The Role of Proteasome in the Cell Cycle Progression of Induced Pluripotent Stem Cells

Materials and Methods

Cell culture

Although Vilchez et al. [18] have shown that proteasome activity does not change with passage number in the same cell line; we have studied all cell lines at the same passage number. Fibroblasts (Primary Dermal Fibroblasts; Normal, Human, Adult, PCS-201-012) and mesenchymal stem cells (Adipose-Derived Mesenchymal Stem Cells; Normal, Human, PCS-500-011) were purchased from ATCC® (USA). ey were cultured in Dulbecco's modi ed Eagle's medium supplemented with penicillin/streptomycin and fetal bovine serum in a humidi ed atmosphere of 5% CO_2 and 95% air at 37°C as recommended by the supplier. Fibroblast derived iPSCs were a gi from Prof. Taner Onder (KOC University, Istanbul, Turkey). e asks and plates were coated with BD Matrigel hESC-quali ed Matrix (BD Biosciences, Cat. No. 354277) at concentrations recommended by the supplier. Cells were maintained in mTeSR1 medium (Stem Cell Technologies, Cat. No. 05850) and passaged a er applying dispase

regulators in both sides. e 26S proteasome degrades its substrates in an ATP- and ubiquitin-dependent manner. e main substrates of 26S proteasome are signaling molecules that are involved in cell cycle, apoptosis, proliferation and di erentiation. Unfolded or misfolded proteins such as the ER-resident proteins that are retro-translocated to the cytosol as well as cytosolic unfolded proteins which su er from environmental triggering factors or mutations are also degraded by the 26S proteasome [9].

ESCs are undi erentiated cells, which are immortal and capable of di erentiating into all other cell types of organisms. ESCs are so-called pluripotent stem cells [14]. e potential of ESCs in therapeutic medicine is signi cant but inter-personal genetic material di erences limit stem cell or stem cell-derived somatic cell transplantations. In addition, ethical problems on using ESCs limit their applications. Accordingly, MSCs gained importance in regenerative medicine because of their multipotency and easy isolation and culturing procedures [2,3]. Moreover, iPSCs introduced disease-speci c individual pluripotent stem cells in regenerative medicine studies.

Discussion

Proteasomal system plays many crucial roles in cells. It is composed of 20S catalytic unit and di erent regulators. e 20S proteasome, by itself, degrades oxidized proteins in an ATP- and ubiquitin-independent manner. Oxidized proteins are produced by energy metabolism, natural aging process, cell signaling or environmental e ects [10]. Another crucial complex of the proteasomal system is the 26S proteasome, which is composed of the 20S proteasome and 19S

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