GlycanAge Report For Medical Professionals

GA-HR-009485

Date of birth: 18/09/1962
Date of sampling: 09/07/2023
dd mm yyyy

This report does not constitute medical advice. Results should be interpreted by a medical professional in context of medical history, clinical signs and symptoms.

What is GlycanAge?

GlycanAge is a scientifically proven measurement tool. It responds quickly to lifestyle changes, allowing you to measure their impact.

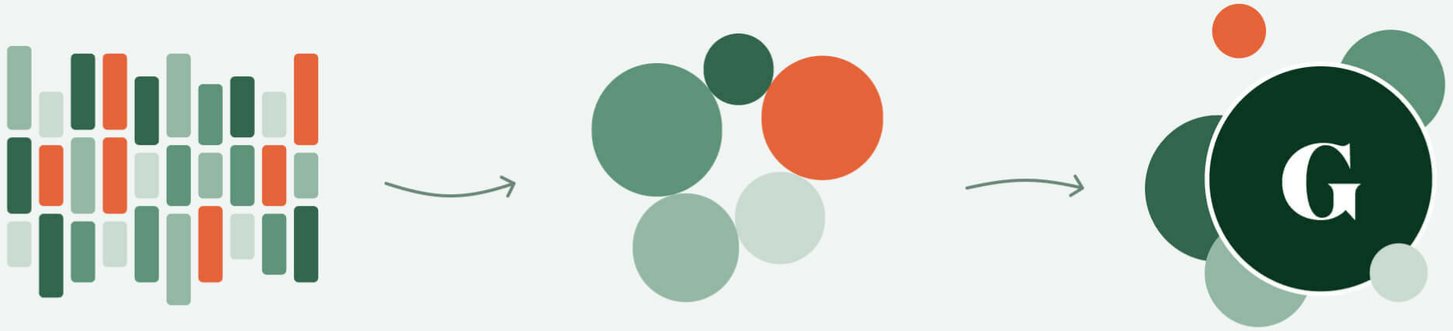
It works by measuring **chronic inflammation** in your immune system at the molecular level – also known as **inflammaging**.

What can it tell me?

Your biological ageing is influenced by your genes, age, and **lifestyle**. GlycanAge measures how your **lifestyle** choices affect the activity of your immune system.

If you make changes and re-test, GlycanAge will help you understand whether the adjustments in your lifestyle and habits are moving you in the right direction.

How do we analyse your profile?



Analyse composition

We look at 29 different glycan structures gathered from your blood sample to determine your unique glycan composition.

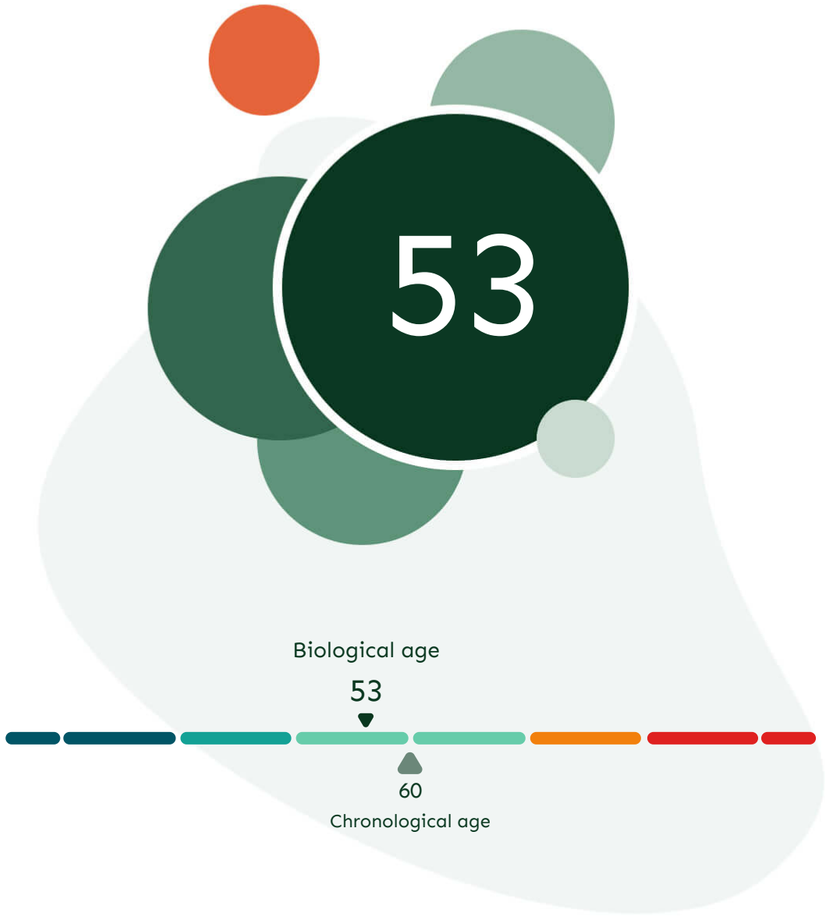
Group data into indexes

We group related structures into indexes. Some indexes promote chronic inflammation, while others shield you against it.

Calculate GlycanAge

We combine and weigh your data to calculate your GlycanAge – a single number that represents the current age of your immune system.

Your Biological Age



Good news!

Your biological age is 7 years younger than your chronological age.

If you haven't already, please review your results with your healthcare specialist at undefined to learn about areas you might want to investigate and improve.

GlycanAge reflects the levels of **chronic inflammation** in the body

Biological age

53

Lower biological age

Lower chronic inflammation

Optimised lifestyle

An optimised lifestyle will often reflect in lower inflammation. This includes:

- Optimised diet
- Quality sleep
- Optimal exercise routine
- Good stress management

Pharmacological effect

Certain pharmacological interventions and programmes assist in lowering chronic inflammation:

- Hormone therapy
- Long-term steroids
- Anti-inflammatory drugs
- Certain medication

Genetic advantage

Some individuals are genetically predisposed towards lower chronic inflammation:

- Family history of centenarians

Other factors

Other less common factors that lower chronic inflammation:

- Pregnancy
- Blood transfusion

Higher biological age

Higher chronic inflammation

Not optimised lifestyle

Unoptimised lifestyle will often reflect in higher inflammation. This includes:

- Poor diet
- Sleep deprivation
- Over/under exercising
- Poor stress management

Higher risk of future diseases

Some individuals are genetically predisposed towards inflammatory chronic diseases:

- Family history of chronic diseases

Current health status There are certain health conditions and life periods which naturally lead to increased inflammation levels.

- Existing chronic condition(s)
- Hormone imbalance
  - Post-pregnancy
  - Menopause
  - Testosterone deficiency

Further investigation

You may investigate further for signs of chronic inflammation:

- Check for lack of nutrition
- Check hormone levels
- Assess cardiovascular risk
- Blood tests
- Check of unusual symptoms

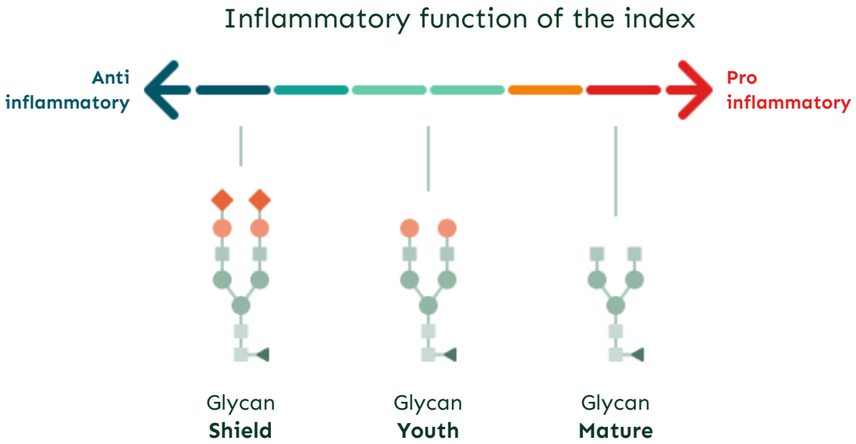
Chronic inflammation is a major contributor to aging. It is also considered an important hallmark of aging and a catalyst to a wide range of chronic diseases.

Result Breakdown

We analyse 29 different glycan structures gathered from your blood sample. We group related structures into 5 indexes.

