Multipath Herbal Nutraceutical Improves Self-Reported Markers of Health and Life Expectancy in Clinical Study

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Abstract

Background

Research indicates that aging and health are affected by hundreds of biochemical pathways. The major goal of this study was to test the effects of a multipath antiaging dietary supplement on healthy adults using markers of health and life expectancy. While results on the clinical lab test markers from the study were published earlier, the self-reported survey markers are reported herein.

Methods

The design of the dietary supplement intervention clinical study was an open-label field study. Fifteen men and women aged 42 to 79 years took a 10 component dietary supplement SC100+ twice daily for 15 weeks. In self-rated surveys taken at the end of the trial, the subjects reported their perceived changes with respect to 6 markers of overall health (Overall Health, Ability to Concentrate, Joint Flexibility, Work Productivity, Ability to Relax, and Immune Function) and 7 potential markers of life expectancy (Stress Tolerance, Energy Level, Endurance, Ease of Walking, Climbing Stairs, Overall Mood, and Vitality). The survey also contained a key control marker (Skin Age Spots) and two secondary control markers (Skin Wrinkles and Vision) that were expected to stay constant during the 15 week trial. Paired two-sided Student t-tests were performed to determine the significance of each marker rating post treatment in comparison to the observed change in the key control marker. The survey results were also compared with the significant changes after 15 weeks of multipath treatment on blood pressure, HDL Cholesterol, stress levels, and lung capacity that were published previously.

Results

In the self-rated surveys taken at the end of the trial, the subjects rated 6 markers of overall health (Overall Health, Ability to Concentrate, Joint Flexibility, Work Productivity, Ability to Relax, and Immune Function) and 7 potential markers of life expectancy (Stress Tolerance, Energy Level, Endurance, Ease of Walking, Climbing Stairs, Overall Mood, and Vitality) as to the degree each marker changed for the better or worse. All of the test markers appeared to significantly improve with respect to the control marker for skin aging spots, while the other secondary control markers indicated no significant improvement. There were no reported side effects. The self-reported survey markers follow a similar positive pattern observed with the clinical tests on blood pressure, HDL Cholesterol, stress levels, and lung capacity from the same clinical trial that was recently published.

Conclusions

While larger placebo-controlled clinical studies are needed, this small pilot trial suggests that complex multipath herbal supplements that target 8 to 10 aging pathways may have the potential to promote overall health without generating significant side effects. The data also provide indirect support for the hypothesis that multipath supplements like SC100+ may extend life expectancy.
Keywords
Aging; Antiaging; Stress; Energy; Mood; Concentration; Endurance; Concentration; Immune Function; Work Productivity; Joint Flexibility; Ability to Relax

List of abbreviations
HDL: High-density lipoprotein
HRV: Heart rate variability
IRB: Institutional Review Board
PEF: Peak expiratory flow
SC100+: Stem Cell 100+

Background
Aging studies in many animal species have reported over a hundred genes linked to the aging process. These published results provide evidence for the Evolution Theory of Aging [1, 2], which predicts that aging leads to poorly functioning organisms as optimal gene function and fitness decline with age after maturation to adulthood. The fact that many genes have altered expression with age suggests the hypothesis that a multipath treatment to nudge the expression of many critical genes back toward youthful fitness levels could promote rejuvenation in older subjects. Since aging plays a major role in age-related diseases and overall health, a multipath natural product approach targeting critical genes involved in aging might also promote overall health and extend life expectancy. This multipath natural product supplement hypothesis was tested in Drosophila aging and was successful in significantly extending mean and maximum life span [3]. Overall health as measured by enhanced fertility also appeared to be improved by the multipath natural product supplement [3].

To test this composite multipath hypothesis in humans, we have completed a small open-label clinical trial that treated 15 healthy subjects for 15 weeks with the multipath nutraceutical supplement SC100+ containing 10 active components. In designing the SC100+ formulation, the strategy was to target a critical number of the known pathways linked to health, fitness, and longevity. The independent targeted pathways included: adult stem cell function, telomere loss, neural stress, diet or exercise induced inflammation, insulin-like growth factors, autophagy, vascular circulation, neural function, and oxidative stress.

