

APPLICATION NOTE

Unlocking New Frontiers in Aging Research

Streamlining aging studies: Automated high-content screening for 3Rs *in vivo* testing at the *in vitro* scale

Unlocking New Frontiers in Aging Research



Aging research aims to unravel the biological processes behind cellular and organismal decline to extend healthspan — the period of life spent in good health — and lifespan. As interest grows in preventive aging interventions, the need for high-throughput, efficient, and scalable research tools has become paramount.

Using an *in vivo* model at the *in vitro* scale, Nagi Bioscience offers an innovative solution designed to empower researchers in the aging field with real-time, actionable insights into the effects of various interventions on aging pathways, without any ethical compromise.


By providing a streamlined solution for testing and evaluating a wide array of compounds, Nagi Bioscience accelerates the discovery and de-risking of potential therapeutics that can enhance healthspan, reduce age-related decline, and ultimately contribute to a longer, healthier life.

Achieve the otherwise unattainable

Automated *in vivo* healthspan and lifespan at *in vitro* scale: Nagi's technology uniquely combines the benefits of *in vivo* testing with the efficiency and scale of classical *in vitro* setups. This approach enables rapid, scalable assessments of healthspan and lifespan, reducing reliance on vertebrate models and the associated ethical concerns.

Healthspan assessment beyond Survival: Our innovative approach accelerates decision-making by distinguishing between drug mechanisms of action and detect subtle physiological changes missed by traditional endpoint assays. When survival outcomes are identical, Nagi Bioscience reveals crucial insights in healthspan.

Cost-effective preclinical solution: Leverage the *C. elegans* model to conduct low-cost, ethically sound preclinical studies, generating actionable, publication-ready data without the labor and high costs associated with vertebrate testing.

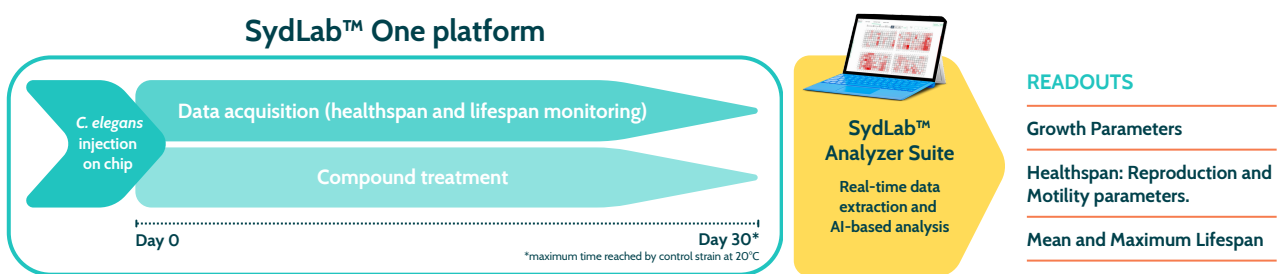
	<i>in vitro</i>	 nagi bioscience	Mice
Healthspan	> 384 drugs/month	192 drugs/month	3-5 drugs/month
Lifespan	> 384 drugs/month	96 drugs/month	3-4 drugs/year
Translational value	Low	High	High

The numbers of drugs per month/year refer to the number of compounds that can be tested in 30 days, without technical repetitions or controls.



From research to results: Our approach

Age synchronized populations of *C. elegans* are injected into the microfluidic chips and controlled by a fully automated protocol. In each channel, *C. elegans* are exposed to a well-defined liquid environment, including the compounds to be tested. All readouts are monitored all along their life cycle. In addition to aging-related insights, the high-content imaging enables the visualization and analysis of diverse phenotypes, supporting broader applications.

