



GlycanAge

GLYCANAGE®



Company Profile

GlycanAge, founded by Professor Gordan Lauc, aims to calculate a person’s biological age using glycan analysis. Glycans are important, but often overlooked building blocks of life; the surfaces of all cells are covered with a thick layer of glycans and there is no cell on this planet that can survive without this thick coating. The same is true for most proteins, including the infamous S-glycoprotein of the SARS-CoV-2 virus. SARS-CoV-2 depends on its S-glycoprotein for virus entry and cell fusion, but without it, is merely a non-functional backbone that cannot perform its function. Clearly glycans are important to all life, and it has been nearly a decade since a comprehensive policy document, endorsed by the US National Academies, concluded that “glycans are directly involved in the pathophysiology of every major disease”.

Glycans are linked to the aging of our immune system and they can reveal how we are changing on the inside. Glycans attached to immunoglobulins are one of the major features that differentiate immunoglobulins from young and old people. This difference is partly defined only by our chronological age, but even more with our biological age determined by our lifestyle choices. GlycanAge is the only company that analyses the level of low-grade chronic inflammation in order to calculate a person’s biological age, by analysing glycans on the main protein of the immune system – immunoglobulin G.

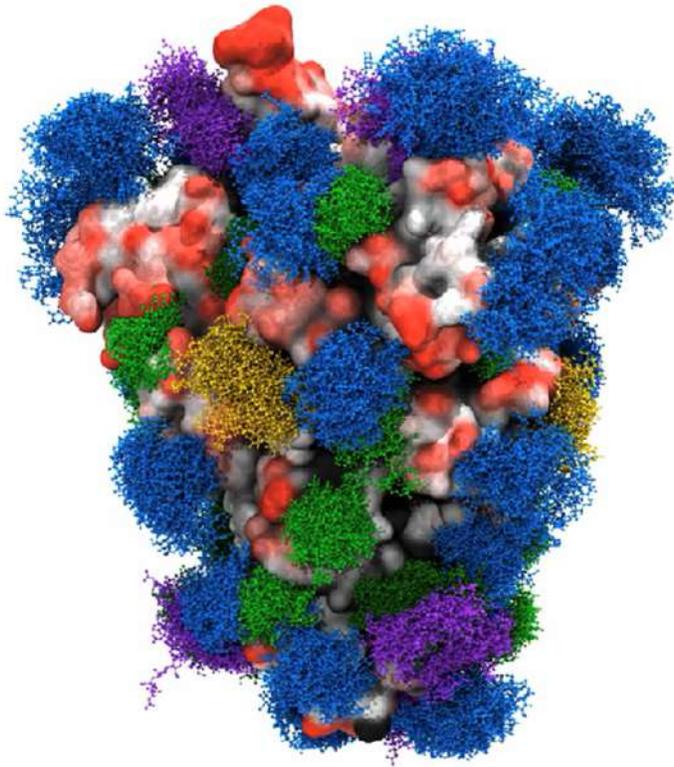


Figure 1. SARS-CoV-2 virus is reliant on its S-glycoprotein for function.

Changes in glycan composition can regulate inflammatory responses, aid viral immune escape, regulate apoptosis and promote cancer cell metastasis. Glycans are the ultimate layer of complexity of life and they integrate genetic, epigenetic and environmental information into physiological processes that are vital in all aspects of health and disease. They are the first messengers of any change in the homeostasis of the body. By unlocking the potential of the human glycome, GlycanAge is enabling their customers (both individuals and clinical partners) to better navigate healthy aging and disease prevention.

GlycanAge was incorporated in 2016 as a commercial spinout of Genos, the largest research institute and pioneer of high-throughput glycomics and precision medicine. Genos is the world's leading laboratory in high-throughput glycan analytics and, in total, has analysed over 150,000 individual glycomes, with a current pace of over 30,000 analyses per year. Led by Professor Gordan Lauc, Genos was the first to perform large scale studies of the human plasma glycome (in 2009) and human IgG glycome (in 2011), which were the basis for the subsequent first genome-wide association studies of the human plasma and IgG glycomes. Genos received 23M euro of non-dilutive grant funding, of which 15M was used for IgG research over the span of 10 years, in which over 100+ scientific papers were published.

