Dear friend, you are presumably here to find out more information on TA-65 telomeres and telomerase. This page contains just a small amount of what I have written about the topics but, many times the questions I get are the same. Here you will find the answers to many of the more frequently asked questions that I could not cover on the TA-65 page.

Please note: I kept many of them in "post format" as they were originally published on the internet.

Lengthened telomeres restore immune system to a younger state

New study is the first ever Peer-Reviewed Report of a Telomerase Activator taken by live humans.

New York, NY (September 8, 2010) — A pioneering study published in the *Rejuvenation Research Journal* today shows that TA-65, a natural Telomerase Activator made and marketed by Telomerase Activation Sciences, Inc. ("T.A. Sciences"), *reduces the percentage of short telomeres in immune cells and restores and remodels the aging human immune system to be more like that of a younger individual.*

The year-long study of the first 100 clients of T.A. Sciences found that TA-65, a nutritional supplement marketed only through specialized doctors, had been successful in lengthening shortened telomeres. Telomeres are sequences of DNA, located at the ends of all chromosomes, which serve as cellular clocks of aging. Every time a cell divides, telomeres shorten until they become critically short, and the cell either stops functioning properly or dies. By activating a gene that is normally turned off, TA-65 has been shown to activate the enzyme telomerase. Telomerase has the unique ability to restore telomere length and is so important that its discovery won the Nobel Prize for Medicine in 2009.

In addition to TA-65's telomerase activating properties, the study observed a statistically significant decline in senescent cytotoxic (CD8+/CD28-) T cells. This resulted in the human subjects' immune systems being restored to a more youthful state. A rejuvenated immune system holds great potential to help subjects whose immune systems have been weakened by a lifetime of various stresses and age related decline.

"Telomere science is relatively new and scientists are now beginning to understand the pervasive role telomeres play in the aging process and how much harm short telomeres cause." said Noel Thomas Patton, Founder of T.A. Sciences. "Many studies have established that short telomeres are associated with the decline of the immune system and other major organ systems. Such effects of age-related decline are severe and the benefits of telomere rejuvenation can be profound. Rejuvenating shortened telomeres will change the nature of what healthy aging means."

In addition to taking TA-65, which is a natural product derived from the Chinese herb Astragalus, subjects were given a comprehensive dietary supplement pack, and physician counseling.

The study was led by Calvin Harley, Ph.D, and co-authored by Dr. Weimin Liu, Dr. Maria Blasco, Dr. Elsa Vera, Dr. William Andrews, Dr. Laura Briggs, and Dr. Joseph Raffaele. Several hundred clients of T.A. Sciences have now received TA-65 without any reports of serious adverse events.

Rejuvenation Research

A Natural Product Telomerase Activator As Part of a Health Maintenance Program

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Abstract

Most human cells lack sufficient telomerase to maintain telomeres, hence these genetic elements shorten with time and stress, contributing to aging and disease. In January, 2007, a commercial health maintenance program, PattonProtocol-1, was launched that included a natural product-derived telomerase activator (TA-65®, 10–50 mg daily), a comprehensive dietary supplement pack, and physician counseling/laboratory tests at baseline and every 3–6 months thereafter. We report here analysis of the first year of data focusing on the immune system. Low nanomolar levels of TA-65® moderately activated telomerase in human keratinocytes, fibroblasts, and immune cells in culture; similar plasma levels of TA-65® were achieved in pilot human pharmacokinetic studies with single 10- to 50-mg doses. The most striking *in vivo* effects were declines in the percent senescent cytotoxic ($CD8^+/CD28^-$) T cells (1.5, 4.4, 8.6, and 7.5% at 3, 6, 9, and 12 months, respectively; p = not significant [N.S.], 0.018, 0.0024, 0.0062) and natural killer cells at 6 and 12 months (p = 0.028 and 0.00013, respectively). Most of these decreases were seen in cytomegalovirus (CMV) seropositive subjects. In a subset of subjects, the distribution of telomere lengths in leukocytes at baseline and 12 months was measured. Although mean telomere length did not increase, there was a significant reduction in the percent short (<4 kbp) telomeres (p = 0.037). No adverse events were attributed to PattonProtocol-1. We conclude that the protocol lengthens critically short telomeres and remodels the relative proportions of circulating leukocytes of CMV^+ subjects toward the more "youthful" profile of CMV^- subjects. Controlled randomized trials are planned to assess TA-65®-specific effects in humans.

PEOPLE TAKE DIETARY SUPPLEMENTS with the intent to preserve mental, physical, and emotional health and vigor into old age. Although drugs and surgical procedures that target diseases of the elderly will hopefully arrest or partially reverse tissue damage caused by aging and chronic stress, measures to maintain health are arguably a better approach to lengthening our healthy life span. Most dietary supplement programs include combinations of vitamins, antioxidants, and other constituents, some of which have been shown to have significant health benefits in controlled clinical studies, whereas others may show adverse effects,[1–6] underscoring the need to assess functional effects of combination products. This paper presents initial data from an ongoing observational study of a novel dietary supplement program, PattonProtocol-1, which includes a natural product-derived telomerase activator targeting a fundamental aspect of cellular aging.

Telomerase is an enzyme that synthesizes the specific DNA sequence at telomeres, i.e., the terminal DNA at the ends of all chromosomes.[7,8] Telomeres are essential genetic elements responsible for protecting chromosome ends from being recognized as "broken DNA." Because telomeric DNA cannot be fully replicated by conventional DNA polymerases, and because telomeres undergo degradative processing and are a "hotspot" for oxidative damage,[9] telomeres will gradually shorten with time and cell division unless there is sufficient telomerase activity to maintain telomere length.

Telomerase is activated in fetal development, thus protecting telomeres from significant loss during this period of dramatic cell expansion.[10,11] However, telomerase is repressed before birth in most somatic tissue, and, as a consequence, birth marks the beginning of telomere erosion in most tissues throughout life. Tissues with continual cell turnover or periods of rapid proliferation are "telomerase competent" in that they upregulate telomerase during early phases of progenitor expansion.[12,13] All adult somatic stem cells appear to be capable of activating telomerase during tissue regeneration. However, these periods of activation are insufficient to prevent telomere loss, and this is compounded by a decreased ability to activate telomerase during aging and stress.[14–16] In addition, stress can accelerate telomere loss by increasing cell turnover and the amount of telomeric DNA lost per cell division.[17,18]

In cross-sectional studies, humans lose telomeric DNA at a very modest rate of about 15–60 bp per year, likely reflecting the small numbers of stem cells that are actively dividing in proliferative tissues compared to the total stem cell reserve, and the quiescent state of cells in other tissues. Telomere shortening has been investigated in human cells in culture, in human genetic diseases with mutated telomerase, and in animal models of telomerase deficiency.[13,19–26] These studies point to a causal relationship between telomere loss, cell aging, reduced tissue regeneration, and loss of tissue structure and function. In support of this causal relationship, epidemiological studies show that short telomeres in humans are a risk factor for atherosclerosis, hypertension, cardiovascular disease, Alzheimer disease, infections, diabetes, fibrosis, metabolic syndrome, cancer, and overall mortality.[18,24,25,27–30]

