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Opinion Article

Clinical Characteristics of Human Induced Pluripotent Stem Cell

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DESCRIPTION

Human physiology and disease can now be studied at the cellular level induced Pluripotent Stem Cells (iPSCs). They also have the potential to be applied in precision medicine, such as personalized drug testing. This statement describes the origins of iPSC lines, their use for cardiovascular disease modelling, precision medicine, and strategies for promoting their wider use for biomedical applications. Human iPSCs have three characteristics that make them uniquely qualified as model systems for studying human diseases: they are of human origin, which means they contain human genomes; they are pluripotent, which means they can be differentiated into any of the human body's somatic cell types; and they are stem cells, which means they can be expanded from a single cell into millions or even billions of cell progeny. iPSCs allows to study cells that are genetically matched to specific patients, and genome-editing tools enable the introduction or correction of genetic variants. The use of iPSCs to better understand cardiomyopathies, rhythm disorders, valvular and vascular disorders, and metabolic risk factors for ischemic heart disease has made some initial progress.

Human pluripotent stem cells exhibit clonal variations in lineage bias, allowing cells to be selected that best suit the needs of each application. The diversity of their sources is a distinguishing feature of iPSC technology. Human iPSCs should ideally be obtained through minimally invasive procedures that pose the least risk. Dermal fibroblasts were used to create the first human iPSCs. A biopsy may leave a visible scar in healthy people, and there is always the risk of infection, so the harvest site must be chosen with care. Human pluripotent stem cells have enormous potential for developing novel therapeutic approaches for regenerating or replacing functionally impaired tissues. Furthermore, the use of autologous cells for *in vitro* disease modelling and drug testing without re-transplantation into the host has grown in importance as a scientific branch of regenerative medicine. The differentiation of hematopoietic stem cells from PCSs for leukaemia and other blood disorders, the creation of liver organoids for treating liver failure, and the creation of kidney organoids for treating kidney failure are all examples of hPSC technology applications that are making steady progress. Tumor formation, unwanted immune responses, and the transmission of adventitious agents are among the identified risks (identified in clinical experience) or potential or theoretical risks (observed in animal studies). There is currently no clinical experience with pluripotent stem cells (i.e., embryonic stem cells and iPSC). Because of their characteristics of unlimited self-renewal and high proliferation rate, the risks associated with a product containing these cells are considered high, if not unacceptable.

APPLICATIONS

Many diseases are difficult to treat due to a lack of knowledge about the mechanisms that contribute to disease progression. As a result, diseases must be modelled so that treatments can be developed that target the root cause of the disease. Throughout history, there has been numerous disease testing models developed. Some of them can to some extent, mimic the human cellular microenvironment and metabolism. Many animal models have been used for disease modelling, including rats, mice, dogs, monkeys, dogs, and primates. However, the use of animals as disease models is restricted due to existing variability in their genetic make-up, which is highly responsible for biological functions, and thus differences are observed when compared to human individuals. Second, when the individuals are of different species, the problem becomes even more complicated. Different species have different genetic make-ups and, as a result, produce different proteins.

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