牡丹复合肽 特殊膳食

PEONY COMPOSITE PEPTIDE

www.taukeholding.com

开启肽健康时代

Kickstart the Era of Peptide Health

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你对肽了解多少?

How much do you know about peptides?

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肽的发现与诺贝尔奖

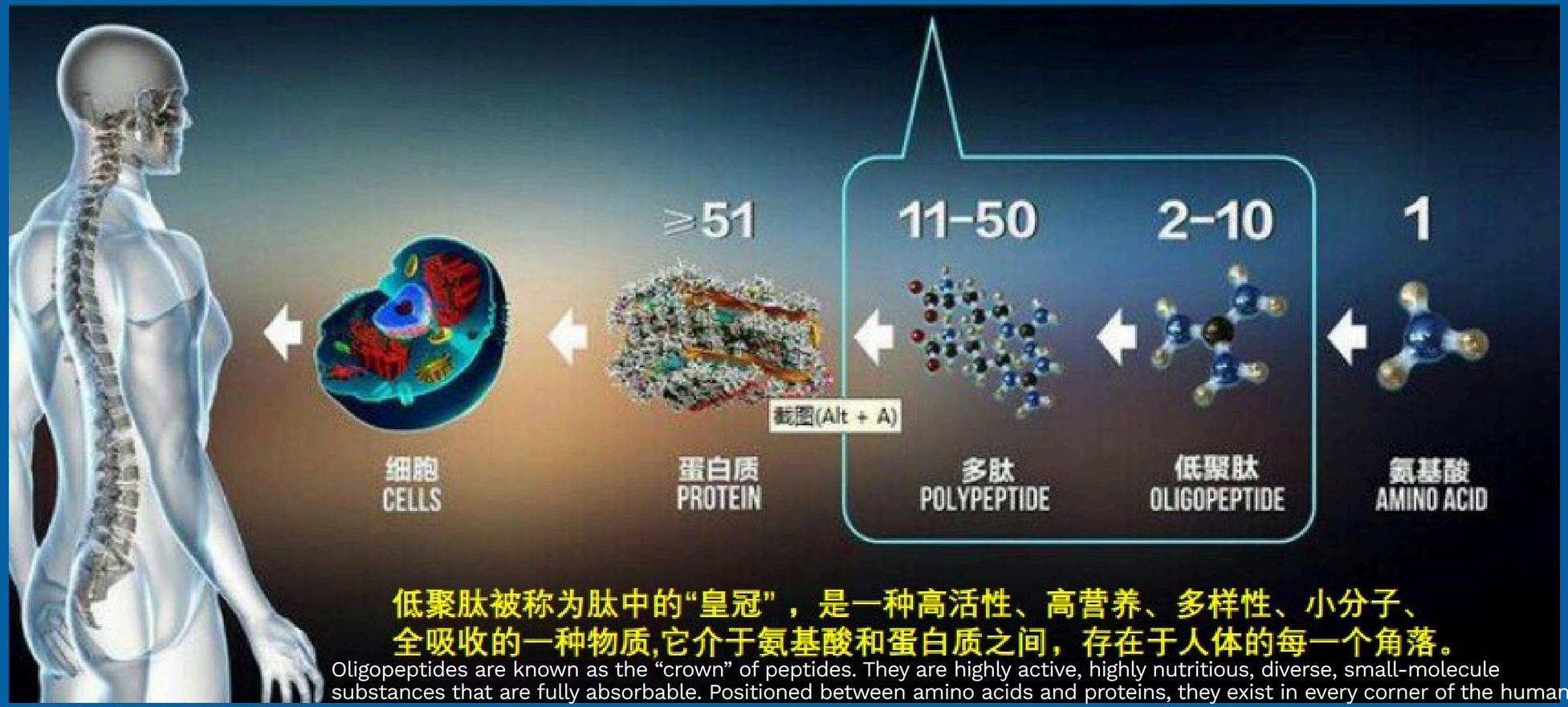
The Discovery of Peptides and the Nobel Prize

美国尤·格林博士：肽几乎被用于治疗任何疾病，无药可比。
德国鲍威尔·克鲁德博士：找到了一个新的抗衰老药物-肽，
肽能使人年轻、健康。
美国生物学家克拉兹博士：小分子活性肽疗法，将至少提高
人类寿命20年。
美国华裔科学家，诺贝尔奖获得者，朱棣文博士：21世纪的生物工程
就是研究基因工程与蛋白质工程，研究蛋白质就是研究肽。

Dr. U. Green (USA): Peptides can be used to treat almost any disease—there is no comparable medicine.
Dr. Bauer Krude (Germany): A new anti-aging drug has been discovered—peptides.
Peptides can make people younger and healthier.
Dr. Kraze (USA, Biologist): Small molecule active peptide therapy could increase human lifespan by at least 20 years.
Dr. David J. Win (USA, Chinese-American, Nobel Laureate): The 21st century of bioengineering is the study of genetic engineering and protein engineering. Studying proteins is essentially studying peptides.

1902年，科学家第一次发现肽近百余年，有几十位科学家获得诺贝尔奖
肽的发现及应用是近百年来人类健康史上的一个奇迹

In 1902, scientists first discovered peptides. Over the past century, dozens of scientists have been awarded the Nobel Prize.The discovery and application of peptides is a miracle in the history of human health over the past hundred years.



Oligopeptides are known as the “crown” of peptides. They are highly active, highly nutritious, diverse, small-molecule substances that are fully absorbable. Positioned between amino acids and proteins, they exist in every corner of the human body.

什么是肽

人体内蛋白质种类、功能各异，但都是由20多种人体必需氨基酸组成的。
肽是一种链状的氨基酸聚合物，是介于氨基酸和蛋白质之间的中间物质。
体内很多活性物质，如激素、酶类都是肽。