Chronic viral infections such as cytomegalovirus (CMV) and human immunodeficiency virus (HIV) accelerate telomere loss and premature aging of the immune system, especially the virus-specific cytotoxic T cells[31–36] responsible for killing infected cells. In addition to telomere loss, these cells often lack expression of the co-stimulatory receptor CD28 and have reduced proliferative capacity, reduced ability to secrete antiviral cytokines and chemokines, increased resistance to apoptosis, and compromised ability to lyse infected cells. About 50% of the U.S. population is infected with CMV as judged by circulating CMV-specific antibodies, but after an initial 30% seropositivity rate by age ≈10, there is ≈1% annual seroconversion rate throughout life leading to ≈90% seropositivity by the ninth decade. This linear increase has made it difficult to distinguish the effects of pure immunosenescence from those that can be attributed to this extremely common virus.[37,38]

Here we report initial findings from a dietary supplement program which includes TA-65®, a purified small-molecule telomerase activator derived from an extract of a plant commonly used in traditional Chinese medicine. Telomerase activation and functional studies on a related molecule (TAT2) from the same plant have been previously reported for human skin keratinocytes and immune cells in culture.[36] Effects of TAT2 in tissue culture studies with $CD8^+$ T cells from HIV/acquired immunodeficiency syndrome (AIDS) subjects included increased replicative capacity, improved cytokine and chemokine responses to antigens, and increased killing of autologous HIV-infected $CD4^+$ cells.

PattonProtocol-1

PattonProtocol-1 was launched in January, 2007, by TA Sciences (New York) as a commercial age-management product composed of a natural product–derived telomerase activator (TA-65®, described below), a dietary supplement pack (online material S1), laboratory testing (Table 1), and physician counseling. All subjects signed a comprehensive Customer Acknowledgement

Form. Baseline assays (Tables 1 and 2) indicated that most individuals were within the normal ranges for the majority of tests. In a small number of cases described in the Results section, the consulting physician prescribed medications for subjects based upon clinical tests. There was no qualitative change in the overall conclusions whether these subjects were included or censored from the analysis. We report results for all evaluable subjects who completed 12 months of the protocol by June, 2009. The number of subjects at 3, 6, 9, and 12 months for most tests was 43, 59, 27, and 37, respectively. The age and gender frequencies of the subset at each time point were similar to those of the total baseline population ($n = 114$; 63 ± 12 years, 72% male).

TA-65®

TA-65®, exclusively licensed to TA Sciences from Geron Corporation, is a >95% pure single chemical entity isolated from a proprietary extract of the dried root of *Astragalus membranaceus* and formulated into 5- to 10-mg capsules with inert excipients. Starting doses of 5–10 mg/day were considered safe on the basis of historical usage of extracts. Some subjects increased their dosage after several months on the product to 25–50 mg/day. Cumulative dose consumed during the year was recorded for each subject and used for preliminary dose–response analysis.

Clinical laboratory assays

At baseline and each time, point blood samples were drawn and shipped the same day at ambient temperature to analytical laboratories. Assays for standard blood counts, blood chemistry, specialized immune subsets, CMV antibody titer, and inflammation markers were conducted at Quest Diagnostics or Bio-Reference Laboratory. Specialized immune subset analyses were conducted at UCLA Clinical Laboratories and Pathology Services.

Telomerase activity assay in cultured human keratinocytes and fibroblasts

Telomerase activity was measured in human neonatal keratinocytes (Cascade Biologics, Portland, OR) and in MRC5 fetal human fibroblasts (ATCC# CCL-171) pre-and posttreatment in culture with TA-65® using the telomere repeat amplification protocol (TRAP) assay, essentially as described elsewhere.[39] In brief, telomerase activity was measured in actively growing cells incubated for 24–48 h with TA-65® in the vehicle (dimethylsulfoxide [DMSO] at 1% vol/vol [keratinocyte culture] or 0.5% [fibroblasts]) versus vehicle alone. Measurements were typically made at 5–10 population doublings (PD) (keratinocytes) or 30–40 PD (fibroblasts). Telomerase reaction products were resolved by electrophoresis on nondenaturing polyacrylamide gels and quantified by exposure to Phosphor Screens and imaging on PhosphoImager SL (Molecular Dynamics).

Telomere length assays

Median telomere length in peripheral lymphocytes and granulocytes was determined by FlowFISH at Repeat Diagnostics (Vancouver, Canada) essentially as described elsewhere.[40] Mean telomere length by qPCR[41] was performed in the laboratory of Dr. Richard Cawthon (University of Utah, Salt Lake City, UT). High-throughput quantitative fluorescence *in situ* hybridization (qFISH)[42] was performed at CNIO, Madrid, for inter- and intranuclear telomere length distributions.

Statistics

Data from this study were collected primarily as a hypothesis-generating exercise because subjects were not participating in a controlled prospective study, and statistical analyses were not formally defined *a priori*. Baseline data were analyzed for cross-sectional age effects. Student *t*-tests were used for comparison of means and the F-distribution for significance of linear regression against subject age. Except where indicated, two-tailed paired *t*-tests were conducted at each time point for comparisons to the baseline values. For percentage of short telomeres analyzed by HT qFISH, individual differences between baseline and postproduct data were analyzed by chi-squared analysis.

Mechanism of action

TA-65® activates telomerase in human neonatal keratinocytes and fetal fibroblasts in culture

TA-65® upregulates telomerase activity in low- and mid-passage human neonatal keratinocytes two- to three-fold in a dose-responsive manner (Fig. 1A). In these studies, activation was two- to three-fold at the lowest concentrations tested (30–100 nM), and activation was not as great at higher concentrations. This pattern is similar to that seen for TAT2, a related molecule tested in human immune cells.[36] The ability of TA-65® to upregulate telomerase activity was also tested in human fetal fibroblasts (MRC5) over a broad concentration range (Fig. 1B). Untreated and vehicle (DMSO)-treated MRC5 cultures showed extremely weak telomerase activity; there was essentially no telomerase extension products with a size greater than that of T1, the minimum size needed to detect a product in the TRAP assay. Results from three independent experiments indicated that TA-65® at concentrations as low as 1 nM induced processive telomerase activity in MRC5 cells. Telomerase activation by TA-65® in the 1–30 nM range in multiple cell types is important, because plasma levels of TA-65® are typically in the 1–20 nM range 4–8 h postoral ingestion of 5–100 mg TA-65® (unpublished data).

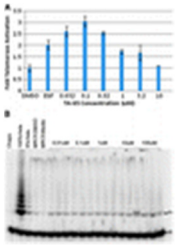

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FIG. 1. Telomerase activation by TA-65® in neonatal foreskin keratinocytes and fetal lung MRC-5 fibroblasts. **(A)** Keratinocytes in triplicate wells were exposed for 48–72 h in different experiments to the dimethylsulfoxide (DMSO) vehicle control, epidermal growth factor (EGF) (positive control, typically 10 ng/mL), or TA-65® at indicated concentrations, and products were analyzed as described in Methods. Results from analysis of telomere repeat amplification protocol (TRAP) ladders resolved by gel electrophoresis and quantified by ImageQuant on a PhosphoImager are shown for a typical experiment. **(B)** MRC-5 cells were exposed to TA-65® at concentrations shown for 48 h. Each replicate represents an independent lysate (a replicate culture dish within one experiment). "Chaps" represents the lysis buffer control (no cell extract). HeLa cells are used as positive control cells as described in Methods. T1 is the first telomerase extension product capable of amplification by PCR. IC is the internal control PCR product. Shown is a representative gel from three independent experiments.

