



TECHNOLOGY

Novel Method of Internal Organ and Organoid Generation For Therapy and Research in Humans and Animals

OVERVIEW

Background

Advances in stem-cell research have opened up remarkable possibilities for therapeutic and research applications in humans and animals. Stem cells are capable of indefinite proliferation to give rise to either cells of the same type or cells of different tissues in an organism. When combined with gene-editing technologies, the use of stem-cells can potentially solve major problems such as 1) replacing diseased cells or tissues of a patient, 2) providing miniature organs (organoids) that mimic human tissues for study of development and disease, and serving as closer-to-human alternatives to animal models while studying or validating therapies, 3) for production of improved live-stock for selected traits, and 4) on-demand production of human organs in animal models. Any realization of the above mentioned goals requires a reliable, consistent and replicable cell stock that overcomes problems of poor viability, labor-intensive screening for desired cell-types, and inconsistent genetic alterations resulting in mixed-cell populations. While pigs are currently used for transplantation studies, the production of endogenous human organs in pigs is still speculative.

Innovative Technology

Researchers at the University of Maryland have developed a novel method of generating stem-cell lines committed to giving rise to cells of internal organs alone, through a combination of embryonic cell line selection followed by gene-editing and embryo implantation to generate pigs with donor-derived cells contributing exclusively and extensively to internal organs. Such a method should be transferable to human cell lines, thus providing a pathway for endogenous organ production and alleviating the short supply of organs available for transplantation worldwide. This technology promises to revolutionize not only life saving organ transplants, but also provide a more relevant model to study human disease and treatment protocols.

Advantages

- Stable cell lines ensuring reliability, consistency and replicability
- Saves time and resources through avoidance of labor-intensive screening procedures
- Development of more reliable animal models for the study of disease treatments

Applications

- Potentially applicable for cell-replacement therapies using patient's own cells
- On demand production of human organs in suitable animal models
- Selective production of improved live-stock in animal husbandry

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EXTERNAL RESOURCES

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