Scientific Evidence-based

Efficacies of Korean Red Ginseng

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KOREA GINSENG CORP
I. Introduction

II. Efficacy of Korean Red Ginseng (KRG)
   - Boost the immune system
   - Help recovery from fatigue
   - Support blood circulation
   - Support memory function
   - Act with anti-oxidant properties
   - Improve female health in perimenopause

III. Other efficacy of KRG

IV. Misunderstanding & Safety of KRG

V. Conclusion
Korean Ginseng

- Scientific name:
  - Family: Araliacea
  - Genus: Panax (Greek word, Pan=all, axos=cure)
  - Species: Panax ginseng C. A. Meyer

- Perennial shade plant
  - cultivated for 4-6 years

- Ginseng is the root of Panax ginseng C. A. Meyer, used as a tonic, prophylactic and restorative medicine for thousands of years
Classification by processing method

❖ **Fresh ginseng**
  - Unprocessed ginseng, harvested from a field.

❖ **White ginseng**
  - Mostly 4 to 5 years-old fresh ginseng skin peeled and dried.

❖ **Red ginseng**
  - Mostly 6-years-old fresh ginseng
  - Steamed and dried fresh ginseng
  - Light yellowish brown to light reddish brown in color
  - New ginsenosides and other ingredient are produced
I. Introduction

Manufacturing process of Red Ginseng (ISO 19610)

1. Fresh Ginseng (*Panax ginseng* C.A.Meyer)
2. Washing
3. Steaming
4. Drying
   - Hot air
   - Sun light
5. Dried Steamed Ginseng (Red Ginseng)
6. Packaging
II. Efficacy of KRG

Panax ginseng & Efficacy area _pubmed_(~2011)

- Others 1128(33%)
- Menopausal 19(1%)
- Anxiolytic 22(1%)
- Hyperlipidemia 24(1%)
- Antiobesity 26(1%)
- Sexual 30(1%)
- Hypertension 39(1%)
- Fatigue 59(2%)
- Inflammatory 106(3%)
- Anti-diabetes 109(3%)
- Radiation 118(3%)
- Immune 123(4%)
- CNS 224(7%)
- Liver 236(7%)
- Cardiovascular 260(8%)
- Antioxidant 321(9%)
- Cancer 366(11%)

Total 3,413

※ Currently more than 4,000 (~2017)
Ⅱ. Efficacy of KRG

6 Efficacies of KGC Korean Red Ginseng Certified by KFDA

- Act with anti-oxidant properties
- Help recovery from fatigue
- Boost the immune system
- Improve female health in perimenopause
- Support blood circulation
- Support memory function

Adaptogenic Activity
KRG decreased significantly the incidence of common cold symptom complex in the all patient during a 2-year accumulation investigation.
The effect of Korean red ginseng supplement on CK, GOT, peak torque, and ROM after strenuous downhill running

- KRG 40mg/kg (2.5~4g/day)
- Placebo

For 14 days

Monitoring for 7 days

For 45 min

Biomarkers for muscle injury

- CK
- GOT

- KRG stimulated the recovery of creatine kinase and GOT after down hill exercise.
- KRG may improve muscular fatigue and protect muscle injury with vigorous exercise.
Ⅱ. Efficacy of KRG

Support blood circulation

- Platelet adhesion
- Platelet plug
- Platelet aggregation
- Thrombus

- Atherosclerosis
- Cerebrovascular diseases
- Myocardial infarction

Figure 4. Plaque Rupture and Thrombosis

Cell 104:503 2001
II. Efficacy of KRG

Support blood circulation

Effect of Korean Red Ginseng extract on blood circulation in healthy volunteers: A randomized, Double-blind, Placebo-controlled trial

- 87 healthy volunteers, 1.5 or 3 g/day, for 8 weeks
- ADP & Collagen, platelet aggregation promoters were reduced by Korean red ginseng

- KRG may improve blood circulation by inhibiting thrombus formation, and can prevent from cardiovascular diseases, such as atherosclerosis, myocardial infraction, and cerebrovascular diseases.
Cerebrum cortex / hippocampus in memory and cognition

- The selective lesion in pyramidal cells in hippocampal CA1 region impairs learning and memory
- Neural progenitor cells in hippocampus is involved in learning and memory

II. Efficacy of KRG

Support memory function
II. Efficacy of KRG

Support memory function

Protective effect of ginsenosides, active ingredients of Panax ginseng, on kainic acid-induced neurotoxicity in rat hippocampus

Protective effect on neuronal damage

- Pretreatment of KRG saponin (50 or 100 mg/kg for 7 days, ip) significantly attenuates KA-induced cell death in the CA1 and CA3 regions
Ⅱ. Efficacy of KRG