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Baseline observations

The relationships between age and various biomarkers including telomere length have been reported in a number of cross-sectional studies. Table 2 shows mean values, standard deviations, count, slope, and R^2 from linear regression on subject age, and the statistical significance of the slope for the baseline tests investigated in this report. As expected, this population showed a

highly significant decline as a function of client age in both lymphocyte and granulocyte telomere length by FlowFISH analysis, and the slopes of the decline (55 and 34 bp/year; $p = 10^{-15}$ and 10^{-8}, respectively) are comparable to those reported previously.[43–45] Age-dependent increases are seen in the percent senescent ($CD8^+CD28^-$) cytotoxic T cells, percent natural killer (NK) cells, and percent and absolute number of neutrophils. Significant age-dependent decreases are seen in naïve ($CD8^+CD95^-$) cytotoxic T cells, B cells, and lymphocytes.

Because CMV infection can have a significant impact on immune markers,[37,46] we analyzed the age-dependency of baseline immune subsets by CMV status (Fig. 2 and Table 3). Lymphocyte, but not granulocyte, telomere length was longer in CMV^- subjects than that in CMV^+ subjects, suggesting that CMV infection drives increased turnover (and hence telomere shortening) in lymphocytes, but has relatively little effect on hematopoietic stem cells. Telomere length in granulocytes is considered a surrogate of telomere length in hematopoietic stem cells due to their short transit time to peripheral blood, and short half-life in circulation.[42] The ages of the CMV^+ and CMV^- subjects (65 ± 12 and 62 ± 13, respectively) were not significantly different, but the mean lymphocyte TL in CMV^+ individuals was 680 bp less than that observed in the CMV^- group ($p = 0.003$), suggesting an acceleration of aging by about 10 years in the CMV^+ group based on −55bp per year for lymphocytes.

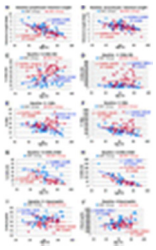

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FIG. 2. Baseline telomere length and immune subset data as a function of subject age segregated by cytomegalovirus (CMV) status. Overall baseline data without segregation by CMV status is provided in Table 2. Correlations with age for lymphocyte and granulocute telomere length **(A,B)** and immune subsets **(C–J)** at baseline were determined by linear regression in the CMV^+ and CMV^- subjects. Telomere length and immune parameters were analyzed by flow cytometry as described in Methods.

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As expected, baseline numbers and the rate of increase in senescent cytotoxic T cells ($CD8^+/CD28^-$) in percent and absolute counts was highest in the CMV^+ population (Table 3 and Fig. 2C,D). The slight increase in per cent of senescent cytotoxic T cells as a function of age in CMV^- subjects (Fig. 2C) despite declining absolute numbers of these cells (Fig. 2D) is a consequence of a significant decline in total $CD8^+$ cells as a function of donor age in CMV^- subjects (Fig. 2 E,F). The difference in the mean number of $CD8^+$ T cells between CMV^+ and CMV^- subjects (208 cells/μL) is essentially accounted for by the difference in mean number of senescent $CD8^+$ T cells between these two subpopulations (200 cells/μL) (Table 3). Although the $\%CD8^+CD28^+$ cells at baseline was significantly higher in CMV^- subjects ($p < 0.0001$), this was due primarily to the elevated absolute number of $CD8^+CD28^-$ cells in the CMV^+ subset (i.e., an increased denominator for the CMV^+ group). The absolute number of nonsenescent cytotoxic T cells ($CD8^+CD28^+$) was not significantly different between CMV^+ and CMV^- subjects (Table 3).

CMV^+ subjects had significantly fewer absolute and percent naïve cytotoxic T cells ($CD8^+CD95^-$) at baseline than did CMV^- subjects ($p < 0.0005$ and 0.07, respectively) (Table 3), but in both populations there was dramatic reduction in the absolute and relative abundance of

these cells as a function of subject age (Fig. 2 G,H), consistent with previous studies.[47,48] In 80- to 90-year-old subjects, there were <50 naïve $CD8^+$ cells/μL.

A novel finding in the baseline dataset is an apparent effect of CMV infection on neutrophils: CMV^- subjects show an increase in neutrophil number and percentage as a function of subject age compared to an essentially flat profile with age for the CMV^+ subjects (Fig. 2I,J). At baseline, the mean number of neutrophils in CMV^- subjects was about 20% higher than that in CMV^+ subjects ($p = 0.02$ by absolute counts, $p = 0.003$ by %) (Table 3). There was also highly significant increase in baseline percent ($p = 0.00015$) and absolute numbers of NK cells ($p = 0.006$) in the total population (Table 2), but there was no significant difference between CMV^- and CMV^+ subjects.

Changes from baseline

Reduction in percent cells with short telomeres

Two independent measures of median or mean telomere length (by FlowFISH and qPCR) showed no consistent change with time on PattonProtocol-1 (data not shown). However, we also analyzed the distribution of individual telomere lengths using automated high-throughput confocal microscopy (HT qFISH[42]). Telomere signals within the nuclei of white blood cells were analyzed from 13 subjects at baseline and a follow-up time point between 12 or 18 months. Mean telomere length by HT qFISH correlates relatively well with median telomere length by FlowFISH (supplemental data S2) and also showed no consistent change of overall telomere length (Fig. 3A). However, HT qFISH revealed a decline in the percentage of nuclei with short telomeres (<4kbp) in 10 of the 13 individuals ($p < 0.05$ for 7 of those 10) at 12–18 months compared to baseline, while only one of the remaining 3 individuals had a significant increase in percent short telomeres (Fig. 3B). Given these data, we used a one-tailed paired *t*-test to determine the probability that the overall mean reduction across all 13 subjects was due to chance ($p = 0.038$). In separate studies in murine cells in culture and *in vivo* we have shown that TA-65® alone will reduce the percentage of cells with short telomeres with minimal effects on mean telomere length (M.B., manuscript in preparation).

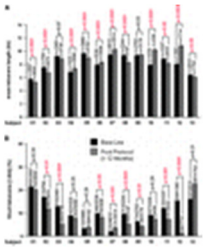

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FIG. 3. Mean telomere length and percent of nuclei with short telomeres at baseline and post TAS protocol. **(A)** Mean telomere length values ± standard error (SE) of the indicated individuals at base line (black bars) and post PattonProtocol-1 (grey bars) as determined by high-throughput quantitative fluorescent *in situ* hybridization (HT qFISH). The total number of nuclei analyzed is indicated (n) on top of each bar. Statistical significance was assessed by the Student *t*-test. **(B)** Percentage of nuclei with short (<4 kb) telomeres at base line (black bars) and post-TAS protocol (grey bars) as determined by HT qFISH. Numbers above bars represents the number of nuclei with short telomeres (<4 kb) out of the total number of nuclei analyzed. The chi-squared test was used to evaluate the statistical significance for each individual tested.

Information about Downloading

Positive remodeling of the immune system

There were a number of striking changes from baseline in the adaptive and innate immune system of subjects on PattonProtocol-1. We saw statistically significant "age-reversal" effects in the number and percent of senescent ($CD8^+CD28^-$) cytotoxic T cells, particularly after 3 months

(Fig. 4A). Senescent $CD8^+CD28^-$ T cells dropped with a linear trend from roughly 39% in the baseline population to about 36% at 12 months in the overall population ($p=0.0068$ at 12M). Most of this effect was due to a 20% drop in the number of $CD8^+CD28^-$ cells in the CMV^+ population (Fig. 4D, $p=0.0044$ at 12M). This decrease, relative to the age-related increase of 0.57%/year and 3 $CD28^-$ cells/year in CMV^+ individuals, represent an apparent age reversal of ≈5–20 years in this biomarker of immune aging.

