GENOMICA
Next Generation Genetics

A genetic profile of biological pathways associated with longevity



- ***Understand genetic predisposition***
- ***Integrate clinical data***
- ***Personalise healthy ageing programmes***

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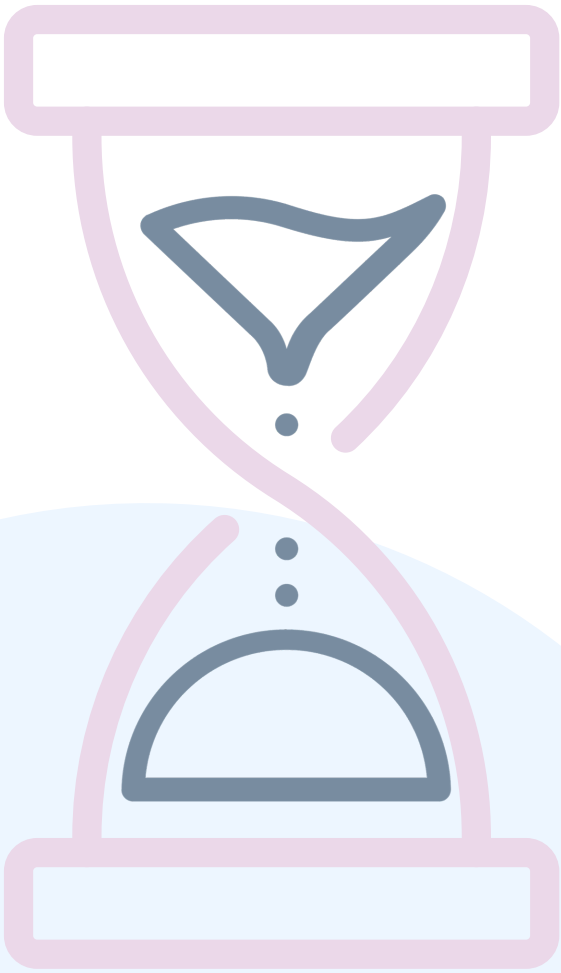
LONGEVIGEN

AGEING AND LONGEVITY

Ageing is a progressive, heterogeneous and multifactorial biological process characterised by a gradual decline in the body's ability to maintain homeostasis, respond to environmental challenges and repair cellular damage.

The way and rate at which this process unfolds depend on the **dynamic interaction** of genetic background, epigenetic regulation, environmental exposures, nutrition, physical activity, sleep quality, stress, clinical status and stochastic factors.

Within this framework, **healthy ageing**—the preservation over time of the physical, cognitive, metabolic and social capacities needed to maintain independence and quality of life—is particularly important. **Longevity** is therefore not solely about reaching an advanced age, but also about preserving function and wellbeing.



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CHRONOLOGICAL AGE AND BIOLOGICAL AGE

Chronological age is the time elapsed since birth; **biological age** describes the functional state of the body's different systems. Among people of the same chronological age, cardiovascular, metabolic, immune, muscular and cognitive function may vary considerably. However, no single universally accepted marker can fully measure an individual's biological age.

Key biological processes underlying ageing

The most extensively studied mechanisms are closely interconnected, and their relative importance may vary across tissues and stages of life:

- *Genomic instability*
- *Telomere attrition*
- *Epigenetic alterations*
- *Loss of proteostasis*
- *Mitochondrial dysfunction*
- *Cellular senescence*
- *Deregulated nutrient sensing*
- *Stem cell exhaustion*
- *Altered intercellular communication*
- *Chronic low-grade inflammation*

The **genetic component** contributes to interindividual variability in longevity and susceptibility to age-related conditions, but it does not act in isolation. It can be influenced by lifestyle, environment, and the individual's clinical conditions.

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A PERSONALIZATION-ORIENTED GENETIC TEST

LONGEVIGEN is a genetic test that analyses a selected panel of variants in genes involved in several key biological processes associated with ageing, cellular resilience and longevity.

The areas assessed include:

- CELLULAR STRESS RESPONSE
- DNA REPAIR
- MITOCHONDRIAL FUNCTION
- TELOMERE MAINTENANCE
- SENESCENCE, APOPTOSIS AND AUTOPHAGY
- IMMUNE AND INFLAMMATORY REGULATION
- CELL-CYCLE CONTROL
- ANTIOXIDANT DEFENCE AND GLUTATHIONE METABOLISM
- FOLATE, HOMOCYSTEINE METABOLISM
- METHYL-GROUP METABOLISM

