Chimerism in humans

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Abstract. *In this article, we analyzed what Chimerism is and what it is related to people. Also, the Chimerism assay is a diagnostic test for monitoring donor blood cells and lymph nodes. recipient after allo-stem cell transplantation. Analysis of chimerism in blood and bone marrow samples provides important information about the engraftment of donor cells and the risk of recurrence of the underlying disease In this review, we have summarized the description of chimerism.*

Key words: *Chimerism, hematopoietic stem cell transplantation, laboratory, sign, types, characteristics, consequence, importance.*

Аннотация. *В этой статье мы разобрали, что такое химеризм и какое он имеет отношение к людям. Кроме того, анализ «Химеризм» представляет собой диагностический тест для мониторинга донорских клеток крови и лимфатических узлов, реципиент после трансплантации алло-стволовых клеток. Анализ на химеризма в образцах крови и костного мозга дает важную информацию о приживлении донорских клеток и риске рецидива основного заболевания. В этом обзоре мы суммировали описание химеризма.*

Ключевые слова: *Химеризм, трансплантация гемопоэтических стволовых клеток, лаборатория, признак, виды, характеристики, последствия, значение.*

Annotatsiya*. Biz ushbu maqolada Ximerizm nima ekanligi va insonlar bilan aloqadorlini tahlil qildik. Shuningdek, Ximerizm tahlili donor qon*

hujayralari va limfa tugunlarini kuzatish uchun diagnostik testdir. O‘zak hujayra transplantatsiyasidan keyin qabul qiluvchi. Qon va suyak iligida kimerizm tahlili namunalar donor hujayralarining singdirilishi va qaytalanish xavfi haqida muhim ma’lumotlarni beradi asosiy kasallik Ushbu sharhda biz ximerizmning tavsifini umumlashtirdik.

Kalit so‘zlar: *Ximerizm, gematopoetik o‘zak hujayra transplantatsiyasi, labaratoriya, belgi, turlari, xususiyatlari, oqibati, ahamiyati.*

Chimerism is when two embryos (fraternal twins), resulting from the development of two separate eggs fertilized separately by two sperm, are united in the early stages of development (blastomere or gastrula stages) and are born as a single living being.

In ancient Greek mythology, there are stories of a fiery creature called a chimera. This terrible beast was a mixture of a lion, a goat and a snake.

Literary analysis and research methodology.

In modern medical literature, only about 100 cases of chimerism have been recorded. Chimerism can also affect non-human animals. This often results in two different color types in different halves of the same animal, for example, two different colored eyes.

What causes chimerism?

People can experience one of several types of chimerism. Each has a slightly different cause and can cause different symptoms.

Microchimerism

In humans, chimerism often occurs when a pregnant woman takes several cells from her fetus. The opposite can happen when the fetus absorbs some of the mother's cells.

These cells can enter the maternal or fetal bloodstream and migrate to various organs. They can remain in the body of the mother or child for ten or more years after birth. This condition is called microchimeria.

Artificial chimerism

This type of chimerism can occur when a person receives a blood transfusion, stem cell transplant, or bone marrow transplant from another person and receives some of that person's cells. This is called artificial chimerism.

In the past, artificial chimerism was more common. Today, transfused blood is usually treated with radiation therapy. This helps the transfusion or transplant recipient better absorb the new cells without having to constantly introduce them into their own body.

Twin chimerism

A more extreme form of chimerism can occur when a pair of twins is conceived and one embryo dies in utero. The surviving fetus may absorb some of the dead twin's cells. This gives the surviving fetus two sets of cells: its own and some of the twin's cells.

Tetragametic chimerism

In other cases, human chimeras develop when two different sperm fertilize two different eggs. All these cells are then combined into one human embryo with crossed cell lines. This is called tetragametic chimerism.

What are the signs of chimerism?

Signs of chimerism vary from person to person. However, most people do not see any symptoms or do not recognize these signs as chimerism. Some symptoms include:

hyperpigmentation (increased darkening of the skin) or hypopigmentation (increased lightening of the skin) small patches or areas up to half the body intersex with male and female parts of different colors (intersex) or vaguely sexual in appearance (causes infertility) two or more sets of DNA in the body's red blood cells are associated with possible autoimmune problems such as skin and nervous system.

