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The Death of Death N°176
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In our science work, this means we are focused on using AI to help accelerate scientists' work to cure, prevent, or manage all diseases by the end of this century.

Chan Zuckerberg Foundation, December 5, 2023, Annual Letter 2023 from Mark & Priscilla.

This month's theme: A Review of Longevity News

Introduction

2023 is the first full year "after COVID". It is also the first year where the impact of artificial intelligence on medical research is significant.

As societies around the world experience demographic shifts toward an increasingly aged population, the implications of aging are becoming more significant. Issues such as healthcare, social support systems, and the overall quality of life for older adults gained prominence this year. We also saw many discoveries in therapeutics and technology concerning gerontology in 2023.

This letter is a subjective choice of what we consider some of the most important news for longevity in 2023.

AI, sharing of health data, and medical research

In 2023, ChatGPT impressed the world. Artificial intelligence is better than human intelligence for a fast-increasing number of tasks. This is the source of existential risks and existential hopes. This can be the source of much medical progress.

The field of medical research has seen significant advancements in the unfolding of proteins, greatly aided by artificial intelligence.

Using AI, MIT researchers identify a new class of antibiotic candidates. The search algorithm allows the model to generate not only an estimate of each molecule's antimicrobial activity but also a prediction for which substructures of the molecule likely account for that activity.

Among many initiatives around the use of AI tools, the site asklongevitygpt.com/, supported by Heales has the ambition of making health databases and scientific medical articles analyzable through AI for all interested scientists and longevists.

Concerning the sharing of health data, the evolution is still prolonged for at least three main reasons: data detained by private or public organizations not ready to share, privacy concerns, and interoperability difficulties. In an ideal world, we would have a system trusted by citizens managed by a public institution or a non-profit organization where by default (opt-out) all health data anonymized or pseudonymized can be used for scientific research (and not for any other use). The European Health Data Space is a very positive project to have a system close to this ideal. Progress of work for better use of European health data can be followed on the site TEHDAS (Towards European Heath Data Space).

New compounds and therapeutics

Gene Therapy Mediated Partial Reprogramming Extends Lifespan and Reverse Age-Related Changes in Aged Mice

In recent studies, adeno-associated virus (AAV)-mediated gene therapy delivering the OSK (Oct4, Sox2, and Klf4) combination demonstrated remarkable outcomes in mice, showcasing an extension of lifespan and improvements in various health parameters. Furthermore, the gene therapy exhibited the ability to reverse epigenetic aging biomarkers in human cells. The researchers advocate for subsequent monitoring studies in larger animal models to rigorously assess both the safety and efficacy of partial genetic reprogramming interventions.

Taurine deficiency as a driver of aging

The decline in taurine levels with age has been observed, prompting investigations into its potential role in aging. Notably, supplementing taurine has shown promise in extending both the health span and life span in mice and worms, while also positively influencing health span in monkeys. These findings strongly suggest that taurine deficiency may be a contributing factor to the aging process in these species. To determine whether taurine deficiency similarly impacts aging in humans, comprehensive and prolonged taurine supplementation trials with stringent controls are essential.

Researchers extend the lifespan of the oldest living lab rat

Sima, born on February 28, 2019, has achieved a significant milestone by living for 47 months, surpassing the previously recorded oldest age of 45.5 months for a female

Sprague-Dawley rat. In this study, Sima has outlived her closest competitor by nearly six months. The plasma fraction termed "E5" resulted in a more than 50% reduction in the epigenetic ages of blood, heart, and liver tissue. Furthermore, cellular senescence, not associated with epigenetic aging, saw a considerable reduction in vital organs. This study provides compelling evidence that a plasma-derived treatment substantially reverses aging according to both epigenetic clocks and benchmark biomarkers of aging.

About negligible senescence of mammals

Five years later, with double the demographic data, naked mole-rat mortality rates continue to defy Gompertzian laws by not increasing with age

The naked mole-rat (Heterocephalus glaber), a rodent species similar in size to a mouse, is renowned for its eusocial behavior and extended lifespan. In a previous study, it was reported that demographic aging—signified by an exponential rise in mortality hazard as organisms age—does not occur in naked mole rats. The data supporting this conclusion were amassed over three decades, beginning with the initial captive rearing of H. glaber. Over the subsequent five years, this study significantly expanded the demographic dataset. Upon re-examining earlier findings in light of this new information, they not only found them to be upheld but also reinforced. These observations bear implications for understanding the evolution of remarkable lifespan in mole-rats and the ecological factors that may have accompanied this evolutionary trait.

