

CORRECTION

Correction to: Rescue of premature aging defects in Cockayne syndrome stem cells by CRISPR/Cas9-mediated gene correction

Si Wang^{1,2,5}, Zheyang Min^{1,13}, Qianzhao Ji^{2,4}, Lingling Geng⁵, Yao Su⁵, Zunpeng Liu^{3,4}, Huifang Hu^{3,4}, Lixia Wang^{2,4}, WeiQi Zhang^{2,4,5,6,7}, Keiichiro Suzuki^{9,10}, Yu Huang¹¹, Puyao Zhang¹, Tie-Shan Tang^{4,6,12}, Jing Qu^{3,4,6}✉, Yang Yu¹✉, Guang-Hui Liu^{2,4,5,6,8}✉, Jie Qiao^{1,13}✉

¹ Department of Obstetrics and Gynecology, Center for Reproductive Medicine, Peking University Third Hospital, Beijing 100191, China

² National Laboratory of Biomacromolecules, CAS Center for Excellence in Biomacromolecules, Institute of Biophysics, Chinese Academy of Sciences, Beijing 100101, China

³ State Key Laboratory of Stem Cell and Reproductive Biology, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China

⁴ University of Chinese Academy of Sciences, Beijing 100049, China

⁵ Advanced Innovation Center for Human Brain Protection, National Clinical Research Center for Geriatric Disorders, Xuanwu Hospital Capital Medical University, Beijing 100053, China

⁶ Institute for Stem cell and Regeneration, Chinese Academy of Sciences, Beijing 100101, China

⁷ Key Laboratory of Genomic and Precision Medicine, Beijing Institute of Genomics, Chinese Academy of Sciences, Beijing 100101, China

⁸ Beijing Institute for Brain Disorders, Beijing 100069, China

⁹ Institute for Advanced Co-Creation Studies, Osaka University, Osaka 560-8531, Japan

¹⁰ Graduate School of Engineering Science, Osaka University, Osaka 560-8531, Japan

¹¹ Department of Medical Genetics, School of Basic Medical Sciences, Peking University Health Science Center, Beijing 100191, China

¹² State Key Laboratory of Membrane Biology, Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China

¹³ Peking-Tsinghua Center for Life Sciences, Academy for Advanced Interdisciplinary Studies, Peking University, Beijing 100871, China

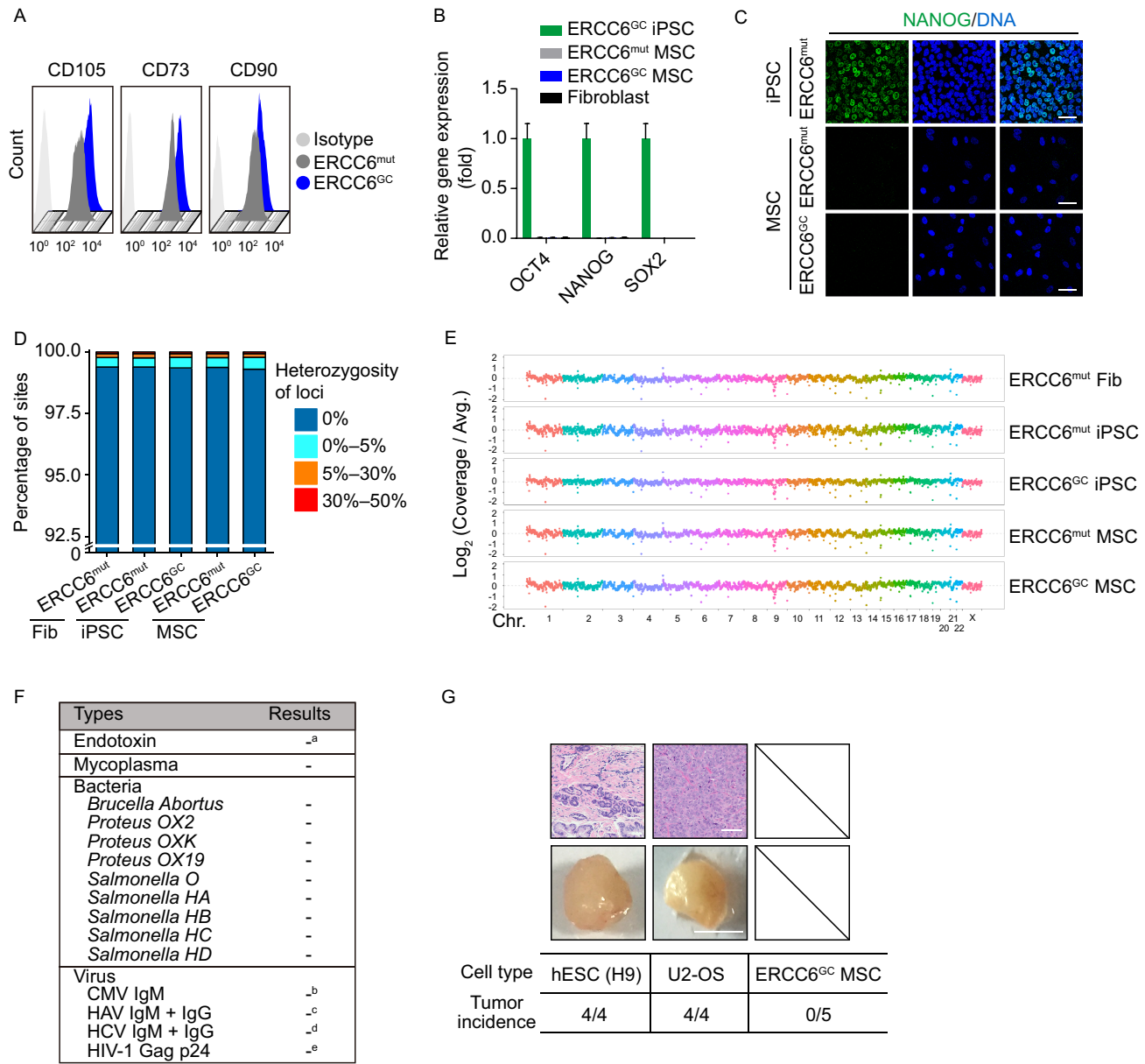
✉ Correspondence: qujing@ioz.ac.cn (J. Qu), yuyang5012@hotmail.com (Y. Yu), ghliu@ibp.ac.cn (G.-H. Liu), jie.qiao@263.net (J. Qiao)