In formulating SC100+, we started our research work with natural product extracts found in the herbal multipath supplement that increased mean and maximum lifespan in Drosophila [3] and then added other natural product compounds known to act on other independent age-related pathways. In adding additional nutraceuticals, we identified the subset of nutraceuticals that have a proven history of use in herbal medicine to treat pleotropic human health conditions. We also identified the subset of nutraceuticals that have little or no known side effects. Finally, we focused on stem cell function as a critical factor in rejuvenation [4-6] by screening candidate longevity nutraceuticals for their effectiveness in stimulating and/or maintaining adult stem cell growth in human tissue culture screens. The final ten herbal extracts in SC100+ provide a diverse set of bioactive natural products, which appear to act on many of the critical health and longevity pathways, as is specified in detail in the background to our previous article on the treatment with SC100+ in the clinical trial [7].

The ten SC100+ components are a set of synergistic natural products that act on a critical number of the longevity targets. In our previous publication, we reported on objective lab tests (blood pressure, HDL Cholesterol, heart rate variability as a measure of stress, and lung capacity) from subjects at baseline and post treatment with SC100+ [7]. In this article, I present the self-reported surveys taken by the subjects at the end of the trial that typify the changes in various makers linked to health and life expectancy over the treatment period.

Materials and Methods
Multipath SC100+ dietary supplement and treatment dose

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Copyright: © 2018 Bryant Villeponteau. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
The patent-pending SC100+ dietary supplement has the following 10 active natural products present in each capsule: 1) Astragalus membranaceus root extract; 2) Rhodiola rosea root extract; 3) Vaccinium Uliginosum fruit extract standardized for resveratrol analogs; 4) Tulsi leaf extract; 5) Pine Bark root extract standardized for 94% Oligomeric-Proanthocyanidins; 6) L-Theanine; 7) Genistein; 8) Methyl Folate (300 mcg 5-MTHF); 9) Methyl B12 (250 mcg Methylcobalamin); and 10) Vitamin D3 (1000 IU). The recommended dose was two capsules per day.

Study participants and design
The clinical trial described in this paper was a small open-label pilot study on the effects of SC100+ on health markers in male and female subjects 42 to 79 years of age (mean of 57 years). The needed sample size for some of the markers was calculated based on a smaller pilot study with 5 subjects, wherein blood pressure and cholesterol were measured at baseline and after 6 weeks of treatment. The final trial patient size was determined using an online power analysis calculator for systolic and diastolic blood pressure, HDL Cholesterol, Lung function, and Stress testing. The power analysis showed that a 90% chance of detecting a 5% change in Blood pressure and HDL Cholesterol required 13 to 15 patients, while a 5% change in Lung Function or Stress levels required 5 to 6 patients. Therefore, our goal was a sample size of at least 15 patients without a placebo control. Unfortunately, project funding only allowed for 15 to 16 patients and placebo controls would require almost double our available funding. The open label pilot study was retrospectively registered on Feb. 8, 2017 (NCT03052491).

Sixteen volunteers for the trial were recruited publicly from Los Angeles and San Diego and the actual trial was run March through August of 2016. One subject dropped out in the first week due to unrelated medical problems from doctor-prescribed hormone treatment. The other 15 subjects completed 15 weeks on the SC100+ supplement without any reported side effects. SC100+ capsules were provided by Centagen, Inc. in Boulder, CO.

The selection criteria for the study volunteers consisted of: 1) Excludes subjects younger than 35 years or pregnant women; 2) No history of metastatic cancer, heart attack, or dementia; 3) Currently healthy with no life-threatening diseases; 4) Willing to undergo clinical blood tests and other non-invasive tests at baseline and after taking SC100+; 5) Committed to taking one SC100+ capsule twice daily for the test period; 6) Willing to sign the IRB Research Participant Consent Form.