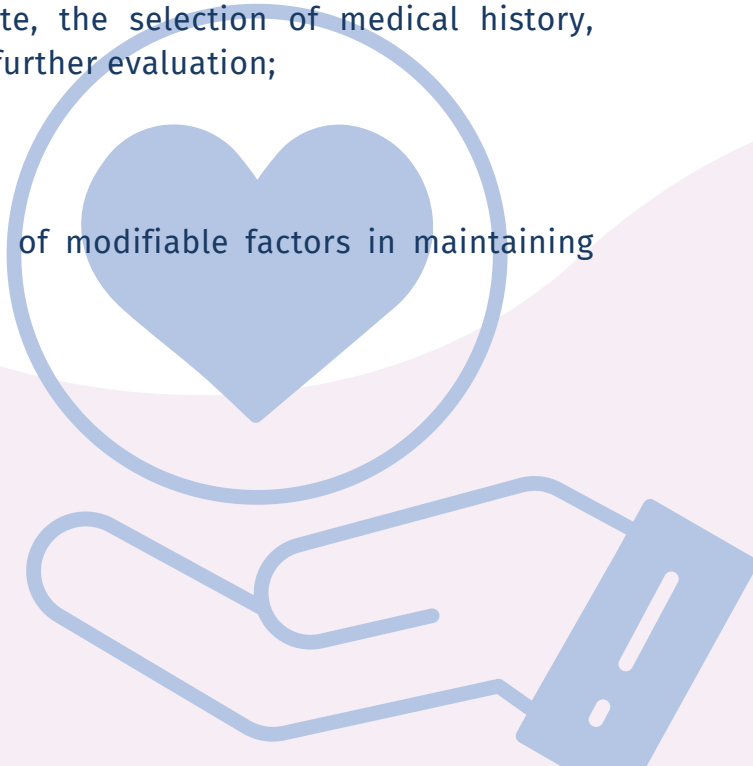
Test Objective

The aim is to **characterise the individual's genetic profile** relating to processes that may **influence patterns of ageing** and the **ability to maintain cellular homeostasis over time**. The information is intended to inform preventive and personalised care and should be integrated into a comprehensive professional assessment.

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PURPOSE OF THE TEST

- identify common variants associated with functional differences in the principal biological pathways assessed;
- characterise genetic predispositions relating to stress response, telomere maintenance, mitochondrial function, antioxidant defence, immune balance and folate metabolism;
- support an integrated interpretation of interactions among genes within the same biological pathway or functionally convergent processes;
- add another layer of information to personalised clinical, nutritional and preventive assessments;
- help guide, where clinically appropriate, the selection of medical history, functional or laboratory parameters for further evaluation;
- promote greater awareness of the role of modifiable factors in maintaining long-term health.



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WHO IS IT FOR?

The test is intended for physicians and healthcare professionals involved in prevention and longevity medicine programmes, particularly in:

longevity and healthy ageing clinics
integration of genetic profiles into personalised programmes for prevention, monitoring and preservation of function;

preventive and internal medicine
contextualisation of modifiable risk factors and support in selecting clinically appropriate biomarkers;

clinical nutrition and lifestyle medicine
assessment of one-carbon metabolism, glutathione pathways and antioxidant defence in relation to nutritional status;

sports medicine and rehabilitation
contextualisation of mitochondrial function and metabolic flexibility alongside clinical and functional measures;

aesthetic and regenerative medicine
evaluation of redox and inflammatory balance within integrated prevention and healthy ageing programmes.



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GENES ANALYSED

LONGEVIGEN analyses **20 genes** and **25 variants**, organised into **five biological areas**.

BIOLOGICAL AREA	GENES
Cellular ageing and longevity regulation	**FOXO3, TERT, STN1/OBFC1, NAF1, SIRT1, TP53, IGF1R, APOE**
Antioxidant defence and redox homeostasis	**SOD2, GCLC, GCLM, GPX1, GSTP1, CAT**
Mitochondrial function	**PPARGC1A**
Immune and inflammatory balance	**IL6, IL10, TLR4, TNF**
Folate cycle and one-carbon metabolism	**MTHFR**

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FIVE BIOLOGICAL AREAS

The panel is organised into **five functional areas**:

1 Cellular ageing and longevity regulation

Genes: FOXO3 · TERT · STN1/OBFC1 · NAF1 · SIRT1 · TP53 · IGF1R · APOE

Stress response, DNA repair, cell-cycle control, apoptosis, autophagy, metabolic signalling and telomere maintenance.

These mechanisms support the ability of cells to adapt to stimuli, repair damage, remove impaired components and preserve genomic stability, thereby limiting the accumulation and propagation of potentially harmful alterations.

2 Antioxidant defence and redox homeostasis

Genes: SOD2 · GCLC · GCLM · GPX1 · GSTP1 · CAT

Neutralisation of reactive oxygen species, glutathione synthesis and utilisation, and detoxification of electrophilic compounds.

Reactive oxygen species are produced physiologically during cellular metabolism and contribute to intracellular signalling and immune responses. When their production exceeds antioxidant and repair capacity, oxidative stress may develop, potentially damaging DNA, proteins, lipids and mitochondrial structures.

3 Mitochondrial function

Genes: SOD2 · GCLC · GCLM · GPX1 · GSTP1 · CAT

Mitochondrial biogenesis, energy production, substrate oxidation and adaptation to exercise and metabolic demands.

Mitochondria generate much of the energy required by cells and help regulate metabolism, apoptosis, calcium homeostasis and stress responses.
With advancing age, energy efficiency and metabolic adaptability may decline. The test analyses one variant in PPARGC1A, which encodes PGC-1α, a central regulator of mitochondrial biogenesis, fatty-acid oxidation and skeletal-muscle adaptation to exercise.