Biomarkers

Numerous potential biomarkers of aging were proposed in 2023, spanning from molecular changes and imaging characteristics to clinical phenotypes.

Scientists have made important progress in studying markers that indicate aging, but there's still a lot of work to be done. We expect to make breakthroughs by understanding how these markers work, combining different types of data, using new technologies, and confirming the practical value of these markers through extensive studies and collaboration. Applying new technologies might also help construct potential biomarkers. Advances in AI, such as machine learning and deep learning, may provide advocated solutions to untangle the complexity of aging.

Experiments on animals

LEV Foundation is performing large mouse lifespan studies Robust Mouse Rejuvenation (RMR), with the administration of four interventions namely Rapamycin, Senolytic, mTERT, and HSCT. All of these have individually, shown promise in extending mean and maximum mouse lifespan and health span. Their main focus is to test interventions that have shown efficacy when begun only after the mice have reached half their typical life expectancy, and mostly on those that specifically repair some category of accumulating, eventually pathogenic, molecular, or cellular damage.

The primary endpoint of the study is to determine the interactions between the various interventions, as revealed by the differences between the treatment groups (receiving different subsets of the interventions), on lifespan.

Earlier this month, they announced the launch of a plan for Robust Mouse Rejuvenation-2 (RMR2). According to the website, “as in RMR1, the ambition for RMR2 is to achieve "Robust Mouse Rejuvenation". We define this as an intervention or treatment program that: is applied to mice of a strain with a well-documented mean lifespan of at least 30 months is initiated at around 12 months younger than the mean lifespan and increases both mean and maximum lifespan by at least 12 months The four interventions will be Deuterated Fatty (Arachidonic) Acids, Mouse Serum Albumin, Mesenchymal Stem Cells and Partial Cellular Reprogramming.

Experiments on humans

Concerning trials done on humans, what Bryan Johnson does is probably the most interesting initiative. This 45-year-old enthusiast known for his annual expenditure of $2 million on an age reversal regimen announced in July on Twitter that he was discontinuing blood-swapping procedures. Just two months ago, Johnson had involved his 17-year-old son, Talmage, in a tri-generational blood-swapping treatment that also included his 70-year-old father, Richard. He is the founder of Rejuvenation Olympics, this website is to have a public forum to share protocols and validated results for age rejuvenation.

Longevity activism

The number of organizations, conferences, websites, and online activities concerning longevity research is growing. For example, the International Longevity Alliance now tells more than 50 non-profit organizations from 36 countries, and the Party for Biomedical Rejuvenation Research in Germany hopes to have the first elected member of the European Parliament during the elections of June 2024. This year, longevity activism culminated In October, with the Dublin Longevity Declaration: a consensus recommendation to immediately expand research on extending healthy lifespans that you may sign. The declaration mentions:

An increase in healthy lifespans, through much better treatment of age-related diseases (dementia, heart disease, cancer, frailty, and many more), would deliver extraordinary benefits - including savings of trillions of dollars per year in healthcare costs. Here, dozens of world-leading experts declare that such an advance is now potentially within reach, by targeting the underlying aging processes, and efforts to achieve it should be immediately and greatly expanded.

Financing Research and Investments of Big Organizations

Many organizations announced big investments in the field of longevity. Even a big cosmetic company Dior is implied. The four biggest actors in terms of announced investments explicitly for healthy longevity (or against all diseases) are Google Calico, Altos Labs, the Chan Zuckerberg Initiative, and Hevolution. Sadly, none of the four

organizations had announced important breakthroughs during the year 2023.

The (relatively) good news of the month: Life expectancy rising again

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According to the "Health at a Glance 2023. OECD INDICATORS" (November 7, 2023) based on Eurostat data:

"Provisional Eurostat data for 2022 point to a strong rebound in life expectancy in many Central and Eastern European countries, but a more mixed picture for other European countries, including reductions of half a year or more in Iceland, Finland and Norway".

In the USA, life expectancy rebounded in 2022 with a 1,1-year increase but is not back to pre-pandemic levels

The general picture seems to be that where life expectancy decreased sharply due to COVID-19, it rises now sharply. Where COVID-19 had less negative influence, the rise is less or there is even a decrease in life expectancy. Globally, the situation in 2022 is far better than in 2021, but not yet back to the pre-covid situation.

For more information

- Heales, Longevity Escape Velocity Foundation, International Longevity Alliance, Longecity, and Lifespan.io
- Heales Monthly Science News
- Heales YouTube channel
- AI-generated image
- Contact us