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An overview of recent advancements in anti-aging medicines

Muhammad Arsalan Ali Sajid [1,*], Muhammad Hassan [2] and Ayesha [3]

[1] *University of Sargodha, Pakistan, Urgench branch of Tashkent Medical Academy, Uzbekistan.*
[2] *Akhtar Saeed Medical College, Lahore, Pakistan.*
[3] *Urgench Branch of Tashkent Medical Academy, Uzbekistan.*

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Abstract

The phenomenon of aging is most common to all living organisms and its definition is the loss or reduction of the ability to reproduce offspring and the slowly decrease in physical fitness. The current aging population is considered to be a major burden of the 21st century. Therefore, in order to slow the process of aging and maintain the health of the elderly, the discovery of new antiaging medicine remains a top priority. Several well-known researchers are working on this issue which is considered to be a multi-billions of dollars industry in future. Institutes like CRG with scientists like Nicholas Stroustrup and David Sinclair and many others have discovered some advancement in this regard, and looking forward for many more to come, some of these advancements are being described below.

The aging process makes death increasingly possible, but it has a stochastic aspect that produces a wide distribution of life span even in homogeneous populations. Studying this stochastic behavior could link molecular mechanisms to the aging process that determines life span. Therefore, C. elegans appears to be involved in physiological aspects that consistently respond to multiple interventions. The existence of invariant dynamics of organism aging in genetic and environmental contexts provides the basis for new quantitative frameworks to assess how and to what extent specific molecular processes contribute to the aspects of aging that determine lifespan. Others are Nutraceuticals, Telomerase, Calorie restriction, Thymus rejuvenating, and effects of some drugs as anti-aging.

Keywords: Anti-aging; Burden; Advancements; Interventions; C-elegans

1. Introduction

Antiaging drugs are becoming a growing industry, but many supplements or protocols lack scientific proofs which will support their claims. This review examines and explains the clinical implications and mechanisms of action of the interventions about antiaging. Caloric restriction mimetics define compounds that mimic the advantages of calorie restriction, including protein kinase activators AMP (metformin), growth hormone / ILGF-1 inhibitors (pevisomant), the targets of mammals of the rapamycin inhibitor (rapamycin) and the activator of the sirtuin pathway (resveratrol). Hormone substitutes have also been extensively used in the elderly population to better the quality of life. Manipulating a healthy microbiota of gut through prebiotic and probiotic or anal microbiota supplementation has important potential in antiaging medication. Vitamin D is expected to become an important antiaging drug in the future due to its many positively effects on the elder population [1, 2, 16].

This can be aided by living style choices including healthy eating, exercise, stress management, and dietary supplements. Technologies emerging genomics give permission to people to create their own programs, while initial phase detection of heart disease and cancer will help longevity. Biotechnological therapies as stem cells, recombinant DNA technology,

* Corresponding author: Muhammad Arsalan Ali Sajid
University of Sargodha, Pakistan, Urgench branch of Tashkent Medical Academy, Uzbekistan.

cloning (therapeutic) and gene therapy should play an important role in promoting successful aging. We are on the threshold of artificial intelligence (AI) and nanotechnology (NT). Artificial intelligence will combine our biological minds with modern forms of no biological intelligence, greatly expanding our ability to think, create and experiment. NT will eventually allow us to make devices that can create molecules like our current cellular machines, one atom at a time. The goal of today's antiaging medicines is to prevent disease and aging, enabling people to take advantage of the powerful biotech and nanotechnology treatments that will be developed in the decades to come. These future therapies have the potential to significantly extend life span.

Nutraceuticals: In my practice, I stress the importance of using doctor-regulated, pharmaceutical-grade supplements. Without the FDA regulations on supplements, purchasing over-the-counter or online supplements can be dangerous because no one is entirely sure what harmful ingredients or additives may be in them. Be sure to consult your doctor before starting anything [17].

BHRT (Bioidentical Hormone Replacement Therapy): balances and replenishes hormones lost with aging, which in turn are responsible for youth, and is a great way to slow down the aging process. Biologically, women go through menopause, while men go through andropause, which occurs in middle age. Many changes can occur, what we commonly refer to as a midlife crisis, affecting people mentally, physically, emotionally and sexually. Discuss appropriate tests and treatment with your doctor [18].

2. Telomerase

Inside our cells, our DNA is divided into 46 segments called chromosomes. At each end of these chromosomes are protected regions called telomeres. Your telomeres shorten throughout your life, and people with shorter telomeres have a higher risk of developing old age illnesses and dying faster than those with longer telomeres [19].

Fortunately, there is an enzyme called "telomerase" that can stretch telomeres. In the late 1990s, telomerase caused a sensation as a potential life-prolonging therapy, until scientists found that mice that were given more of the substance had a significantly higher risk of cancer [20].