Support memory function

Proof of the mysterious efficacy of ginseng: basic and clinical trials: effects of red ginseng on learning and memory deficits in an animal model of amnesia

- Korean red ginseng (100mg/day, p.o.) • young rat with hippocampal lesion • tested 3 spatial learning paradigms

A. Sham + water
   a. 1st day
   t = 600 s
   n = 8
   d = 4289.5 cm

   b. 14th day
   t = 189.2 s
   n = 50
   d = 8470.5 cm

   c. 28th day
   t = 189.5 s
   n = 50
   d = 7656.9 cm

B. Ischemia + water
   a. 1st day
   t = 600 s
   n = 7
   d = 3490.4 cm

   b. 14th day
   t = 600 s
   n = 6
   d = 3055.0 cm

   c. 28th day
   t = 600 s
   n = 35
   d = 6182.8 cm

C. Ischemia + ginseng
   a. 1st day
   t = 600 s
   n = 5
   d = 2736.5 cm

   b. 14th day
   t = 189.2 s
   n = 50
   d = 6158.4 cm

   c. 28th day
   t = 400.8 s
   n = 50
   d = 6316.8 cm
Ⅱ. Efficacy of KRG

Act with anti-oxidant properties

Reactive oxygen species

Red ginseng /saponin /etc.

Oxidative Damage

Aging, Cancer, Diabetes, Degenerative brain disease, Atherosclerosis . . .
Ⅱ. Efficacy of KRG

Beneficial effects of Korean red ginseng on lymphocyte DNA damage, antioxidant enzyme activity, and LDL oxidation in healthy participants: a randomized, double-blind, placebo-controlled trial

Effects of 8-week supplementation of Korean red ginseng (KRG) on lymphocyte DNA damage LDL oxidation.

A. Comparison of mean values for damaged tail length (μm) and tail moment in lymphocyte DNA and the concentrations of oxidized LDL (U/L).

Nutrition Journal 2012, 11:47
B. Images of lymphocyte DNA damage performed by comet assay before and after treatment between the placebo and high-dose groups.
Ⅱ. Efficacy of KRG

Clinical Efficacy of Korean Red Ginseng on Postmenopausal Syndrome

- 30 patients (suffered postmenopausal symptoms), 57.3 years
- 6 capsules/day (KRGE & herbal extract) → Kupperman index

<table>
<thead>
<tr>
<th>Factors</th>
<th>Pre-treat</th>
<th>Post 4wks</th>
<th>Post 8wks</th>
<th>Post 12wks</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot flush</td>
<td>안면홍조</td>
<td>64</td>
<td>32</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>Neuropsychological Sx (Anxiety, Headache)</td>
<td>신경/심리 증상 (불안, 두통)</td>
<td>60</td>
<td>32</td>
<td>36</td>
<td>20</td>
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<tr>
<td>Paresthesia</td>
<td>지각이상</td>
<td>28</td>
<td>8</td>
<td>18</td>
<td>24</td>
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<td>Insomnia</td>
<td>불면</td>
<td>28</td>
<td>14</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Nervousness</td>
<td>신경질</td>
<td>10</td>
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<td>2</td>
<td>6</td>
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<tr>
<td>Depression</td>
<td>우울증</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>4</td>
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<tr>
<td>Vertigo</td>
<td>어지럼증</td>
<td>17</td>
<td>3</td>
<td>5</td>
<td>11</td>
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<tr>
<td>Fatigue</td>
<td>피로</td>
<td>23</td>
<td>16</td>
<td>17</td>
<td>9</td>
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<tr>
<td>Arthralgia</td>
<td>관절통</td>
<td>20</td>
<td>13</td>
<td>12</td>
<td>7</td>
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<tr>
<td>Myalgia</td>
<td>근육통</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Palpitation</td>
<td>드근거림</td>
<td>16</td>
<td>7</td>
<td>6</td>
<td>4</td>
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<tr>
<td>Urinary Sx</td>
<td>비뇨기과 증상</td>
<td>45</td>
<td>45</td>
<td>36</td>
<td>36</td>
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<tr>
<td>Motor Sx (Backpain)</td>
<td>운동성 증상 (요추염좌)</td>
<td>30</td>
<td>27</td>
<td>33</td>
<td>30</td>
</tr>
<tr>
<td>Sweat, Dry mouth</td>
<td>담, 구강건조</td>
<td>48</td>
<td>39</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Gastrointestinal Sx</td>
<td>위장성 증상</td>
<td>30</td>
<td>15</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4. Changes of factors in menopausal index before and after treatment
### Ⅲ. Other Efficacy of KRG

Korean red ginseng (Panax ginseng) improves glucose and insulin regulation in well-controlled, type 2 diabetes: Results of a randomized, double-blind, placebo-controlled study of efficacy and safety.

