doney KC, Monroe D, Witherspoon RP, et al. Previous donor pregnancy as a risk factor for acute graft-versus-host disease in patients with aplastic anaemia treated by allogeneic marrow transplantation. *Br J Haematol*. 1990;74(4):492-6.