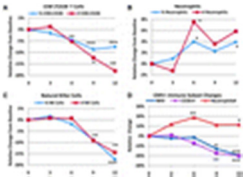

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FIG. 4. Relative changes from baseline as a function of time (months) for immune subsets. The mean of the absolute change from baseline for each parameter across all subjects for which data at that time point was calculated and then expressed as a percent change from the mean value at baseline for those subjects. In **A–C**, data for both cytomegalovirus-positive (CMV^+) and CMV^- subjects are combined. **(D)** Relative mean change is shown for the CMV^+ population subpopulation only. Asterisks next to a data point signifies $p<0.01$ (***), $p<0.05$ (**), and $p<0.1$ (*) for a two-tailed paired (within-subject) *t*-test analysis comparing baseline to time point values.

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At baseline, CMV^+ individuals had a significantly lower number and percent of neutrophils compared to CMV^- individuals (Table 3). After 3 months on PattonProtocol-1, there was an overall increase in number and percent of neutrophils (Fig. 4B) which was primarily driven by the effects of the Protocol in the CMV^+ subjects (Fig. 4D), suggesting that as in the case with $CD28^-$ cells, PattonProtocol-1 may reverse a potentially detrimental effect of CMV infection on neutrophils.

The percent and number of NK cells significantly decreased after about 6 months on product (Fig. 4C). A decrease was observed in both CMV^+ and CMV^- individuals, but again the effect was more pronounced in the CMV^+ population (data not shown). The changes at 12 months in the overall population (about a 15% decline in both % and number of NK cells) was highly significant ($p=0.0035$ and 0.0021 for number and per cent cells, respectively), and dramatic compared to the baseline increases per year in NK cells for the CMV^+ group (+2.4 cells per year and +0.3% per year).

The inability to maintain telomeres with age and chronic stress has been linked to declining health and the increased risk of disease and death from many causes, including cancer.[16,25,49–52] In this study, we report that a 1-year health maintenance program consisting of a dietary supplement pack combined with a natural product–derived telomerase activator results in a decreased percentage of short leukocyte telomeres and remodeling of the relative proportions of the circulating leukocytes of CMV^+ subjects toward the more "youthful" profile of CMV^- subjects.

One of the strengths of our study is the low CMV-positivity rate (54%) in a relatively older population, which allows us to separate the effects of age and CMV status on immunosenescence. It also serves to mitigate one of our study's weaknesses—the lack of a control group—as the subjects were initially unaware of their CMV status and their subsequent knowledge is unlikely to have caused the segregation of many of the effects of the protocol by CMV status.

Our description of the decrease in $CD8^+CD28^-$ T cells as a positive remodeling of the immune system is supported by the increased morbidity and mortality associated with what is known as the immune risk profile (IRP). This profile has been defined as a CD4/CD8 less than 1 in association with CMV seropositivity by longitudinal studies of individuals in their eighties and nineties in the OCTO/NONA Swedish cohort.[53] As in our cohort, the major driving force for the decreased CD4/CD8 in CMV^+ subjects in this population is likely the accumulation of virus-specific $CD8^+CD28^-$ T cells. These studies have reported 6-year follow-up data, and no individuals who have survived to 100 years old exhibit the IRP, even if they are CMV^+. The authors conclude that successful immune aging entails being able to control CMV infection without accumulating senescent cytotoxic T cells. Thus, we conclude that the 20% reduction in $CD8^+CD28^-$ T cells is a salutary effect, even though we have yet to see increases in the number of $CD8^+CD28^+$ T cells. Telomere shortening associated with replicative senescence is the probable cause of loss of CD28 expression and apoptosis resistance of $CD8^+$ T cells.[54] The decrease in the percentage of short telomeres we found makes upregulation of telomerase by TA-65 the most likely mechanism for this salutary effect.

Age-related changes in the innate immune system have not been as well characterized as those of the adaptive immune system, although the importance of changes in the former is increasingly being recognized.[55] It is generally agreed that the per-cell activity of neutrophils as measured by oxidative burst, phagocytosis, and chemotaxis decreases with age.[56] There is less agreement on the effect of aging on neutrophil number which has been variously reported to be preserved,[57] decreased,[58] or increased[53] with age. CMV status is not reported in the first two studies, but in the last study from the above-mentioned NONA cohort, the increase in neutrophil number is based on a comparison between 18 middle-aged (55-year-old) subjects with a 55% CMV^+ prevalence rate and 120 very old subjects (92–100-year-old) with a 87% CMV^+prevalence rate. Most of the cross-sectional increase of 960 neutrophils occurs within the 92 to 100 year olds, with only a 52-cell increase between 55 and 92. There is also a significant longitudinal increase over a 6-year interval in the very old group. This suggests that there is selection for those very old subjects able to increase their circulating neutrophils in the face of deteriorating tissues, increased inflammation, and increased exposure to infectious agents. Our novel finding that by age 62 the neutrophil number is 20% higher and continues to increase with age only in CMV^- subjects can be interpreted as a compensatory increase in the face of declining per cell activity and barrier function, as well as increased antigenic load. The absence of a cross-sectional increase with age in neutrophil number in CMV^+ subjects suggests that this compensation is blocked in the CMV^+ subjects perhaps due to inhibitory cytokine production by the senescent T cells. The effect of the protocol to increase neutrophil count in CMV^+ subjects can be interpreted as a salutary removal of this block in part through reduction in the number of senescent T cells.

There is a broad consensus that NK cell number increases with age to compensate for decreased per-cell activity, which results from impaired signal transduction,[59] but other mechanisms such as decreased barrier function and increased antigenic/pathogenic load may also contribute to increased NK cells with age.[60] The decrease in NK cell number induced by the protocol is an "age reversal," but because we did not measure NK activity we cannot say whether it is from improved barrier function or improved signal transduction. Unlike other cells of the innate immune system, NK cells proliferate after activation and experience further telomere shortening once they are released from the bone marrow.[61] The decrease in the percentage of short

telomeres we found could result in improved signal transduction as a mechanism for the reduction in NK cell number. Taken together, these three changes in leukocyte number induced by the protocol represent a remodeling of the immune systems of CMV^+ subjects to look more like those of CMV^- subjects and successfully aging CMV^+ centenarians.

Physicians who monitored the health of the current study subjects through 1 year on the product reported no adverse events that were likely related to the protocol. However, 2 subjects who recently escalated their daily dose reported feeling "anxious" on 100 mg/day but not when they switched back to 50 mg/day. A placebo-controlled study will be needed to determine if this potential adverse effect is real. No new cases of cancer or cardiovascular disease were reported during the overall 260 person-years of dosing with PattonProtocol-1 through June, 2010, and this is statistically significant ($p<0.05$, cancer; $p<0.02$, CVD) assuming baseline age-specific risks in our population were similar to those of the U.S. population.