The research team behind Genos is combining glycomic data with extensive genetic, epigenetic, biochemical and physiological data in a systems biology approach. GlycanAge was established as a commercial spinout of Genos with the intention to translate research discoveries into products for the healthcare market to improve quality of life for all.



Gordan Lauc: “I have worked in the field of glycan biomarkers for 30 years and finally we are at the stage where we can offer reliable tests for the healthcare market. GlycanAge is the first of the series of glycan markers, it can be used not only by clinicians but also end customers as well. While medicine is still focusing on treating disease, GlycanAge is helping people to navigate their own healthy ageing and prevent diseases”

The majority of chronic diseases are non-communicable diseases that are formed by often years of exposure to inflammation. The main protein of our immune system is immunoglobulin G and different glycans attached can change how it functions, which can be analysed using IgG glycomics. As we age, glycans become increasingly pro-inflammatory, and an increase in low-grade chronic inflammation and progressive inflammaging is one of the key hallmarks of aging that has not been researched enough due to lack of adequate biomarkers. In a research study on how different aging clocks are associated with health outcomes, IgG Glycomics was one of the best at predicting future hospitalisation due to the broadest range of diseases including influenza, pneumonia, circulatory diseases, diabetes and metabolic diseases, outperforming 11 other molecular aging clocks.

GlycanAge has so far managed to experience 300% year-on-year growth with only one product, GlycanAge. This was achieved with almost no marketing spend, one salesperson and minimal investment from the CEO alongside a few strategic angels, including Tim Marbach from Asia Venture Group and Maud Pasturaud from the Atomico Angel Group.

GlycanAge is also expanding in the perimenopausal and menopausal health markets with a study that showed that changes in estrogen levels change the composition of the glycans on IgG. Upon FDA approval, GlycanAge will release MenoAge, one of the first tests that will serve as the most reliable indicator of average estrogen levels over the past three months. Further products also include DiabRisk, which will predict the risk of developing type II diabetes and is also still awaiting regulatory approval.

With access to new markets, the company will position itself as a global leader in prognostic and diagnostic testing with a potential exit through an IPO or by becoming an acquisition target for large diagnostic companies.

The company has incredible room for growth with little or no competition. The company is seeking outside capital to cover regulatory costs and serve as fuel for marketing efforts which will bring predictable and scalable revenue increase in the next 2 years. GlycanAge will open a \$5M seed round in 2022, allowing investors to unlock new market growth opportunities and invest in menopause R&D, building a world-class customer-obsessed sales and marketing team to deliver exponential growth and dominate the menopause space. GlycanAge are raising US\$5M to setup the first of its kind high throughput glycomic lab in the US, scale up operational and sales capacities, invest further into menopause R&D and launch MenoAge.



Flagship Product Deep Dive

GlycanAge background

All autoimmune and many chronic diseases are often preceded by years of gradual inflammation. That inflammation slowly accumulates small damages that become disease-causative. By monitoring an individual's internal state of health, GlycanAge hopes to ensure long-term health and lower the risk of encountering non-communicable diseases. Type II diabetes, atherosclerosis and rheumatoid arthritis are all diseases that can often be avoided by ensuring a proper lifestyle that promotes health and rejuvenation rather than inflammation.

As we age, glycans change from a more anti-inflammatory profile to a pro-inflammatory profile. GlycanAge analyses the composition of glycans or sugar molecules found on IgG in order to determine a person's biological age based on their inflammatory environment. Epigenetic changes in the DNA have shown little correlation to incidence of diseases, and whilst traditional blood markers may be useful for diagnosing certain specific diseases, only GlycanAge focuses on analysing the state of the immune system that can lead to chronic and non-communicable disease.

Since GlycanAge analyses the glycans that can change how IgG functions in the body – either inflammatory or anti-inflammatory – increase in GlycanAge directly correlates with an increase in systemic inflammation, which is the underlying root cause of most chronic and autoimmune disorders and thereby serves as a prognostic tool.

