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Research Article

The Preliminary Study on the Effect of Mongolian Milkvetch Root Extract Containing Cycloastragenol on Telomere Length in Myanmar People

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Abstract

Telomere shortening is a primary hallmark of biological aging and is influenced by factors such as nutritional status and psychological stress. The effects of RejuMax, a nutritional supplement containing cycloastragenol derived from Mongolian milkvetch root extract, on telomere length in the Myanmar population had not been previously investigated. This study evaluated the impact of RejuMax supplementation on telomere length in healthy middle-aged adults in Myanmar. A total of 10 participants (mean age: 50.1 ± 10.3 years) were enrolled, including four men (mean age: 51.5 ± 13.8 years) and six women (mean age: 49.1 ± 8.5 years). Participants received RejuMax supplementation for six months, followed by a six-month washout period. Average telomere length (TL) was measured at baseline, after six months of supplementation, and after the washout period using the qPCR method. RejuMax supplementation was well tolerated, and no adverse events were reported during the study. A statistically significant increase in TL was observed following the six-month supplementation period ($p < 0.05$). However, telomere length declined toward baseline values during the subsequent washout phase, suggesting that the observed effects may not be sustained in the absence of continued supplementation.

Abbreviations

TEL: Telomere; TL: Average Telomere Length; SCR: Single-Copy Reference

Introduction

Telomeres are repetitive nucleotide sequences (TTAGGG) located at the ends of eukaryotic chromosomes that safeguard genomic stability during cell division. Telomeres protect the integrity of information-carrying DNA by serving as caps on the terminal portions of chromosomes [1]. Telomere length decreases with age, contributing to cellular senescence [2,3]. With each replication cycle, telomeres progressively shorten, making cells increasingly susceptible to chronic diseases. [4].

Telomere length generally shortens with each cell division until one or more telomeres become critically short, triggering cell senescence, loss of normal cell function, genomic instability, and possibly cell death or tumor initiation [5]. Telomerase is the only enzyme that can replicate and lengthen telomeres. When telomerase is inactive, telomeres shorten with each cell cycle until they reach a critically low length. At this point, cells can no longer divide and undergo senescence or apoptosis. The enzyme that synthesizes telomeric DNA can slow or even reverse telomere shortening in normal human cells in culture and contribute to slowing or reversing degenerative age-related diseases in animals [6].

Natural compounds derived from *Astragalus mongholicus* (Mongolian milkvetch), specifically saponins cycloastragenol

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and astragaloside IV, have demonstrated significant telomerase-activating potential in *in vitro* and *in vivo* preclinical studies [7,8]. These compounds possess a wide variety of pharmacological activities, such as anti-aging, anti-inflammatory, antioxidant, anti-fibrotic, anti-microbial, anti-viral, hepatoprotective, and endothelial protective properties. Moreover, they enhance telomere maintenance, improve immune function, and mitigate age-related physiological decline [9,10].Natural product telomerase activators could play a role in the treatment of aging-related diseases in humans [11-14]. Zhang et al. demonstrated that cycloastragenol is a potentially novel senolytic agent with *in vivo* activity that can be used to treat age-related diseases. [15]. Furthermore, animal studies strongly support the link between telomere length and lifespan, suggesting that mice with longer telomeres exhibit increased longevity and improved health [16]. However, despite these promising laboratory results, evidence from human clinical trials remains sparse and inconclusive.

Aging research is of particular importance in Myanmar, where the average life expectancy is approximately 67 years, considerably lower than the global average (WHO, 2021). This disparity underscores the urgent need to better understand the biological mechanisms underlying premature aging, age-related morbidity, and reduced longevity within the local population. Identifying accessible and evidence-based nutritional interventions that promote cellular health and longevity represents both a scientific imperative and a public health priority. Such approaches have the potential to enhance health span, reduce the burden of age-associated diseases, and improve overall quality of life among the people of Myanmar.

This knowledge gap highlights the need for rigorously designed clinical studies to determine whether cycloastragenol can meaningfully modulate telomere length in humans. Therefore, the present study aimed to evaluate changes in telomere length among healthy middle-aged adults following six months of supplementation with RejuMax, a cycloastragenol-containing extract derived from Mongolian milkvetch root.

Materials and methods

Participant selection and study population

Fasting blood samples were collected from 10 healthy volunteers (4 males and 6 females; mean age: 50.7 years, range: 39–65 years) recruited from the workforce at FAME Pharmaceuticals Industry Co., Ltd. Written informed consent was obtained from all participants before study inclusion. Eligibility was based on meeting the health standards defined in the factory's annual medical check-up criteria.