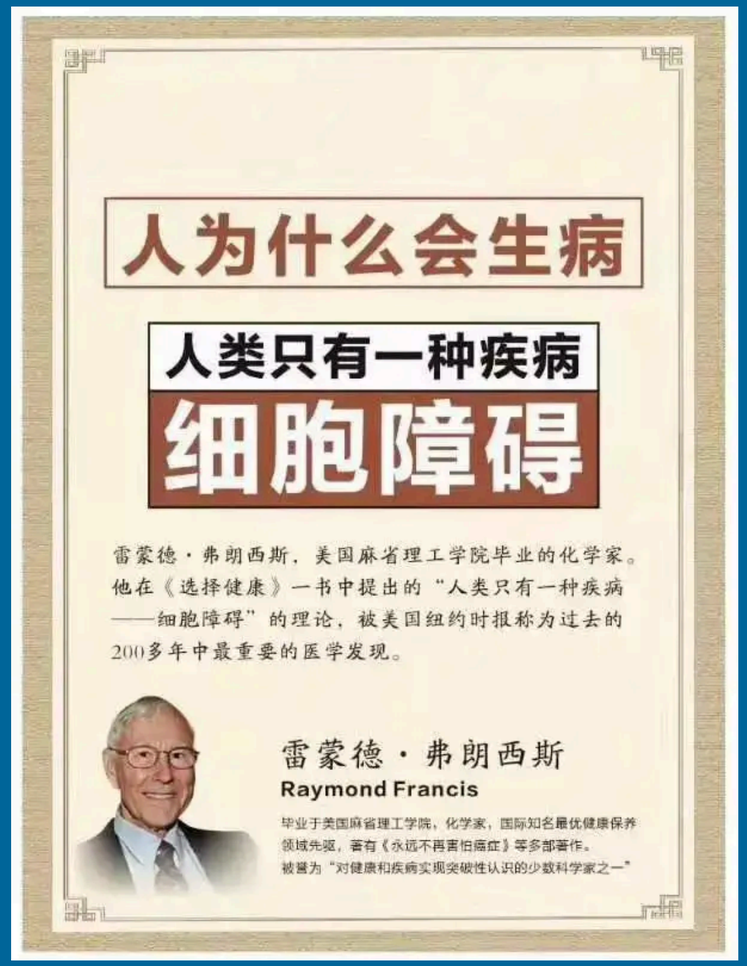
Proteins in the human body vary in type and function, but they are all composed of more than 20 essential amino acids. Peptides are chain-like polymers of amino acids and serve as intermediate substances between amino acids and proteins. Many active substances in the body, such as hormones and enzymes, are peptides.

肽的特点与作用

Characteristics and Functions of Peptides

肽的充足与否，决定生命体的健康与否

The sufficiency of peptides determines the health of the body.



200多年最重要的医学发现

The most important medical discovery in over 200 years

《美国纽约时报》
The New York Times, USA

分化	构成	组合	组成
differentiation	constitute	combine	compose

细胞 cell → 组织 organization → 器官 organ → 系统 system → 人体 human body

细胞是构成人体的基本单位人体的疾病、衰老甚至死亡都是从细胞开始的细胞健康才能人体健康

Cells are the basic units that make up the human body. Diseases, aging, and even death all begin at the cellular level. Only when cells are healthy can the human body remain healthy.

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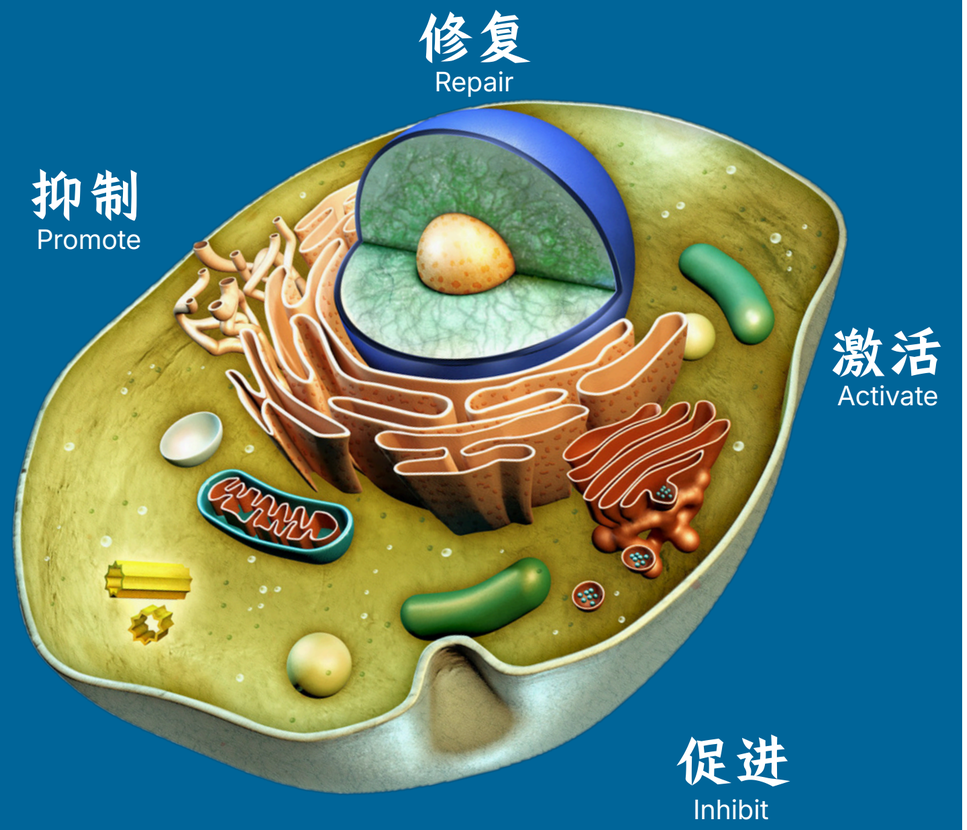


