

## Leukemia Inhibitory Factor

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### The effect of Leukemia Inhibitory factor on self-renewal and differentiation of mesenchymal stem cells in vitro

\*Jabbarpour Bonyadi M.<sup>1,2</sup>, Mahdavi N.<sup>1</sup><sup>1</sup>Faculty of Natural Sciences, University of Tabriz, <sup>2</sup>Drug Applied Research Center & Biotechnology Research Center, Tabriz University of Medical sciences

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**Objectives:** Multipotent mesenchymal stem cells (MSc) have been known for a long period of time. These cells are adherent, clonogenic and fibroblastic and can be isolated from bone marrow stroma of postnatal organisms. Under appropriate conditions, these cells can give rise to broad spectrum of fully differentiated connective tissues including cartilage, bone, adipose tissues and muscle cells. Upon the isolation of cells in vitro, these cells tend to differentiate and it is very difficult to direct these cells into self-renewal in order to get more Multipotent MSc for medical purposes. In this study, the effect of leukemia inhibitory factor (LIF) on MSc has been investigated. In the presence of LIF, embryonic stem cells proliferate without differentiation. However the effect of LIF on MSc has not been fully investigated. **Methods:** Bone marrow stroma cells were extracted from 2-month-old and 8-month-old mice. These cells were cultured in a medium containing LIF. After formation of colonies, cells were stained by methylen blue. The activity of alkaline Phosphatase was also investigated. To study the effect of LIF on self-renewal ability of MSc, cells were cultured in a primary culture containing LIF. Colonies formed in the primary cultures, were harvested and re-cultured. The number and size of colonies compared with these cultured without LIF. **Results:** In the presence of LIF, cells tend to express alkaline phosphatase enzyme more than control cells. However, in the presence of LIF in primary culture, there was no difference in the number of colonies. The size and number of colonies in secondary culture were significantly increased among those cells grown in the presence of LIF in primary culture. The number and quality of colonies did not show any significant difference among those cells extracted from 2-month-old and 8-month-old mice. **Conclusion:** The presence of LIF in primary culture does not affect the number of colonies formed. However, most of the cells in the primary culture express alkaline phosphatase. These cells tend to differentiate into bones. The presence of LIF in primary culture increases the self renewal ability of cells. Also these cells have more proliferation ability in comparison with control cells. The numbers of mesenchymal stem cells with aging do not decrease. Therefore, mesenchymal stem cells do not age and their number stays constant during the lifetime.

**Key words:** LIF, MSc, Alkaline Phosphatase, Self-renewal, differentiation.

LIF (LIF) Leukemia Inhibitory Factor

U/ml LIF (αMEM)

LIF

U/ml LIF

LIF

LIF

(MSc) Alkaline Phosphatase (Self-Renewal) LIF

\*Corresponding Author: Dr Morteza Jabbarpour Bonyadi, Assistant Professor of Molecular Medical Genetics, Faculty of Natural Sciences, University of Tabriz, Drug Applied Research Center, Tabriz University of Medical sciences, Tel:3363234; Fax: 3363231; E-mail:bonyadim@tbzmed.ac.ir

(gp130-LIFR) LIF

JAK-STAT

( )

Adult Stem Cells

Embryonic Stem Cells

ERK SHP-2

( )

LIF

Pluripotent

Multipotent

( )

LIF

( )

CFU-ALP

( )

(MSc)

( )

LIF

CFU

Colony Forming Unite

CFU

Multipotent

CFU

( )

(C57BL/6 )

10x

G

)

Self-Renewal

( )

(

(LIF) Leukemia Inhibitory Factor

(Self Renewal)

Pluripotent

LIF ( )

Totipotent

10x

FBS % : ) αMEM

( %

αMEM

LIF

(C57BL/6)

(Genetic Background)

CFU

PBS

) NFB 10%

(

NaH<sub>2</sub>PO<sub>4</sub>

Na<sub>2</sub>HPO<sub>4</sub>

(

)

TRIS-HCL DMF MX-PO<sub>4</sub>

)

(Red Violet LB Salt

(Trypan Blue)

CFU-F

)

FBS % ) αMEM

(

(

CO<sub>2</sub>

CFU

:

LIF

CFU

αMEM

(Gibco-BRL 1x10<sup>5</sup> U/μg)

U/ml LIF

:

)

Standard Deviation

:

(Excel

CFU-ALP\*

)

(

(Colony Forming Unit Alkaline Phosphatase positive) CFU-ALP<sup>+</sup>

CFU-ALP<sup>-</sup>

CFU-ALP<sup>+</sup>

( )

( ) **Self-Renewal**

:

CFU-ALP<sup>-</sup>

CFU-F

μg/ml C

αMEM FBS % )