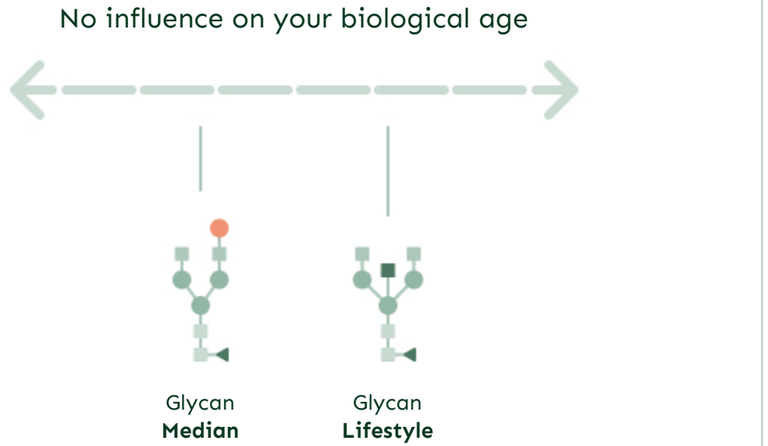
Primary indexes

These glycan index have a pro- or anti-inflammatory function. By looking at a ratio between these indexes, we're able to determine your biological age.

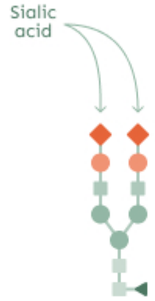


Supportive indexes

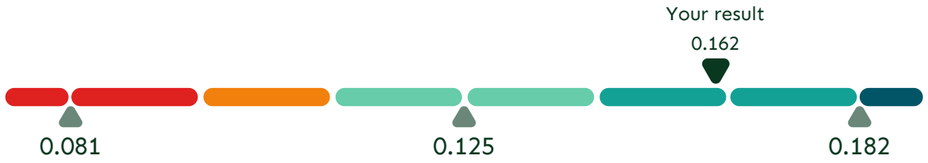
These indexes can help narrow down associations with specific disease types, genetic traits, and/or some lifestyle habits. **They don't influence your overall biological age.**



Glycan **Shield (S)** Anti-inflammatory



Glycan Shield represents glycans with sialic acid (S) — your best defense against chronic inflammation. Sialylated glycans protect against cell damage resulting from overactive natural killer cell activation.



This result ranks you in the 95th percentile

Having a higher percentile ranking **is better** for this index

Glycan Shield Associations

As this index has a primarily anti-inflammatory function, having **low amounts** of it is associated with the following:

- **Accelerated aging**
- **Ovarian cancer**
- **Colorectal cancer**
- **Urothelial cancer**
- **Multiple myeloma**
- **Sjögren's syndrome**
- **IBD**
- **ANCA-associated vasculitis**
- **Autoimmune haemolytic anaemia**
- **T1DM**
- **T2DM**
- **Hypertension**

* Your result is compared to people within your age group, biological sex, and ethnicity.

How to further optimise and improve

1 Questions to ask

- What is your patient's nutrition like?
- How varied is their phytonutrient intake?
- Does their nutrition fit their workout regime?
- Are they taking the right supplements for them?

2 Look at additional metrics

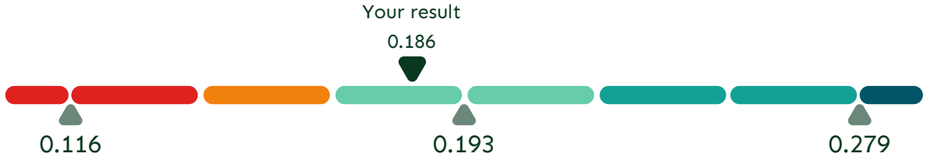
- Check vitamin and toxin levels.
- Check extended lipid profile.

3 Introduce lifestyle interventions

- Diverse diet rich in phytonutrients.
- Adequate rest between workout days.
- Simple supplementation (Mg, Zn, Omega-3, vitamin D).
- Optimise micro-nutrient intake.
- Experimental data: NAD+ supplementation and vitamins.

Glycan **Youth (G2)** Anti-inflammatory

Glycan Youth represents glycans with two galactoses (G2). Glycan Youth prevents unwanted pro-inflammatory effects of the C5a component of the complement pathway. Galactose is crucial in suppressing the pro-inflammatory pathways that lead to autoimmunity.



This result ranks you in the 43rd percentile

Having a higher percentile ranking **is better** for this index

Glycan Youth Associations

As this index has a primarily anti-inflammatory function, having **low amounts** of it is associated with the following:

- **Accelerated aging**
- **Obesity**
- **Ovarian cancer**
- **Endometrial cancer**
- **Colorectal cancer**
- **Ankylosing spondylitis**
- **SLE**
- **IBD**
- **Coeliac disease**
- **Non-alcoholic fatty liver disease (NAFLD)**

* Your result is compared to people within your age group, biological sex, and ethnicity.

How to further optimise and improve

1 Questions to ask

- Does this patient have signs of autoimmunity?
- Do they need to manage their weight?
- Do they have a hormonal imbalance?

2 Look at additional metrics

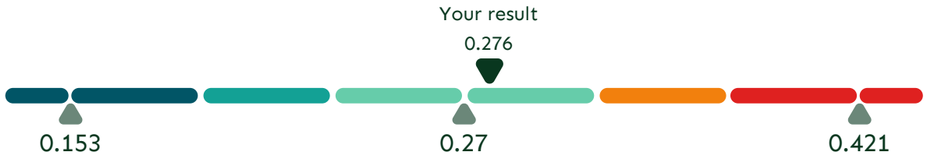
- Do a systems review and symptom assessment.
- Check hormone levels.
- Check body composition.

3 Introduce lifestyle interventions

- Hormone optimisation (HRT, TRT, stress level management).
- Diet optimisation.
- Extensive weight loss if indicated..
- Moderate and high intensity exercise.
- Calorie restriction.
- Management of autoimmune conditions.

Glycan **Mature (G0)** Pro-inflammatory

Glycan Mature represents glycans without galactoses. It is structurally and functionally opposite to Glycan Youth. Too many glycans without galactose can over-activate the complement system, leading to cellular damage and inflammation.



This result ranks you in the 53rd percentile

Having a lower percentile ranking **is better** for this index

Glycan Mature Associations

As this index has a primarily pro-inflammatory function, having **high amounts** of it is associated with the following:

- **Accelerated aging**
- **Obesity**
- **(Peri)menopause**
- **Various types of cancer**
- **Cardiometabolic diseases**
- **Autoimmune and inflammatory diseases**

* Your result is compared to people within your age group, biological sex, and ethnicity.

How to further optimise and improve

1 Questions to ask

- Could their hormones be imbalanced?
- Are they of perimenopausal age?
- Are they over- or under-exercising?

2 Look at additional metrics

- Check hormone levels (Sex hormones, Thyroid hormones, Cortisol, Melatonin, Insulin).

3 Introduce lifestyle interventions

- High-intensity exercise (in chronologically younger patients).
- Hormone optimisation.
- Extensive weight loss if indicated.
- Adequate rest between workout days.

Glycan **Median (G1)**

Supportive index

Glycan Median represents glycans with one galactose. This index has a prominent genetic component. Glycans within this index have a unique way of binding to endothelial cells, therefore having a significant impact on cardio-vascular health, especially in women.

This result ranks you in the 9th percentile

This index doesn't influence your overall biological age. However, It can help narrow down associations with specific disease types, genetic traits, and/or some lifestyle habits.

Glycan Median Associations

Either extremes (low/high) of this index in conjunction with the other primary indexes may be associated with:

- **Cardiovascular diseases**
- **Autoimmune diseases (predisposition)**
- **Socioeconomic development of the country**

* Your result is compared to people within your age group, biological sex, and ethnicity.

Supportive insights

1 Questions to ask

- What is their Mature and Youth index like?
- What are their living conditions?
- What is their risk of cardiovascular diseases?
- Is there a family history of cardiovascular diseases?

2 Look at additional metrics

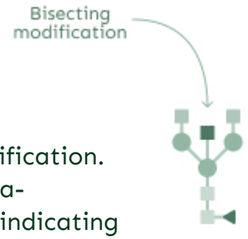
- Assess their CVD risk (blood pressure, lipid profile [Lp(a), LDL-p, LDL size, oxLDL, ApoB, etc.], hsCRP, homocysteine).
- Understand their autoimmune profile/risk.