Subject Recruitment and Follow-Up
The recruitment period started in mid-February, 2016, and continued through early April of 2016. The first subjects started baseline testing March 12, 2016, while the last subject was baseline tested April 10, 2016. All subjects had completed the final testing at the end of the trial by August 14, 2016. Depending on their schedule, SC100+ supplementation and follow up continued for an average of 15 weeks with a minimum of 13.5 weeks and a maximum of 16.5 weeks. All 15 subjects completed the survey at the end of the test period.

Statistical Analysis
Results are expressed as mean +/- 95% t-test confidence intervals. Paired two-sided Student t-tests were performed to evaluate the significance of differences between tested survey markers and the control age spot marker that was not expected to change during the 15 week test. A p value of <0.05 was considered significant. All statistical analyses were carried out with Microsoft Excel and double checked using the commercial scientific statistics software from GraphPad Software, Inc.

Results
SC100+ was tested in an open label pilot study
We have carried out an IRB approved clinical trial using the 10 active component multipath formulation SC100+ to treat human volunteers for a period of 15 week duration. The pilot study was an open-labeled field trial on healthy human subjects. Seven females and eight males participated and completed the trial with no reported side effects. The average age of the subjects was 57 with a range of 42 to 79 years. Most subjects were in their 50s, while 3 subjects were under 50 years of age and 2 subjects were over 70.

The subjects were tested at baseline and after 15 weeks on SC100+ for the following: systolic and diastolic arterial blood pressure, heart rate, total blood cholesterol, HDL blood cholesterol, stress, lung capacity, and self-rated health survey. For the intervention clinical trial, the subjects were instructed to take one SC100+ capsule twice daily at breakfast and dinner. During the clinical trial with SC100+, the subjects were permitted to continue taking their prescription drugs and any supplements that they had previously been taking.
Figure 1 shows a flow chart of the clinical trial. Potential subjects were first contacted at youth soccer matches or using the parental email lists of junior soccer players. Twenty subjects expressed interest in joining the trial and were assessed for eligibility. All 20 subjects were deemed eligible. Three of the 20 subjects later declined to participate and one subject moved away and was thus unavailable for testing. The remaining 16 subjects received a 60 day supply of SC100+. One subject dropped out of the trial in the first week due to issues with hormone replacement therapy that was added a few days before starting the SC100+ study. The remaining 15 subjects completed the trial. Tests for blood pressure, heart rate, cholesterol, stress, and lung capacity were performed on the 15 subjects at baseline and after 15 weeks on SC100+ and were reported in an earlier publication [7]. The self-reported results are described below.

Self-Reported Surveys: SC100+ Promotes Index Markers of Overall Health and Life Expectancy

On completion of 15 weeks on SC100+, the subjects were asked to fill out an online survey to document their self-rated evaluations after taking SC100+. In the survey the subjects choose from a pull-down menu containing the ratings for their perceived changes over the 15 weeks taking the supplement: Much Better (Code = +3), Better (Code = +2), Somewhat Better (Code = +1), Stayed the Same (Code = 0), Somewhat Worse (Code = -1), Worse (Code = -2), or Much Worse (Code = -3) for each index marker. The markers were: Overall Health, Ability to Concentrate, Joint Flexibility, Work Productivity, Ability to Relax, Immune Function, Quality of Sleep, Bowel Regularity, Weight Management, Hair and Nails, Age Spots, Skin Wrinkles, Vision, Stress Tolerance, Energy Level, Endurance, Ease of Walking, Ease of Climbing Stairs, Overall Mood, and Vitality.