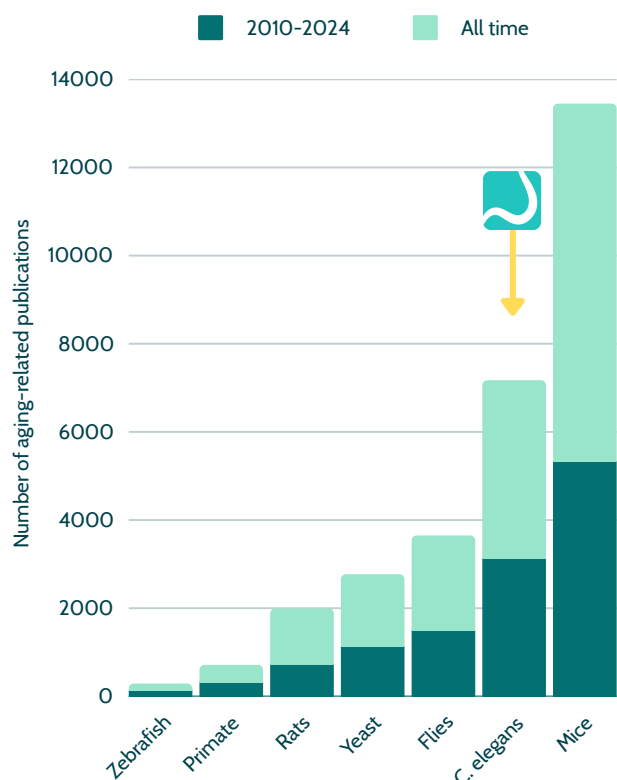


C. elegans: A gateway to Aging Research

Caenorhabditis elegans has become a powerful ally in the quest to slow aging and extend the healthy years of human life. With its short lifespan and genetic similarities to humans, *C. elegans* allows researchers to rapidly study how different interventions can protect against the decline of healthspan and lifespan.

This model enables scientists to explore the biological roots of aging and to pinpoint compounds and genetic pathways that delay age-related deterioration. As a whole organism, *C. elegans* offers a more relevant and integrated system for studying aging compared to cell cultures or organoids, while still avoiding the ethical concerns, high costs, and logistical limitations of vertebrate models.

Discoveries made in *C. elegans* provide valuable insights that help guide the development of treatments aimed at preserving human health and vitality as we age, bringing us closer to effective solutions for age-related conditions and longer, healthier lives.



Advancing aging research with SydLab™ One, an automated high-throughput *in vivo* platform

Introduction

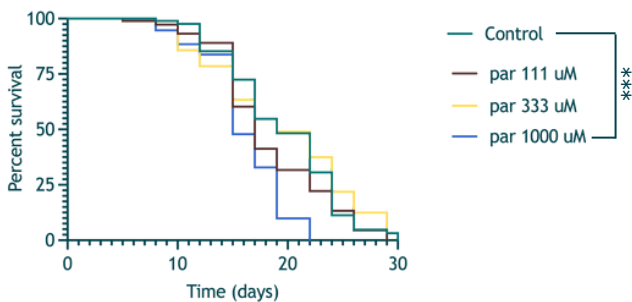
In the following case studies, we used Nagi Bioscience's fully automated solution to showcase how the SydLab™ One platform enables efficient evaluation of drug efficacy on lifespan and healthspan metrics, providing researchers with actionable insights to accelerate their discoveries.

Case study 1

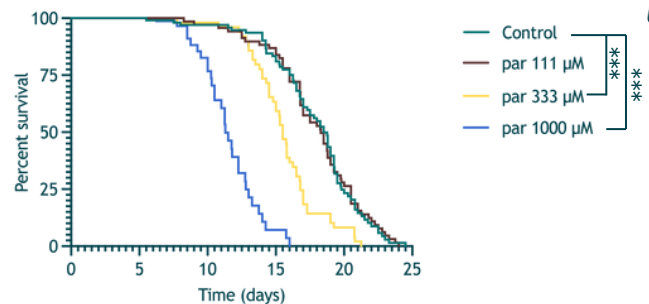
To study SydLab™ One's capability to generate real-time, actionable lifespan insights, we compared treatments using Paraquat and Nicotinamide (NAM), along with control conditions. For a tangible comparison with traditional methods, we conducted the same experiment on NGM plates.

Paraquat

Traditional method on NGM plates

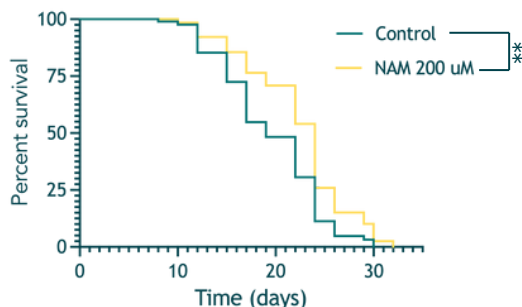


SydLab™ One platform

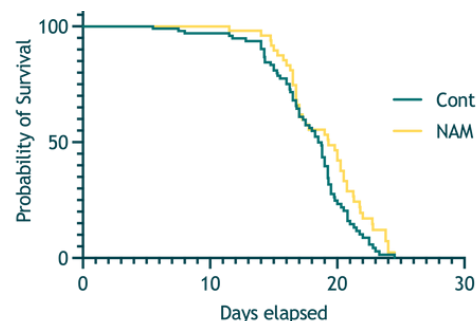


Nicotinamide (NAM)