However, studies in recent years have shown that as long as telomerase is temporarily activated, telomeres can be reloaded without increasing the risk of cancer. The mice that received this treatment lived longer, had higher bone density, and had better blood sugar control [21].

3. Thymus Rejuvenating

Behind the breastbone and in front of the heart there is small organ called the thymus, which is responsible for making immune cells. Thymus recession is one of the reasons we become more susceptible to infections as we age, as older people die more often from the flu and coronavirus [22].

The good news is that we have several ideas for reversing the low function of the thymus, from stem cells to gene therapy and hormones and drugs. Evidence of a hormonal approach to thymus regeneration not only increased its size and the number of new immune cells in the participants. It also appears to make them younger biologically overall, as measured by their "epigenetic clock" (more on that later)[23].

Often the overall effect of a treatment on aging is greater than the narrow markers it is trying to influence, but it is particularly surprising that the rejuvenation of such a small organ appears to affect our entire biological clock.

4. Calorie Restrictions

Of all anti-aging intercessions, dietary mediations have the best potential. Caloric limitation can dial back the aging system and delay the normal and most extreme existence of creatures of various starting points without causing ailing health in people [3, 4]. McKay et al [5]. announced that limitation of food admission in rodents delayed middle and most extreme life expectancies and diminished the occurrence and eriousness of persistent sickness. Ensuing outcomes have shown that calorie limitation affects life expectancy in an assortment of life forms [4, 6, 7]. Various investigations have likewise shown the constructive outcomes of calorie limitation in people. Restricting calorie consumption while keeping up with satisfactory nourishment has gainful impacts, for example, forestalling the advancement of corpulence, cardiovascular sickness, hypertension and disease [8]. In a controlled report, calorie limitation joined with significant degrees of actual work showed decreases in pulse, body weight, serum cholesterol levels, insulin levels, and other

anthropometric and physiological boundaries [9]. The instrument by which calorie limitation incites life delaying properties isn't completely perceived, yet four potential objective pathways have been proposed: enactment of (AMP) protein kinase [10]. and sirtuin [11].

Restraint of insulin like development factor. Flagging [12]. and restraint of the mammalian objective of rapamycin by rapamycin [13]. These pathways are the super putative systems of activity of caloric limitation, straightforwardly or by implication controlling cell development, mitochondrial work and autophagy [14]. In any case, regardless of its demonstrated advantages, calorie limitation is a troublesome method to utilize successfully in people in light of the fact that the drawn out utilization of the treatment is troublesome as it requires a serious level of assurance and poise. This mystery has prompted the disclosure of mixtures that impersonate the wellbeing and life span aftereffects of calorie limitation without really restricting calorie consumption [15]. These mixtures are classified "calorie limitation mimetics". The illustrative components connected with CRM are portrayed.

A few tests have been completed on survival tests in C. elegans, giving significant data on the developmentally monitored determinants of aging. To empower fast acquisition of survival curves at erratic factual goals, we fostered an adaptable imaging and analysis stage to notice nematodes for quite a long time on one square meter of agar surface with a goal of 8µm. The technique creates super durable visual records of individual passings from which survival curves are built and approved, producing information steady with manual strategies for quite a long time in norm and unpleasant conditions. Our strategy considers fast and definite converse chemical and genetic evaluating for consequences for survival and takes into account the quantitative investigation of the measurable design of aging [34].

C. elegans people live for quite a long time as self-repeating grown-ups, delivering huge quantities of isogenic posterity. Early examinations have shown that point transformations in the parts of the insulin/IGF-1 pathway can twofold the middle lifespan2-5. These discoveries were therefore reached out to different organic entities, including Drosophila and mice, making C. elegans a metazoan model for concentrating on the genetics of aging. Consequently, acquiring the C. elegans survival curve has turned into a significant piece of aging exploration. In current practice, survival curves of creatures developed on strong agar in Petri dishes, took care of with a mat of E. coli, were gotten physically by day by day perception under a low-power analyzation magnifying lens. Passing is perceived by disappointment. The development of an individual to answer to the upgrade of a string requires difficult, dreary and emotional perception. This convention gives solid motivations to keep populace sizes, interesting perceptions and restricted imitations little, while restricting the reproducibility and extent of the gathered information [35].

Survival analysis is broadly used to survey a singular's capacity to endure exogenous pressure. Openness to high temperatures (35 ° C) or poisons drastically abbreviates the life expectancy of C. elegans. Normal survival times range from hours to 16.28 days, making high-recurrence information assortment difficult for manual strategies. We assessed the exhibition of the LM under two pressure safe circumstances: openness to raised temperatures16 and oxidizing tert-butyl hydro peroxide (t-BuOOH) 28. The LM requires no alteration other than changing the subset of boundaries that our picture analysis programming utilizations to evaluate the worm's movement and determine the worm's opportunity ridiculously [36].