GlycanAge reports 24 directly measured glycans using 30/50 different glycan structures. To simplify this for the user, Glycan Age has developed three key indexes or scores, G0, G2 and GS, which are reported to the user when they complete the GlycanAge test.

- G0 are glycans without galactose, which are the most proinflammatory.
- G2 are glycans with two galactoses, which are suppressing inflammation.
- GS are glycans with sialic acid, which also suppress inflammation

After grouping into these categories, GlycanAge ultimately simplifies into one simple number, biological age, which reflects a person's inflammatory status. This number correlates highly with chronological age but not perfectly. The difference is determined by the person's lifestyle.

GlycanAge has analysed IgG glycan profiles of more than 150 000 people to build this model and compare an individual with this model to determine their GlycanAge. A higher biological GlycanAge indicates more inflammatory glycans are present which can lead to disease. The direct link to inflammaging is why GlycanAge has the greatest value for predicting the risk of developing autoimmune and chronic diseases in the future.



GlycanAge results correlate with other, traditional biomarkers of an unhealthy lifestyle such as: glucose levels, HbA1c, triglycerides, cholesterol, LDL, BMI and others. GlycanAge can extract structures that may also be specific to certain diseases in the future. Glycans also strongly respond to lifestyle interventions that are positively linked to the biology of aging including diet, weight loss, physical activity and changes in the microbiome.

Following a GlycanAge test, consumers have the option to have a consultation with a clinician who goes through the user's health profile and makes a conclusion on what may be the main reason for the inflammatory glycans. Based on this advice, the user can make lifestyle changes and assess whether they have an impact on their GlycanAge by taking another test.

Unlike other tests that focus mostly once the disease is already evident, GlycanAge focuses on prevention and timely action before the illness manifests. This enables users to use GlycanAge as a personal navigator that can identify interventions that are most beneficial, but at the same time as a motivation tool that provides feedback in real-time.

The company possesses IP on the product, with no competitor capable of emulating its technology due to lack of infrastructure and human capital. GlycanAge is currently marketed as a non-diagnostic test. However, together with Genos which leads the Human Glycome project, the company is collaborating with instrument providers to develop IVD certified instruments and reagents that will enable IVD certification of glycan profiling. Upon certification, due to specific glycans relating to certain health outcomes, GlycanAge believes that glycan reports have the potential to be used as clinical diagnostics for diseases such as cardiovascular risk.

Proof of efficacy

Increased GlycanAge is akin to a more inflammatory environment and accelerating GlycanAge predicts chronic disease incidence and hospitalisation better than any clinical biomarkers and other clocks, as demonstrated by an independent, peer reviewed study of 11 different molecular aging clocks. While there are other biological age testing kits on the market – there is none that analyses the main actor of the immune system. IgG is the main culprit behind chronic-low grade inflammation that leads to autoimmune and chronic diseases, proving the clinical relevance to long term health outcomes.

Product development: MenoAge and DiabRisk

GlycanAge is continually improving and updating the value of its offering through the continual research efforts of its parent company, Genos, which is the main driving force in the advances of knowledge of human glycome in the past 10 years. With each study, more information is gained about the correlation of specific glycan structures and the development of specific diseases.

Interestingly, in women, a sharp change from a more anti-inflammatory glycan profile to a more inflammatory one occurs around the age of perimenopause. Subsequent studies have shown that this phenomenon is due to estrogen.



High levels of estrogen correlate with “younger” glycans, which have an anti-inflammatory profile and consequently lower glycan biological age. In females, the change from a young to old IgG glycan profile is particularly pronounced in the time preceding the average age of menopause. This observation led to the theory that estrogen may be regulating IgG glycosylation, which was proven in a study where gonadal hormones were deprived and estrogen provided transdermally. This finding led to GlycanAge building a new product, MenoAge, that can serve as a prognostic test for diagnosing perimenopause and menopause.

“After analysing the IgG N-glycome in over 100,000 people we developed the GlycanAge test of biological age that is helping people to manage their health better. Recently our focus has shifted to perimenopause since our initial data suggested that women experience an increased pace of biological ageing in this period. In this current large study, on a unique cohort of twins, performed in a collaboration with Professor Tim Spector and his team, we managed to confirm this observation,” says Gordon Lauc.