TA-65® activated telomerase in cultured human cells at concentrations seen in the plasma of subjects on the protocol. Paradoxically, although ≈40% of subjects showed an increase in mean telomere length over time, on average across all subjects there was a nonsignificant decline in mean telomere length. However, we speculate this effect is explained by cell dynamics and the fact that telomerase preferentially lengths the shortest telomeres.[62–64] Rescue and selective expansion of near-senescent cells with short telomeres could lead to a reduction in the population mean telomere length despite some lengthening of telomeres in all cells. Because detrimental effects of telomere loss are primarily driven by short, dysfunctional telomeres, and loss of tissue function and disease onset in proliferative tissues have been associated with telomere lengths <4 kbp,[25,65] we believe that our observed reduction in telomeres <4 kbp in subjects on PattonProtocol-1 is a significant, positive response, and that TA-65® contributes to the apparent benefit of the dietary supplement. In support of this, studies with TA-65® given orally in old mice showed similar reductions in percent cells with short telomeres and positive functional effects on tissues (Blasco et al., submitted) and preliminary dose–response analyses showed an increase in salutary effects with TA-65® doses up to 20–30 mg per day average compared to the initial 5- to 10-mg per day dose (data not shown). Finally, analysis of additional biomarkers of aging in subjects on PattonProtocol-1 suggest improvements in the cardiovascular system, metabolism, and bone mineral density, which will be further studied and reported elsewhere. Independent randomized controlled studies with TA-65® alone are planned.

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Calvin Harley is one of the inventors of TA-65. He consults for TA Sciences and is personally taking TA-65. He owns stock and stock options in Geron Corporation, a company that is developing telomerase activators for therapeutic purposes and the company that licensed TA-65 to TA Sciences. He is co-founder, President, and CEO, and holds stock in Telome Health, Inc., a diagnostics company that will provide telomere- and telomerase-related assay services to the healthcare industry. Joseph Raffaele consults for TA Sciences; he is CEO of PhysioAge Systems, LLC, a company that provides biomarkers of aging analysis, including telomere lengths, to medical practices, and he is co-founder of PhysioAge Medical Group which offers TA-65 through the Patton Protocol. William H. Andrews owns stock or membership options in Geron Corporation and Sierra Sciences; he consults for TA Science, is a client of TA Sciences who is taking TA-65, and is one of the subjects studied to generate data for this manuscript. He is the founder, President, and CEO of Sierra Sciences, a company that develops therapeutics for inducing telomerase expression and has provided financial support for some of the studies described in this manuscript. Weimin Liu is an employee of TA Sciences. Elsa Vera and Maria Blasco have no competing financial interests.

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1) **The cancer question the post below addresses the reasons for the misconception that TA-65 might cause cancer and the converse: how it might actually benefit or reduce the likelihood of cancer**

Does Telomere Science Reveal a Cure for Cancer?

This post is going to be a little more scientific and detailed than I normally send, I hope that is ok, let me know what you think about this style of education and if you like it I'll do more.

When we see people who are exceptionally fit or in incredibly good health in their later years we often blame it on having good genes.

And, that is partially true but the part that is true is the part of the genetic material we all share, it is the end of the chromosome called telomerase. Telomeres control how long and how well we live.

Let me explain.

The discovery of telomerase is a real Christmas miracle. It was on Christmas day that Greider and Blackburn finally proved their theory that an enzyme added telomeric DNA to the ends of chromosomes. That was in 1984, and that enzyme was later named telomerase.

Telomerase is present and active in stem cells, germ cells and cancer cells which is one reason these cells never reach senescence (an endpoint where cells die or no longer divide and thus become inert). Normal cells don't express telomerase. That gene is suppressed in them. One key to immortality is turning that gene on. Thanks to extensive scientific research, a natural activator TA-65 has been discovered and proven to successfully lengthen telomeres.

But every new discovery is initially feared, then embraced by pioneering spirits, and finally adopted by the hungry masses (or in the case of naturally occurring cures, co-opted by corporations to be patented and turned into expensive controlled medicine since they can't patent nature).

When it comes to telomeres, many fear turning this gene on in healthy cells is unsafe and risky. Their concern stems from what incorrectly appears to be a similarity or link with cancer.

So, what about cancer? If telomerase is turned on in cancer cells and is the reason a cancer cell continuously replicates, would turning it on in normal cells increase the risk of these cells mutating and becoming cancerous? Specifically is there any evidence that TA-65 causes cancer?

The answer is no and I'll tell you why.

Stimulating growth of telomeres on normal chromosomes does not cause them to become cancerous because cancer cells are by definition abnormal cells. This bears repeating. It DOES NOT cause normal cells to become cancer cells.

As I explained, cancer cells are abnormal cells. When your genetic material (DNA) becomes damaged or is altered, it mutates and affects normal cell growth and division. Activating telomerase to lengthen telomeres does not alter or damage our DNA. Scientists have turned on the telomerase of normal cells ATTEMPTING to turn these cells into cancer cells and have been repeatedly unsuccessful.

For the past few decades telomerase research was almost solely focused on creating a "telomerase inhibitor" that could be a potential cure for cancer. Because 80% of all human cancers are immortalized by the turning on of telomerase it's a logical conclusion that preventing the immortality of cancer cells would slow growth and allow chemotherapies to work more effectively.

I support this research, but when TA-65 was discovered a decade ago and has been shown to be safe and effective as a telomerase activator in healthy cells then the research focus and possibilities expanded. It's with these new possibilities that I am most intrigued by and signal health and vitality for all long into our "golden years".

We know that when cells approach senescence (their endpoint), the short telomeres stimulate the chromosome instability which can cause the mutations that are responsible for creating cancerous cells. If we lengthen the telomeres and extend the life of the cell, we thereby reduce the risk of chromosome rearrangement (where tumor-suppressor genes can be shut off and cancer-causing genes turned on). Telomerase has also been shown to extend the life span of our immune cells, which improves their ability to seek and destroy cancer cells.

According to the American Cancer Society, 78% of all cancers are diagnosed in people 58 years and older. Cancers are more likely to occur when signs of cellular senescence are present and when the immune system begins to be compromised with age and lose its ability to respond to threats. It follows then that extending the period of time before normal cells reach senescence and before immune cells die, would help prevent the creation and spread of cancer in our bodies.

It's important to note that the unbridled and aggressive way telomerase is activated in cancer cells is also very different from the gentle and mild activation of telomerase in stem-cell and germ-cell lines. TA-65 mimics the natural and gentle activation of telomerase in stem-cells and germ-cells. In 2002, testing and research began with TA-65 and to date there are no studies linking its use to cancer. Rather studies showing its ability to increase the number of "good guys to fight off the bad guys", gives hope that it will assist our bodies when fighting off cancerous mutations.

In addition adding TA-65 to human non immortal cancer cell lines, adding TA-65 to pre malignant cells (cells on their way to becoming cancer), adding to-65 to highly cancer prone mice and of course giving TA-65 to people has shown no increases in cancer. AS far as prevention that has not yet been thoroughly studied but many of us in the longevity field believe it holds promise for reducing the risk of cancer.

This next one is a follow up to the where does it come from and how does it work question

TA-65 is derived from the Astragalus root, a natural compound used and researched for its ability to measurably boost the immune system. Before it was released as a supplement it was studied for effectiveness against various viruses and proved beneficial against HIV to CMV viruses, among others. These viruses are associated with increased cancer rates, and because of this the question is often posed, "could a telomerase activator actually improve cancer outcomes and maybe even be a cancer preventative?" Geron, the parent company that produces TA-65, is commencing tests and attempting to answer that question.