To simplify reporting on our analysis, I separated the above markers into four broad categories, which are shown on the left column of Table 1 as Overall Health, Specialized Health Conditions, Controls, and Life Expectancy. The index Markers of Overall Health included the following health markers: Overall Health, Ability to Concentrate, Joint Flexibility, Work Productivity, Ability to Relax, and Immune Function. The Specialized Health Conditions markers include Quality of Sleep, Bowel Regularity, Weight Management, and Hair/Nails, which are a specialized sub-group of Overall Health. The self-reported mean ratings are shown in Table 1 along with the ratings of three Control Index Markers (Age Spots, Skin Wrinkles, and Vision), which were unlikely to change in 15 weeks of taking SC100+ and thus provided a placebo-like check on subjects that might have been overly optimistic in their perception of specific changes where no changes actually occurred.

The self-reported survey of subject marker ratings (Table 1) indicate that the mean ratings for Overall Health markers (Overall Health, Ability to Concentrate, Joint Flexibility, Work Productivity, Ability to Relax, and Immune Function) were highly positive compared to placebo-like claims of improvement in Age Spots (p<0.05). In contrast, positive ratings for the Specialized Health Conditions (Quality of Sleep, Bowel Regularity, Weight Management, and Hair/Nails) were not significantly changed relative to the placebo-like control marker for Age Spots. The two other placebo-like index markers (Vision and Skin Wrinkles) also did not change significantly while taking SC100+. Finally, Table 1 also shows that the hypothesized index markers for Life Expectancy (Stress Tolerance, Energy Level, Endurance, Ease of Walking, Climbing Stairs, Overall Mood, and Vitality) were all rated as significantly improved with SC100+ treatment relative to the rating for the placebo-like control marker for Age Spots.

Lab Test versus Survey Values for Each Subject along with Age and Gender Data

To check whether the lab tests on cardio health (blood pressure, heart rate, and HDL Cholesterol) and Stress/Lung tests from our previously published article [7] tell a different story from the self-reported Health and Life Exp surveys (shown in Table 1) or vary with age or gender, I have compared the combined test and survey data for all 15 subjects in Table 2 below.

The combined scores in Table 2 allow us to analyze many aspects of the differing data sets. First, I checked whether the Health and Life Exp surveys give differing results. A paired t test gave a value of p = 0.66, suggesting the Health and Life Exp surveys do not give significantly different results for the individual subjects. Likewise I checked the Cardio and Stress/lung tests for significant differences by pair t tests and found p = 0.32, suggesting little significant differences in differing types of lab measurements.

We next checked whether the combined lab tests values for each subject are significantly different from combined self-reported survey data (column 9 versus 8
Figure 1: Participant Clinical Flow Diagram: The flow of subjects through each stage of the SC100+ clinical study is shown in the Clinical Flow Diagram.

Table 1: SC100+ Promotes Improvement in Markers of Overall Health and Life Expectancy