Comprehensive baseline data including demographics, body mass index (BMI), smoking status, alcohol consumption, physical activity levels, medical history, and concurrent medication use were collected via structured questionnaires and clinical examinations before enrollment. All participants were non-smokers, had no history of chronic metabolic diseases, and were not taking any medications known to interfere with the study outcomes.

Materials (RejuMax product)

The telomerase activator evaluated in this study was RejuMax, a proprietary formulation comprising cycloastragenol-standardized Mongolian milkvetch root extract and chitosan powder, manufactured by FAME Pharmaceuticals Industry Co., Ltd. (Yangon, Myanmar). Each oral capsule contains 100 mg of Mongolian milkvetch root extract (standardized to 10 mg cycloastragenol) and 50 mg of chitosan powder as an excipient.

In this six-month preliminary clinical study involving healthy volunteers, dosing was age-stratified as follows: participants aged 35–59 years received one capsule daily in the morning (10 mg cycloastragenol/day), while participants aged 60–65 years received two capsules daily (one morning, one evening; 20 mg cycloastragenol/day).

RejuMax is a registered, commercially available health supplement with an established safety profile and no known toxicity. The study dosage (1–2 capsules daily) was selected in accordance with the manufacturer's safety guidelines and published clinical literature on cycloastragenol and *Astragalus*-derived formulations (e.g., TA-65), which demonstrate biological activity and safety within daily cycloastragenol dosage ranges of 5 to 20 mg.

DNA isolation

DNA was extracted from whole blood using the innuPREP Blood DNA Mini Kit – IPC16 (IST Innuscreen GmbH, Berlin, Germany) according to the manufacturer's protocol. The innovative liquid handling-based instrument InnuPure C16 touch (Analytik Jena, Germany) was used for automated nucleic acid isolation. A ScanDrop^2 Nano-volume spectrophotometer (Analytik Jena, Germany) was used to determine the purity and quantify the DNA concentration.

Measurement of absolute telomere length by qPCR

The average telomere length was determined using the Absolute Human Telomere Length Quantification qPCR Assay Kit (ScienCell, #8918). The kit includes a telomere (TEL) primer set that amplifies telomere sequences, single-copy reference (SCR) primers for data normalization, and reference genomic DNA with a known telomere length as a reference for calculating the telomere length of target samples. For qPCR, 5 ng/µL of genomic DNA was combined with the TEL or SRC primers, 2 µl from the stock solution, 10 µl of 2X GoldNStart TaqGreen qPCR master mix, and nuclease-free water to a final volume of 20 µl. Each sample was prepared in triplicate in a 96-well plate and cycled on a qTower^{3}G touch (Analytik Jena, Germany). The cycling steps included initial denaturation at 95 °C for 10 min, followed by 32 cycles of denaturation at 95 °C for 20 s, annealing at 52 °C for 20 s, and extension at 72 °C for 45 s. Melt curve analysis was performed at the end of the run.

To calculate the average telomere length, the ΔCq (TEL) and ΔCq (SCR) values were determined by subtracting the Cq values of the target sample from the Cq values of the reference sample for the TEL and SCR primers, respectively. ΔΔCq was calculated as ΔCq (TEL)−ΔCq (SCR). The fold change was assessed as 2^-

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$^{\Delta\Delta Cq}$. The total telomere length of the target sample per diploid cell was calculated using the following formula: reference sample telomere length (1.23 ± 0.09 Mb) × $2^{-\Delta\Delta Cq}$. As there are 92 chromosome ends in one diploid cell, the average telomere length on each chromosome end was obtained by dividing the total telomere length by 92.

Statistical analysis

Mean values and standard deviations were calculated for the ten participants. The results were analyzed using Excel 2026 and GraphPad Prism software (version 10.6.1; GraphPad Software, Inc., La Jolla, CA, USA). The TL of the participants was evaluated using Welch's t-test to identify statistically significant differences. Statistical significance was set at $p < 0.05$.

Results

Compliance

Ten participants with a mean age of 50.1 ± 10.29 years were included. There were four males (mean age: 51.5 ± 13.8 years) and six females (mean age: 49.1 ± 8.5 years). All participants completed the 6-month supplementation and 6-month washout phases, with no adverse side effects reported.

