CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

S1206

Project Title

Rescue of Mice Receiving Lethal Irradiation by Stem Cell Transplantation: A Potential Cure for Leukemia

Abstract

Objectives/Goals

1. To test the hypothesis that a newly isolated stem cell line has the potential to differentiate into hematopoietic stem cells by using this line of stem cell to rescue lethally irradiated mice with stem cell transplantation.
2. To confirm the viability and regeneration of the transplanted stem cells in recipient animal.

Methods/Materials

1. Recipient GFP(-) mice, will be irradiated with a lethal dose of radiation to destroy their residential bone marrow cells. Stem cells will be prepared from GFP(+) mice and injected intravenously into the recipient mice immediately after irradiation. Survival and erythrocytes regeneration will be observed and compared between the group of stem cell treated and un-treated mice.
2. DNA samples will be extracted from peripheral blood withdrawn from stem cell treated mice and will be used as templates for PCR detection of the donor cell specific GFP gene. DNA samples extracted from un-treated mice will be used as negative control.
3. PCR conditions will be optimized in order to improve the sensitivity and specificity for detection of the donor cell specific GFP gene. The following parameters will be tested: descending amount of template DNA, ascending number of PCR cycle and ascending annealing temperature.

Results

1. The survival for lethally irradiated mice with stem cell transplantation was significantly improved.
2. Sensitivity and specificity for detection of donor cell specific GFP gene in recipient mice was significantly improved by higher annealing temperature and higher number of PCR cycles with least amount of template DNA.

Conclusions/Discussion

1. Survival is significantly improved and erythrocyte function is restored in the stem cell treated mice whose bone marrow cells have had been destroyed by lethal irradiation. This result implies that this type of stem cells may have the potential to substitute bone marrow cells in curing leukemia.
2. Viability and regeneration of the transplanted stem cell in the recipient mice is confirmed by PCR using template DNA extracted from the blood of recipient mice.
3. Sensitivity and specificity for detection of donor stem cells specific GFP gene in recipient mice is significantly improved by higher annealing temperature and higher number of PCR cycles with least amount of template DNA. It is determined that annealing at 64 0C with reaction cycles set at 36, yields the best results in terms of specificity and sensitivity.

Summary Statement

Stem cells have potential to be used in leukemia treatment

Help Received

Used lab equipment at Stanford University under the supervision of Dr. Ke-Jung Huang