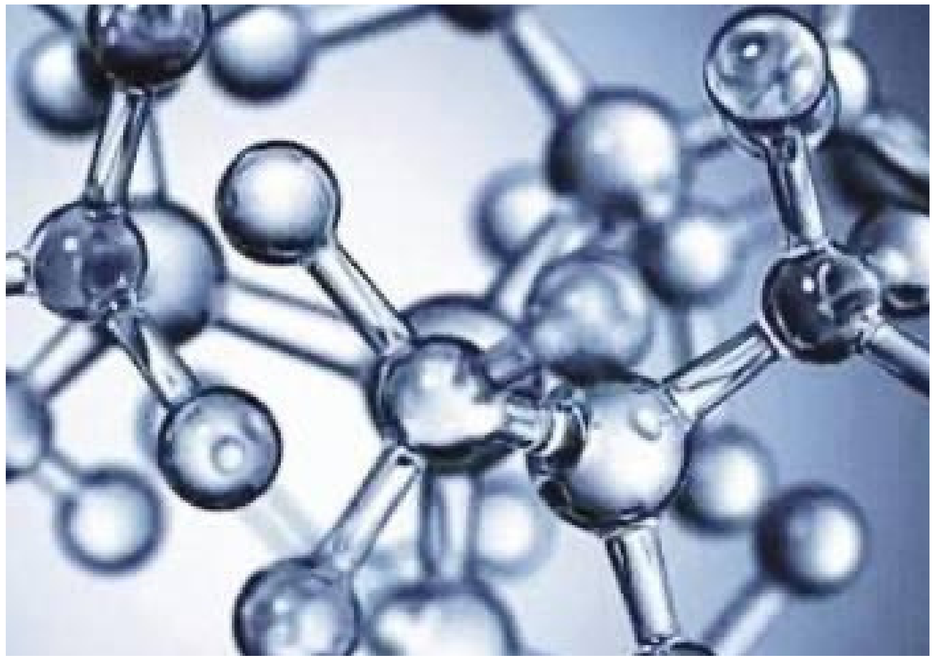
肽对细胞的四大作用

The Four Major Effects of Peptides on Cells

- **抑制——抑制细胞的变性**
  Inhibition — Inhibits cell degeneration
- **激活——激活细胞活性，参与更多生理过程**
  Activation — Activates cell activity and participates in more physiological processes
- **修复——修复破损的细胞结构**
  Repair — Repairs damaged cellular structures
- **促进——促进细胞的正常新陈代谢**
  Promotion — Promotes normal cellular metabolism

肽的吸收特点

Absorption Characteristics of Peptides



小 强 快 高 全

Small Strong Fast High Comprehensive

小—分子量极小（1000道尔顿以下），可穿透很多屏障

Small — Extremely low molecular weight (below 1,000 Daltons), capable of penetrating many barriers

强—生物活性强，甚至可以和空气发生反应

Strong — Highly bioactive, even capable of reacting with air

快—快速吸收，起效快，不需要消化，不消耗能量，不被酶解，不被酸碱破坏，直接吸收，没有代谢废物

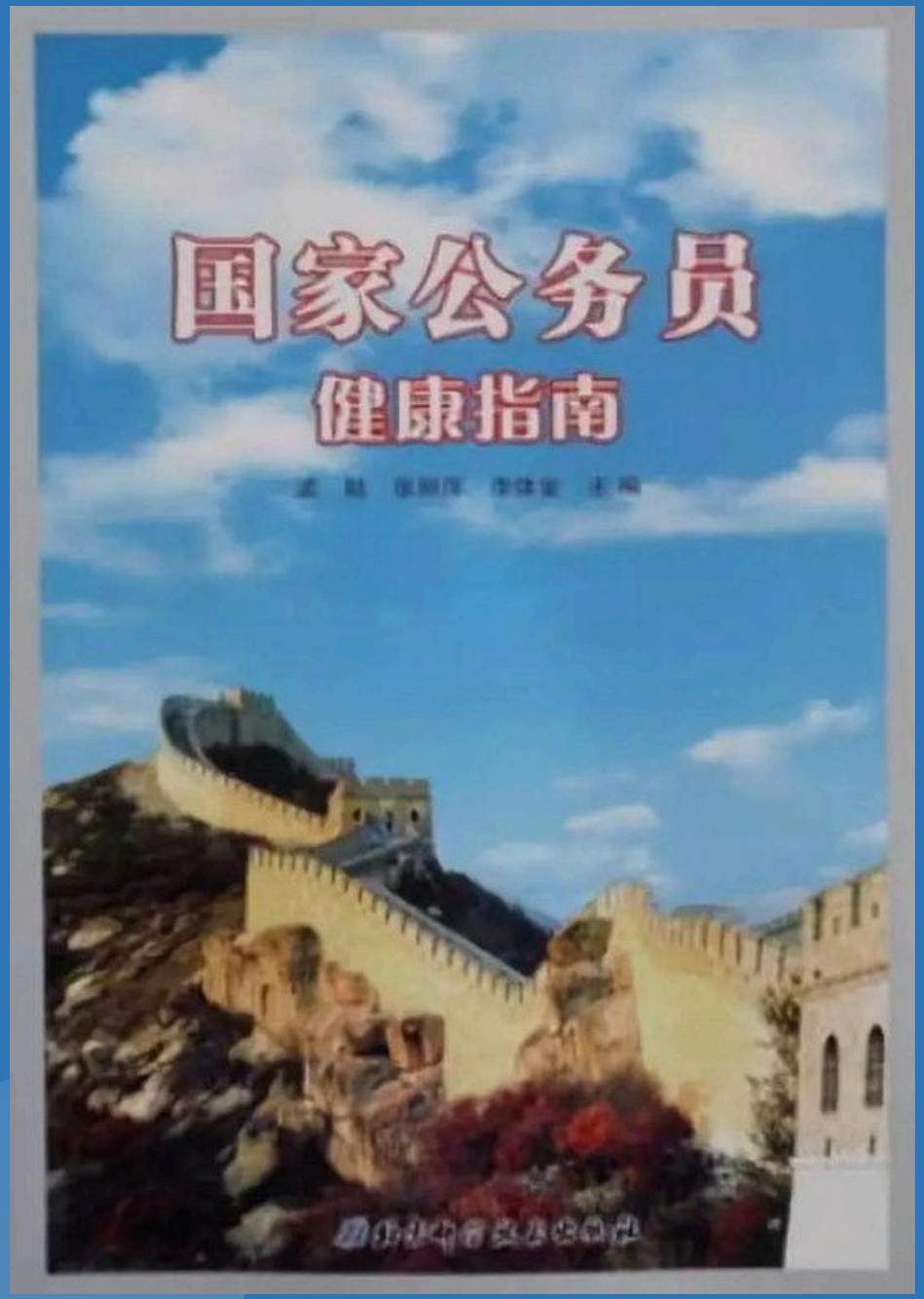
Fast — Rapid absorption and quick effect; does not require digestion, consumes no energy, is not broken down by enzymes, is resistant to acid and alkali, absorbed directly, and produces no metabolic waste.

高—高效吸收，小分子肽几乎能100%被吸收利用

High — Highly efficient absorption; small-molecule peptides can be almost 100% utilized

全—作用全面，具有药物的延伸性，修复全身细胞

Comprehensive — Exerts wide-ranging effects, with drug-like extensibility, repairing cells throughout the body



肽的国家政策

National Policies on Peptides

“十三五”相关规划：

将发展活性肽产业放在优先发展位置。

“13th Five-Year Plan” Related Policy:

The development of the active peptide industry is placed as a priority for growth.

《国家公务员健康指南》：

已将生物活性肽列为预防慢性病的优选方案之一。

“National Civil Servants Health Guidelines”:

Bioactive peptides have been listed as one of the preferred options for preventing chronic diseases.

现代人越来越缺乏肽

Modern people are increasingly deficient in peptides.