<table>
<thead>
<tr>
<th>Markers</th>
<th>Outcome Measures</th>
<th>Mean +/- 95% CI</th>
<th>Paired t Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Health</td>
<td>Overall Health</td>
<td>1.87 +/- 0.354</td>
<td>p &lt; 0.00001</td>
</tr>
<tr>
<td></td>
<td>Ability to Concentrate</td>
<td>1.80 +/- 0.374</td>
<td>p = 0.00001</td>
</tr>
<tr>
<td></td>
<td>Joint Flexibility</td>
<td>1.00 +/- 0.513</td>
<td>p = 0.010</td>
</tr>
<tr>
<td></td>
<td>Work Productivity</td>
<td>1.60 +/- 0.585</td>
<td>p = 0.0006</td>
</tr>
<tr>
<td></td>
<td>Ability to Relax</td>
<td>0.93 +/- 0.532</td>
<td>p = 0.036</td>
</tr>
<tr>
<td></td>
<td>Immune Function</td>
<td>1.47 +/- 0.692</td>
<td>p = 0.003</td>
</tr>
<tr>
<td>Special Conditions</td>
<td>Quality of Sleep</td>
<td>0.53 +/- 0.411</td>
<td>p = 0.262</td>
</tr>
<tr>
<td></td>
<td>Bowel Regularity</td>
<td>0.60 +/- 0.520</td>
<td>p = 0.334</td>
</tr>
<tr>
<td></td>
<td>Weight Management</td>
<td>0.80 +/- 0.630</td>
<td>p = 0.155</td>
</tr>
<tr>
<td></td>
<td>Hair and Nails</td>
<td>0.60 +/- 0.504</td>
<td>p = 0.173</td>
</tr>
<tr>
<td>Controls</td>
<td>Age Spots</td>
<td>0.27 +/- 0.254</td>
<td>Paired Control</td>
</tr>
<tr>
<td></td>
<td>Skin Wrinkles</td>
<td>0.40 +/- 0.281</td>
<td>p = 0.334</td>
</tr>
<tr>
<td></td>
<td>Vision</td>
<td>0.40 +/- 0.408</td>
<td>p = 0.546</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>Stress Tolerance</td>
<td>1.53 +/- 0.587</td>
<td>p = 0.0018</td>
</tr>
<tr>
<td></td>
<td>Energy Level</td>
<td>1.80 +/- 0.521</td>
<td>p &lt; 0.00001</td>
</tr>
<tr>
<td></td>
<td>Endurance</td>
<td>1.47 +/- 0.626</td>
<td>p = 0.0004</td>
</tr>
<tr>
<td></td>
<td>Ease of Walking</td>
<td>0.87 +/- 0.507</td>
<td>p = 0.033</td>
</tr>
<tr>
<td></td>
<td>Ease of Climbing Stairs</td>
<td>1.00 +/- 0.554</td>
<td>p = 0.022</td>
</tr>
<tr>
<td></td>
<td>Overall Mood</td>
<td>1.47 +/- 0.587</td>
<td>p = 0.005</td>
</tr>
<tr>
<td></td>
<td>Vitality</td>
<td>1.33 +/- 0.540</td>
<td>p = 0.0007</td>
</tr>
</tbody>
</table>
Table 1 is data derived from a self-reported survey at the end of the trial, where the subject rates his or her perception of any benefit/harm after taking SC100+ using various index markers. The subject goes online and chooses from a pull-down menu containing the ratings: Much Better (Code = +3), Better (Code = +2), Somewhat Better (Code = +1), Stayed the Same (Code = 0), Somewhat Worse (Code = -1), Worse (Code = -2), or Much Worse (Code = -3). The mean coded score is shown in column 3 for each outcome measure and is shown with +/- the 95% Confidence Intervals (CI). The last column is the paired student t probability of significance that compares each outcome measure versus the placebo-like Age Spots marker (shown as the first Control Marker in Table 1).

