The Interesting Reality of Stress Granules Formed in Regulating Stem Cell Fate: A Step Towards Successful Personalized Medicine

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Induced Pluripotent stem cells (iPSCs) are currently recognized as one of the most potential sources for cell based therapy. iPSCs are highly sensitive to different types of stresses, indicating the importance of stress response program in regulating stem cell fate. In this study we have tested the effect of hyperosmotic stress on one of the components of the stress response program, stress granules (SGs). Human (h)iPSCs (IMR-90, purchased from WiCell) treated with different concentrations of NaCl to induce hyperosmotic stress was used as our model. Our results showed that hyperosmotic stress induces SG formation in iPSCs. SGs is initiated within the normal physiological range of NaCl (150mM) and reached its maximum (100%) in a concentration little beyond the normal range (200 and 300 mM). However, when the concentrations increase to reach 400 mM, no SG formation was observed. In addition, under the hyperosmotic stress conditions ranging from 50mM-400mM no alteration of the shape and morphology of iPSCs was observed. The time course of 200mM NaCl treatment showed SG formation that lasts up to 2 hrs, however with high concentrations of 400mM iPSCs are resistance to SG formation was observed at any time of treatment. In conclusion, SG formation occur under hyperosmotic stress but under specific concentrations and for an extended period of time, indicating its role in regulating stem cell fate. Understanding this role is crucial in producing high quality iPSCs that can be used efficiently and safely in cell therapy, drug screening, and diseases modeling.