3 Follow-up steps

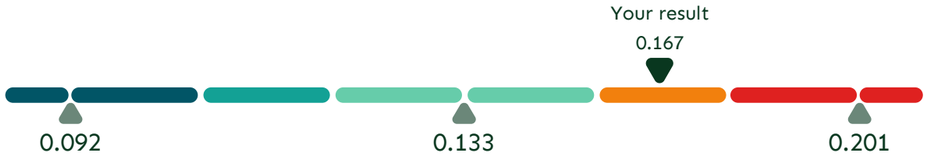
- Mature and Youth index optimisation.
- Cardiovascular disease risk management.
- Autoimmune disease management.

Glycan **Lifestyle (B)**

Supportive index



Glycan Lifestyle represents glycans that have a bisecting modification. Bisection often occurs as a result of smoking, obesity, and ultra-processed foods. It also has a prominent genetic component, indicating familial longevity.



This result ranks you in the 91st percentile

This index doesn't influence your overall biological age. However, It can help narrow down associations with specific disease types, genetic traits, and/or some lifestyle habits.

Glycan Lifestyle Associations

High results in this index in conjunction with the other primary indexes may be associated with:

- **Inflammatory diseases**
- **Cardiometabolic diseases**
- **Unhealthy lifestyle**
- **Unhealthy environment**
- **Chronic obstructive pulmonary disease (COPD)**

* Your result is compared to people within your age group, biological sex, and ethnicity.

Supportive insights

1 Questions to ask

- Is your patient a smoker?
- Do they often consume ultra-processed foods?
- What are their stress levels?
- What is their sleep schedule and quality like?
- Do they have a family history of diabetes?

2 Look at additional metrics

- BMI.
- Lifestyle habits.
- Passive environmental exposures and endocrine disruptors.
- Toxin check (e.g., metals, mould, pollution).

3 Follow-up steps

- Include more non-processed whole foods.
- Advise to stop smoking/vaping.
- Consider an air filter system to use at home.
- Weight loss, if indicated.
- Introduce stress management techniques.
- Optimise sleep (improve sleep hygiene, introduce blue-light blocking glasses, etc.).
- Omega-3 supplementation.

Glycan insights

Beta Version

We've extracted data from over 300 scientific papers to understand how glycan indexes vary in individuals with specific diseases.

Specific diseases have their own unique glycan fingerprint that can provide valuable insights into a patient's health.

Our research led us to observe that patients with certain diseases have higher levels of some, and lower levels of other indexes, when compared to their healthy counterparts.

Full study is available on **ScienceDirect**.

Important notice:

Glycan insights should be triangulated with other clinical data. Glycan changes may reflect progression of pathological changes into disease, and thus occur up to 10 years before the onset of any symptoms.

Your patient's profile overlaps

We've cross-referenced the most research-supported diseases with your patient's glycan profile:

Overlaps indicate how many of your patient's glycan metrics overlap with disease-specific glycan changes. Diseases have a different number of max overlapping metrics. Refer to disease-specific pages for more info.

Cardiovascular diseases:	**Overlaps:**
Increased risk of hypertension	**1/1** Some overlap
Pre-hypertension	**0/1** No significant overlap
Hypertension	**1/3** No significant overlap
Myocardial infarction	**1/1** Some overlap
Atherosclerosis	**2/5** No significant overlap
Coronary artery disease	**0/2** No significant overlap
Autoimmune diseases:	
Rheumatoid arthritis	**1/4** No significant overlap
Ulcerative colitis	**1/4** No significant overlap
Crohn's disease	**2/5** No significant overlap
SLE	**3/4** Minor overlap
Metabolic diseases:	
Type 2 diabetes	**2/5** No significant overlap
Dyslipidemia	**2/4** No significant overlap
Respiratory diseases:	
COPD	**2/2** Some overlap
Female reproductive health:	
Perimenopause	**1/4** No significant overlap

How to interpret the data from your glycan insights

1. **Your patient's glycan fingerprint compared to disease-specific patient profiles**

   Disease-specific changes in glycan indexes are represented by arrows. Your patient's results are shown above arrow. The percentiles relate specifically to your patient.

2. **Additional relevant metrics**

   Sometimes there are other relevant metrics for assessing disease risks. Such metrics are age, family history, biological sex, BMI, and similar.

3. **At-a-glance summary**

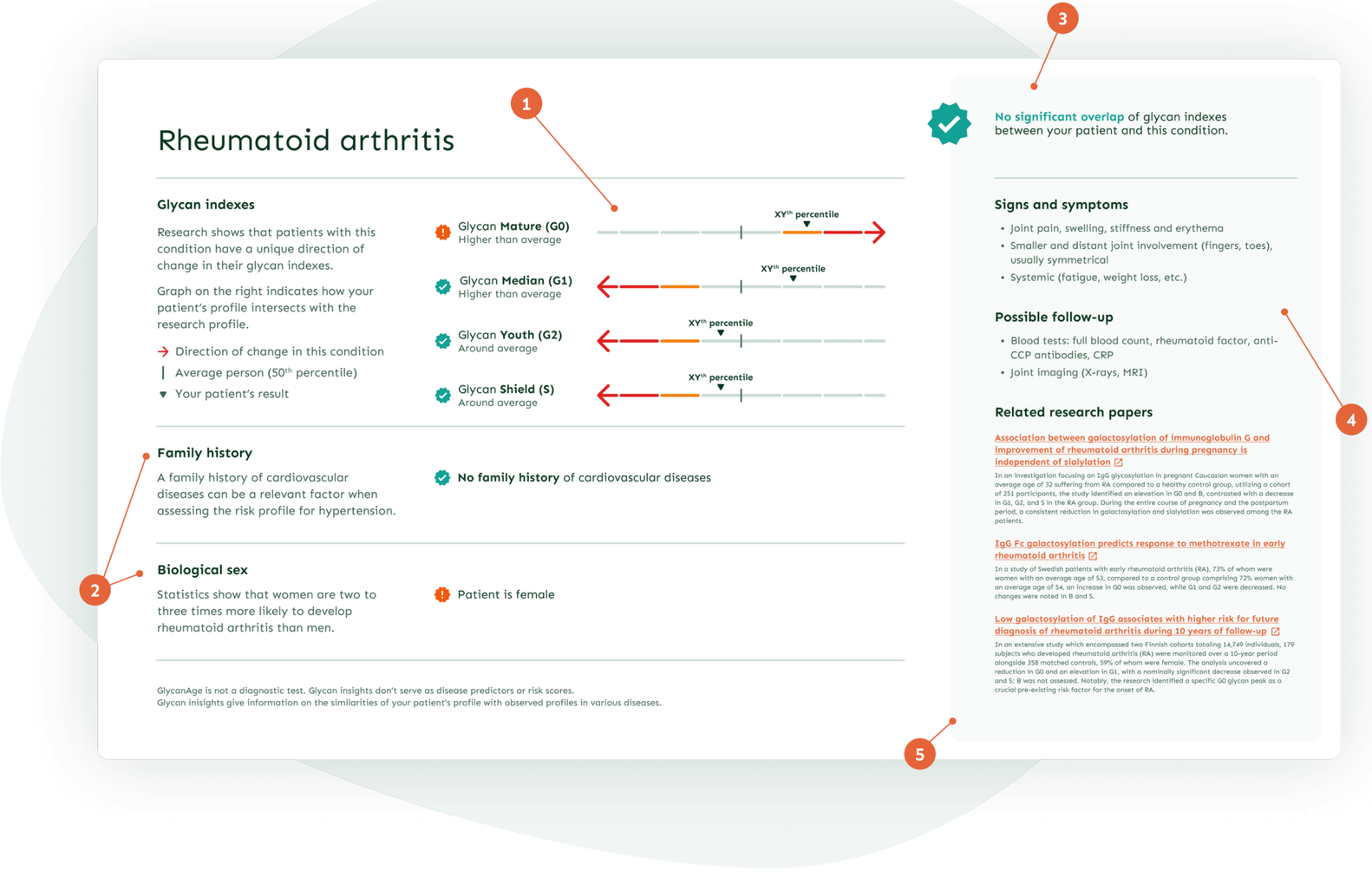
   Here you can find a summary of measurable metrics (1 and 2). However, it is important to take your patient's full medical history into account, as well as observe the amount of overlap of their glycan fingerprint.

4. **Follow-up hints**

   Useful follow-up tests and symptoms to check for when assessing the risk of a disease.

5. **Related research papers**

   Research that was done to observe glycosylation patterns within a specific disease or condition.



Increased risk of hypertension

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

Graph on the right indicates how your patient's profile intersects with the research profile.

- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result

Glycan **Lifestyle (B)**
Higher than average

Family history

A family history of cardiovascular diseases can be a relevant factor when assessing the risk profile for hypertension.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

GlycanAge is not a diagnostic test. Glycan insights don't serve as disease predictors or risk scores.
Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

Some overlap of glycan indexes between your patient and this condition.

Signs and symptoms

- Usually asymptomatic

Possible follow-up

- Serial blood pressure (BP) measurements Â± 24-hour BP monitoring
- BMI and/or body composition check
- Basic bloods (lipid profile, renal and liver function)

Related research papers

N-glycosylation of immunoglobulin G predicts incident hypertension

In a study investigating the relationship between IgG glycosylation and hypertension, 989 unrelated incident hypertension cases and 1628 controls from the TwinsUK cohort, with a mean follow-up of 6.3 years, were examined. The average age of the participants was 56. The findings, which included an observed increase in B, were validated in additional cohorts from the "10 001 Dalmatians" (106 individuals) and KORA S4 (729 individuals). A predictive model incorporating age, BMI, mean arterial pressure (MAP), and specific glycan peaks with B modifications demonstrated robust predictive accuracy, achieving a very high AUC of 0.923.

Pre-hypertension

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

Graph on the right indicates how your patient's profile intersects with the research profile.

- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result

Glycan **Youth (G2)**
Around average

Family history

A family history of cardiovascular diseases can be a relevant factor when assessing the risk profile for hypertension.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

No significant overlap of glycan indexes between your patient and this condition.

Signs and symptoms

- Usually asymptomatic

Possible follow-up

- Serial blood pressure (BP) measurements ± 24-hour BP monitoring
- BMI and/or body composition check
- Basic bloods (lipid profile, renal and liver function)

Related research papers

The Association Between Glycosylation of Immunoglobulin G and Hypertension: A Multiple Ethnic Cross-Sectional Study

In an extensive study with 4757 participants, including 913 from the Chinese Han Beijing population, 985 from Croatian Korčula, 896 from Croatian Vis, and 1963 from Scottish Orkney, researchers investigated changes in IgG glycans associated with prehypertension and hypertension. The demographic composition of the study was approximately 40% female and 60% male participants. A notable observation was the decrease in G2 in the cohort with prehypertension.

Hypertension

No significant overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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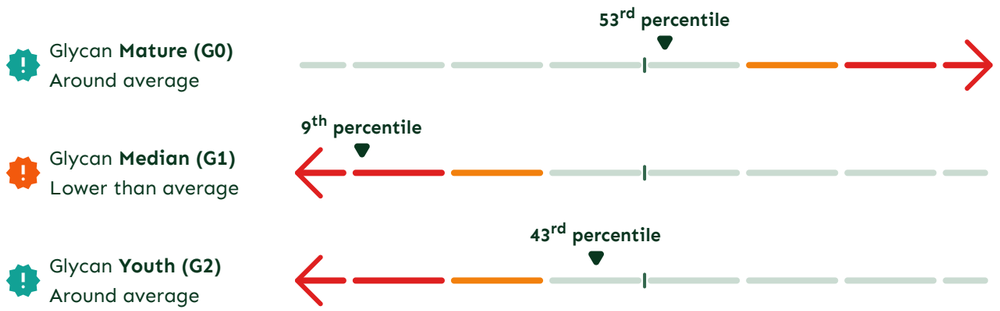
- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of cardiovascular diseases can be a relevant factor when assessing the risk profile for hypertension.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

Signs and symptoms

- Usually asymptomatic
- BP consistently >140/90 mmHg
- Signs of malignant hypertension (headache, dizziness, breathlessness, etc.)

Possible follow-up

- Serial BP measurements and/or 24-hour BP monitoring
- BMI and/or body composition check
- Basic blood tests (lipid profile, renal and liver function)

Related research papers

The Association Between Glycosylation of Immunoglobulin G and Hypertension: A Multiple Ethnic Cross-Sectional Study

In an extensive study with 4,757 participants, including 913 from the Chinese Han Beijing population, 985 from Croatian Korčula, 896 from Croatian Vis, and 1963 from Scottish Orkney, researchers investigated changes in IgG glycans associated with prehypertension and hypertension. The demographic composition of the study was approximately 40% female and 60% male participants. Among hypertension patients, there was a noted decrease in G2 and S, alongside an increase in G0.

MI and CVA

Major overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

Graph on the right indicates how your patient's profile intersects with the research profile.

- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result

Peak **22 (P22)**
Lower than average

Family history

A family history of cardiovascular diseases can be a relevant factor when assessing the risk profile for myocardial infarction and stroke cases.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

Risk factors

- Past medical history (cardiometabolic syndrome, autoimmune disease)
- Medication history (e.g., statins, blood thinners)
- Current/previous smoking history

Possible follow-up

- Blood tests: basic and extended lipid profile (e.g., Lp(a), ApoB), hsCRP, homocysteine, renal and liver function, HbA1c
- BP check
- ECG
- Cardiology referral for other tests (e.g., cardiac echo, coronary CT)

Related research papers

Immunoglobulin G N-Glycosylation Signatures in Incident Type 2 Diabetes and Cardiovascular Disease

In the EPIC-Potsdam cohort, involving 2,175 participants in the cardiovascular disease (CVD) subcohort, which includes 417 cases of MI and CVA, changes in IgG glycosylation were analysed. This cohort comprised 61% females and 39% males, with an average age of 49. In male participants, an increase in G0 and B was observed, along with a decrease in G2 and S. A predictive model employing 2 specific glycan peaks was developed, demonstrating a hazard ratio (HR) of 1.60.

Atherosclerosis

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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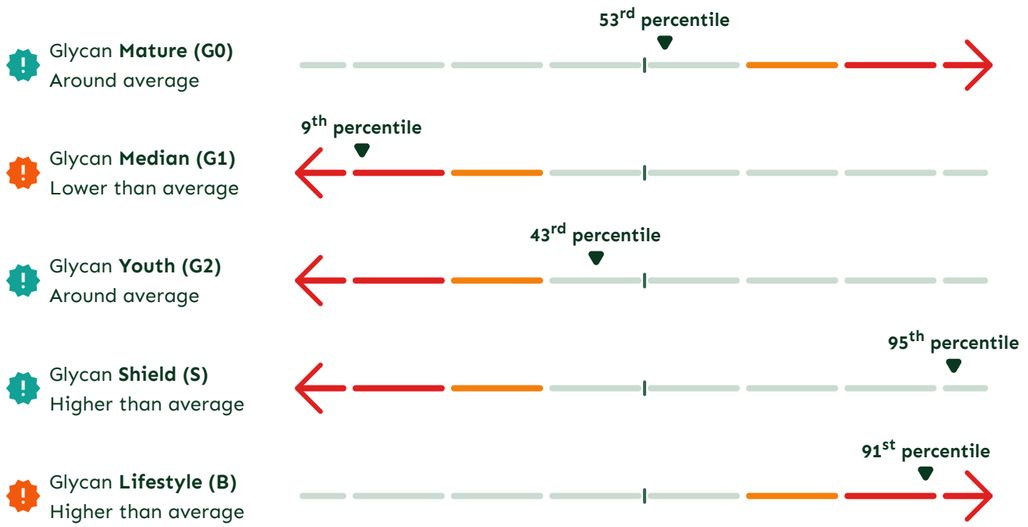
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of cardiovascular diseases, including family history of familial hyper-cholesterolemia, can be a relevant factor when assessing the risk profile for atherosclerosis.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

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No significant overlap of glycan indexes between your patient and this condition.

Signs and symptoms

- Usually asymptomatic
- Signs of coronary artery disease (e.g., self-resolving chest pain, breathlessness)
- Signs of peripheral artery disease (e.g., leg pain during activity)

Possible follow-up

- Blood tests: basic and extended lipid profile (e.g., Lp(a), ApoB), hsCRP, homocysteine, renal and liver function, HbA1c
- BP check
- ECG
- Cardiology referral for other tests (e.g., coronary artery calcium score)

Related research papers

Glycosylation Profile of Immunoglobulin G Is Cross-Sectionally Associated With Cardiovascular Disease Risk Score and Subclinical Atherosclerosis in Two Independent Cohorts

In a study involving 2970 women aged 40–79 from the TwinsUK cohort, IgG glycosylation was examined in relation to the estimated 10-year risk of atherosclerotic cardiovascular disease and the presence of carotid and femoral plaque. A decrease in G1, G2 and S was observed, alongside an increase in G0 and B. These findings were replicated in 967 women from the ORCADES cohort (Orkney Complex Disease Study). Additionally, some of these glycan changes were also associated with 845 men in the study.