Table 2: Combined Lab Test and Survey Values for all subjects

<table>
<thead>
<tr>
<th>Subject #</th>
<th>Age</th>
<th>Compliant</th>
<th>Health Survey</th>
<th>Life Exp Survey</th>
<th>Cardio Tests</th>
<th>Stress/Lung Tests</th>
<th>All Surveys</th>
<th>All lab Tests</th>
<th>Health Survey</th>
<th>Life Exp Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (F)</td>
<td>42</td>
<td>100%</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>ND</td>
<td>17</td>
<td>20</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>2 (F)</td>
<td>45</td>
<td>40%</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3 (M)</td>
<td>45</td>
<td>100%</td>
<td>16</td>
<td>15</td>
<td>8</td>
<td>ND</td>
<td>31</td>
<td>18</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>4 (M)</td>
<td>52</td>
<td>75%</td>
<td>6</td>
<td>2</td>
<td>10</td>
<td>12</td>
<td>8</td>
<td>22</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>5 (M)</td>
<td>53</td>
<td>100%</td>
<td>10</td>
<td>9</td>
<td>13</td>
<td>ND</td>
<td>19</td>
<td>23</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>6 (F)</td>
<td>54</td>
<td>100%</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>12</td>
<td>23</td>
<td>22</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>7 (M)</td>
<td>54</td>
<td>100%</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>20</td>
<td>16</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>8 (F)</td>
<td>55</td>
<td>30%</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>5</td>
<td>13</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>9 (F)</td>
<td>56</td>
<td>100%</td>
<td>10</td>
<td>10</td>
<td>14</td>
<td>16</td>
<td>20</td>
<td>30</td>
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<td>10</td>
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<tr>
<td>10 (M)</td>
<td>56</td>
<td>90%</td>
<td>9</td>
<td>6</td>
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<td>11</td>
<td>15</td>
<td>25</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>11 (F)</td>
<td>58</td>
<td>100%</td>
<td>20</td>
<td>17</td>
<td>8</td>
<td>8</td>
<td>37</td>
<td>16</td>
<td>20</td>
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<tr>
<td>12 (M)</td>
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<td>100%</td>
<td>5</td>
<td>10</td>
<td>17</td>
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<td>10</td>
</tr>
<tr>
<td>13 (F)</td>
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<td>100%</td>
<td>10</td>
<td>9</td>
<td>14</td>
<td>6</td>
<td>19</td>
<td>20</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>14 (M)</td>
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<td>9</td>
<td>15</td>
<td>16</td>
<td>14</td>
<td>24</td>
<td>30</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>15 (M)</td>
<td>79</td>
<td>100%</td>
<td>11</td>
<td>10</td>
<td>17</td>
<td>10</td>
<td>21</td>
<td>27</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Mean</td>
<td>57</td>
<td></td>
<td>9.6</td>
<td>9.3</td>
<td>11.2</td>
<td>10.2</td>
<td>18.9</td>
<td>21.3</td>
<td>9.6</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Table 2 summarizes the Health and Life Exp (Life Expectancy) surveys by combining the self-reported survey values for each subject (Columns 4 and 5). Likewise the combined Cardio (blood pressure, heart rate, and HDL Cholesterol) and Stress/Lung tests are shown for each subject in columns 6 and 7. In setting values for Cardio, blood pressure is given 8 points total (e.g. negative changes = 0, no change = 2, small positive change = 4, positive mean change = 3, and 2X mean change = 4), heart rate is given 4 points total, and HDL Cholesterol is given 8 points total using similar coding strategy. Column 8 combines the scores from the Health and Life Exp surveys to calculate the All Surveys score. Column 9 combines both the Cardio and Stress/lung scores to get the All Lab Tests score. ND = Not Done and mean Stress/Lung test average of 10 was used to obtain the All Lab Test Values in column 9 for the missing ND cases.

We also tested whether the data is significantly different if you compare the composite gender data for males versus females: The non-paired t tests give a value of p = 0.34, suggesting there are no significant difference between male and female combined values.

Discussion
The self-reported survey results shown in Table 1 suggest that all of the ratings for markers affecting Overall Health (Overall Health, Concentration, Joint Flexibility,
Work Productivity, Ability to Relax, and Immune Function) were significantly positive compared to placebo-like claims of improvement in Age Spots (p<0.05). While one should be cautious with self-reported data, these results provide suggestive support for our hypothesis that SC100+ promotes overall health.

Like the markers for Overall Health, the proposed markers for Life Expectancy (Stress Tolerance, Energy Level, Endurance, Ease of Walking, Climbing Stairs, Overall Mood, and Vitality) were significantly improved compared to placebo-like claims of improvement in Age Spots (p<0.05). Stress Tolerance and Endurance have both been linked to longevity and all-cause mortality in both animals and humans [8-11]. Other studies have shown that higher scores on mobility and Activities of Daily Living (ADL) are associated with lower all-cause mortality [12], which link mobility markers like Energy level, Ease of Walking, Ease of Climbing Stairs, and Vitality as indices of life expectancy. Finally, Mood Disorders cause big increases in mortality risks [13, 14]. The results in Table 1 indicate that all of these indirect life expectancy markers are rated largely positive by SC100+ treated subjects.

