What is Pandoradiet™?

Pandoradiet™ is a proprietary extract powder of *Boesenbergia pandurata*, an edible plant with efficacies related to weight management and anti-skin aging. These effects have been proven in animal tests as well as human clinical studies, and its mechanism of action has been elucidated. Pandoradiet™ is 100% safe for consumption, and it is highly water-soluble, heat-stable, and acid-stable, enabling its versatile application in various formulations: drink, tablet, capsule, granule, etc.

*Boesenbergia pandurata* is an edible plant and member of the Zingiberaceae family, and it is found either in the wild or cultivated in the South Asia region. Our R&D team has discovered that *Boesenbergia pandurata* extract shows simultaneous efficacies related to weight management and anti-skin aging via extensive screening of over 1,000 medicinal plants over a period of 10 years.

Standardization of Pandoradiet™

Pandoradiet™ is standardized to Panduratin A, an active component.

Safety of Pandoradiet™

- Acute Oral Toxicity: LD₅₀ was found to be >2,000 mg/kg b.w. in male and female rats.
- No mutagenicity or genotoxicity.
  - Chromosomal aberration test: Negative
  - Ames Bacterial Reverse Mutation Assay: No mutagenic potential was observed.
  - Micronucleus Test: Negative.
- Human Clinical Studies: No adverse effects reported.
- Well-established safety of *Boesenbergia pandurata*.
  - Root or rhizome of *Boesenbergia pandurata* listed as food in CODEX (34th Session, Geneva, Switzerland, 4-9 JULY 2011, HS 3322).
  - *Boesenbergia pandurata* listed as edible in USDA plant database (PI 260833, PI 262357).

Efficacies of Pandoradiet™

1. Weight management: reduction of body weight and body fat; works exercise mimetic.
2. Anti-skin aging: reduction of wrinkling and improvement of skin moisture and glossiness.
   * Efficacies were shown to be statistically significant in five animal studies and two randomized, double-blind, placebo-controlled human clinical studies on total 203 participants.

Journal Publications on Pandoradiet™

**Weight management**

**Anti-skin-aging**
- Oral administration of fingerroot (*Boesenbergia pandurata*) extract reduces ultraviolet b-induced skin aging in hairless mice (*Food Science and Biotechnology*, 2012, 21(6);1753-1760).
Clinical Study: Weight Management

Test material: Pandoradiet™ 600 mg.
Design: randomized, double-blind, placebo-controlled; 12 weeks.
Subjects: n=150 (39 men, 111 women): Weight (kg) 71.9; BMI (kg/m²) 27.4.
Analysis: ITT (intention to treat analysis)/ANCOVA.

**Body weight & BMI reduction**
Weight 182% and BMI 197% were reduced in Pandoradiet™ group in comparison with the control group after 12 weeks.

**Reduction of total fat and body fat in body parts as measured by DEXA* scanning**
Total fat, trunk fat, and android fat contents were reduced by 136%, 125%, and 123%, respectively, in the Pandoradiet™ group in comparison to fat contents of the control group.

*DEXA: Dual-energy X-ray absorptiometry

**Mechanism of action of Pandoradiet™ on weight management**
Pandoradiet™ activates LKB1-mediated AMPK (AMP-activated protein kinase) and PPAR (peroxisome proliferator-activated receptors) α/δ signalling pathway for its weight management effect. Activation of AMPK results in ACC inactivation, which then reduces the malonyl-CoA concentration, and inhibits lipid utilization. Reduction of malonyl-CoA concentration leads to activation of carnitine palmitoyltransferase (CPT)-1 to promote β-oxidation of fatty acids. Increased expression of PPARα and PGC-1α also promotes β-oxidation of fatty acids.
Animal Study of Weight Management

In an obese mouse model induced by high fat diet (HFD), when Pandoradiet™ was administered, body fat % decreased considerably by up to 32.9% while adipocyte size decreased by 45% compared to HFD only-fed mice.

**Comparison: whole body fat by CT * scan**

- **HFD**: Body fat = 66.7%
- **HFD + Pandoradiet™200 mg**: Body fat = 44.7%

---

**Change in Adipocyte Size**

- HFD
- HFD + Pandoradiet™

**Relative adipocyte size (% of HFD)**

- -45%

---

Especially, white fat, known as bad fat, decreased by 19% while brown fat, known as good fat, increased by as much as 86% by Pandoradiet™ feeding.