The perimenopausal and menopausal market is underserved, and there is currently no test that can give complete hormonal insight. Blood tests are unreliable as long-term indicators of hormone levels since hormones fluctuate daily. MenoAge is a test that will serve as the most reliable indicator of average estrogen levels over the past three months and will open the peri/menopausal market. The test itself is pending FDA approval.

DiabRisk will be the company’s third product and will analyse total plasma glycome to predict risk of type II diabetes. As diabetes will soon become the most prevalent modern disease, GlycanAge aims to expand into the prognostic as well as diagnostic market.

Target market

As well as targeting older consumers that wish to modify their current GlycanAge, the company also targets young individuals, though before mid-thirties it is sufficient to have one test every few years. Subsequently, testing frequency should increase to at least once per year, while women approaching perimenopause should get tested every few months.

Individual clients and healthcare providers are GlycanAge’s target customers. The company’s biggest client base to date is providers of antiaging interventions since the GlycanAge test can be used to objectively confirm success of their interventions.

For the B2C market, the biggest opportunity lies in women aged 40/55 who are undergoing hormonal changes, athletes, people with existing health issues as well as those interested in the prevention of illness. The global menopause market is forecasted to reach 22.7 billion by 2023 and preventative and personalised medicine is to hit 575 billion. GlycanAge encompasses all of these markets.

Channels to market

For the B2B market, GlycanAge’s biggest opportunity lies in the wellness industry, from longevity clinics to functional medicine practitioners. It is partnering up with longevity clinics as well as influential figures in the



longevity space to increase its exposure in the wellness markets.

However, the future route to expansion will be aimed more towards the B2C market as it will provide a more scalable source of revenue as well as an affiliate program. The affiliates, as well as partners, receive a commission from each test, so GlycanAge aims to increase its marketing spend via social media channels to grow its audience and market to consumers directly thus increasing the profit margin.

With access to new markets, the company will position itself as a global leader in prognostic and diagnostic testing with a potential exit through an IPO or by becoming an acquisition target for large diagnostic companies.

Success Factors

Team and Reputation

The scientific aspect of the GlycanAge is led by prof. Gordon Lauc, a pioneer in high-throughput glycomics while the commercial aspect is led by Nikolina Lauc, an entrepreneur with over 10 years of experience.

As GlycanAge is a spin-out of Genos, the scientific team boasts 10 postdoctoral scientists and many Ph.D. students which have contributed greatly to the field of glycomics. Through participation in 6 FP7, 5 H2020 and one IMI2 grants (direct funding of over 8M EUR) and some other national and international grants (direct funding approx. 5M EUR) Genos has accumulated significant material and human resources that enabled successful integration of glycomics into multiple genetic, epidemiological and clinical studies.

The team have already made relationships with multiple longevity and menopause clinics, that use GlycanAge in assessments of their patients.

GlycanAge is structured and positioned in such a way to use the intellectual capital to create products that will be the spear-tip of new advances in personalised medicine.

Intellectual Property

As a spinout of Genos, GlycanAge continues to gain information about the correlation of specific glycan structures and the development of specific diseases. This is invaluable IP that can be used to generate further glycan tests for specific conditions/diseases that are related to inflammaging.

The company possesses IP on its product GlycanAge with no competitor capable of emulating its technology due to lack of infrastructure and human capital. This product alone managed to experience 300% year-on-year growth. GlycanAge is currently marketed as a non-diagnostic test, however, together with Genos which leads the Human Glycome project, the company is collaborating with instrument providers to develop IVD certified instruments and reagents that will enable IVD certification of glycan profiling. Upon certification, due to specific glycans relating to certain health outcomes, GlycanAge believes



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Funding

GlycanAge has had pre-seed investment from the CEO alongside a few strategic angels, including Tim Marbach from Asia Venture Group and Maud Pasturaud from the Atomico Angel Group.

GlycanAge will open a US\$5M seed round in 2022, allowing investors to unlock new market growth opportunities. The capita raised will be used to invest in menopause R&D and to build a world-class customer-obsessed sales and marketing team to deliver exponential growth and dominate the menopause space.

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