The Table 1 results are further supported by our previously published lab test data reporting that the same SC100+ treatment significantly lowered blood pressure and stress, while significantly raising HDL cholesterol and lung function [7]. Blood pressure is an important indicator of overall health and longer life [15]. Stress is very strong predictor of overall health and all-cause mortality [10, 16-18]. People with higher levels of HDL cholesterol have lower risks of ill health, frailty, and total mortality, while having higher physical performance levels and cognition [19-22]. Lung function (as measured by peak expiratory flow or PEF) has been shown to be a valid measure of overall health status and all-cause mortality [23-27].

Table 2 combines the published lab test data on blood pressure, stress, HDL cholesterol, and lung function with the self-reported survey data for the individual subjects. The accumulated data in Table 2 from both the lab tests and survey data suggest that there is not a significant difference in the results for the lab tests versus the self-reported survey questions or males versus females or differing responses with age. Thus, a subject who scores very high on the lab test data is also likely to give high ratings to markers of overall health or life expectancy. Taken together, both the lab test data and the self-reported survey data provide suggestive support for our hypothesis that SC100+ promotes overall health and life expectancy.

One difference that does appear to be important was compliance in taking the SC100+ supplement, as the two females (subjects 2 and 8) with low treatment compliance rates estimated at 40% and 30% compliance respectively had about one half of the mean values of those with 100% compliance (Table 2). This can be viewed as an effect of low dosage of SC100+.

Limitations of this preliminary study are easy to identify. First, this was an open-label clinical study without a placebo test group. In practice, many of the variables testing significant in the published study were objective tests such as lung function, HDL Cholesterol, and HRV tests [7], which typically test very low in placebo tests. In the case of the self-reported surveys in Table 1, I included survey questions that were not expected to change while taking SC100+, so as to better determine the power of any placebo effect on self-reported improvements.

A second limitation of the preliminary study is the small size of 15 subjects. A larger trial would be needed to have better confidence in these promising results. Despite the small size, both genders were represented and all ages in the 40s, 50s, 60s, and 70s were part of the trial and showed positive trends with respect to the Overall Health and Life Expectancy markers.

A third limitation of this pilot study is the short duration of 15 weeks, which may not be long enough to accurately measure sustained changes in the markers of Life Expectancy. Some would argue that a study of 3 to 5 years would be needed to really determine what might be happening with Life Expectancy.

Notwithstanding the possible limitations, this study suggests that simultaneously targeting multiple critical antiaging pathways has the potential to give pleotropic beneficial effects to healthy people. Since most age-related conditions and diseases have multiple causes, this apparent success of addressing multiple genetic and biochemical pathways simultaneously has important implication for future clinical trials and current clinical practice.

Declarations
Ethics approval and consent to participate
The clinical trial (IRCM-2016-091) was approved for up to 20 subjects by the Institutional Review Board (IRB) in the Institute of Regenerative and Cellular Medicine on Feb. 25, 2016. Written informed consent for the clinical trial was obtained from all volunteers prior to baseline testing and the informed consent forms were
approved by the IRB. The selection of subjects for the study adhered to NIH guidelines.

**Consent for publication**

Not applicable

**Availability of data and materials**

The dataset generated and analyzed from the 15 individual subjects during the current study are included in the current study as a PDF supporting file (see Clinical Raw Data). As for the SC100+ dietary supplement, contact info@Centagen.com for SC100+ research samples or purchase the commercial version of SC100+ (Stem Cell 100+) online at www.Centagen.com.

**Competing interests**

BV is a cofounder, unpaid consultant, and equity holder in Centagen. This does not alter the author’s adherence to the policies on sharing data or materials.

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**Author’s Information**

BV has a career in both academia and biotech (see BV’s biographical summary in Wikipedia).

**Trial Registration**

The open label pilot study was registered retrospectively on Feb. 8, 2017 (NCT03052491).

**References**


