纳豆激酶
NATTOKINASE

纳豆激酶（nattokinase，简称NK）是在纳豆发酵过程中由纳豆枯草杆菌秆菌所产生的一种丝氨酸蛋白酶，具有直接水解交联纤维蛋白的作用，是纳豆中溶解血栓的最主要物质。是由日本心脑血管专家——须见洋行博士于1980年著名的“下午茶时间实验”中提取出的天然溶栓物质。

Nattokinase(NK), an important ingredient for dissolving thrombus in natto, is a serine protease from Bacillus subtilis which has the function of direct hydrolysis crosslinking. It is a natural thrombolytic substance extracted by Dr. Hiroyuki Sumi.

中国纳豆激酶原料制造商
Nattokinase Manufacturer in China

中国纳豆激酶产品方案提供商
Nattokinase Product Solution Provider in China

口服乳剂及制备方法已获中国专利（专利号：ZL 201410198490.0）
Method of Nattokinase Oral Emulsion Preparation Has Obtained
A Chinese Patent（Patent No. ZL 201410198490.0）

纳豆激酶溶栓机制[1]
THROMBOLYTIC EFFECT OF NATTOKINASE[1]

近年来，各国研究机构对纳豆激酶的基因序列和生理生化特性进行一系列研究，表明纳豆激酶的生物活性、安全性和溶栓效率均高于链激酶、尿激酶等常见溶栓药物，可作为一种新型的溶栓产品被开发并加以应用。2016年，欧盟食品安全局正式确认纳豆激酶作为新资源食品的安全性，并将认证结果予以公布。

In recent years, the physiological and biochemical characteristics of nattokinase were investigated by many research institutions. The results indicated that the biological activity, safety and thrombolytic activity of nattokinase is stronger than streptokinase and urokinase. Nattokinase has been approved as a Novel Food Ingredient by EFSA in 2016.

纳豆激酶溶栓机制

B: 纤溶酶原激活剂作用
Tissue Plasminogen Activator

A: 直接溶栓作用
Direct Plasmin

C: 纤溶酶原激活剂作用
Urokinase Plasminogen Activator

血管内皮细胞
Vascular Endothelial Cell

纤溶酶
Plasmin

尿激酶
Urokinase

纳豆激酶
Nattokinase

纤维蛋白溶解产物
Fibrous Degradation Products

组织型纤溶酶原激活剂
Tissue Plasminogen Activator

www.sunengbio.com
溶血栓（特别在针对陈旧性血栓尤为有效）

Dissolve Thrombus (Especially for Obsolete Thrombosis)

健康作用

**HEALTH EFFECTS**

- **溶血栓**（特别是针对陈旧性血栓尤为有效）

A study on comparison of nattokinase and urokinase by SunGenBio: Patients with obsolete thrombosis were treated with 300 FU nattokinase in 4th experiment. The results indicated that the thrombus for over 36 hours had completely dissolved within 2 hours. The thrombolysis rate of another group who were treated with 1500 FU nattokinase is higher than the same amount of urokinase.

- **溶血栓**（特别是针对陈旧性血栓尤为有效）

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- 2015年《科学报告》期刊的“预防血管内凝血和抗凝血性能研究”

  **A study** “Thrombolysis activity of nattokinase in mouse models” published in *Scientific Reports* in 2015 reported that increasing the content and activity of nattokinase in serum of mice with thrombus in the blood vessels and hemagglutination was decreased by plasma after 2-8 h. Antiplatelet and antithrombic pathways were activated to prevent thrombosis.

- **溶血栓**（特别是针对陈旧性血栓尤为有效）

A study on comparison of nattokinase and urokinase by SunGenBio: Patients with obsolete thrombosis were treated with 300 FU nattokinase in 4th experiment. The results indicated that the thrombus for over 36 hours had completely dissolved within 2 hours. The thrombolysis rate of another group who were treated with 1500 FU nattokinase is higher than the same amount of urokinase.
抗血凝
Anticoagulant

2013年，“纳豆激酶通过抑制血小板聚集和血栓形成来改善血液流动研究”
结论：纳豆激酶能明显抑制胶原蛋白和凝血酶诱导的血小板聚集，通过摄入纳豆激酶，因血凝造成的血管阻塞完全打开，并阻断了因血凝造成的血栓及血管壁损伤的发生风险。

A study "Nattokinase improves blood flow by inhibiting platelet aggregation and thrombus formation" in 2013 reported that Nattokinase significantly inhibited both the collagen- and thrombin-induced platelet aggregations, and fully prevented the occlusion. It also inhibited platelet aggregation by blocking thromboxane formation, and thereby delay thrombosis following oxidative arterial wall injury.

降血压
Reduce Blood Press

- 2016年一项评估北美人中的“纳豆激酶的消耗与血压的降低和心血管风险标记有关研究”
结论：纳豆激酶在降低血栓的同时改善血管的弹性，调节血管的收缩和舒张，防止因血凝造成血压上升，效果对比一般安慰剂更加显著。

A study "Consumption of nattokinase is associated with reduced blood pressure and von Willebrand factor, a cardiovascular risk marker: results from a randomized, double-blind, placebo-controlled, multicenter North American clinical trial" in 2016 is to evaluate the effects of consumption of nattokinase on hypertension in a North American hypertensive population, and reported that nattokinase promoted blood vessel elasticity and dissipated thrombus or blood clots. Consumption of nattokinase was associated with a reduction in both systolic and diastolic BP, the effect was much more effective than the placebo.