年龄因素 Age Factor

随年龄增长，肽分泌量逐渐降低

With increasing age, peptide secretion gradually decreases.

疾病因素 Disease Factor

慢性病，消耗肽增多，合成肽减少

Chronic diseases increase peptide consumption and reduce peptide synthesis.

环境污染 Environmental Pollution

蛋白酶活性降低，肽的来源就减少

Reduced protease activity leads to a decrease in peptide sources.

生活方式 Lifestyle Factors

不良生活方式，消耗肽增多，合成能力下降

Unhealthy lifestyles increase peptide consumption and reduce peptide synthesis capacity.

人体不能缺乏蛋白质 The human body cannot lack protein.

肌肉量减少和关节疼痛
肌肉是人体最大的蛋白质库，肌肉无力、疼痛和质量下降是蛋白质缺乏的标志，老年人中很常见

Reduced Muscle Mass and Joint Pain
Muscles are the largest protein reservoir in the human body. Muscle weakness, pain, and loss of mass are signs of protein deficiency and are very common among the elderly.

食欲紊乱
蛋白质摄入过低，人会时常感到饥饿，容易对食物和零食格外渴望，甚至出现暴饮暴食

Appetite Disorders
With insufficient protein intake, people often feel hungry, have strong cravings for food and snacks, and may even engage in overeating or binge eating.

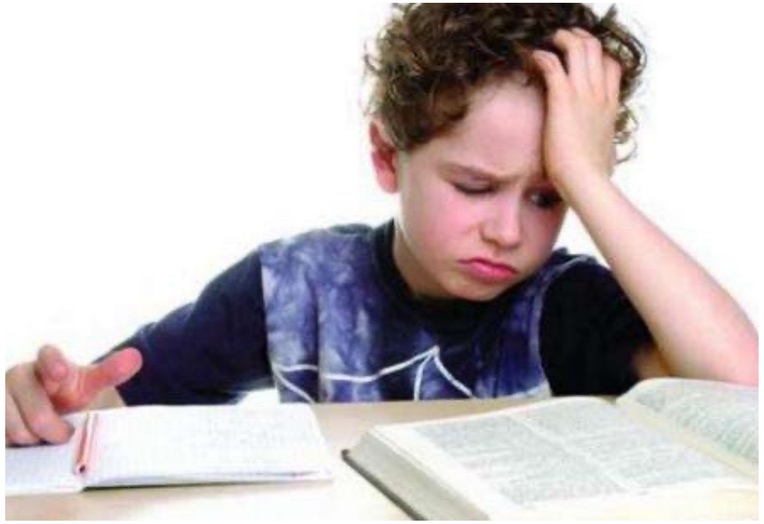
骨折风险增加
蛋白质是钙吸收和帮助骨代谢所必需的物质，没有足够的蛋白质会导致骨路变弱，增加骨折风险

Increased Risk of Fractures
Protein is essential for calcium absorption and bone metabolism. Insufficient protein can weaken bones and increase the risk of fractures.

人体不能缺乏蛋白质 The human body cannot be without protein.

睡眠不足
食物中色氨酸摄入不足，易导致睡眠障碍。而牛奶中富含色氨酸，睡前吃喝杯牛奶，有助于睡眠

Sleep Deprivation
Insufficient intake of tryptophan from food can lead to sleep disorders. Milk is rich in tryptophan, and drinking a glass of milk before bed can help improve sleep.



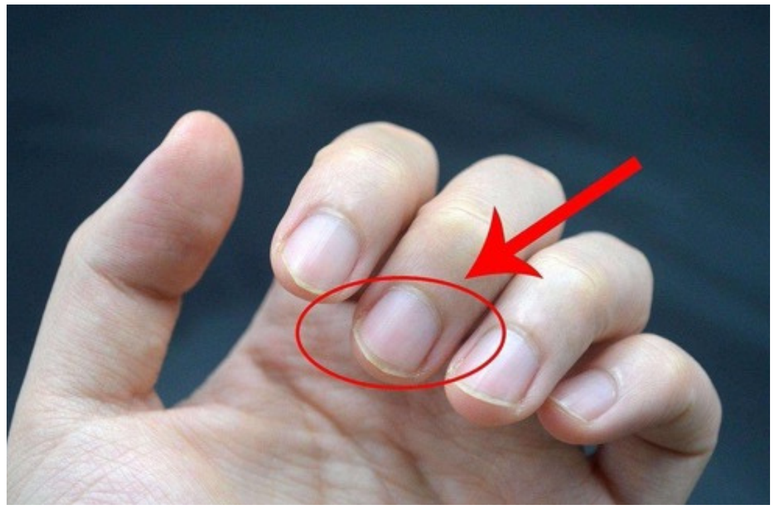
脂肪肝
脂肪肝是蛋白质缺少最常见的症状之一，可能导致肝纤维化、肝功能不全，甚至引发肝肿瘤

Fatty Liver
Fatty liver is one of the most common symptoms of protein deficiency. It may lead to liver fibrosis, liver dysfunction, and even liver tumors.

记忆力减退
摄取蛋白质以支持健康的大脑功能是非常重要的。记忆力差或学习新事物困难，说明缺乏蛋白质

Declining Memory
Consuming protein to support healthy brain function is very important. Poor memory or difficulty learning new things indicates a protein deficiency.

人体不能缺乏蛋白质 The Human Body Cannot Lack Protein



皮肤干燥
蛋白质给肌肤提供营养。蛋白质缺乏，皮肤也会失去弹性，变得粗糙，并伴有皮肤暗沉

Dry Skin
Protein provides nutrition for the skin. A protein deficiency can cause the skin to lose elasticity, become rough, and appear dull.

指甲异常
指甲由角质和蛋白质组成。蛋白质缺乏会导致指甲脆弱、易碎，甚至指甲上有褐色斑点

Abnormal Nails
Nails are composed of keratin and protein. Protein deficiency can cause nails to become weak, brittle, and may even result in brown spots on the nails.

脱发
蛋白质含量不足，身体会停止使用蛋白质作为毛发生长原料，头发会变少、褪色，甚至脱发

Hair Loss
With insufficient protein intake, the body stops using protein as a raw material for hair growth, leading to thinning, discoloration, and even hair loss.

补充蛋白质的局限性 Limitations of Protein Supplementation

营养部均衡者易缺乏蛋白质，植物蛋白吸收率低；
对蛋白质摄入有要求的病人如肾病、结石、痛风等
Those with a nutritionally balanced diet are prone to protein deficiency, plant protein has a low absorption rate; patients with protein intake requirements, such as kidney disease, kidney stones, gout, etc.