Traditional method on NGM plates



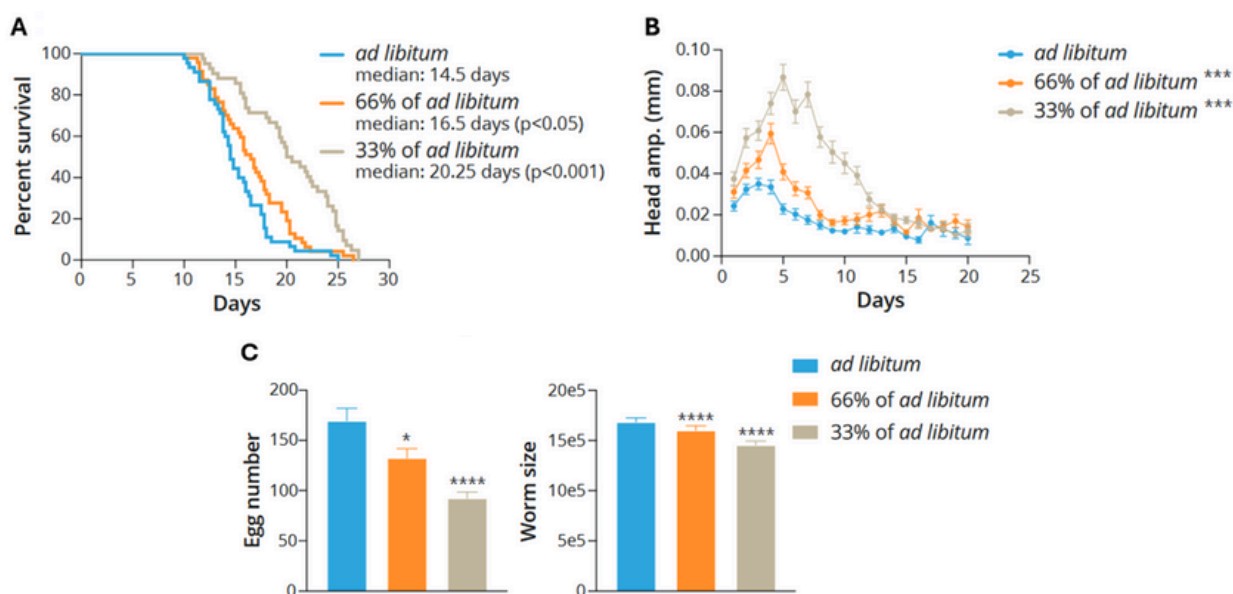
SydLab™ One platform



The SydLab™ One platform accurately quantifies the expected lifespan changes in *C. elegans* subjected to varying treatments. It demonstrates the anticipated lifespan shortening with increasing concentrations of Paraquat and the lifespan extension with higher doses of Nicotinamide. The results obtained with SydLab™ One are consistent with those obtained through manual plate-based assays.

Case study 2

To further exploit SydLab™ One's potential, we decided to investigate the response of *C. elegans* to varying levels of caloric restriction. In this study, we quantified *C. elegans*' motility, healthspan, growth dynamics and reproductive potential.



The SydLab™ One platform quantifies the expected lifespan extension resulting from progressive food dilution interventions (A), aligning with previous literature (66% of ad libitum: +10%; 33% of ad libitum: +39%). Phenotypic analysis reveals that both food dilution interventions significantly enhance motility (B), a hallmark of increased healthspan, while negatively impacting reproduction and worm size (C).

Conclusion



The SydLab™ One platform delivers fast and precise quantification of key aging phenotypes, including lifespan and healthspan, providing a deeper understanding of the mechanisms underlying age-related changes and improving the predictive value of preclinical research.



SydLab™ One also identifies how various compounds impact aging-related phenotypes pinpointing those which positively influence aging parameters and facilitating the selection of better drug candidates, to accelerate progress towards therapeutic breakthroughs.

These case studies demonstrate that Nagi Bioscience's aging solution enables researchers to generate high-quality, reproducible *in vivo* data with fewer resources and in less time compared to traditional approaches. By automating complex workflows and minimizing user intervention, this solution provides an accessible, cost-effective approach for aging research. These capabilities enhance productivity and data integrity while accelerating the path to discovery.

Explore our technologies
and research solutions



Discover the capabilities of SydLab™ One
with the Discovery Pack experience

Let's connect

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