Streszczenie w języku angielskim.

The doctoral thesis focuses on research into human induced pluripotent stem cells (hiPSCs) and their applications in treating respiratory diseases such as cystic fibrosis (CF) and chronic obstructive pulmonary disease (COPD). It presents the results of successful derivation and characterization of three lines of human induced pluripotent stem cells (hiPSCs) from peripheral blood mononuclear cells (PBMCs) of patients with cystic fibrosis (CF) and chronic obstructive pulmonary disease (COPD). The cell lines were designated as CF001, CF002, and COPD001. Non-integrating Sendai viral vectors delivering Yamanaka transcription factors (OCT4, SOX2, cMYC, and KLF4) were used for cell reprogramming. All three lines exhibited typical hiPSC colony morphology. Pluripotency was confirmed through immunostaining of surface markers (SSEA4, TRA-1-60) and nuclear markers (OCT4, SOX2). The ability to differentiate into the three germ layers was demonstrated by positive staining of appropriate markers after direct in vitro differentiation. The loss of Sendai virus genes and exogenous reprogramming factors was confirmed by RT-qPCR. Karyotype analysis showed a normal karyotype in all lines. Short tandem repeat (STR) genotyping confirmed the genetic identity of the derived lines with the donor cells. Periodic tests for mycoplasma presence in the culture medium yielded negative results. The derived hiPSC lines were characterized according to current standards and biobanked, enabling their use in further research on respiratory diseases, disease modeling, organoid creation, toxicological studies, and genetic engineering. Future plans include further development of reprogramming methods and the application of hiPSCs in cell and regenerative therapy.

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