特殊群体
Special Nutritional Groups

补充外源性蛋白，会引起部分人的过敏反应，
如海鲜、牛奶、豆类等，都是大分子蛋白
Supplementing with exogenous protein can cause allergic reactions in some people. Foods such as seafood, milk, and legumes are all large-molecule proteins.

过敏反应
Allergic Reactions

蛋白质不是吃多少补多少，尤其消化能力薄弱的人，
大量未消化的蛋白质被排出体外，不能满足基本摄入需求
Protein intake does not equal absorption, especially for people with weak digestive ability. Large amounts of undigested protein are excreted from the body and cannot meet basic intake requirements.

造成浪费
Causes Waste

蛋白质解产物从尿排出，增加肾脏负担，尤其糖尿病、
肾病或老年人；高蛋白极易造成肠道不适。
未吸收的蛋白质在肠道细菌作用下产生大量含氨类毒物，
如肝解毒不及时可扩散到大脑，引起脑组织功能障碍
Protein breakdown products are excreted through urine, increasing the burden on the kidneys, especially in people with diabetes, kidney disease, or the elderly; high protein intake can easily cause intestinal discomfort. Unabsorbed protein produces large amounts of ammonia-containing toxins under the action of intestinal bacteria. If the liver cannot detoxify in time, these toxins may spread to the brain and cause dysfunction of brain tissue.

加重负担
Increases Burden

摄入量 ≠ 吸收量

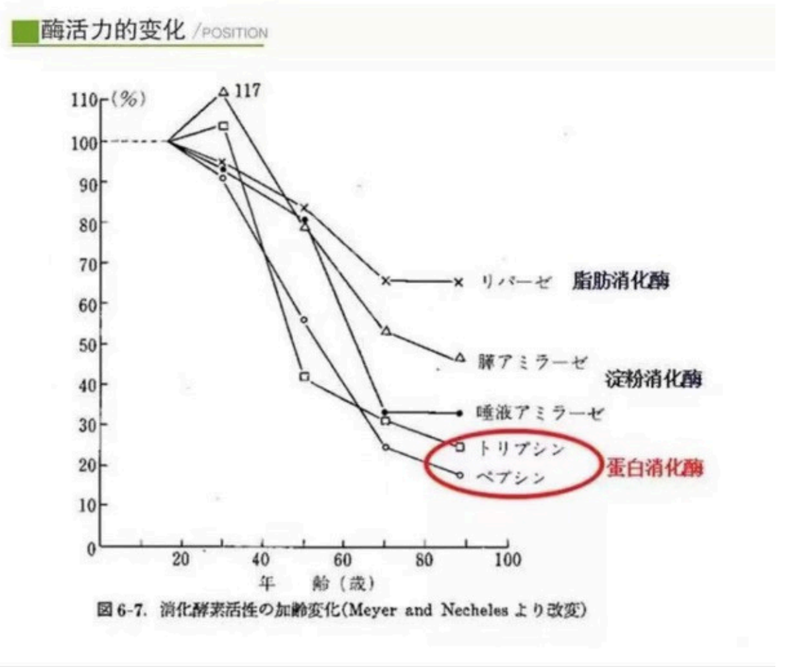


図 6-7. 消化酵素活性の加齢変化(Meyer and Necheles より改変)

随着年龄的增长

降低最多的正是蛋白消化酶

特殊膳食与保健品、药品的区别

Difference Between Special Dietary Foods, Health Supplements, and Drugs

- **特膳与普通食品的区别** Difference Between Special Dietary Foods and Regular Foods

  特膳具有特殊的营养指向性，为特殊人群提供丰富的、难以从日常普通膳食中摄取的营养成分，而普通食品对特殊人群没有明确的针对性。

  Special dietary foods have specific nutritional targeting, providing special groups with rich nutrients that are difficult to obtain from daily regular diets, while regular foods do not have clear targeting for special groups.

- **特膳与保健食品的区别** Difference Between Special Dietary Foods and Health Supplements

  保健食品对机体的某些生理功能可提供一些保健作用，一般不以提供营养为目的，尤其无法满足特定生理阶段的针对性营养补充，不宜作为普通食品长期使用。特膳对特殊人群具有全面的营养价值，可作为日常食品长期食用。

  Health supplements can provide certain health benefits for specific physiological functions, and are generally not intended to provide nutrition; they are especially unable to meet targeted nutritional supplementation for specific physiological stages and are not suitable for long-term use as regular food. Special dietary foods have comprehensive nutritional value for specific groups and can be consumed as daily food over the long term.

- **特膳食品与药品的区别** Difference Between Special Dietary Foods and Drugs

  特膳为特殊人群提供特殊营养，降低代谢负担。不同于药品，不用于治疗疾病。

  Special dietary foods provide specific nutrition for special groups and reduce metabolic burden. Unlike drugs, they are not used to treat diseases.

“做健康行业的百年企业”

"Building a Century-Old Enterprise in the Health Industry"

太爱肽集团—专业做肽27年

Tai Ai Peptide Group — Specializing in Peptides for 27 Years

- **始于1997年**
  Founded in 1997
- **北京朝阳区CBD商圈**
  CBD Business District, Chaoyang District, Beijing
- **研发、生产、销售、服务为一体的集团化企业**
  A group enterprise integrating research and development, production, sales, and service.

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中国胶原蛋白肽之父
Father of Collagen Peptides in China

“谁都无法抗拒衰老，我们用肽可以将人类衰老的脚步放慢，放慢，在放慢！”
“No one can resist aging, but with peptides, we can slow down the pace of human aging—slow it down, slow it down, and slow it down even more!”

——吴庆林
— Wu Qinglin

- **太爱肽集团创始人**
  Founder of Tai Ai Peptide Group
- **中国小分子肽多项核心技术拥有者**
  Holder of multiple core technologies in small-molecule peptides in China
- **2018年首届健康中国年会“终身成就奖”**
  Recipient of the "Lifetime Achievement Award" at the 2018 First Health China Annual Conference

2010年第12期国家级期刊《中国发明与专利》，被誉为“中国胶原蛋白肽之父”
In Issue 12 of the 2010 national-level journal China Inventions & Patents, he was honored as the "Father of Collagen Peptides in China."