Coronary artery disease

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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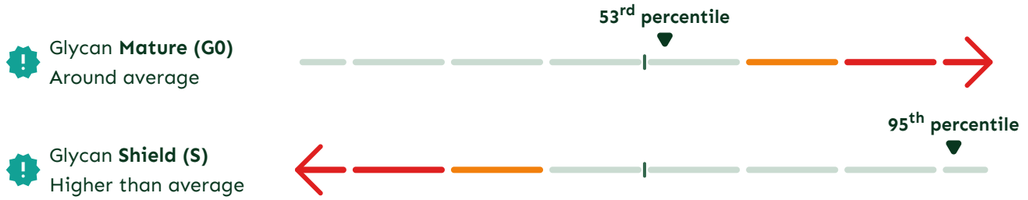
- ▼ Your patient's result



Family history

A family history of cardiovascular diseases, including family history of familial hyper-cholesterolemia, can be a relevant factor when assessing the risk profile for CAD.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

No significant overlap of glycan indexes between your patient and this condition.

Signs and symptoms

- Self-limiting chest pain ± radiation into jaw/left arm/back
- Breathlessness
- Other (syncope, palpitations, leg edema, orthopnea, etc.)

Possible follow-up

- Blood tests: basic and extended lipid profile (e.g., Lp(a), ApoB), hsCRP, homocysteine, renal and liver function, HbA1c
- BP check
- ECG
- Cardiology referral for other tests (e.g., stress echocardiogram)

Related research papers

IgG N-Glycosylation Is Altered in Coronary Artery Disease

In the CAPIRE study, male and female participants aged 45 to 75 years without prior clinical manifestations of coronary artery disease (CAD) were assessed using coronary computed tomography angiography (CCTA). They were categorized into CAD-negative (clean coronaries) and CAD-positive (significant coronary atherosclerosis) based on CCTA findings, aligning with the AHA classification. This research paper aimed to explore the association between the N-glycome profile of immunoglobulin G (IgG) and CAD presence. Among the 198 women in the study, with an average age of 59.9 years, significant glycan alterations were noted, specifically an increase in G0 and a decrease in S.

Rheumatoid arthritis

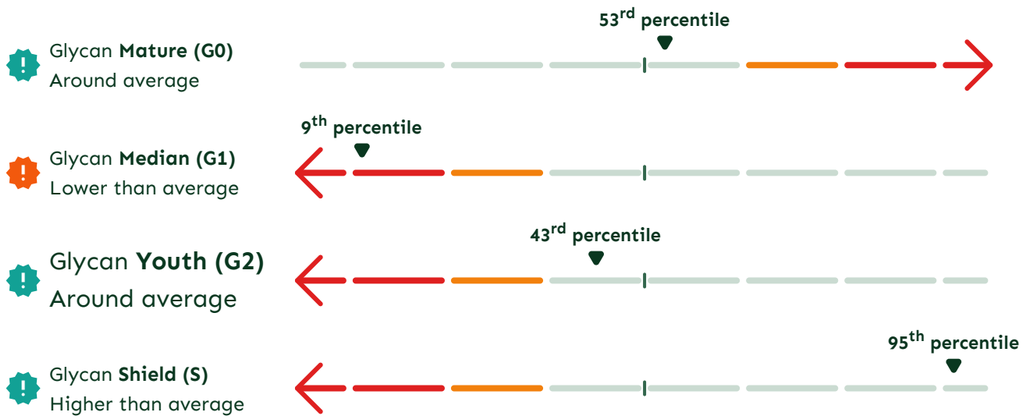
No significant overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

Graph on the right indicates how your patient's profile intersects with the research profile.

- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of autoimmune diseases can be a relevant factor when assessing the risk profile for hypertension.

Missing data on this metric

Biological sex

Statistics show that women are two to three times more likely to develop rheumatoid arthritis than men.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

Signs and symptoms

- Joint pain, swelling, stiffness and erythema
- Smaller and distant joint involvement (fingers, toes), usually symmetrical
- Systemic (fatigue, weight loss, etc.)

Possible follow-up

- Blood tests: full blood count, rheumatoid factor, anti-CCP antibodies, CRP
- Joint imaging (X-rays, MRI)

Related research papers

Association between galactosylation of immunoglobulin G and improvement of rheumatoid arthritis during pregnancy is independent of sialylation

In an investigation focusing on IgG glycosylation in pregnant Caucasian women with an average age of 32 suffering from RA compared to a healthy control group, utilizing a cohort of 251 participants, the study identified an elevation in G0 and B, contrasted with a decrease in G1, G2, and S in the RA group. During the entire course of pregnancy and the postpartum period, a consistent reduction in galactosylation and sialylation was observed among the RA patients.

IgG Fc galactosylation predicts response to methotrexate in early rheumatoid arthritis

In a study of Swedish patients with early rheumatoid arthritis (RA), 73% of whom were women with an average age of 53, compared to a control group comprising 72% women with an average age of 54, an increase in G0 was observed, while G1 and G2 were decreased. No changes were noted in B and S.

Low galactosylation of IgG associates with higher risk for future diagnosis of rheumatoid arthritis during 10 years of follow-up

In an extensive study which encompassed two Finnish cohorts totaling 14,749 individuals, 179 subjects who developed rheumatoid arthritis (RA) were monitored over a 10-year period alongside 358 matched controls, 59% of whom were female. The analysis uncovered a reduction in G0 and an elevation in G1, with a nominally significant decrease observed in G2 and S; B was not assessed. Notably, the research identified a specific G0 glycan peak as a crucial pre-existing risk factor for the onset of RA.

Ulcerative colitis

No significant overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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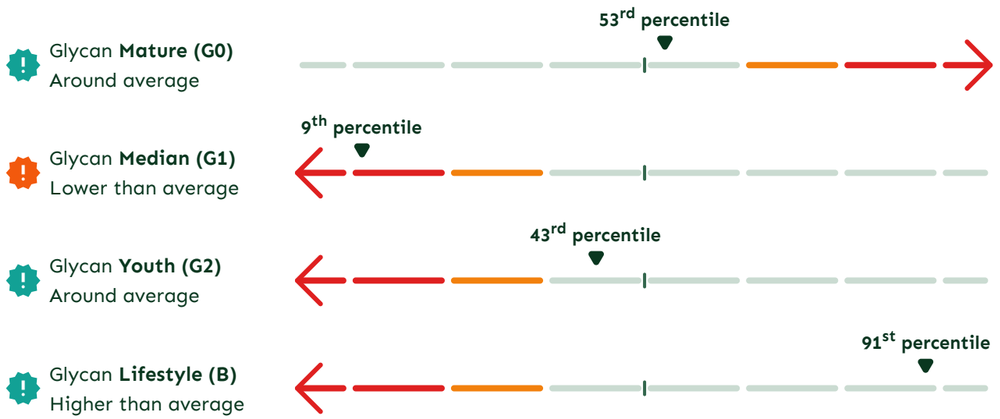
- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of autoimmune diseases and inflammatory bowel disease can be a relevant factor when assessing the risk profile for ulcerative colitis.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

Signs and symptoms

- Abdominal pain and cramping
- Urgency to defecate
- Recurring diarrhea (± blood)

Possible follow-up

- Blood tests: full blood count, renal and liver function, CRP
- Stool tests: faecal immunochemical test (FIT), fecal calprotectin
- Referral for CT colonoscopy

Related research papers

Inflammatory bowel disease associates with proinflammatory potential of the immunoglobulin G glycome

In a Scottish study examining IgG glycosylation in IBS, focusing on the ulcerative colitis (UC) segment, a cohort of 507 UC patients and 320 controls, all with an average age of 45, was evaluated.The analysis revealed a significant increase in G0 and a decrease in G1 in the UC patients compared to the controls. Observed alterations of specific glycan peaks demonstrated predictive power, with an area under the curve (AUC) of 0.72, indicating their potential utility in distinguishing between UC patients and healthy individuals.

Glycosylation of Immunoglobulin G Associates With Clinical Features of Inflammatory Bowel Diseases

In a comprehensive study examining IgG glycosylation patterns in IBS, a cohort including 1,056 UC patients from Italy, 253 from the US, and controls (427 in Italy and 440 from the US) was analyzed. The average age of participants was 39, with a balanced gender distribution. The findings showed a decrease in G1, G2, and B glycan traits and an increase in G0 across UC patients. The glycosylation traits were incorporated into a model that demonstrated significant predictive capability with an AUC of 0.814. Additionally, a correlation was observed between decreased galactosylation and more severe cases of UC, notably those requiring surgical intervention, compared to controls.