How is chimerism diagnosed?

People often find out they are chimeras by accident. There are known cases of chimerism discovered during genetic tests for medical reasons, for example, during organ transplantation.

Discussion and results.

Human and animal chimeras can have two different blood types at the same time. Each blood type can have the same amount. For example, in one case of a female chimera, the blood contained 61% O and 39% A.

Tortoiseshell cats are often chimeras. Their division is the result of the fusion of two different embryos. Although these cats may be fertile, they often are not. This is because the extra DNA they receive links their color trait to infertility.

Fertility treatments such as IVF and multiple embryo transfer, which can sometimes lead to twin and twin pregnancies, have not been shown to increase the likelihood of a chimera being born in humans.

Many chimeras experience DNA interference in their blood. But it can also happen elsewhere in the body. This means that a parent with chimerism can pass two or more sets of DNA to their child. For example, a child may receive two sets of DNA from the mother and one from the father.

After a bone marrow transplant, a person is left with a mixture of the original blood cells and DNA from the donor's blood cells. In other cases, their bone marrow may only match the donor's DNA. This is due to the fact that the bone marrow continues to regenerate.

According to researchers, microchimerism from fetus to mother can occur in almost every pregnant woman. In a small study, all women who died during pregnancy or within a month of giving birth had fetal cells in some body tissue. Experts do not know exactly how this chimerism affects mother and child.

Over the past few decades, a small number of stories about chimeras have made mainstream news headlines.

Taylor Mule, an American singer, has been special since childhood. And she had a perfect line on her stomach that contrastingly divided her body into two parts. Regular flesh color and hot pink. Both parts of the body reacted differently to insect bites. If the “bodily” one reacted traditionally, then in the second half everything swelled. The adventures didn't end there. Mule grew a double tooth. And later she was discovered to be allergic to more than 150 foods!

The girl suffered for a long time with her birthmark. Taylor even tried to remove the spot with a laser, but in her own words, “It turned out to be too painful.” In 2009, Taylor learned that she had chimerism. That is, she has two sets of DNA, each of which contains the genetic code for an individual person. Essentially, two people coexist in her body. This rare condition can occur during fetal development. Mule most likely had a twin, which she absorbed in the womb.

A US resident from Washington state, Lydia Fairchild, after a divorce, turned to the government services of her state for social benefits. To do this, Lydia and her husband, Jamie Townsend, had to confirm maternity and paternity with a DNA test, which, surprisingly, showed that Lydia is not the mother of their three common children. The state sued for fraud, but Lydia was acquitted, as her lawyer Alan Tindell provided the court with an article from the New England Journal of Medicine, which talked about 52-year-old Boston teacher Karen Keegan (according to other sources - Keener), who in 1998 needed kidney transplantation. Three of her sons agreed to be donors, but during genetic analysis it turned out that two of them were not related. Research carried out in connection with this case showed that Karen Keegan turned out to be a chimera - a creature in whose body tissues with different genomes were initially present. Based on this, extensive DNA tests were carried out with Lydia’s relatives. But in the case of Lydia Fairchild, everything turned out to be more complicated - the DNA of her children proved only a relationship with their grandmother, Lydia’s mother. The investigation was able to figure it out only through a series of tissue analyzes of different parts of the body. It turned out that Lydia's skin and hair contain one genome, and her cervix contains another, corresponding to the maternal genome of her children. Chimerism of this type - “tetragametic chimerism” - is formed in the early stages of pregnancy, when two eggs are fertilized by two sperm and one organism is formed from two zygotes. Lydia Fairchild was acquitted, and a program was dedicated to this case in 2006 on American television.

Conclusion

Chimerism in humans is a rare genetic disorder that can result in the presence of two or more populations of cells in the body. The causes and exact genetic mechanisms are not yet fully understood. Symptoms and manifestations of the disease can be varied, and diagnosis is carried out using genetic studies. Genetic testing helps determine whether a person's blood cells contain DNA that is not found in the rest of their body. Multiple sets of DNA in the bloodstream are a classic sign of chimerism. But people can live their whole lives without knowing they are chimeras because it is a rare disease and people are not usually tested for it.

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