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生产实力
Production Capacity

河北大厂 （2006年投产）
Dachang, Hebei (Commissioned in 2006)

辽宁大连 （2009年投产）
Dalian, Liaoning (Commissioned in 2009)

山东菏泽 （即将投产）
Heze, Shandong (About to be Commissioned)

600余亩的现代化生产基地
10万级GMP标准车间
数十条现代化专业生产线
年产小分子肽原料及产品5000余吨的产能

Over 600 acres of modern production base
100,000-level GMP standard workshops
Dozens of modern professional production lines
Annual production capacity of more than 5,000 tons of small-molecule peptide raw materials and products

牡丹复合肽（特殊膳食）

PEONYCOMPOSITE PEPTIDE

牡丹低聚肽粉、牦牛骨胶原蛋白肽粉、鳕鱼胶原蛋白肽粉、牛骨胶原蛋白肽粉、山药肽粉、牡蛎低聚肽粉、乳清肽粉、人参肽、牡丹低聚肽粉、维生素C、维生素B、维牛素B、牛磺酸、罗汉果甜苷、食用香精等综合营养素，经厂家自有专利技术精制而成，1000D以下小分子肽添加量不低于90%，特别添加有益于人体的营养成分，分子小，易吸收利用。

Peony oligopeptide powder, yak bone collagen peptide powder, cod collagen peptide powder,bovine bone collagen peptide powder, yam peptide powder, oyster oligopeptide powder, whey peptide powder,ginseng peptide, peony oligopeptide powder, vitamin C, vitamin B, vitamin B complex,taurine, mogroside (monk fruit extract), edible flavorings, and other comprehensive nutrients,refined using the manufacturer’s proprietary patented technology.The content of small-molecule peptides under 1000 Da is no less than 90%,with specially added nutrients beneficial to the human body;
the small molecules are easily absorbed and utilized.

延缓衰老、预防三高、补肾壮骨、提高免疫。

Slow Down Aging, Prevent the “Three Highs” (High Blood Pressure, High Blood Sugar, High Cholesterol), Strengthen Kidneys and Bones, Enhance Immunity

组方优势：

Formula Advantages:

抗衰老 抗氧化——鳕鱼胶原蛋白肽粉、山药肽粉

Anti-Aging & Antioxidant — Cod Collagen Peptide Powder, Yam Peptide Powder

预防三高——牡丹低聚肽粉、人参肽粉

Prevent the “Three Highs” — Peony Oligopeptide Powder, Ginseng Peptide Powder

补充骨关节营养 滋补肝肾——牦牛骨胶原蛋白肽粉、

Supplement Bone & Joint Nutrition
Nourish Liver & Kidneys

Yak Bone Collagen Peptide Powder

牛骨胶原蛋白肽粉、

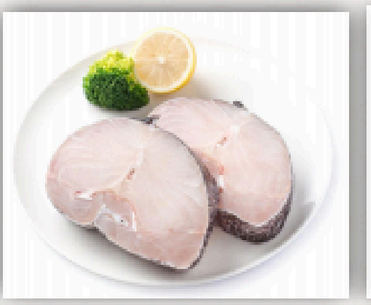
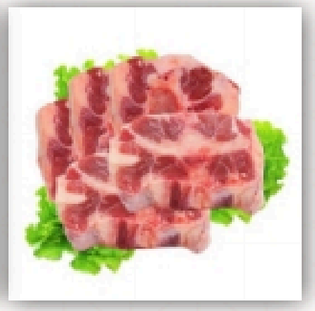
ovine Bone Collagen Peptide Powder

牡蛎低聚肽粉

Oyster Oligopeptide Powder

提高免疫力——乳清蛋白肽

Enhance Immunity — Whey Protein Peptide

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牡丹低聚肽粉 Peony Oligopeptide Powder

“国花”牡丹，原产中国，已有1900多年的栽培历史。
被誉为“国色天香”“花中帝王”。牡丹是我国独特的名贵花卉，
以河南、山东菏泽最为出名。2012年，中国花卉协会正式命名菏泽为
“中国牡丹之都”。2013年11月26日，习近平总书记来到菏泽市调研，
考察了尧舜牡丹产业园，对菏泽提出“后来居上”的殷切期望。

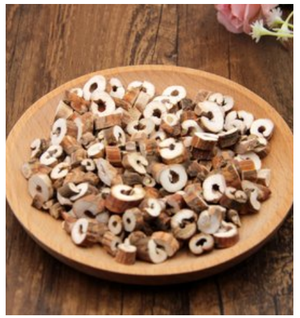
The “national flower,” the peony, is native to China and has a cultivation history of over 1,900 years. It is praised as the “national beauty with heavenly fragrance” and the “king of flowers.” The peony is a unique and precious flower in China, with Heze in Shandong and Henan being the most famous regions. In 2012, the China Flower Association officially designated Heze as the “Peony Capital of China.” On November 26, 2013, General Secretary Xi Jinping visited Heze, inspected the Yao-Shun Peony Industrial Park, and expressed his earnest expectation for Heze to “surpass others and achieve greater success.”

营养价值 Nutritional Value

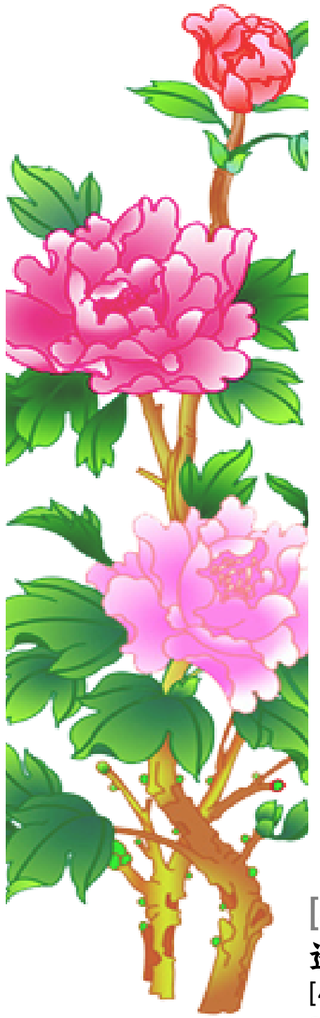
牡丹全是都是宝，花可赏、根入药、籽出油、蕊制茶、瓣提露……
牡丹活性成分极其丰富，具有极高的利用价值。牡丹根的皮经干燥炮制后成为传统中药丹皮，具有清热凉血、活血化瘀的作用。牡丹花既可观赏又可提取精油、原花色素等成分。牡丹种子可制成牡丹籽油、牡丹籽蛋白。牡丹花中主要的活性成分是多酚和黄酮类化合物，它们突出的特点是具有较强的抗氧化能力。牡丹籽油中不饱和脂肪酸占主体地位，突出的特点是具有强抗氧化力，以及降血压、降血脂、降血糖、延缓动脉硬化等效果，均对人体有益。
牡丹叶中的活性物质在抑菌方面效果较好[4]。