Crohn's disease

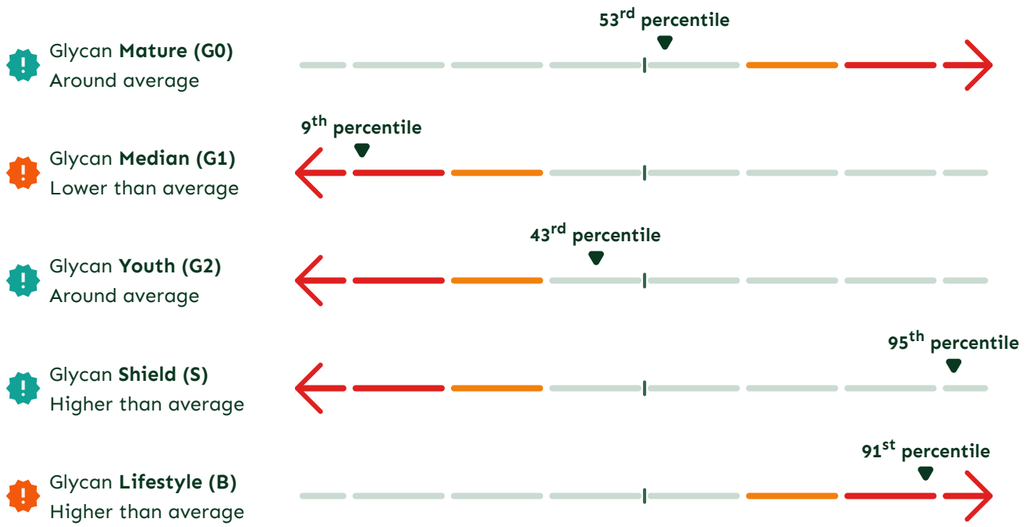
No significant overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

Graph on the right indicates how your patient's profile intersects with the research profile.

- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of autoimmune diseases and inflammatory bowel disease can be a relevant factor when assessing the risk profile for Crohn's disease.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

Signs and symptoms

- Abdominal pain and cramping
- Recurring diarrhea (± blood)
- Weight loss

Possible follow-up

- Blood tests: full blood count, renal and liver function, CRP
- Stool tests: faecal immunochemical test (FIT), faecal calprotectin
- Referral for CT colonoscopy

Related research papers

Inflammatory bowel disease associates with proinflammatory potential of the immunoglobulin G glycome

In a Scottish study examining IgG glycosylation changes in IBS, a cohort of 287 CD patients and 320 controls, all with an average age of 42, was evaluated. The analysis indicated a significant increase in G0 and B glycan traits and a decrease in G1, G2, and S in CD patients compared to controls. The changes in specific glycan peaks showed predictive value, with an AUC of 0.77.

Glycosylation of Immunoglobulin G Associates With Clinical Features of Inflammatory Bowel Diseases

In a study focusing on CD, a cohort including 874 CD patients from Italy, 391 from the United States, and controls (427 in Italy and 440 from the United States) was analyzed for IgG glycosylation changes. With an average participant age of 35 and an equal gender distribution, the research revealed a decrease in G1, G2, and S glycan traits and an increase in G0, while B remained unchanged. The glycosylation traits contributed to a model achieving an AUC of 0.849, indicating strong predictive capability. A link was noted between decreased galactosylation and more severe CD manifestations, such as the necessity for surgical intervention, compared to controls.

Systemic lupus erythematosus (SLE)

Some overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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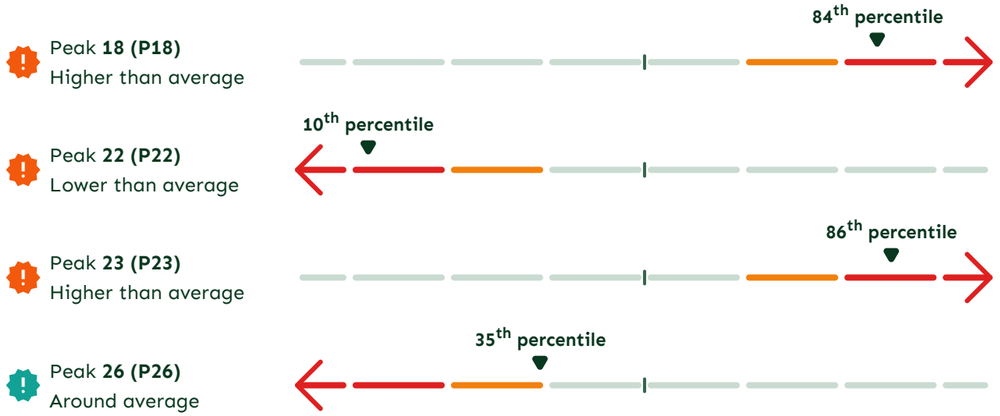
- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of autoimmune diseases and inflammatory bowel disease can be a relevant factor when assessing the risk profile for SLE.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

Signs and symptoms

- Systemic (e.g., fatigue, weight loss, mouth ulcers, butterfly skin rash)
- Organ-specific (chest pain, difficulty breathing, leg swelling, anaemia, etc.)
- Joint pain and swelling

Possible follow-up

- Blood tests: full blood count, renal and liver function, CRP, ESR, autoantibodies (e.g., ANA, anti-dsDNA)
- Urinalysis
- Organ-targeted imaging (e.g., CT thorax, CT abdomen)

Related research papers

Association of Systemic Lupus Erythematosus With Decreased Immunosuppressive Potential of the IgG Glycome

In an analysis focusing on SLE, a discovery cohort consisting of 261 predominantly female SLE patients and 247 matched controls of Latin American Mestizo origin was studied for changes in IgG glycome, alongside two independent replication cohorts from Trinidad (108 SLE patients and 193 controls) and China (106 SLE patients and 105 controls). The study identified specific alterations in glycan traits, including a decrease in G2 and S, and notable changes in glycan peaks, with increases in peaks 18 and 23 and decreases in peaks 22 and 26. Utilizing these peak variations, a predictive model was developed, achieving an AUC of up to 0.882.

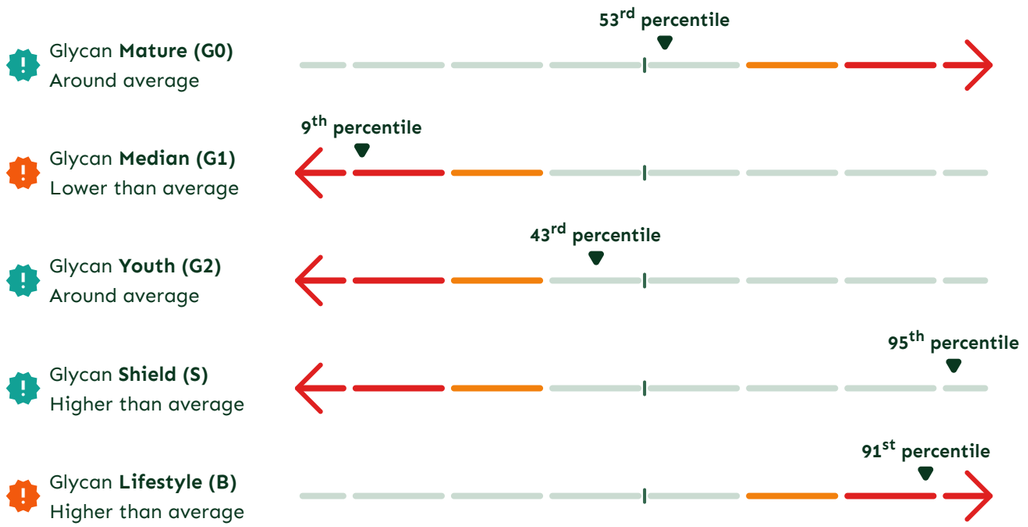
Type 2 diabetes mellitus

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

Graph on the right indicates how your patient's profile intersects with the research profile.

- → Direction of change in this condition
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of cardiovascular diseases can be a relevant factor when assessing the risk profile for type 2 diabetes.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

No significant overlap of glycan indexes between your patient and this condition.

