# The genetics of longevity: Can we inherit a longer life?

**Victor Loesch***

Department of Biochemistry, Chiba University, Japan

## Introduction

Why do some people live well into their 90s or even past 100 with minimal health problems, while others face chronic illness much earlier in life? The quest to understand the secrets of a long, healthy life has led scientists to explore one powerful factor: genetics. While lifestyle and environment play major roles, evidence suggests that the blueprint for longevity may be partially written in our DNA [1].

Research into genetic contributions to longevity has revealed that genes can influence how our bodies age, how we respond to stress, and how likely we are to develop age-related diseases like heart disease, cancer, and Alzheimer's. In families with many long-lived individuals, researchers have consistently found inherited genetic factors that appear to support healthier aging [2].

One of the most studied genes linked to longevity is APOE, particularly the APOE2 variant. While APOE4 increases the risk of Alzheimer's disease, APOE2 seems to offer protection. Similarly, genes involved in DNA repair, inflammation control, and cellular metabolism—such as FOXO3, SIRT1, and LMNA—have been associated with a longer lifespan and better resilience to disease [3].

The FOXO3 gene, for example, has been found at higher frequencies in centenarians across different populations. It plays a role in regulating oxidative stress, insulin sensitivity, and immune function—all critical processes in aging. People with specific variants of this gene tend to have lower rates of cardiovascular disease and cancer, two leading causes of death [4].

However, genetics is only one piece of the puzzle. Studies of identical twins suggest that only about 20–30% of the variation in human lifespan is due to genetic factors. The rest is shaped by environment and behavior—such as diet, exercise, smoking, alcohol use, and social connections. In other words, while we may inherit a predisposition for longevity, how we live still matters immensely [5].

Another important aspect is epigenetics—changes in gene expression that are influenced by lifestyle and environmental factors. Epigenetic modifications can activate or silence certain genes involved in aging and disease. This means that even individuals with a strong genetic advantage can compromise their longevity through unhealthy choices, and vice versa [6].

The study of "blue zones" (regions with high numbers of centenarians, such as Okinawa, Sardinia, and Ikaria) shows that genetics and lifestyle often work together. In these areas, long life tends to run in families, but common habits like plant-based diets, daily physical activity, strong social bonds, and low stress levels contribute significantly [7].

Modern advances in genetic testing now allow people to learn about their genetic predisposition for longevity. While this can provide useful insights, it's important to remember that having or lacking certain genetic traits is not destiny. Lifestyle interventions remain the most effective way to promote healthy aging for the majority of people [8].

The field of longevity genetics is also informing anti-aging research and drug development. Scientists are exploring how to mimic the effects of longevity genes through medications or gene therapy, potentially extending not just lifespan but also healthspan—the number of years lived in good health [9].

Still, ethical questions remain. Could this research lead to unequal access to longevity-enhancing treatments? Will genetic information about aging be used responsibly by insurers or employers? As science progresses, these concerns must be carefully addressed [10].

## Conclusion

In conclusion, the genetics of longevity suggests that while we may inherit part of our potential for a longer life, it's ultimately shaped by how we live. Genes may load the gun, but lifestyle pulls the trigger. With the right choices—and continued research—we may all have a better shot at living longer, healthier lives.

## References

1. Perls T, Kunkel LM, Puca AA. The genetics of exceptional human longevity. J Am Geriatr Soc. 2002;50(2):359-68.
2. Browner WS, Kahn AJ, Ziv E, et al. The genetics of human longevity. Am J Med. 2004;117(11):851-60.
3. Perls T, Terry D. Genetics of exceptional longevity. Exp Gerontol. 2003;38(7):725-30.
4. Brooks-Wilson AR. Genetics of healthy aging and longevity. Hum Genet. 2013;132:1323-38.
5. Vijg J, Suh Y. Genetics of longevity and aging. Annu Rev Med. 2005;56(1):193-212.

***Correspondence to:** Victor Loesch**,** Department of Biochemistry, Chiba University, Japan. E-mail: victor.loesch@gmail.com

***Received:** 1-May-2025, Manuscript No. aarrgs-25-165435; **Editor assigned:** 5-May-2025, PreQC No. aarrgs-25-165435 (PQ); **Reviewed:** 17-May-2025, QC No. aarrgs-25-165435; **Revised:** 24-May-2025, Manuscript No. aarrgs-25-165435 (R); **Published:** 31-May-2025, DOI: 10.35841/aarrgs-7.3.267*

***Citation:** Loesch V. The genetics of longevity: Can we inherit a longer life? J Res Rep Genet. 2025;7(3):267.*

6. Caruso C, Ligotti ME, Accardi G, et al. How important are genes to achieve longevity?. Int J Mol Sci. 2022;23(10):5635.
7. Atzmon G, Rincon M, Rabizadeh P, et al. Biological evidence for inheritance of exceptional longevity. Mech Ageing Dev. 2005;126(2):341-5.
8. Vaupel JW. Inherited frailty and longevity. Demography. 1988;25(2):277-87.
9. Christensen K, Johnson TE, Vaupel JW. The quest for genetic determinants of human longevity: Challenges and insights. Nat Rev Genet. 2006;7(6):436-48.
10. Gems D, Partridge L. Genetics of longevity in model organisms: Debates and paradigm shifts. Annu Rev Physiol. 2013;75(1):621-44.


***Citation:*** *Loesch V. The genetics of longevity: Can we inherit a longer life? J Res Rep Genet. 2025;7(3):267.*