Everything about the peony is valuable: its flowers can be admired, its roots used as medicine, its seeds pressed for oil, its stamens used for tea, and its petals processed into extracts...
The peony is extremely rich in active compounds and has very high utilitarian value. After drying and processing, the bark of the peony root becomes the traditional Chinese medicine Danpi, which has the effects of clearing heat and cooling the blood, promoting blood circulation, and removing blood stasis.Peony flowers can be both appreciated for their beauty and used to extract essential oils and natural flower pigments. Peony seeds can be made into peony seed oil and peony seed protein. The main active compounds in peony flowers are polyphenols and flavonoids, which are notable for their strong antioxidant properties. Peony seed oil is predominantly composed of unsaturated fatty acids, with the outstanding characteristics of strong antioxidant capacity, as well as effects of lowering blood pressure, blood lipids, and blood sugar, and delaying arteriosclerosis, all of which are beneficial to the human body.
The active substances in peony leaves have good antibacterial effects.

- 牡丹籽：
  牡丹肽、牡丹纤维、牡丹籽油
  Peony Seeds:
  Peony Peptides, Peony Fiber, Peony Seed Oil



- 牡丹根：
  牡丹根皮、丹皮酚
  Peony Root:
  Peony Root Bark, Paeonol



- 牡丹花：
  花瓣（牡丹花水、牡丹精油）牡丹花蕊茶）
  Peony Flower:
  Petals (Peony Flower Water, Peony Essential Oil), Peony Stamen Tea

[4]高姗. 牡丹活性成分研究进展
[4] Gao Shan. Research Progress on Active Compounds of Peony

营养价值 Nutritional Value

牡丹籽是牡丹植株的精华结晶，传承了牡丹本身具有的一切特性外，它更有自己的独特的营养成分和医药保健功能，牡丹种子是受果壳和种壳双层保护的坚果，具有天然的“长寿”基因。

小分子活性肽作为蛋白质主要水解产物，通常具有较好的还原力，清除自由基、螯合金属离子、抑制活性氧生成等抗氧化活性，能够有效延缓机体衰老。研究发现，**牡丹籽多肽的综合抗氧化能力与谷胱甘肽相近或更优**[5]。

Peony seeds are the crystallized essence of the peony plant. In addition to inheriting all the characteristics of the peony itself, they also possess their own unique nutritional components and medicinal and health-promoting functions. Peony seeds are nuts protected by a double layer of fruit shell and seed coat, containing a natural “longevity” gene.Small-molecule active peptides, as the main hydrolysis products of proteins, generally have strong reducing power. They exhibit antioxidant activities such as scavenging free radicals, chelating metal ions, and inhibiting the generation of reactive oxygen species, effectively delaying the aging of the body. Studies have found that the comprehensive antioxidant capacity of peony seed peptides is comparable to or even superior to that of glutathione [5].

[5]陈容,胡素素,郑淳坚,柯德森.牡丹籽蛋白提取工艺及其多肽应用研究进展[J].现代食品,2021,(19):23-27

[5] Chen Rong, Hu Susu, Zheng Shunjian, K. Derson. Research Progress on the Extraction Process of Peony Seed Protein and Its Peptide Applications [J]. Modern Food, 2021, (19): 23-27

牦牛骨 Yak Bone

牦牛是生活在高寒缺氧富含多种中草药的青藏高原上，其骨密度大，骨质优良，富含胶原蛋白、氨基酸、软骨素、维生素以及 Ca、P、Mg、Zn 等矿物元素和人体所需的微量元素。胶原蛋白是牦牛骨中含量较高的蛋白，可达总蛋白含量的 40.9%。早在两千年前，《四部医典》等藏医宝典中就有利用牦牛骨治疗诸如骨质增生、骨质疏松的记载。研究表明，动物骨中的蛋白质具有很高的营养价值，可明显增强骨密度、促进骨生长发育、改善骨质疏松。食用牦牛骨胶的小鼠具有更强的耐缺氧、耐寒和抗疲劳的能力，同时增强小鼠的抗应激和增强免疫功能的作用。

The yak lives on the Qinghai-Tibet Plateau, a high-altitude, cold, and hypoxic region rich in various medicinal herbs. Its bones have high bone density and excellent quality, and are rich in collagen, amino acids, chondroitin, vitamins, as well as minerals such as calcium (Ca), phosphorus (P), magnesium (Mg), zinc (Zn), and other trace elements required by the human body. Collagen is the most abundant protein in yak bones, accounting for up to 40.9% of the total protein content. As early as two thousand years ago, Tibetan medical classics such as the Four Medical Tantras recorded the use of yak bones to treat conditions like bone hyperplasia and osteoporosis.Research shows that proteins in animal bones have high nutritional value, can significantly enhance bone density, promote bone growth and development, and improve osteoporosis. Mice fed yak bone collagen exhibited stronger tolerance to hypoxia, cold, and fatigue, while also showing enhanced stress resistance and improved immune function.

摘自：《牦牛骨及其功效活性研究进展》刘宇
Excerpt from: "Research Progress on Yak Bone and Its Functional Activities" by Liu Yu

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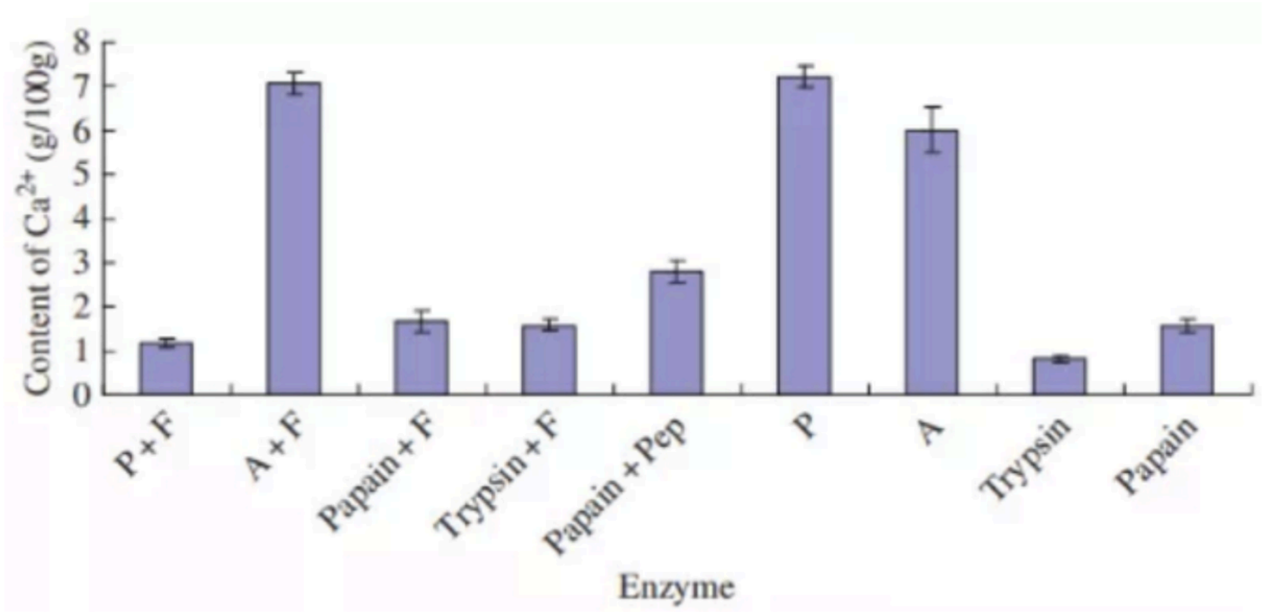
牦牛骨胶原蛋白肽 Yak bone collagen peptide

