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## Systematic gain-of-function and loss-of-function screen in embryonic stem cells and mesynchymal stem cells reveal multiple key factors for stem cell renewal and differentaion

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gain-of-function screen to pinpoint factors crucial for the osteogenic differentiation of mesenchymal stem cells (MSCs)  $\mathbf{1}$  with 12000 different genes, a loss-of-function screens to reveal factors critical for the renewal of mouse embryonic stem cells (ESCs) with 4801 shRNAs respectively were established

## We identified:

- A. 9 genes are sufficient and essential for regulation of the bone formation. Among them, MSC02 ApoA1 can promote bone formation to 3-40 folds. Currently, part of the results are included in the paper revised by Nature Communications (Impact factor 10.0) and two different patents are applied. It was successfully demonstrated that MSC protein/inducing drug can completely prevent and treat bone loss disease like osteoporosis
- 132 genes essential for mouse ESC renewal was revealed by the shRNA functional screen. The first shRNA screen in ESCs B. and published part of the method in Current Protocols in Stem Cell Biology (2013) was established. Among the 132 genes found crucial for ESC renewal, Nme6 and Nme7 are essential for the expression of 8 key stemness factors, renewal, pluripotency, and oncogenicity of ESCs. The results were published in Stem Cells (2012)
- C. miR-200c can regulate human ESC renewal by suppressing the GATA4 expression. The paper is published in Stem Cell Research (2013)

## Biography

Jean Lu was a Postdoc at Yale University and started to launch functional screen in human embryonic stem cells. After she established her laboratory in 2007 at Academia Sinica, she set up and performed the first high throughput shRNA in mouse embryonic stem cells and an unbiased cDNA library screen in mesenchymal stem cells. The finding can help to enhance embryonic stem cell expansion and develop new treatment for bone diseases. He is also the co-PI of the National RNA core which joined the TRC consortium founded by nine institute including Broad Institute, Harvard University, MIT, Sigma, etc.

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