Signs and symptoms

- Fatigue
- Increased thirst and frequent urination
- Slow wound healing, blurred vision, frequent thrush

Possible follow-up

- Blood tests: full blood count, renal and liver function, fasting glucose and insulin, HbA1c, HOMA-IR
- BP check
- BMI and/or body composition check

Related research papers

IgG glycan patterns are associated with type 2 diabetes in independent European populations

In the DiaGene study, a population-based case-control study with 1,886 cases and 854 controls, 58 IgG glycan traits were analyzed. The findings were then replicated and meta-analyzed in the combined population-based studies of CROATIA-Korcula, CROATIA-Vis, and ORCADES, involving 162 cases and 3,162 controls. Within this research, 46% of cases and 60% of controls were female, with an average participant age of 65. The analysis revealed a decrease in G1, G2, and S glycans, alongside an increase in G0 and B. A predictive model incorporating four specific glycan peaks achieved an AUC of 0.729. When IgG glycans were added to a model containing only age and sex, the AUC improved from 0.542 to 0.734, although incorporating them into a more comprehensive model did not significantly enhance the AUC.

Dyslipidemia

No significant overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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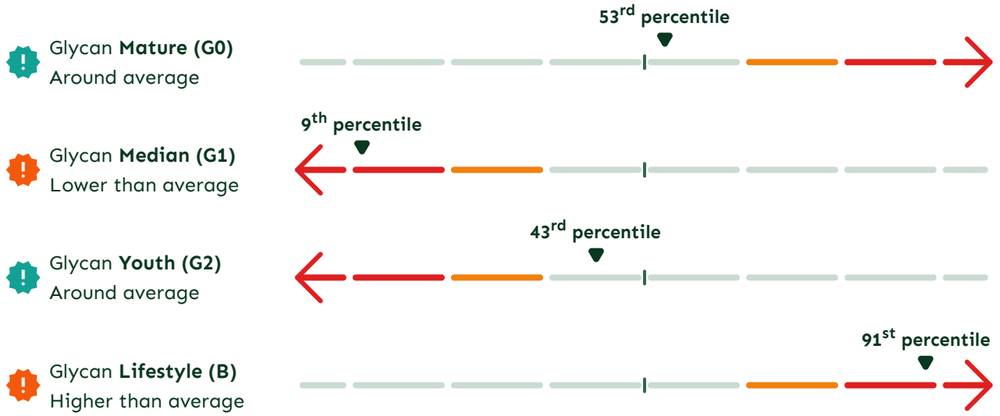
- | Average person (50th percentile)
- ▼ Your patient's result



Family history

A family history of cardiovascular diseases, including family history of familial hyper-cholesterolemia, can be a relevant factor when assessing the risk profile for dyslipidemia.

Missing data on this metric

BMI

Higher BMI intensifies cardiovascular diseases risk by promoting atherosclerosis and enhancing cardiac workload.

Missing data on this metric

Signs and symptoms

- Usually asymptomatic

Possible follow-up

- Lipid profile blood tests: basic and extended (incl. oxLDL, VLDL, LDL-P, Lp-PLA2, Lp(a), ApoB)
- Other blood tests: hsCRP, homocysteine, renal and liver function, HbA1c
- BP check

Related research papers

The changes of immunoglobulin G N-glycosylation in blood lipids and dyslipidaemia

In a study focusing on IgG glycome changes related to dyslipidemia, 598 participants (67% female participants) were selected from a larger observational cross-sectional study conducted in 2012, which initially involved 913 participants of Chinese Han ancestry from Beijing. The glycomic analysis revealed a decrease in G2 and S, coupled with an increase in G0 and B. A predictive model incorporating six specific glycan structures was developed from these findings, resulting in an AUC of 0.692.

Coronary Obstructive Pulmonary Disease (COPD)

Major overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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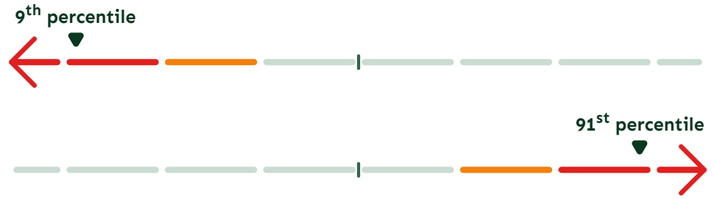
Glycan **Median (G1)**
Lower than average

Glycan **Lifestyle (B)**
Higher than average



GlycanAge is not a diagnostic test. Glycan insights don't serve as disease predictors or risk scores.
Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

Signs and symptoms

- Difficulty breathing
- Chronic cough (± productive)
- Fatigue

Possible follow-up

- Blood tests: full blood count
- Spirometry
- ECG, chest X-ray

Related research papers

N-glycosylation patterns of plasma proteins and immunoglobulin G in chronic obstructive pulmonary disease

In a Croatian study focusing on COPD, researchers analyzed IgG glycosylation in 137 COPD patients and 95 controls in the discovery cohort, and 61 COPD patients and 148 controls in a replication cohort from another medical center. The discovery cohort included 97 female participants (42%), while the replication cohort had 116 females (56%). The study observed a decrease in G1 and an increase in B glycan structures in COPD patients.

For those who want to know more:

The analysis also revealed that N-glycans could distinguish between different COPD stages according to GOLD guidelines, with more complex glycan structures becoming relatively more abundant as the disease advanced. The study also noted significant associations between glycans and the frequency of COPD exacerbations and highlighted the impact of smoking, a major risk factor for COPD, on glycan compositions.

Perimenopause

No significant overlap of glycan indexes between your patient and this condition.

Glycan indexes

Research shows that patients with this condition have a unique direction of change in their glycan indexes.

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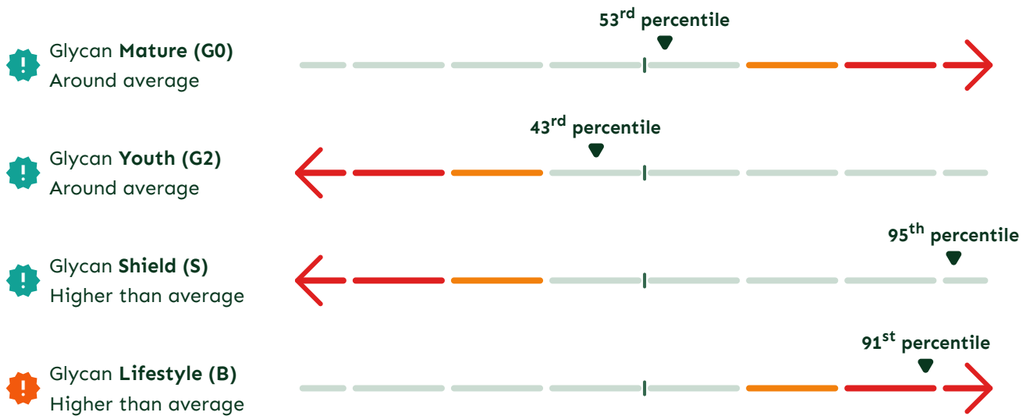

Age

Women between the ages of 40 and 55 are primarily assessed for perimenopause and menopause, as this is the most common age range for these transitions.

Missing data on this metric

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Glycan insights give information on the similarities of your patient's profile with observed profiles in various diseases.

Signs and symptoms

- Irregular menstrual cycle
- Vasomotor symptoms (e.g., hot flushes)
- Other (e.g., mood swings, cognitive difficulties, sleep disturbance)

Possible follow-up

- Blood tests (incl. FSH, oestradiol, progesterone, testosterone, AMH)
- Blood pressure check
- Referral to (peri)menopause specialist/gynaecologist

Related research papers

Estrogens regulate glycosylation of IgG in women and men

In a comprehensive study examining IgG galactosylation only, 713 healthy adults from two cohorts representing White, Hispanic, and African American back grounds, along with 159 subjects from four randomized controlled trials on endocrine manipulation, were assessed, totaling 872 participants with an equal gender distribution. The study found that menopause was linked to an increase in agalactosylated IgG glycans, particularly the fucosylated nonbisected (G0F) glycoform. Treatment effects were noted, where conjugated estrogens and raloxifene reduced G0F glycans in postmenopausal women, and in premenopausal women, leuprolide increased G0F glycans, an effect that was reversed by estradiol.