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>KRG</th>
<th></th>
<th>KRG</th>
<th>KRG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 0</td>
<td>Week 12</td>
<td>Change</td>
<td>Week 0</td>
<td>Week 12</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>6.6 ± 0.3</td>
<td>6.5 ± 0.3</td>
<td>−0.1 ± 0.1</td>
<td>6.4 ± 0.3</td>
<td>6.5 ± 0.3</td>
</tr>
<tr>
<td>Fasting indices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FPG (mmol/L)</td>
<td>7.7 ± 0.4</td>
<td>8.2 ± 0.7</td>
<td>0.4 ± 0.5</td>
<td>7.4 ± 0.4</td>
<td>7.2 ± 0.4</td>
</tr>
<tr>
<td>FPI (pmol/L)</td>
<td>35 ± 4</td>
<td>38 ± 6</td>
<td>3 ± 7</td>
<td>47 ± 4</td>
<td>31 ± 3</td>
</tr>
<tr>
<td>HOMA-IS (composite)</td>
<td>0.6 ± 0.1</td>
<td>0.6 ± 0.1</td>
<td>0.0 ± 0.1</td>
<td>0.6 ± 0.1</td>
<td>0.7 ± 0.1</td>
</tr>
</tbody>
</table>

Fast plasma insulin (FPI) decreased by 34% and homeostasis model assessment -insulin sensitivity (HOMA-ISI) increased by 33% on KRG ($P < 0.05$) compared with placebo.
Korean red ginseng (Panax ginseng) improves glucose and insulin regulation in well-controlled, type 2 diabetes: Results of a randomized, double-blind, placebo-controlled study of efficacy and safety.
Korean Red Ginseng Improves Vascular Stiffness in Patients with Coronary Artery Disease

Changes in systolic (A) and diastolic (B) blood pressure (BP) following a 10-week treatment with Korean red ginseng or placebo.

Changes in heart femoral (hf)- pulse wave velocity (PWV) (A) and brachial ankle (ba)-PWV (B) in patients with coronary artery disease following a 10-week treatment with Korean red ginseng or placebo.
KRG decreases systolic BP and arterial stiffness, probably via the inhibition of ROCK activity, in patients with coronary artery disease.

Changes in Rho-associated kinase (ROCK) activity in peripheral blood mononuclear cells (PBMCs) following a 10-week treatment with Korean red ginseng or placebo in four patients with coronary artery disease.

※ Rho-associated kinase: mediating oxidative stress signaling

ROCK activity is significantly correlated with vascular stiffness.
Red Ginseng Extract Improves Coronary Flow Reserve and Increases Absolute Numbers of Various Circulating Angiogenic Cells in Patients with First ST-Segment Elevation Acute Myocardial Infarction

- Red ginseng extract, 3 g/day, for 8 months

Eligible patients (n = 50) were randomly assigned to receive either red ginseng extract (25 patients) or placebo (25 patients), and red ginseng extract (3 g/day) was coadministered with 75 mg of clopidogrel and 100 mg of aspirin on a daily basis. AMI, acute myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass surgery; DS, diameter stenosis.
Ⅲ. Other Efficacy of KRG

**Phytother Res. 2011, 25: 239–249**

Red Ginseng Extract Improves Coronary Flow Reserve and Increases Absolute Numbers of Various Circulating Angiogenic Cells in Patients with First ST-Segment Elevation Acute Myocardial Infarction

Table 3. Initial and 8-month follow-up coronary flow measurements in the infarct-related artery between the red ginseng and the placebo groups