Spearheading work over the past 25 years has recognized numerous atomic pathways that determine life expectancy and outlined that aging is a plastic interaction. Numerous genetic, little particle and ecological mediations have been displayed to adjust the normal life expectancy of a populace. In any case, considerably under extremely homogeneous circumstances, there is extraordinary fluctuation in the life expectancy of people around the populace mean. In any case, little is had some significant awareness of the starting points and results of between individual contrasts in aging [37].

5. Antiaging effects of metformin

Metformin defers maturing through the IIS pathway. As referenced above, hyperglycemia and hyperinsulinemia can speed up maturing. The two circumstances are governed by the IIS way. Specifically, hepatic insulin responsiveness relies upon the fenestrated porosity of hepatic sinusoidal endothelial cells [38]. Expanded porosity and window frequency, expanded insulin responsiveness in the liver, and delayed life expectancy were seen in mice treated with metformin for quite some time. This is related with actuation of the pAMPK, eNOS/cGMP and pMLCK/actin rebuilding pathways by metformin [39]. Besides, in moderately aged mice, long haul treatment with metformin worked on actual capacity and expanded insulin responsiveness, prompting a more extended life expectancy [35]. Moreover, metformin worked on mental capacity in creature models of mental weakness by diminishing IRS2 and IGF1R in neurons, in this manner forestalling the maturing aggregate [40].

Gathering of cutting edge glycation finished results (AGE), considered a critical marker of maturing [41]., is framed by the limiting of amassed glucose to different proteins. High glucose levels make typical proteins lose their organic capacity by changing over them into maturing proteins. Metformin diminishes the gathering of AGE by advancing the usage of glucose in the tissues. This decreases AGEs and expands AGE receptors in patients with type 2-diabetes and polycystic ovary condition [42]. This peculiarity can advance the communication among AGEs and their receptors (RAGE). In the wake of restricting, intracellular oxidative pressure and atomic element κB flagging pathways are initiated to manage record levels of endothelin-1 and growth corruption factor (TNF) - α, consequently deferring cells..

Metformin postpones maturing by adjusting ROS levels. Metformin has been accounted for to assume a critical part in expanding life expectancy by diminishing the creation of responsive mitochondrial oxygen species through the mitochondrial respiratory chain complex I turns around electron stream. In focal point epithelial cells (CLE), metformin lessens mitochondrial potential and ROS levels and inhibits cell senescence [43]., with comparable impacts saw in the cerebrums of normally matured and matured rodents prompted by D-galactose [44]. Besides, ongoing low-portion metformin upregulates ER-restricted glutathione peroxidase 7, accordingly safeguarding worms and people from untimely maturing [45].

As well as reducing intracellular ROS, metformin can likewise have the contrary impact on ROS creation. De Haes [46]. saw that metformin builds ROS levels, which thusly enacts record of SKN-1, a calculate that advances life span worms. In C. elegans with the SKN-1 freak, this impact of metformin was lost [38]. As referenced above, SKN-1 is a significant anti-aging particle that can be actuated by ROS. This finding might be connected with the hindrance of metformin by the IIS pathway. There is proof that restraint of IIS prompts expanded ROS creation, advancing SKN-1 action [47].

An table to describe effects of metformin as anti-aging on different species.

Table 1 Effects of Metformin on different species in improving the health and longevity [32,33,34].

Species	Model	Result
A Worm	*Caenorhabditis elegans worm*	Drug (Metformin) (25-50, and 100 milli-Moles) increased mean lifespan (by 18% to 36%, to 3-4%).
	Caenorhabditis elegans	Drug (Metformin) at 50 milli-Moles increased median survival by almost 40-45%.
Mice	Female Mice (SHR)	Increased total lifespan to 14-15% and max lifespan by one month.
	Female Mice (SHR)	Increased total lifespan to 37% and max lifespan to 2-3 months (+10.3%).
	neu mice/HER2	Increase in total lifespan by 8 % and adenocarcinoma (mammary) latency by 13.2 to 14%.
	Sv Mice/129	Decrease in total lifespan of female and male mice by 13.4% to 4.4%.
	Adult male mice (C57BL/6)	Increase in extension of total lifespan by 5.83- 6%
	Male Huntington's (diseased mice)	Elongation in the time of survival, increased the lifespan by 20.1%
Human	Patients with Diabetes	Decline in Risk factor to 32% for endpoint, 42% decline in mortality.
	Patients with diabetes/normal people	Monotherapy of Metformin increased median survival time by 15- 38% as compared with normal and respectively with sulphonyl-urea monotherapy.
	patients with Parkinson's disease	Reverses functions of mitochondria.