4 Immune and inflammatory balance

Genes: IL6 · IL10 · TLR4 · TNF

Recognition of danger signals, cytokine production and the balance between activation and resolution of the inflammatory response.

Inflammation is essential for host defence and tissue repair; its effectiveness depends on appropriate activation followed by timely resolution. Ageing may be accompanied by chronic, low-grade systemic inflammation, known as inflammaging. Cellular senescence, visceral adiposity, metabolic alterations, persistent infections, changes in the microbiota and tissue damage may perpetuate this state and impair regenerative capacity.

5 Folate cycle and one-carbon metabolism

Genes: MTHFR

Nucleotide synthesis, homocysteine remethylation, methionine and S-adenosylmethionine production, folate availability, and support for methylation reactions.

These reactions link the folate and methionine cycles and support cellular methylation processes. System efficiency depends on interactions among genotype, folate, vitamins B12, B6 and B2, renal function, nutritional status and current therapies.

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THE TEST RESULT INCLUDES

COMPONENT	DESCRIPTION
Personalised report	Genotype identified for each of the 25 variants, with interpretation by biological area according to the **LONGEVIGEN** model.
Technical report	Supporting scientific document describing the intended purpose, biological rationale, methodology, interpretive criteria and limitations of the test.
Interpretive support	Laboratory support for the requesting healthcare professional to clarify methodological and interpretive aspects of the result.

The result of each analyzed locus is evaluated in relation to the identified genotype and to the scientific evidence selected for the interpretive model; the overall reading also takes into account the possible functional convergence of multiple genes belonging to the same biological area.



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THE TEST IN LONGEVITY MEDICINE PRACTICE

LONGEVIGEN is not a diagnostic test. It is an informational tool designed to support professional assessment by helping to:

- understand the potential contribution of common variants to key biological processes associated with ageing;
- highlight functional areas in which the genetic profile suggests differences in response capacity or resilience;
- contextualise modifiable risk factors without assigning deterministic meaning to the genotype;
- integrate genetic, clinical, nutritional, metabolic and behavioural data with medical history in a unified framework;
- help guide, when appropriate, the assessment of clinically relevant biomarkers;
- support personalised prevention and healthy ageing programmes developed by qualified professionals;
- promote patient engagement and adherence to health-supporting behaviours by improving understanding of the underlying biological processes.

As medicine becomes increasingly personalised, **LONGEVIGEN** adds a stable genetic component to specialist assessment, supporting more informed and targeted prevention and monitoring programmes.

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ANALYTICAL WORKFLOW

The analytical workflow comprises **six** sequential stages:

1

DNA extraction

Genomic DNA is extracted from a biological sample, either a buccal swab or peripheral blood.



2

Target-region amplification

Regions containing the variants of interest are amplified using a targeted PCR-based protocol.



3

Sequencing and genotyping

The amplified products are analysed by **Next-generation sequencing** (**NGS**) to determine genotypes.



4

Bioinformatic analysis

Sequencing data are processed through dedicated pipelines, including quality-control procedures and genotype calling for each variant.



5

Interpretation

Genotypes are evaluated using **GENOMICA**'s interpretive model, based on the scientific evidence and criteria defined for each variant.



6

Report generation

Results are presented in a **personalised report** focused on the assessed genetic predispositions and accompanied by the test's technical report.



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INTERPRETATION FRAMEWORK

The interpretive model developed by **GENOMICA** integrates evidence selected from functional studies, candidate-gene association studies, genome-wide association studies, meta-analyses and other relevant scientific publications. Depending on the variant and trait considered, interpretation may draw on:

- **experimental evidence relating to gene expression or the activity of the encoded protein;**
- **associations between genotype and intermediate biomarkers;**
- **statistical associations between genetic variants and complex phenotypes;**
- **combined evaluation of multiple variants within the same biological pathway;**
- **comparison of the individual's genotype with the interpretive categories defined by the model.**

This approach provides a structured and biologically coherent interpretation of the genetic profile, which should always be integrated with medical history, clinical findings, laboratory parameters and lifestyle.

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FROM SAMPLE TO REPORT IN A FEW SIMPLE STEPS



Request the kit



Complete the documentation



Collect the biological sample



Send the sample to the laboratory



Receive the personalised report

Turnaround time  **~10 working days**

GENOMICA
Next Generation Genetics

EXCELLENCE IN GENETICS AND MOLECULAR BIOLOGY

GENOMICA is a highly innovative company with extensive technical and scientific expertise, active in both clinical applications and research. Supported by a **team with over 20 years of experience in molecular diagnostics**, **GENOMICA** combines **cutting-edge technology** with a **strong commitment to innovation**, delivering increasingly accurate and accessible diagnostic services.

Over **100.000 genetic tests/year**

Dedicated **R&D Team**

Personalized genetic counseling with genetic counselors experts in discussing genetic test results and familial risks

Laboratories with **groundbreaking technologies** and high quality standards

ISO 9001-Certified Laboratory

Rapid Reporting

LongeviGen ENG M rev.00

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