<table>
<thead>
<tr>
<th></th>
<th>Red ginseng group (n = 25)</th>
<th>Placebo group (n = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>After adenosine</td>
</tr>
<tr>
<td><strong>Initial measurements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak diastolic velocity (cm/s)</td>
<td>45.8 ± 21.8</td>
<td>79.1 ± 28.3^a</td>
</tr>
<tr>
<td>Changes from baseline (cm/s)</td>
<td>33.3 ± 25.4</td>
<td></td>
</tr>
<tr>
<td>Peak systolic velocity (cm/s)</td>
<td>22.3 ± 11.6</td>
<td>44.2 ± 22.4^a</td>
</tr>
<tr>
<td>Changes from baseline (cm/s)</td>
<td>22.8 ± 15.1</td>
<td></td>
</tr>
<tr>
<td>Average peak flow velocity (cm/s)</td>
<td>25.1 ± 11.1</td>
<td>51.9 ± 22.3^a</td>
</tr>
<tr>
<td>Changes from baseline (cm/s)</td>
<td>25.5 ± 22.1</td>
<td></td>
</tr>
<tr>
<td>Diastolic-systolic peak velocity ratio</td>
<td>2.07 ± 1.29</td>
<td>1.79 ± 0.91^a</td>
</tr>
<tr>
<td>Changes from baseline</td>
<td>-0.29 ± 0.69</td>
<td></td>
</tr>
<tr>
<td>Heart rate (bpm)</td>
<td>71.8 ± 10.9</td>
<td>79.1 ± 11.1^a</td>
</tr>
<tr>
<td>Changes from baseline (bpm)</td>
<td>7.1 ± 8.4</td>
<td></td>
</tr>
<tr>
<td>PDVR</td>
<td>1.72 ± 0.75</td>
<td></td>
</tr>
<tr>
<td>PSVR</td>
<td>1.99 ± 0.68</td>
<td></td>
</tr>
<tr>
<td>Coronary flow reserve</td>
<td>2.01 ± 0.75</td>
<td></td>
</tr>
<tr>
<td><strong>8-month measurements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak diastolic velocity (cm/s)</td>
<td>36.9 ± 24.2</td>
<td>90.1 ± 38.3^a</td>
</tr>
<tr>
<td>Changes from baseline (cm/s)</td>
<td>43.2 ± 33.6</td>
<td></td>
</tr>
<tr>
<td>Peak systolic velocity (cm/s)</td>
<td>20.1 ± 14.5</td>
<td>48.1 ± 33.2^a</td>
</tr>
<tr>
<td>Changes from baseline (cm/s)</td>
<td>27.9 ± 23.6</td>
<td></td>
</tr>
<tr>
<td>Average peak flow velocity (cm/s)</td>
<td>18.8 ± 10.7</td>
<td>52.6 ± 24.2^a</td>
</tr>
<tr>
<td>Changes from baseline (cm/s)</td>
<td>33.3 ± 19.8</td>
<td></td>
</tr>
<tr>
<td>Diastolic-systolic peak velocity ratio</td>
<td>1.85 ± 0.96</td>
<td>1.67 ± 0.87^a</td>
</tr>
<tr>
<td>Changes from baseline</td>
<td>-0.18 ± 0.61</td>
<td></td>
</tr>
<tr>
<td>Heart rate (bpm)</td>
<td>68.9 ± 9.2</td>
<td>73.1 ± 10.1^a</td>
</tr>
<tr>
<td>Changes from baseline (bpm)</td>
<td>4.2 ± 7.7</td>
<td></td>
</tr>
<tr>
<td>PDVR</td>
<td>2.16 ± 1.26</td>
<td></td>
</tr>
<tr>
<td>PSVR</td>
<td>2.41 ± 0.93^b</td>
<td></td>
</tr>
<tr>
<td>Coronary flow reserve</td>
<td>2.80 ± 0.91^b</td>
<td></td>
</tr>
</tbody>
</table>

Coronary flow reserve (CFR, 관상동맥예비혈량) were similar between the two groups at baseline, and CFR was significantly higher in the red ginseng group than in the placebo group (2.80±0.91 and 2.56±0.77, p < 0.05, respectively) after 8 months of red ginseng administration.
Red ginseng extract increased CD34+, CXCR4+ and CD117+ circulating angiogenic cell mobilization and decreased inflammation in acute myocardial infarction (AMI) patients, thereby improving CFR during the 8-month follow-up.
IV. Misunderstanding & Safety of KRG

1) Single and 28-day Repeated Oral Dose Study in mice
   ✓ Korean red ginseng extracts, 14 days, 50~2000 mg/kg, oral
   ✓ No observed adverse effect

2) 28-day and 90-day Repeated Oral Dose Study in rats
   ✓ Korean red ginseng extracts, 14 days, 0, 500, 1000, 2000 mg/kg, oral
   ✓ No observed adverse effect

3) 6-Month Repeated Dose Study in Rats
   ✓ Rats were fed ginseng added feed (0.625, 1.25, 2.5 g/kg)
   ✓ No observed adverse effect

4) Embryo-Fetal Toxicity in mice
   ✓ Korean red ginseng extracts, 14 days, 20, 200, 2000 mg/kg/day, oral
   ✓ No observed adverse effect
This study confirms the safety and tolerability on daily KRG intake of 2g dosage for 24-week period in healthy adults.

“Korean red ginseng is safe !!”
Thank you!