Average telomere length before and after 6 months of RejuMax treatment

A paired comparison of telomere length before and after 6 months of RejuMax treatment (Figure 1) showed that the baseline average telomere length (TL) was 4.22 ± 1.03 kbp. Following six months of RejuMax supplementation, TL increased significantly to 5.17 ± 0.76 kbp (p <0.0001) across all 10 participants. Subgroup analysis confirmed consistent trends across sexes: males (n=4) showed an increase in TL from 4.08 ± 1.34 kbp to 5.43 ± 0.82 kbp (p <0.0001), while females (n=6) showed an increase in TL from 4.32 ± 0.89 kbp to 5.00 ± 0.75 kbp (p <0.0001). Individual analyses also demonstrated a significant increase in telomere length after treatment with RejuMax (p = 0.0315) (Figure 2).

Average telomere length during the 6-month washout period

The average telomere length was re-evaluated in 10 participants during the 6-month washout period (Figure 3). The results showed a significant decrease in telomere length across all participants (4.35 ± 1.13 kbp, p = 0.0003). Subgroup analysis revealed similar reductions: males (n=4) showed a decrease to 4.20 ± 0.85 kbp (p <0.0001), and females (n=6) showed a decrease to 4.45 ± 1.35 kbp (p= 0.0039). However, individual changes during the washout phase were not statistically significant (p= 0.0759) (Figure 4). Notably, participants exhibiting high occupational stress experienced greater telomere attrition during this phase.

Discussion

The association between psychological stress and accelerated cellular aging is firmly established in the literature.

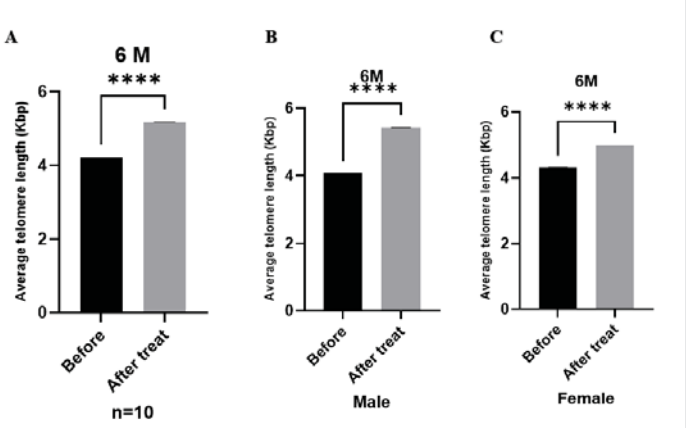

Figure 1: Comparison of average telomere length before and after RejuMax treatment in 10 participants. (A) Mean value for all participants (male and female). (B) Mean value for males. (C) Mean value for females. Data represent the mean ± S.D. (****p < 0.0001).

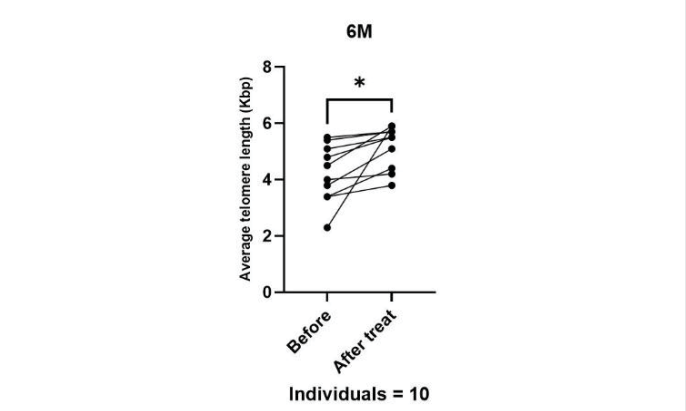

Figure 2: Comparison of average telomere length before and after RejuMax treatment for 6 months in individual participants. Data represent the mean± S.D. (* p < 0.05).

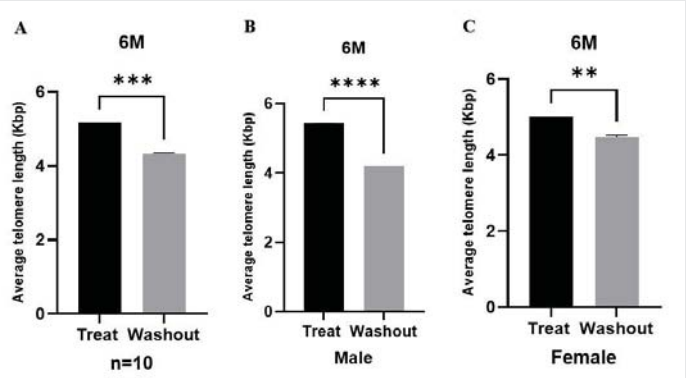

Figure 3: Average telomere length during the washout period in 10 participants. (A) Mean value for all participants (male and female). (B) Mean value for males. (C) Mean value for females. Data represent the mean ± S.D. (** p < 0.01, *** p < 0.001, **** p < 0.0001).