I believeTA-65 is currently offering cutting edge hope for those pioneering souls who want to explore the boundaries of living fully, healthfully, as long as possible.

A key to remember about living longer is that while the number of years you live is important, the number of years you live fully, with great brain and body function is the real measure of longevity. This is called health span. Most people, scientists, doctors and laymen alike agree, maximizing health span is

more important than maximizing life span. Think of it this way, your life can be extended for quite some time with life support but most of us wouldn't chose to live for months or years on life support.

With TA-65 and Telomerase activation increasing life and health span is now within the reach of almost everyone. I speak with people every day who are exploring ways of extending their health span. If you have specific questions around TA-65 and whether or not it might be effective for you, visit my website for info on contacting me, I'll be happy to answer your questions.

And please do let me know in the comments below if you like these more technical, educational pieces, if so, I'll get more of them out right away.

Best,

Dr. Dave

WHAT about RESVERATROL and TA-65?

If you have not read "The Immortality Edge" I would suggest you head on over to Amazon and do so as it will give you very succinct recommendations.

As far as resveratrol is concerned I remain of this opinion: it's a decent antioxidant so you are probably not wasting your money. I think 250 mg is a low dose though. Also as I have publically stated i sent several brands off to be tested independently for telomerase activity and they had no activity on telomerase at all so I do not believe it is effective for that purpose in free living human beings.

Additionally just yesterday the whole mechanism of Resveratrol has been question. It may not work through the sirtuin pathway at all but rather through adipokines which would put it squarely in the "anti-oxidant" category.

It's great to see the interest in telomeres telomerase and longevity. I want to make one thing very clear. Very few people (although it's not ZERO) tell me they want to live forever. But almost everyone tells me they want to be healthy for as long as possible. To me that is what the most immediate promise of telomere biology is. There is also phenomenal progress in telomerase inhibition for those who already have cancer. Just the other day parent company Geron did 2 big things. They released the data on their inhibitor imelestat which is very promising. And second they granted an exclusive international patent to TA Sciences for distribution of TA-65.

HOW DO I GET TA-65?

If you want to get TA-65 from me directly just email me at doc@drdavesbest.com. Or call (866-654-7670) toll free in the US international calls 610) 880-0075
Here is a link to more info on TA-65 http://www.drdavesbest.com/TA65/

I want to stress that TA-65 is not strong enough to immortalize human cells but it is strong enough to lengthen the short (dangerous) telomeres in rather dramatic fashion. I think this may account for the safety of the molecule which is extraordinary.

WHAT IS TA-65 and is there a cheaper version or something else that works as well?

As to its composition. it is not Astragaloside IV which I tested and it has no activity on telomerase. And it is not cycloastragenol either which some people have claimed. It is known as a "related molecule to" TAT2 in Geron circles but the exact composition is carefully guarded and internationally patented. The molecule itself it found in one specific type of Astragalus root located in one specific area of Mongolia. It takes approximately 4 tons of Astragalus root to make one typical (medium dose) yearly course of TA-65 so I hope this answers some of the questions about substitution and cost.

By the way even though I wrote the TAS manual and spoke at 2 major anti-aging conferences on telomeres and was a major contributor to the only "bookstore" book on the topic "The Immortality Edge" and am one of the few distributors in the country licensed to sell the product I do not work for TA Sciences and I have no say in the cost of the molecule.

As to who was first in the country I am clear the first doctor to be on it and distribute I was Dr Fred Vagnini a 7 time bestselling author and a cardio thoracic surgeon turned diabetes and weight loss expert. Dr Sears is indeed one of the early adaptors of the product and I have had the pleasure of swapping "war stories" with him over lunch and dinner at some of the conferences. As a person I like Al very much.

For those of you who really like this topic poke around these people's web sites. In the meantime I will crank out more stuff for you and don't forget to check my blog. DD aka Dr Telomere

HOWCOME THERE ARE SO MANY SUPPLEMENTS THAT CLAIM TO TURN ON TELOMERASE?

The short answer to why research studies show telomerase activation where none exists is as follows

1) Operator inexperience. As I mention in prior posts I actually sent stuff straight to Sierra Sciences the experts in the field to be tested and I share those results in the book at length and shorter versions in these posts.
2) Using genetically modified cell lines
3) Measuring telomerase surrogates and sub units. The entire complex is required. Often increased mRNA templates are seen in the absence of actual telomerase activity
4) Overly optimistic interpretation of results known as bias.
5) Using cell lines that already express measurable telomerase without any other outside agents needed. The gold standard for telomerase expression is human fibroblast cultures since these are extremely hard to induce. If you get results in these you can be sure you have something real; this is where Ta-65 was tested.

6) Using a telomere test with poor precision or accuracy. This is probably the most common when it comes to telomere length especially in shorter studies.
7) What I call the internet misinformation machine. Example Dr X is super successful and has a highly paid copy writing team and a giant list of adoring followers who don't question or research anything that comes from him. That team writes something that is not accurate or is downright false either intentionally or unintentionally. Dr X is busy on a Hawaiian vacation and does not notice the inaccuracy. It gets published generates a good sales response and is distributed via Dr X's vast network of affiliates to many blogs and posts on the internet. Everyone is looking for interesting and stimulating content for their blogs. The affiliates of the affiliates scrape the blog content and pretty soon you have an article that quotes an article that quotes an article etc etc.
You have just witnessed the birth of a FACTOID. There are few areas where there are more factoids than the area of telomeres and telomerase.
Keep in mind telomerase expression is a good thing but often does not equate to actual telomere elongation. That is why TA-65 stands out. In the most meaningful test of all short telomere testing in live free living humans as well as several objective improvements in things like immune function, bones density, glucose etc etc.
No other telomerase supplement has been tested that way. Also there is a difference between slowing down telomere loss and actually lengthening telomeres. A lot of studies that look at humans and supplements are matched to control groups for comparison with nobody having baseline starting telomere lengths in either group. For example: nonsmokers have longer telomeres than smokers. This gets reported as "Not smoking lengthens your telomeres".

Compared to what. In order to say you actually ADD length versus slowing down loss you need a baseline telomere length in the same people as you are testing your supplement/intervention in. If they are longer after the supplement or intervention then you have proven you lengthened telomeres.

A classic example is a recent study that showed multi vitamins added 5% length to telomeres in women who took them versus women who did not. The conclusion's often reported as "multivitamins lengthen your telomeres". More than one doctor on this very site posted that type of interpretation. Again what that study really showed was that multivites probably slow down telomere loss since there was no baseline in either group to prove that actual length was added.

Notice how different this is from slowing down loss. Now don't get me wrong slowing down telomere loss is SUPER important and should be done IN ADDITION to adding length whenever possible.

Also notice that turning on telomerase is not the gold standard, changes in telomere length are. You can turn on telomerase and not add any length at all and possibly not even slow down the loss. The reasons for that are quiet complicated just remember: turning on telomerase does not automatically equal longer telomeres.
The only supplement that has been shown to add length to telomeres in free living human beings is TA-65.

I hope this answers your question and again thanks for the interest. This is an amazing field to be part of and an amazing time to be alive!

Dr Dave aka Dr Telomere

WHAT About Improved Athletic performance and TA-65 ?

