**2018 Innovation System Construction Project by Okinawa Science and Technology promotion Center (OSTC)**
**Research Topic: Appling Proton Freezing Technology to Regenerative Medicine**

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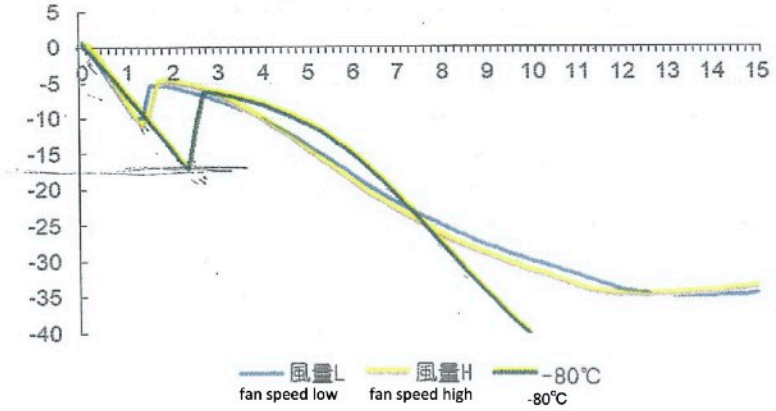
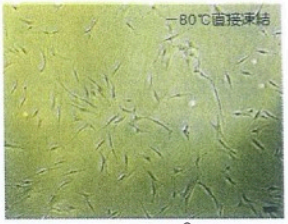
Outline:
The cryopreservation method of the cell occupies an important place in industrializing regenerative medicine.
The technology called "Proton freezing" which is retained by Enrich food manufactures inc. suggests the possibility of solving the problem of cell death due to freezing and thawing, which has been a problem even when using cryopreservation solution.

Freezing velocity and freezing temperature change by Proton freezing system (air volume Low/High) and -80℃ freezer direct freezing method




Fat derived stem cells after freezing and thawing

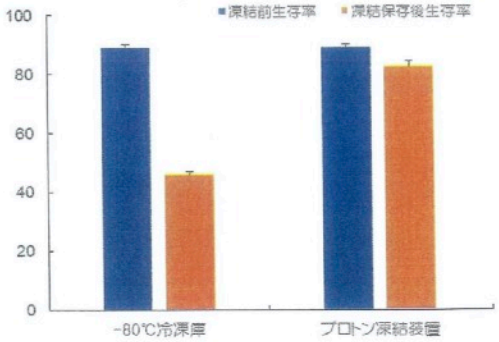

Proton freezer




-80℃freezer

Fat derived stem cells viability after freezing and thawing

Blue: Before freezing Orange: After Cryopreservation




-80℃freezer Proton freezer

**R&D Topic 1-1: Conditional search of the most suitable cryopreserve way of proton freezing system.**
To consider the most suitable freezing condition of proton freezing system,freezing velocity and a freezing temperature change by a direct freeze way of proton freezing system and the-80 ℃ freezer used for a cell freeze in the past were gauged with temperature measurement equipment.Influence by the strength of the cool wind which is the function of the accessory in proton freezing system was also considered.
→ The strength of the cool wind of proton freezing system did not bring any change to the freezing speed and freezing temperature.
→ Proton freezing system restrained supercooling and a rise of latent heat more than the direct freezing way by a -80℃ freezer.

**R&D Topic 1-2 Cryopreservation of Fat Derived Stem Cells**
Comparing proton freezing and conventional freezing method(-80℃) by using fat derived stem cells to determine cell viability before and after freezing, proliferation and differentiation ability of cells.

→ -80℃. cell viability in direct freezing method was 46% whereas the cell viability in proton freezing system obtained 82%.

→ At present, the multiplication ability of the cell after freezing is still in progress, regarding the differentiation potency is being performed differentiation induction to fat depot.

**R&D Topic 1-3: Cryopreservation of ES cells iPS cells**

In ES/iPS cells, the viability and proliferation of cells before and after freezing, proton freezing system and conventional methods were examined. Regarding this cell it is currently in progress.

**Future Goals**
**R&D Topic 1-1: Continuation of cryopreservation of ES/iPSiPS cells**
**R&D Topic 1-2: Islet cells and other cell cryopreservation**
**R&D Topic 1-3: Quality inspection of cells after freezing and thawing**