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HUMAN CHIMERISM: TWO OR MORE GENOTYPES IN ONE BODY

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Abstract: Natural and artificial chimerism, experiments conducted in this regard, the phenomenon of mosaicism, the similarity of organ transplantation to chimerism, the case of Lydia Fairchild, the causes of chimerism and its damage, methods of studying chimerism, and microchimerism.

Keywords: natural chimerism, mosaicism, artificial chimerism, allograft, DNA analysis.

INSON XIMERALIGI: BIR TANADA IKKI VA UNDAN ORTIQ GENOTIP

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Annotatsiya: Tabiiy va sun’iy ximeralik, bu borada qilingan eksperimentlar, mozaiklik hodisasi, organ transplantatsiyasini ximeralik bilan o‘xshashliklari, Lidya Fairchilda uchragan holat, ximerizmning sabablari va uning zararlari, ximerizmni tekshiruv usullari, mikroxmerizm.

Kalit so‘zlar: tabiiy ximerizm, mozaiklik, sun’iy ximerizm, allograft, DNk tahlili.

ХИМЕРИЗМ ЧЕЛОВЕКА: ДВА И БОЛЕЕ ГЕНОТИПА В ОДНОМ ТЕЛЕ

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Аннотация: Естественная и искусственная химерность, эксперименты, проведенные в этом отношении, явление мозаичности, сходство трансплантации органов с химерностью, случай, обнаруженный у Лидии Фэйрчайлд, причины химеризма и его повреждения, методы исследования химеризма, микрохимеризм.

Ключевые слова: естественный химеризм, мозаичность, искусственный химеризм, аллотрансплантат, анализ ДНК**.**

Introduction. Fertilization usually occurs in the initial part of the oviduct, that is, in the fallopian tube. The zygote formed as a result of this process immediately proceeds to the initial stage of embryonic development - the stage of fragmentation (blastulation). In placental mammals, including humans, zygote fragmentation is complete, asynchronous and uneven, in which the embryo is formed as a result of the uneven arrangement of blastomeres and their increase in number. In some cases, two or more eggs can separate and fertilize simultaneously. Usually in such cases, genetically dissimilar dizygotic (binary) twins are born. However, in cases of natural chimeras, two zygotes can merge in the early stages of embryonic development, dissolve the placental barrier and integrate with each other. If these genetically different cells cannot accept each other immunologically, embryonic development stops and spontaneous abortion occurs.

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Literature review. Natural chimeras are often not detected, especially when both zygotes are of the same genetic sex, as this does not lead to significant differences in appearance. Most cases of chimeras are discovered incidentally, for example, during forensic examinations such as blood group analysis or DNA tests, including paternity testing. To date, the number of documented cases of natural chimeras worldwide is approximately 45-50, but this number may only reflect a small fraction of the actual cases. However, along with chimerism, the phenomenon of mosaicism is also observed, in which genetically different groups of cells exist within one organism, which originate from a single zygote and, unlike chimerism, are not associated with the process of fusion.

The phenomenon of mosaicism occurs as a result of DNA mutations that occur during the process of cell differentiation of a person during embryonic development or postnatal life. In this process, a population of cells within an organism becomes genetically distinct, meaning that one group of cells differs from another in terms of their genetic makeup. These differences are usually caused by chromosomal abnormalities, gene mutations, or epigenetic changes. Chimerism is fundamentally different from mosaicism in that chimeras contain two or more genetically distinct cell populations within an organism, usually resulting from the fusion of two or more zygotes.

Research Methodology. Organ transplantation is a complex and life-saving field of medicine in which an organ or tissue is removed from a person (living or deceased) called a donor and transplanted into another person called a recipient. This process is performed to replace damaged, dysfunctional, or defective organs, thereby improving the recipient's quality of life or saving their life. The donor and recipient may be in the same location, but organs are often transported from different geographic locations by specialized transportation methods. Transplantation between individuals of the same biological species (e.g., person-to-person) is called an allograft. In allografts, the donor may be a living individual (e.g., a kidney or liver donor) or a deceased individual. Immunological compatibility is important in these procedures, as the genetic makeup of the donor and recipient is different, which means that the transplanted organ may be rejected by the body. Therefore, during organ transplantation, cells with different genetic information are combined in one organism, which can lead to genetic phenomena such as chimerism or mosaicism.

Analysis and results (Analysis and results). Chimeras are created not only in humans, but also in animals, for example, in rabbits and mice, artificially, in which a special female species is fertilized and one or more zygotes are fused with each other in the early embryonic stages by radioactive or chemical effects. If the mother's body accepts these cells not as pathogens, but as a fetus, a normal offspring will be formed. This offspring can grow healthy, feed and leave normal offspring.

The person whose natural chimerism caused widespread discussion is Lydia Fairchild (USA, 2002). Lydia was the mother of three children. A DNA analysis was conducted through the court to obtain state assistance. The results showed that she was not the biological mother of her children. Because she gave birth to the children herself. Further tests later revealed that Lydia was a chimera. She was actually created from two twin embryos, but one embryo gave rise to some body parts and the other to other parts. As a result, her egg cells had one genotype, while her skin and blood cells had different genotypes. The children were born from the “twin genotype” in her ovaries, but when tested through blood, they revealed different genetic

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makeup. This case caused a great deal of controversy in the legal system and was the first time that human chimerism was heard about by the general public.

Lydia Fairchild (born 1976) is an American woman who was found to have two sets of DNA in her body. In 2002, while pregnant with her third child, she divorced her husband Jamie Townsend. When Lydia filed a lawsuit seeking child support for her children, the court ordered a DNA test to determine Townsend's paternity. The results clearly showed Townsend as the father, but the tests revealed that Lydia herself was not the mother. As a result, Fairchild was charged with fraud - that is, she was suspected of claiming child support for other people's children or participating in a secret surrogacy scheme. Even her previous birth certificates were questioned. When her third child was born, the judge ordered that a doctor be present during the delivery and that Lydia's and the baby's blood be tested immediately. However, DNA tests conducted two weeks later again concluded that Lydia was not the biological mother of the baby. The change came from defense attorney Alan Tindell. He read an article in the New England Journal of Medicine about a Boston woman named Karen Keegan with chimerism and suggested that Lydia's case was similar. After that, extended family testing was conducted. The results showed that the DNA of Lydia's children matched her mother's DNA at the grandmother and granddaughter levels. In addition, while DNA from Lydia's skin and hair cells did not match her children, DNA from a cervical smear (cervical sample) did.

Conclusions and Recommendations. Problems with chimerism: due to the heterogeneity of such genetic information, it causes a number of problems in procedures such as organ transplantation, blood and other biological fluid donation. This problem can be prevented by the above extensive testing.

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