![Blood Pressure Graphs](image)
抗动脉粥样硬化

2003年的一项“阻塞前大血管进行的预防动脉粥样硬化的研究”结果显示，阻塞前大血管的预防能够有效地预防动脉粥样硬化发生，降低了动脉粥样硬化及冠心病的发生率。

2006年，一项“阻塞前大血管进行的预防动脉粥样硬化的研究”进一步证实，阻塞前大血管的预防可以有效地降低冠心病的发病率。

降低中风风险

2007年日本的一项研究表明，阻塞前大血管的预防能够有效地降低中风的风险。
保护心肌缺血
Protect Myocardial ischemia

2006年一项“重组纤溶酶对小型冠状动脉血栓的溶解作用研究”[6]
结论：证实纤溶酶可有效溶解血栓、减少心肌缺血，降低了心肌梗死发生风险。

"Recombinant nattokinase for the dissolution of coronary thrombosis in small pigs" in 2006 confirmed that nattokinase can reduce the risk of myocardial infarction and effectively decrease thrombus formation[6].

改善眼部微循环，保护视力
Improve Eye Microcirculation and Protect Eyesight

2001年，日本研究机构证实纤溶酶可清除视网膜静脉血管的栓塞现象，这一成果揭示纤溶酶在改善眼部微循环及提升保护视力方面有显著效果。

In 2001, Japanese research institutions confirmed that nattokinase can eliminate the risk of retinal versus thrombosis. These findings suggest that nattokinase has a significant effect on improvement of eye microcirculation and eyesight.

双骏生物自主创新第四代生产技术
UTILIZES FOURTH GENERATION NATTOKINASE PRODUCTION TECHNOLOGY BY SUNGENBIO

<table>
<thead>
<tr>
<th>技术</th>
<th>工艺</th>
<th>成分</th>
<th>最高活性</th>
</tr>
</thead>
<tbody>
<tr>
<td>第一代&lt;br&gt;The First Generation</td>
<td>手工&lt;br&gt;Handcraft</td>
<td>纳豆细菌、纳豆素、凝血&lt;br&gt;Nattokinase, Bacillus subtilis natto/Pumice</td>
<td>1,000FU/g</td>
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<td>第二代&lt;br&gt;The Second Generation</td>
<td>固体发酵&lt;br&gt;Solid Fermentation</td>
<td>纳豆细菌、纳豆素、凝血&lt;br&gt;Nattokinase, Bacillus subtilis natto/Pumice</td>
<td>3,500FU/g</td>
</tr>
<tr>
<td>第三代&lt;br&gt;The Third Generation</td>
<td>液体发酵&lt;br&gt;Liquid Fermentation</td>
<td>纳豆细菌、凝血&lt;br&gt;Nattokinase, Natto</td>
<td>20,000FU/g</td>
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<tr>
<td>第四代&lt;br&gt;The Fourth Generation</td>
<td>深层液体发酵、凝集素&lt;br&gt;Submerged Liquid Fermentation, Mucrona Integration</td>
<td>高活性纳豆菌酶&lt;br&gt;High-activity Nattokinase</td>
<td>750,000FU/g</td>
</tr>
</tbody>
</table>

高活性绿色生产流程
HIGH-ACTIVITY GREEN PRODUCTION PROCESS
NATTOKINASE ACTIVITY DETECTION

HPLC

Nattokinase activity was determined by HPLC. It not only can quickly detect nattokinase content, but also provide a quantitative method for the study of nattokinase drug properties.

Detection method:
1) Detector: 280nm
2) Mobile phase: acetonitrile: 0.1%TFA (0min~2min; acetonitrile: 0.1%TFA=7:93; 2min~30min: acetonitrile: 0.1%TFA=61:39)
3) Detection wavelength: 280nm
4) Column: 4.6mm*250mm; 5μm; Zorbax 300SB C3
5) Column temperature: 25°C
6) Flow rate: 1.0ml/min

NKIU法

Nattokinase pure products (Activity 750,000FU/g) were purified by protein purification process. Nattokinase activity unit was defined as NKIU by SunGenBio.
产品特点

CHARACTERISTIC

纯正纳豆菌发酵
Fermented from bacillus subtilis

活性高达85000FU/g（分子量27728D）
Activity 85000 FU/g (Molecular weight: 27728D)

无防腐剂、无添加剂、无化学物质、无溶剂
No preservatives, No additives, No chemical substances, Solvent-free

品质稳定
Stable quality

加工性能良好
Outstanding processing performance

产品应用

APPLICATION

保健食品（辅助预防动脉硬化、降血脂、保护心脑血管等）
Health food (For preventing arteriosclerosis, lowering blood pressure, protecting cardiovascular and cerebrovascular diseases, etc.)

营养补充剂、食品（辅助改善脑部微循环、保护视力等）
Nutritional supplements, foods (helping to improve eye microcirculation, protecting eyesight, etc.)

产品规格

Product Specification

<table>
<thead>
<tr>
<th>包装规格</th>
<th>Package Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>65000FU/g</td>
<td>LDPE（低密度聚乙烯）袋 密封真空铝箔装 5kg × 3/箱</td>
</tr>
<tr>
<td>40000FU/g</td>
<td>LDPE（低密度聚乙烯）袋 密封真空铝箔装 5kg × 3/箱</td>
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<tr>
<td>20000FU/g</td>
<td>LDPE（低密度聚乙烯）袋 密封真空铝箔装 5kg × 3/箱</td>
</tr>
<tr>
<td>10000FU/g</td>
<td>LDPE（低密度聚乙烯）袋 密封真空铝箔装 5kg × 3/箱</td>
</tr>
<tr>
<td>5000FU/g</td>
<td>LDPE（低密度聚乙烯）袋 密封真空铝箔装 10kg × 2/箱</td>
</tr>
<tr>
<td>2000FU/g</td>
<td>LDPE（低密度聚乙烯）袋 密封真空铝箔装 10kg × 2/箱</td>
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参考文献

REFERENCES