CORRECTION TO: PROTEIN CELL

[HTTPS://DOI.ORG/10.1007/S13238-019-0623-2](https://doi.org/10.1007/s13238-019-0623-2)

In Fig. 7C, we used the ERCC6^{mut}-iPSCs (CS-iPSCs) as NANOG-positive control pluripotent cells in the upper panels. However, these cells were inadvertently labeled as

ERCC6^{GC}-iPSCs. In the revised version of Fig. 7C, we have updated the high-quality images along with the corrected mark. In addition, we have also made corresponding changes in the figure legend.



◀ **Figure 7. Safety analysis of gene-corrected CS-MSCs obtained under a cGMP-compliant condition.** (A) FACS analysis indicated the expression of the cell surface markers CD73, CD90 and CD105 in CS-MSCs and GC-MSCs. (B) RT-qPCR analysis of the expression of pluripotency markers OCT4, NANOG, and SOX2 in CS-MSCs and GC-MSCs. GC-iPSCs and CS-fibroblasts were used as positive and negative controls, respectively. Data are presented as the mean $\pm$ SEM, $n = 3$. (C) Immunostaining of the pluripotency marker NANOG in CS-MSCs and GC-MSCs. CS-iPSCs were used as a positive control, Scale bar, 50 μ m. (D) Whole-genome sequencing of single-nucleotide variants (SNVs) in CS-fibroblasts, CS-iPSCs, GC-iPSCs, CS-MSCs and GC-MSCs. Sites with a heterozygosity percentage ranging between 0% and 30% were considered as SNV sites, and sites with a heterozygosity of $>30\%$ were considered as single-nucleotide polymorphisms (SNPs). (E) Whole-genome sequencing of copy number variations (CNVs) in CS-fibroblasts, CS-iPSCs, GC-iPSCs, CS-MSCs and GC-MSCs. Each point represents normalized coverage depth of each 500-kb genomic region of each chromosome. (F) Sterility and pathogen testing of the conditioned medium of GC-MSCs. ^a Endotoxin was identified as negative when the concentration was < 0.25 EU/mL. ^b CMV was identified as negative when the ratio of the OD450 value of sample to the cutoff value (S/Co) was < 1.0 . ^c HAV was identified as negative when the ratio of the cut-off value to the OD450 nm value of the sample (Co/S) was < 0.9 . ^d HCV was identified as negative when the ratio of the OD450 value of the sample to the cut-off value (S/Co) was < 0.9 . ^e HIV-1 was identified as negative when the concentration = 0 pg/mL. (G) Evaluation of the potential tumorigenesis risk of GC-MSCs *in vivo*. A subcutaneous injection of GC-MSCs was performed in immune-deficient mice. Human ESC (line H9) and U2-OS osteosarcoma cell lines were also implanted independently as positive controls. Representative images in the lower panel showing the teratoma and tumor formed from positive cells two months after transplantation, Scale bar, 0.5 cm. HE staining of a teratoma and tumor were shown in the upper panel. Scale bar, 100 μ m. The *in vivo* tumor-formation incidence of each cell type was calculated. $n = 4$ for each positive cell group, $n = 5$ for the GC-MSC group.

OPEN ACCESS

This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.