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Development of Global Human Induced Pluripotent Stem Cell Banks

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The ability to generate induced pluripotent stem cells (iPSCs) from a patient's own adult cells (e.g. fibroblast or peripheral blood mononuclear cells) opens up opportunities of improved disease modeling, drug screening, and individualized treatments for numerous conditions [1,2]. The iPSCs are genetically matched to the patients and can be differentiated to a myriad of therapeutically relevant target cells that bypass immune rejection when transplanted [1]. An increasing number of research laboratories around the world are now working towards optimizing protocols for efficient and reliable iPSC derivation and differentiation, and promoting the use of iPSC in drug screening and clinical applications. The implications are vast, but the key to further tapping into the potential of iPSCs is to establish well-characterized iPSC lines that reflect the diversity of the human population [3], and it is of critical importance to integrate global efforts to ensure delivering quality stem cell resources.

"Since 2007, the International Stem Cell Forum (ISCF), a consortium of more than 20 stem cell research funding bodies, e.g., National Institute of Health (NIH), Medical Research Council (MRC), and The National Health and Medical Research Council (NHMRC) from more than 20 countries, has supported a program proposed by the UK Stem Cell Bank to coordinate existing and developing stem cell banks, regulators, and scientists to deliver consensus opinions on best practices in the management and distribution of stem cell lines" [4]. Practical recommendations and creative solutions are presented to address challenges associated with large-scale efforts to generate iPSC banks.

First, it is important to utilize the knowledge of well-established human embryonic stem cell banks and their experience in standardization and quality control metrics in iPSC resource centers [4]. Second, generation, deposit and characterization of iPSC lines are time consuming and expensive. It is therefore critical to develop a cost-effective way to share and distribute cell lines. The establishment of automated generation, analysis, and culture of iPSC lines should be verified and incorporated [5]. Third, given that one of the main strengths of iPSCs is their immune-compatibility with patients, a critical step is to establish a global network of stem cell banks in order to provide the broadest range of immunological types and ensure widespread availability of high quality cell therapies in the future [3].

In summary, robust international collaboration is needed to reach agreement on the above issues for large-scale production of iPSC lines at clinical grade. Such an initiative would enable the immense potential of iPSCs to move from a scientific finding to a medical revolution.

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