Immunoglobulin G glycome composition in transition from premenopause to postmenopause

In an extensive analysis, IgG glycome composition was studied in 5,080 samples from 1,940 women categorized as pre-, peri-, and postmenopausal, drawn from the TwinsUK registry. The study further included a validation cohort from two different population studies, CROATIA-Vis and CROATIA-Korcula. The participants were predominantly of White origin with an average age of 57. Notable glycan changes were observed in the transition from pre- to perimenopause, marked by an increase in G0 and B, and a decrease in G2 and S. A predictive model using age and IgG glycome to determine the onset of perimenopause was developed, achieving an AUC of 0.853 for a single time point measurement. Detailed differences in the glycan changes from peri- to post-menopause are also elaborated in the full paper.

Share your insights:
Help us enhance our report

We strive for continuous improvement and your feedback is invaluable to us. As we seek to refine the quality and relevance of our report, we invite you to contribute your perspectives and suggestions.

Your insights will ensure that our future reports are even more aligned with your needs and interests, providing you with the most valuable and actionable information.

Click here to provide your valuable feedback

What’s next?

CONTINUE READING

Learn what affects our glycan composition

We’ll review these major areas of interest:

- Genetics
- Natural ageing
- Lifestyle

These are not personally tailored to you.

Exploring this chapter might give you some ideas of what to discuss with your specialist.

TAKE ACTION

Get in touch with your specialist

It is confidential and gives you the opportunity to discuss your health, lifestyle and any medical conditions in conjunction with your results to help you decide what you’d like to do next.

What affects our glycan composition?

Important note

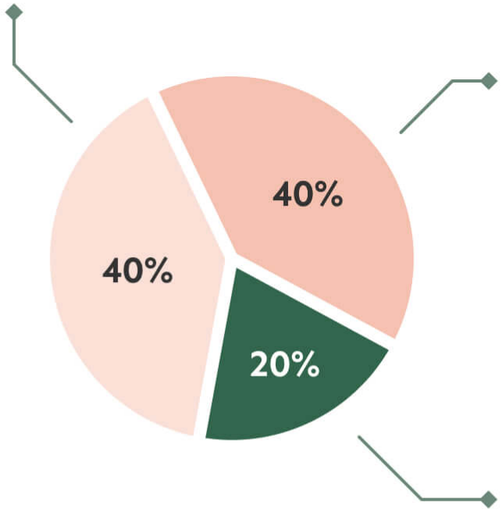
Before you continue...

Content you're about to see is for informational purposes only. It is derived from scientific research.

It is NOT personally tailored to you.

Natural ageing

When we're young, our glycan composition is rich in glycans with sialic acid. As we get older, the glycans tend to lose "arms". More precisely — they lose sialic acids and galactoses. This causes them to transition from preventing chronic inflammation to promoting it.



Genetics

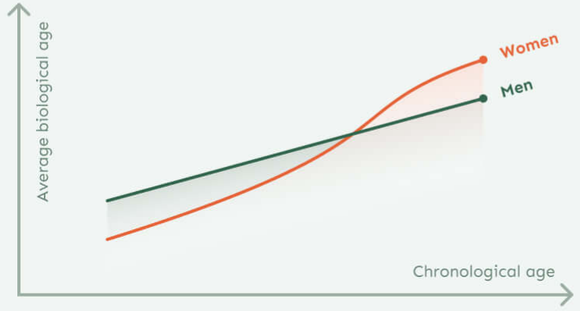
Our glycan composition is partly inherited. We've conducted research on cohorts across the world which demonstrate that different ethnic groups age differently.

Lifestyle

Our lifestyle choices play a major role in shaping us. Nutrition, exercise, stress and medical interventions, all affect our glycan composition. This is great news as it gives us a way to influence our glycans.

Men and women age differently

Men and women exhibit slightly different biological ageing curves. Women tend to have a greater amount of glycans that prevent chronic inflammation BEFORE perimenopause and menopause. During and after — there is usually a strong shift towards pro-inflammatory glycans. Men on the other hand have a much more linear change in glycan profile.



Menopause & Perimenopause

Menopause is when a woman stops having periods and is no longer able to get pregnant naturally. Perimenopause is the period leading up to menopause.

During this life-stage there are drastic changes in women's glycan composition. Pro-inflammatory glycans increase, and anti-inflammatory are reduce.

Andropause

Andropause describes the steady changes (decline) in male's hormone levels, which usually relates to other age-related issues. This steady change is why men have a more linear ageing curve.

Nutrition

Changing nutrition can yield long-term benefits, but optimising it often requires a personalised approach. In our studies, the only plan that had a consistently beneficial effect was a low-calorie diet that removed overly processed foods.

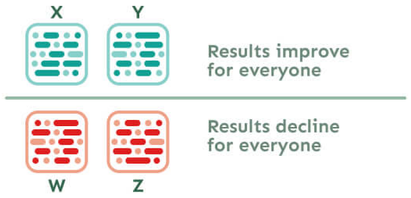
Removing overly processed foods rich in hidden sugars and empty calories improves Glycan Lifestyle index, but doesn't have a significant effect on other indexes.

There is no "magic diet"

We've conducted a research to determine whether there's a diet that is beneficial to **everyone**.

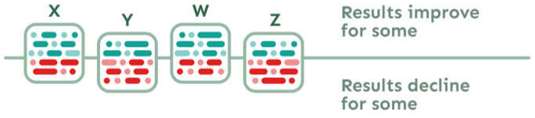
What we expected:

- Clear improvement with diet X and Y
- Clear decline with diet W and Z



What we actually learned:

- No clear indication of benefits for different diets
- **Diet needs to be tailored for your unique metabolism.**



Managing obesity

There are various types of fat our bodies tend to accumulate over the years. Not all fat is considered "bad". However, accumulation of a large amount of excess abdominal fat causes metabolic stress and inflammation.

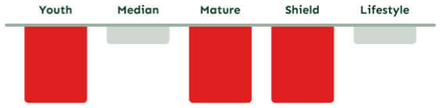
In context of managing obesity, **low calorie diet** yields positive improvements across all indexes.

Extensive weight loss has been proven to positively affect almost all indexes.

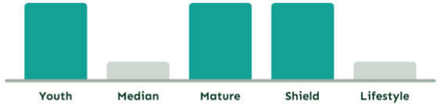
Exercise

Exercise has many positive effects on health, but over-exercise will have a negative effect.

High intensity training when combined with caloric restriction depletes the natural capacity of our immune system. It has a negative impact on most indexes.



However, high intensity training can be beneficial for your glycan profile when combined with a good recovery period and proper nutrition.



Thank you for choosing GlycanAge

Glycans are complex carbohydrate molecules and one of the four primary components of the cell (alongside DNA, proteins, and lipids).

Glycans perform numerous tasks and play a major role in all essential functions of the human body, including our immune system. They participate in virtually all our body's processes; therefore, it is not surprising that molecular defects in glycan synthesis are recognised as a direct cause of an increasing number of diseases.

The study of glycans is still in its infancy. However, it is already providing useful and unique insights into how our bodies age at a molecular level.

GlycanAge provides you access to the most advanced information available. Created by the world's leading authority on glycoscience, Professor Gordan Lauc and fulfilled at his laboratory, Genos — world leaders in the extraction and analysis of glycans.

Our combined research team has studied ageing for over 30 years, publishing our findings in more than 300 scientific papers.

GlycanAge is proven to respond to lifestyle changes, in both scientific trials and personal tests spanning over 200K+ individuals.

List of references

1. Glycosylation Profile of Immunoglobulin G Is Cross-Sectionally Associated With Cardiovascular Disease Risk Score and Subclinical Atherosclerosis in Two Independent Cohorts
2. Decreased Immunoglobulin G Core Fucosylation, A Player in Antibody-dependent Cell-mediated Cytotoxicity, is Associated with Autoimmune Thyroid Diseases
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11. Inflammatory Bowel Disease Associates with Proinflammatory Potential of the Immunoglobulin G Glycome
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14. Intense Physical Exercise Induces an Anti-inflammatory Change in IgG N-Glycosylation Profile
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18. Glycosylation Alterations in Multiple Sclerosis Show Increased Proinflammatory Potential
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24. Hypogalactosylation of serum IgG in patients with coeliac disease
25. Heterogeneity of IgG Glycosylation in Adult Periodontal Disease
26. Estrogens regulate glycosylation of IgG in women and men
27. Glycosylation of plasma IgG in colorectal cancer prognosis
28. Immunoglobulin G glycosylation in aging and diseases
29. IgG Glycome in Colorectal Cancer

“Glycans are directly involved in the pathophysiology of every major disease...

Additional knowledge from glycoscience will be needed to realize the goals of personalized medicine and to take advantage of the substantial investments in human genome and proteome research and its impact on human health.”

— US National Academies, 2012