**Organ volume (% HFD)**

- Whole body
- White fat
- Muscle
- Brown fat

- -19%
- +117%
- +86%

**Decrease of White fat mass by body parts**

- Epididymal fat
- Peritoneal fat
- Subcutaneous fat

- -30%
- -50%

**Exercise Mimetic Effect of Pandoradiet™**

In the mouse treadmill test, Pandoradiet™ feeding increased running endurance of HFD mice as indicated by a dose-dependent increase in time to exhaustion of 340%, implying its exercise mimetic effect.

**Time to exhaustion (Treadmill test)**

- Control: 23.4 min
- HFD: 5.4 min
- Sibutramin: 12.9 min
- Pandoradiet™ 100 g: 15.8 min
- Pandoradiet™ 200 g: 23.8 min

---

* CT: X-ray computed tomography

Denoted by *CT: X-ray computed tomography*.
Clinical Study of Anti-Skin aging

Test material: Pandoradiet™ 600 mg.
Design: randomized, double-blind, placebo-controlled; 12 weeks.
Subjects: n=92 (92 women): less than 48 A.U. in moisture; higher than 4th grade eye wrinkle score.
Statistical analysis: PP(per-protocol analysis), ANCOVA.

Skin wrinkle improvement
Pandoradiet™ helps improve skin wrinkling. Visual assessment showed the skin-improving effect of Pandoradiet™ compared to baseline. Skin wrinkle parameters also showed improvement with statistical significance: Ra and Rz improved by 82% and 58%, respectively, compared to the control group.

Visual and microrelief images

Skin wrinkle parameters measured

Pandoradiet™ exhibited wrinkle-improving effect at every time point.

Improvement in skin moisture, skin glossiness, and skin elasticity
Pandoradiet™ group showed statistically significant improvement in skin parameters. Skin moisture and skin glossiness increased by 38% and 47%, respectively, compared to the control group. Skin elasticity was also improved by 22%.
Effects of Pandoradiet™ on UVB-induced wrinkle formation in the dorsal skin of hairless mice

Pandoradiet™ intake significantly improved skin wrinkling caused by UVB exposure as determined by visual assessment. Instrumental measurement found that Pandoradiet™ intake effectively prevented water loss from skin and improved skin hydration.

Improvement of skin hydration

Reduction of skin water loss

Mechanism of Action of Anti-skin aging

Pandoradiet™ activates TGF-β impaired by UV exposure, resulting in increased collagen synthesis. At the same time, Pandoradiet™ inactivates MAPKinases activated by UV or reactive oxidation substances, resulting in reduction of MMPs, a group of collagen-breaking enzymes, leading to inhibition of collagen breakdown. As a result of these effects of Pandoradiet™, collagen synthesis increases in the skin.

**Pandoradiet™** is highly water soluble and can be used in the form of a tablet, capsule, granule, etc. We presently hold US patents for the exclusive use of *Boesnbergia Pandurata* (Slim: US 13/123,519, Skin: US 12/738,591, Exercise Mimetics: US 13/682,216, China, EU, Japan) as a functional food.

<table>
<thead>
<tr>
<th>Product</th>
<th><strong>Pandoradiet™</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredient</td>
<td><em>Boesnbergia Pandurata</em> Extract 50%, Sodium caseinate, Dextrin</td>
</tr>
</tbody>
</table>

**Specification**

<table>
<thead>
<tr>
<th>Determination</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Yellow brown powder</td>
</tr>
<tr>
<td>Foreign material</td>
<td>Not detected</td>
</tr>
<tr>
<td>Moisture(%)</td>
<td>≤10</td>
</tr>
<tr>
<td>Panduratin A (mg/g)</td>
<td>32-49</td>
</tr>
<tr>
<td>Total Plate Count</td>
<td>&lt;3,000</td>
</tr>
<tr>
<td>Yeast &amp; Mold</td>
<td>&lt;100</td>
</tr>
<tr>
<td>E. coli</td>
<td>Negative</td>
</tr>
<tr>
<td>Salmonella</td>
<td>Absence</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>Absence</td>
</tr>
<tr>
<td>Lead (mg/kg)</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Arsenic (mg/kg)</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Cadmium (mg/kg)</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Mercury (mg/kg)</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

| Storage                | Store at room temperature and avoid hot and humid place |
| Shelf life             | 36 months (Sealed) |
| Package size           | 5 kg            |
| Packaging material     | Inner packaging: Polyethylene(PE) |

This information has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.