As far a s TA-65 and performance the input has been "anecdotal"
meaning reported by users but not studied scientifically. It has been extremely positive though. DR Bill Andrews who discovered the human telomerase gene tells of how TA-65 transformed him from a back of the pack ultra-runner to tops in his age group. Two weeks after I started it I dropped a full minute off my 1 mile "interval run" times with no other changes in training or supplementation.

My sister who is in her mid-50's started to get podium age group finishes 2 months of starting it.

Almost every one notes more energy, but these are all what people notice not what has been actually studied since this is a health and longevity supplement the testing parameters have been limited to that.

In the "Immortality edge" we describe at length the effects of exercise on telomere length and our preferred programs.

Let me also say one thing that is PROVEN and not ANECDOTAL, There is something called overtraining syndrome in athletes. These people lose interest in their sport, start to avhe decreased performance and overall feel poorly as well as having specific signs like poor sleep poor recovery weight loss or gain etc. They definitely have shorter telomeres and this has been documented. In addition their immune systems are far weaker than they should be. On both accounts: protecting the telomeres from shortening and strengthening the immune system there is NO QUESTION TA-65 would be helpful

Can my pet take it!?

TA-65 is not approved for use in animals but i can tell you there are a few people who are doing it. the following animals that are common as "pets" age by telomere loss: humans (LOL) cats dogs horses. There is one other species of marine mammal that also ages via telomere loss but it is not a common pet. For those of you who follow raw food vegan guru David Wolfe look for an in depth interview on the topics above soon. All the best, Dr Dave aka Dr Telomere

Do Bioidentical hormones activate telomerase?

While I agree with many of my anti-aging colleagues in that restoration and balancing of human hormone status is essential no one has done a good study on the effects of hormone action and

manipulation on the telomeres of living humans that I am aware of. There is A GH study in older Mediterranean men that correlates with GH levels but these were not men who were supplemented; their endogenous GH was high compared to their compatriots and there was no control for other factors.

Ina addition all of the studies mentioned above are on genetically engineered mice and cell cultures not people. The induction of telomerase does not always translate into extension of telomeres. I have sent every single supplement mentioned above for testing to Sierra Sciences labs as I have mentioned. None of the above was active at anything resembling typical human dosage. But don't take my word for it I invite you to do the same. You can contact Dr Bill Andrews discoverer of the human HTERT gene sequence via Sierra Sciences in Reno.

I think it is important to actually verify what is often stated on the internet to the degree possible and in some cases actually subsidize the testing of agents claimed to do things. I have done so for many supplements directly and of my own volition with the best lab in the country; one that does nothing but test for telomerase activation and its effects on the very hard to induce human fibroblast lines.

As a Board certified anti-aging doc I agree that bioidentical hormones probably do help keep us young and have been prescribing them to men and women since 2000. But it is still a stretch to say that based on a mouse study with receptor engineering that bioidentical hormones reverse aging at least in humans. In truth it is a stretch to claim that anything does so until population based studies on these interventions are done and that will take a long time. In the meantime we do have at least some data on the subjective and objective effects of telomerase activation via TA-65 on non-engineered human cell lines genetically engineered mice and free living people.

What about hormones? Personally I think they WILL be found to be essential to healthy aging but I doubt they will do anything to extend human lifespan past its own "Hayflick limit" of about 150 years. But do hope human/hormone/telomere length using short telomere testing/ studies are done soon since it will remove yet another argument against their use.

Most recently Elizabeth Blackburn has released a paper on estrogen (it was not specified as "bioidentical by the way") and telomerase. She stated in her paper estrogen DECREASES the amount of telomerase expression but appears to affect and slow down cellular aging through another pathway. This might make it viable to slow down aging but it suggests that at least this hormone will not lengthen your lifespan. Still it may improve your healthspan for those of you who don't care about living longer!

Best, Dr Dave author "THE IMMORTALITY EDGE"

In the following post I give a little bit more personal experience as well as some more questions that are frequently asked about TA-65 telomeres and telomerase

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Fountain of youth or fountain of death, my experiences with telomerase activation

Telomere: a chunk of repeating DNA at the end of all chromosomes tied directly to cell health and cell lifespan. It shortens with age and many stresses including sleep deprivation emotional stress physical inactivity diseases and poor dietary choices.

Telomerase: (short for telomere reverse transcriptase) the enzyme that lengthens the telomere, highly active in only a few types of cells

As an expert in the clinical application of telomere biology I get a lot of question from people asking if telomeres and telomerase the enzyme that lengthen them are really the cure for aging or a potential cause for cancer.

The story goes like this. The telomere is a biologic time clock. The "pop culture" application of this and the one we use in our book "The Immortality Edge" (http://www.drdavesbest.com/AMAZON) states that you can live to 120 years because of telomere length but not much longer. We took some license and called this the Hayflick limit as others before us have even though this is not really what Dr Hayflick discovered or said. Bottom line it seems to have stuck and a lot of people say that the Hayflick limit is the reason we can only live to 120 years. This limit is directly related to the length of the telomere as we now know.

So there you have it a simple easy to understand mechanism of why cells can only divide so many times before they die. Every time the cell reproduces, its one step closer to death and the telomeres are keeping track of the whole process in a sense. Once they get used up and become short, the cell stops dividing and dies. And in recent years the pathways that lead to cell death through aging and disease have been mapped out and ultimately end up shortening the telomere.

The neat thing is that the “telomere theory of aging” includes and helps explain many of the other theories like wear and tear, free radical oxidative damage, the mitochondria theory of aging and many others. As a result we know that all of the things we identify as “unhealthy” including diseases like heart disease and diabetes and conditions like being fat shorten the telomeres and thus shorten our lives.

So what if you can lengthen the telomere or at least slow down the loss?

Well that is the topic of our book “The Immortality Edge”. I along with two other well know anti-aging experts and fellow Telonauts Dr Mike Fossel and Greta Blackburn collaborated to create an “everyman’s guide “to keeping those telomere long. Now most people want to live longer AND a lot healthier and the book is written with that in mind.

Areas of huge interest are drugs and supplements.

Right now the supplement that lengthens telomeres in live free living humans, TA-65, is very expensive and not likely to come down in price soon. Other supplements are often claimed to “turn on telomerase” but when tested in human cell lines at doses that a person could actually take do not work very well or at all.

In addition no other supplement besides TA-65 has human data and this is not likely to change even as people rush new supplements to the market in response to our book and the amazing new findings in telomere biology.

I have personally verified supplements that work and do not work at a world renowned lab that does nothing but test for telomerase activity. That lab is Sierra Sciences and is run by Dr William Andrews a friend of mine and the man who discovered the human telomerase gene. Dr Andrews is responsible for much of what the world knows about telomeres and telomerase. He is one of the truly amazing researchers in the field and in my opinion deserves far more recognition and support than he has gotten for his advances in medicine and of course telomerase biology.

Resveratrol is an example of where much confusion exists. It is listed as both telomerase activator and telomerase inhibitor. Indeed before both properties were evaluated by Sierra Sciences the lab that does nothing but test for telomerase. Citations and articles appeared demonstrating both activities which is

pretty much impossible. Their results with resveratrol and ones that I trust implicitly show no activity of commercial brands either way.

There are supplements that turn on telomerase or preserve telomere length by other means with enough power to preserve telomere length but slowing down shortening is very different than adding length. TA-65 has been proven to add telomere length in real live human beings.

I mentioned TA-65 was expensive but many people who could afford TA-65 are holding back to see if the concept is real or if there are any side effects.

