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Bioengineered uterus: The future of assisted reproductive technology

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Infertility is a common condition with about one million cases occurring annually in India alone. Infertility is defined as the inability to conceive and reproduce due to a defect in the reproductive system. It is a source of much emotional distress for many couples, and scientists are conducting various studies to find novel cures for this condition. There are two types of infertility, namely primary and secondary. Primary infertility refers to the situation when the couple is unable to conceive even once; whereas, in secondary infertility, the woman can get pregnant once but further unable to do so. Uterine factor infertility can be both primary and secondary type infertility, which causes about 6% of all cases of infertility. This is caused due to abnormalities of the uterus which may be due to congenital (since birth) defects, fibroids, or scarring due to injuries. This condition is treated either by corrective surgery or in some cases, allogeneic uterus transplants. This means a healthy, functional uterus is transplanted from the donor to the patient. However, there are several complications in such a procedure, such as the shortage of donors and the host immune rejection of the foreign organ. Additionally, taking immunosuppressants could be harmful to the woman and all her future pregnancies. Hence, there is a need for new technology to solve this problem. A study published by a team of researchers from Wake Forest Institute for Regenerative Medicine, described a promising solution using tissue bioengineering. In an experiment conducted on rabbits, scientists extracted samples of the subject’s uterus and grew them in a culture in vitro. Sufficiently proliferated cells were seeded back into the damaged uteruses using biodegradable scaffolds. After 3 months, the scaffolds disintegrated leaving the newly differentiated tissue behind. Once the uterine tissue had healed, the rabbits were inseminated. 4 out of 10 pregnancies led to live births which was a significant improvement when compared to the control group. The mother and infants were healthy and faced no further complications. This study has opened the doors to further research in the regeneration of many more organs. This technique was successful in regenerating all three layers of the uterine wall (endometrium, myometrium and perimetrium), leading to the proper implantation of embryos. This method of applying bioengineering to create uterine tissue from the patient’s cells will ensure that the graft is accepted by the immune system and the foetus has a safe environment to develop. Regenerative uterine development in humans still has a long way to go; nonetheless, it provides a safe and effective cure to uterine defect infertility.

Keywords: Regenerative medicine, Uterus tissue engineering, Uterine defect, Infertility, Stem cells

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