In their pioneering work, Dr. Elissa Epel and Nobel laureate Dr. Elizabeth Blackburn demonstrated that both perceived and chronic stress are significantly associated with elevated oxidative stress, suppressed telomerase activity, and diminished telomere length [17]. Mechanistically, oxidative stress can directly damage telomeric DNA, thereby accelerating its attrition during cellular division [18].

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Our findings align with prior evidence indicating that telomere dynamics are sensitive to psychological stress [19,20]. In this longitudinal pilot study of ten participants, individuals reporting higher stress levels exhibited greater telomere attrition. A reduction in telomere length was also observed during the six-month washout period following RejuMax supplementation in participants M1, M3, M4, F1, F2, and F5 (Table 1). Overall, telomere length did not differ significantly from baseline after the washout phase, suggesting that the observed effects may not be sustained without continued supplementation.

Extensive evidence indicates that lifestyle and environmental factors play key roles in regulating telomere length and telomerase activity [21,22]. Accordingly, identifying effective telomerase activators remains an important goal in the development of interventions targeting biological aging and telomere-associated disorders. In this study, we evaluated the effects of RejuMax, a cycloastragenol-containing formulation reported to induce telomerase activity in a healthy Myanmar population.

This study has several limitations. First, the small sample size (n = 10; 4 males, 6 females) limits statistical power, increases susceptibility to Type I errors, and precludes robust sex-stratified analyses or broader generalization. Second, the single-arm, open-label design lacked a parallel placebo control group. Consequently, observed telomere length changes cannot be attributed solely to RejuMax supplementation, as natural biological fluctuations, unmonitored lifestyle changes, qPCR measurement variability, and regression to the mean may have introduced bias. Although the decline in telomere length observed during the 6-month washout phase supports a reversible, supplement-dependent effect, randomized double-blind placebo-controlled trials with larger cohorts are required to confirm these exploratory findings.

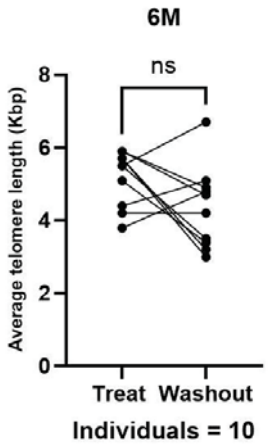

Figure 4: Average telomere length during the 6-month washout period in individual participants. Data represent the mean ± S.D. (ns, not significant).

Table 1: Baseline characteristics and average telomere length measurements of study participants.

No.	Participants	Age (Year)	Average Telomere Length (kbp)		
			Baseline (T0)	RejuMax treatment (T6)	Washout (T12)
1	M1	64	5.5	5.7	3.0
2	M2	63	4.0	4.2	4.2
3	M3	40	2.3	5.9	4.7
4	M4	39	4.5	5.9	4.9
5	F1	62	5.1	5.5	3.5
6	F2	55	3.8	5.1	3.4
7	F3	51	3.4	3.8	4.8
8	F4	46	4.8	5.5	6.7
9	F5	41	5.4	5.7	3.2
10	F6	40	3.4	4.4	5.1
	Average	50.10	4.22	5.17	4.35
	SD	10.29	1.03	0.76	1.13

Abbreviations: M: Male; F: Female; T: Treatment; SD: Standard Deviation.

Our results provide preliminary evidence that cycloastragenol supplementation may positively influence telomere dynamics in healthy middle-aged adults. The observed increase in telomere length after six months of supplementation suggests a potential role for RejuMax in attenuating age-related telomere attrition. These findings are consistent with those of Yu et al., who reported that cycloastragenol exhibits multiple pharmacological activities, including telomerase activation, telomere elongation, and anti-inflammatory, antioxidant, and antiviral effects [7].

In summary, RejuMax supplementation was associated with a significant increase in telomere length over six months, with values returning toward baseline following the washout period. These findings suggest that RejuMax may act as a natural modulator of telomere dynamics with potential implications for aging-related interventions; however, sustained effects appear to depend on continued use.

Conclusion

RejuMax supplementation was associated with a significant increase in telomere length in healthy middle-aged adults; however, this effect diminished following a six-month washout period. These findings suggest that cycloastragenol can modulate telomere dynamics, while psychological and occupational stress may influence the durability of these effects. As the first study of its kind in Myanmar, this work provides a preliminary foundation for larger, controlled trials evaluating telomere-targeted interventions for healthy aging.

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