Is it real? In the past week and article was released that got a lot of attention. A researcher named Dr DePinho used the telomerase enzyme to make lab mice young again. At least some of the scientific community reacted with astonishment. While this is an exciting study and certainly appreciated for its contribution, those of us who have been in the field for years are not at all surprised.

This is not the first experiment of its kind.

Almost a decade ago a fellow named Walter Funk who worked with Dr Andrews grafted old human skin onto mice and then turned on telomerase. The skin assumed the characteristics of young skin. Few noticed Funk's experiment probably because it was "too far ahead of its time". Last year a human population was discovered with "more active "telomerase. Telomerase is not active in most of us and that is why we age for the most part. The people who had this more active telomerase lived longer and were healthier as a whole. As a matter of fact the study was done in people over 100 years old.

While I do not discount the importance of studies in genetically altered mice, the people who are taking TA-65 and /or supplements that slow down telomere erosion are doing what amounts to the best kind of experiment. One done in free living humans. A study was published earlier this year in Rejuvenation Research detailing the extreme safety of TA-65 and the objective benefits.

Literally every week a new study comes out in humans linking disease states to shorter telomeres including of course cancer. In addition the converse is true; longer telomeres correlate with less disease longer life and better health.

In what I consider to be the research development of the year Dr Mike West and colleagues (including Walter Funk and Bill Andrews) essentially took differentiated somatic cells typical of aging adults and

created the equivalent of an embryonic stem cell line which restored telomerase activity in those adult derived cells to a very early stage.

Simply put they were able to generate very young cells from very old ones. In the process the ethical problems with embryonic stem cells were completely removed. Because of this in the not too distant future you will be able to supply a small amount of your own adult cells from pretty much anywhere on your body and create an embryonic stem cell line with very active "youthful" levels of telomerase and use them to fix what ails you with no compatibility issues since they are "yours" anyway and no ethical issues since you donated them to yourself.

If that is not a huge step to curing aging and the diseases associated with it I don't know what is.

Another question is cancer. Much of the original work on telomerase was done on cancer since this enzyme telomerase is active in 85% of human cancers and confers "immortality" to them. No telomerase no immortal cancer cell lines. So scientists continue to try to develop inhibitors to slow down or even help cure cancer.

So turning on telomerase must give you cancer right!?

Wrong. Every study including the ones done in humans has shown no increase in cancer in people who either are taking a telomerase activator (TA-65) or have the genetics for active telomerase (very rare!).

The longevity supplements that turn on telomerase are and will be far more "natural" to the way it is turned on in our stem cells and our germ cells 2 lines where we already have active telomerase enzymes. This quite different from the way it is turned on in cancer.

Personally I have no question that telomerase activation is the beginning of the possibility of slowing down or even reversing aging IN HUMANS and I have been on TA-65 for some time now as well as a bunch of other supplements we talk about in the book.

TA-65 has been tested at Sierra Sciences to doses that far exceed anything a person could realistically take and there is no evidence of any toxicity of any kind.

Besides all me, all of my immediate family is on the telomerase activator as well as the supplements we know to support the telomere. I want my loved ones to live long and be healthy, and I would never give them anything that would harm them.

The bottom line is this: the first real bridge to longer health span and longer life span for PEOPLE is here right now and it's the topic of our book "The Immortality Edge". If you want to live longer and healthier for real, this is a great place to start.

I will continue to update you on my experiences and findings.

Best, Dr Dave aka Dr Telomere

In the following post there are some specific vitamins and supplements that I have tested for telomerase activation.

Telomere Biology : Anti-aging comes of Age

In an ironic twist of fate the words "anti-aging" which have been so overused up to this point actually have become meaningful again!

Last September 3 American Scientists Elizabeth Blackburn, Carol Greider and Joe Stostak were awarded the Nobel Prize in medicine for their pioneering work in a "new" field of longevity medicine known as Telomere Biology.

The only problem was their field was not "new", it began in the 1970's, and the main focus of telomere biology was up to this point was involved with cancer prevention.

Nonetheless a huge explosion of research was touched off by this event and it coincided with the general public beginning to understand what telomeres are and what they do .

So what are they and what do they do?

In our individual cells (of which we have trillions depending on who is doing the counting!) there are 46 chromosomes that carry our individual genetic makeup or genetic code if you will. We get half from our mom and half from our dad and together these chromosomes determine what we look like and how we function. Our absolute limits in terms of health intelligence and performance abilities are probably locked in there as well.

On the end of each and every one of those chromosomes is a relatively short segment of "genetic" material that does not code for anything. Its sole function is to determine the absolute lifespan of the cell by a series of "time clock" functions.

Basically every time the cell divides the telomere segment gets shorter and that cell gets closer to death. This is happening in most of the cells of the body.

Poor lifestyle choices like being overweight sleeping to little not dealing with stress in a healthy fashion smoking drinking and even too much exercise of the wrong type can accelerate the loss of these telomere segments and shorten the life of the cells and thus of you and me.

There is good news though in that you can slow down the loss of the telomere segments and you can actually lengthen those segments as well.

Supplements that have been shown in scientific studies to slow down the loss of the telomere segments are:

Fish oil

Vitamin D3

Green Tea and probably its extract

Some forms of Multi-vitamins

There is however a big difference between slowing down the loss of these segments and actually adding length to them

So far the only known substance that actually lengthens telomeres is an expensive supplement known as TA-65. I have personally tested many other substances at a nationally renowned Lab, one fo the few qualified to actually run tests on telomere and the enzyme that lengthens them known as telomerase and I can tell you that as of this writing (October 2010) no other supplements have shown any meaningful activity at a dose that is safe for human consumption.

There are other supplements that make similar claims but I have tested a bunch of them and nothing else works when tested by a reputable lab and subjected to repeat testing.

The other thing you should know about telomeres (and believe me there is so much more to tell you) is that having longer telomeres seems to correlate directly with better health not just longer life!

I have written a book about the topic of longevity and specifically telomerase that is due out in January of 2011. I talk about the topic frequently in my newsletters and blogs. I have lectured to doctors all over the country to educate them on this exciting aspect of longevity. If you would like more information fell free to visit my website.

Take home message is that the word “anti-aging” finally mean just that thanks to the field of telomere biology

All the best in longevity and health! DR Dave Woynarowski M.D.

Dr Dave is a Board certified Internist and Board certified anti-aging physician. He owns and operates his own supplement company DrDavesbest.com dedicated to true anti-aging and performance enhancing supplements. Dr Dave still writes his own material and does not use copywriting teams for his newsletters blogs etc. His motto is “Use Mother Nature to Beat Father Time!” He is also co-author of "The Immortality Edge" (Published Dec 2010 by John Wiley and Sons) a book dedicated to teaching everyone about the newest hottest field in anti-aging technology; telomere biology and giving practical proven advice for better health and a longer life that everyone can use RIGHT NOW!

For more information on telomeres you can visit Dr Dave's web site www.drdavesbest.com

Dr Dave is commonly known as "Dr Telomere"!

Guarantee - Please note as of September 1, 2010 Dr Dave's Best can no longer offer any refunds on returned merchandise. Please make sure you want the product before you order it! Any charge backs on products that were ordered will be contested. Sorry for any inconvenience but people have completely abused the refund system. We do not offer money back on any info products including CD, DVD or any other non-consumable product, unless it is defective. In that case, any defective CD, DVD and or books will be promptly replaced after defective merchandise has been returned.

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