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CRISPR CAS9 Telomere Extension for Age-Related Diseases and Organism Longevity

Naoki Sato*

Department of Life Sciences, Graduate School of Arts and Sciences, The University of Tokyo, Komaba 3-8-1, Meguro-ku, Tokyo 153-8902, Japan

Abstract

Telomere abrasion is thought to be a sign that the body is getting older. In vitro research has made significant progress in understanding the underlying biology of telomere function; however, the translation of this data to an in vivo perspective is restricted. Although there are a variety of ways for labelling telomeres, the majority of them are toxic to cells and induce DNA damage, or are incompatible with in vivo applications. By attaching Cas9 to a fluorescent protein, the CRISPR-Cas system has permitted the refinement of these areas, allowing telomeres to be visualised in living organisms. The CRISPR Cas 9 technique's high success rate offers new hope for future genome editing therapies.

Keywords: Liver disease • Surgery • Malignancy

Introduction

Any organism's telomere length and rate of telomere shortening are intimately tied to ageing and death. This effect might be reversed if an organism's telomere length was increased [1]. The CRISPR Cas system is a powerful tool that may be used to accurately insert telomeres into the DNA of any cell. Previous telomere extension approaches involving modified mRNA encoding TERT have yielded results that support the concept that telomere elongation can increase an organism's biological age. Telomere extension with CRISPR Cas9 may be able to solve the end replication problem in humans, as well as treat ageing and age-related issues caused by telomere shortening [2]. Telomere removal using CRISPR Cas9 has already been tested on Bone Marrow Neuroblasts cells, with We may add telomeres using the same way by providing a Donor DNA containing n-number (example:1-2kb) of Telomere hexamers without the risk of insertional mutagenesis, as Telomeres can be entirely erased using CRISPR. Telomeres can be inserted to all 23 pairs of chromosomes in humans using this method. Telomeres could potentially delay the onset of age-related disorders like dementia, as well as counteract the effects of ageing on human tissues in principle [3].

Experiments on human cell lines to extend Telomere length have been undertaken, and the findings corroborate this hypothesis. These experiments were carried out utilising a modified mRNA expressing TERT. Because the function of telomeres has been preserved across species, we may be able to extend the longevity of other species by lengthening the telomeres in their DNA [4].

Telomerase editing is also conceivable using the CRISPR Cas system, which can both ablate and boost TERT expression by targeting the promoter of hTERT. Depending on the design and utility, this could aid cell death in malignant cells or turn normal cells into immortal cells. If we map the genomes of a young man and the same human being after 10 years, the loss of telomeres can be calculated, and the difference in telomere length can be added back, along with the correction of any DNA damage that may have occurred in those 10 years, we should be able to reverse the biological age of that human being, resolving all age-related issues.

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***Address for Correspondence:** Naoki Sato, Department of Life Sciences, Graduate School of Arts and Sciences, The University of Tokyo, Komaba 3-8-1, Meguro-ku, Tokyo 153-8902, Japan, E-mai: naoki.s@gmail.com*

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