6. Discussion

Simultaneously, even as the bio gerontology community battles to separate itself from contemporary providers of anti-aging items and administrations, the quest for measures to accomplish what Gruman [32]. calls "life span" - radically dragging out human lifespan without being impacted. By any element. Aging-related illness and inability - is a purchaser drive supported and upheld by the NIA and other NIH organizations For instance, various examinations have laid out

that dietary calorie limitation in different lab creatures expands normal and greatest future and dials back age-related changes. Postponing aging is the everlasting goal of individuals. Ebb and flow anti-aging exploration centers on supplement location pathways, receptive oxygen species, and homeostasis of protein, telomeres, epigenetics and microorganisms. These pathways eventually influence wellbeing and life span by impacting related quality articulation, protein creation, and catalyst movement. Besides, these components are interconnected and frequently moldable, and the anti-aging impacts of metformin are additionally connected to these pathways [28].

As an antiaging medication up-and-comer, metformin has extraordinary advantages. It is reasonable and generally protected, and no critical incidental effects have been seen in 60 years of clinical use. Furthermore, metformin gives brilliant cardiovascular assurance, as well as anticancer and antifiery impacts, which are significant measures of a sound life. With regards to the anti-aging system of metformin, the dietary pathway is the vital instrument by which metformin brings down glucose and furthermore applies its anti-aging impacts [27]. Metformin diminishes levels of AGE, a marker of aging, by lessening insulin and glucose levels and by expanding insulin responsiveness. ROS will obliterate the natural construction of macromolecules like qualities and proteins and speed up aging. Specifically, metformin can animate the development of responsive physiological oxygen species and actuate SKN-1 to defer aging. Within the sight of ROS gathering, metformin instigates antioxidant proteins (SIRT3, GPx7) to keep up with ROS homeostasis and decrease oxidative feelings of anxiety [25,26]. Strangely, autophagy initiation and autophagic stream are managed by ROS. Moreover, mTOR-interceded protein homeostasis assumes a vital part in deferring aging. Metformin hinders the movement of mTOR by initiating AMPK. Downregulation of mTOR prompts enactment of autophagy, forestalling the aggregation of harmed proteins (eg, presenilin and SA-β-lady). Also, epigenetics and microorganisms are extra focuses of metformin-intervened antiaging impacts. The explanation of these components is fundamental for understanding the organic impacts of metformin and creating effective systems for postponing aging in people. Notwithstanding, exploring the antiaging capability of metformin faces many difficulties, including drug fixation, measurements routine, and absence of clinical preliminary information. More exploration is thusly required.

7. Conclusion

As an antiaging medication up-and-comer, metformin has extraordinary advantages. It is reasonable and generally protected, and no critical incidental effects have been seen in 60 years of clinical use. Furthermore, metformin gives brilliant cardiovascular assurance, as well as anticancer and anti-fiery impacts, which are significant measures of a sound life.

The aging process makes death increasingly possible, but it has a stochastic aspect that produces a wide distribution of life span even in homogeneous populations. Studying this stochastic behavior could link molecular mechanisms to the aging process that determines life span. As Caenorhabditis elegans lifespan machine has been established in various establishment like CGR and in some establishments in South Korea etc. and these lifespan machine gave many useful information about various factors of stress and other conditions and their impact on lifespan. Therefore, C. elegans appears to be involved in physiological aspects that consistently respond to multiple interventions. In this way, the time scale determines a new state variable r (t) which controls the mortality risk with an estimated aging dynamics involving a single constant of the effective aging rate.

Therefore, the role of molecular mechanisms on longevity can only be seen through their statistical effects on populations. Indeed, survival tests in C. elegans provide important information on evolutionarily conserved again determinants. The existence of invariant dynamics of organism aging in genetic and environmental contexts provides the basis for new quantitative frameworks to assess how and to what extent specific molecular processes contribute to the aspects of aging that determine lifespan. Others are Nutraceuticals, Telomerase, Calorie restriction, Thymus rejuvenating, and effects of some drugs as anti-aging.

As we all know elder people are considered to be a burden on national health and economic system specially in European countries so large efforts are nowadays being made to slowdown aging process and this is most researching field nowadays a several outcomes have come till now and many yet to come in this regard.

Compliance with ethical standards

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Author's Short Biography

Muhammad Arsalan Ali Sajid belongs to Pakistan, I obtained my first degree in pharmacy from University of Sargodha, Pakistan, after that I started his MD from Tashkent Medical Academy Urgench branch, Uzbekistan, during my early graduation I was keen in research projects and research studies, I published my first case study in 2nd year of my graduation year 2015, After that I have published 11 different research articles and case studies in different prestigious international journals, my research interests are epidemiology, public health and nanotechnology.