(

LIF

CFU-F

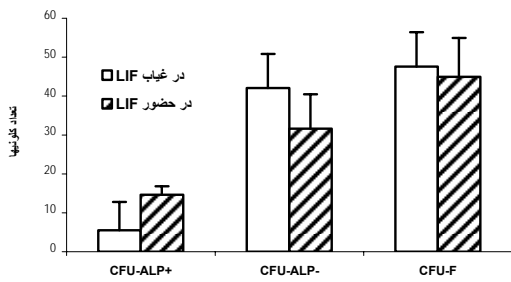
LIF

CFU-F

Standard Deviation

(Excel

تعداد کلونیهای حاصل از سلولهای استخراج شده از مغز قرمز استخوان (موش 2 ماهه)



LIF

LIF

CFU-F

( )

(

CFU-F

LIF

(CFU-F)

LIF

LIF

CFU-ALP

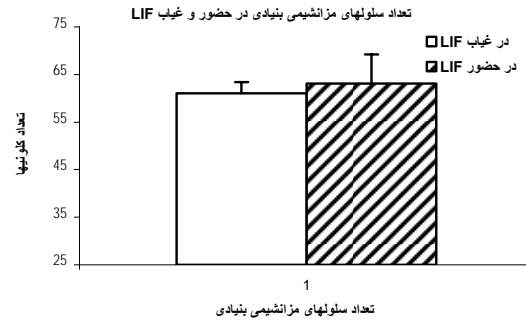
LIF

( )

( )

( )

Self-Renewal



تعداد سلولهای مزانشیمی بنیادی

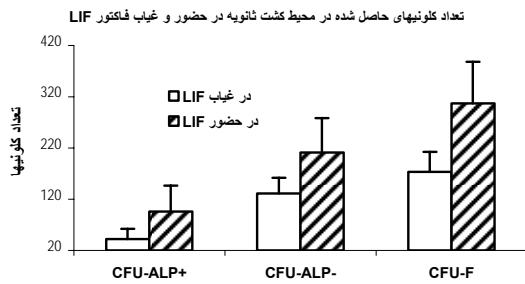
LIF

CFU

CFU-F

LIF

LIF



LIF

( )

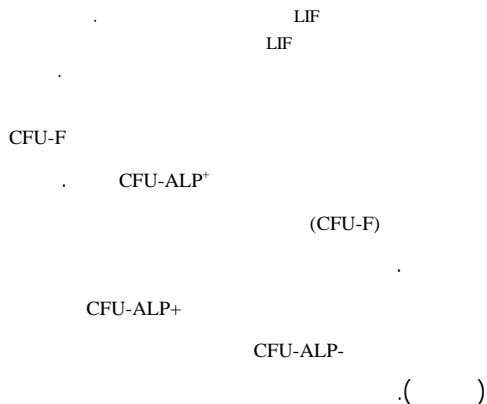
CFU-F

( ) CFU-ALP<sup>+</sup>

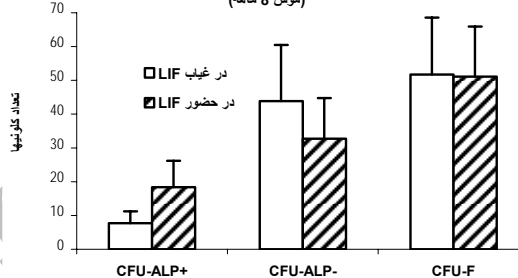
LIF

(Self-Renewal)

LIF

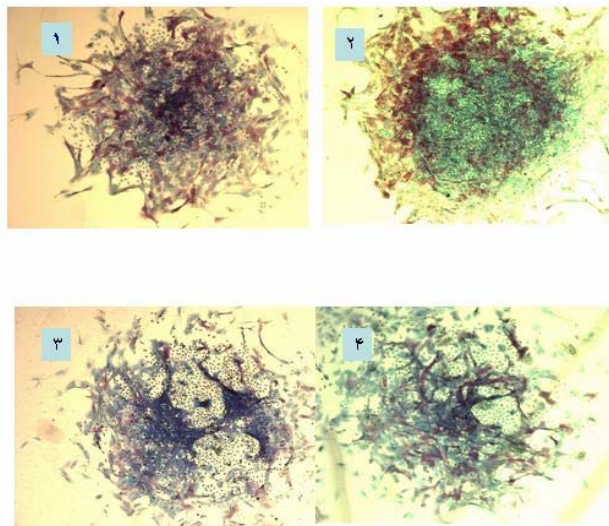


تعداد کلونیهایی تشکیل یافته از سلولهای استخراج شده از مغز قرمز استخوان (موش 8 ماهه)



LIF

( )



Cell Proliferation

LIF

LIF

LIF

LIF





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