- **补充骨骼营养，促进钙类吸收**
  Supplement bone nutrition and promote calcium absorption.

由复合蛋白酶水解的牦牛骨胶原蛋白肽显示出最佳的钙结合能力为7.194g/100g。Zhen等报道了来自中性蛋白酶水解的绵羊骨肽的最大钙含量约为1.97g/100g(干基)。Jung等人研究了骨的酶促水解，得到的寡肽具有6.5g/10g的高亲和力钙。通过与上述结果的比较，可以得出结论，牦牛骨胶原蛋白肽具有优异的钙结合能力。

Yak bone collagen peptides hydrolyzed by compound proteases exhibited the highest calcium-binding capacity of 7.194 g/100 g. Zhen et al. reported that the maximum calcium content of sheep bone peptides hydrolyzed by neutral protease was approximately 1.97 g/100 g (dry basis). Jung et al. studied the enzymatic hydrolysis of bone and obtained oligopeptides with a high calcium affinity of 6.5 g/10 g. By comparison with the above results, it can be concluded that yak bone collagen peptides possess excellent calcium-binding capacity.



不同牦牛骨胶原蛋白肽的钙结合能力

▲外文期刊《Functions of Different Yak Bone Peptides》

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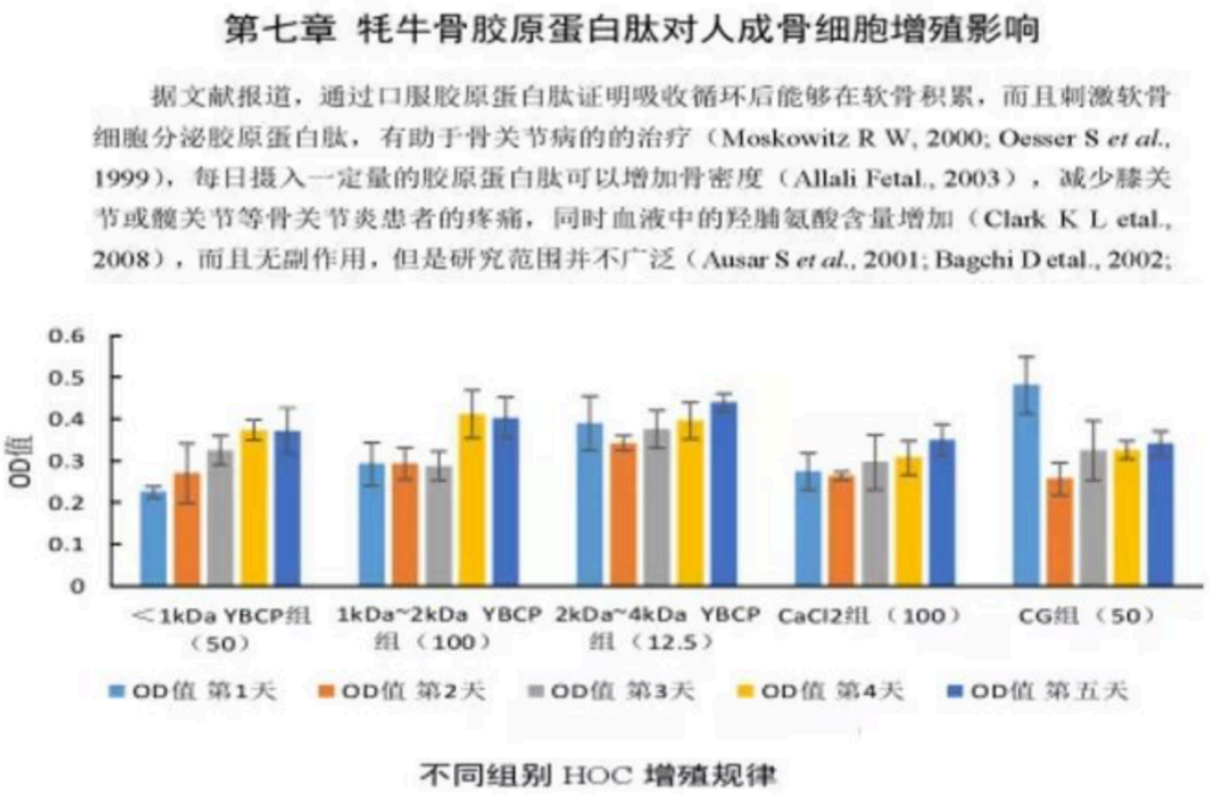
牦牛骨胶原蛋白肽

Yak bone collagen peptides

- **强化骨关节，促进骨生长**
  Strengthen bones and joints, and promote bone growth.

以HOB为体外模型，确定了分子量对人成骨细胞增殖的最佳浓度，在各样品最适浓度下，多肽表现出更强的促增长趋势。表明牦牛骨胶原蛋白肽可促进人成骨细胞的增殖，从而有效强化骨关节功能。

Using HOB as an in vitro model, the optimal concentrations for different molecular weight fractions to promote human osteoblast proliferation were determined. At their respective optimal concentrations, the peptides demonstrated a stronger growth-promoting effect. These findings suggest that yak bone collagen peptides can enhance the proliferation of human osteoblasts, thereby effectively improving bone and joint function.



▲博士学位论文《牛骨营养品质评价与牦牛骨胶原蛋白肽功效研究》

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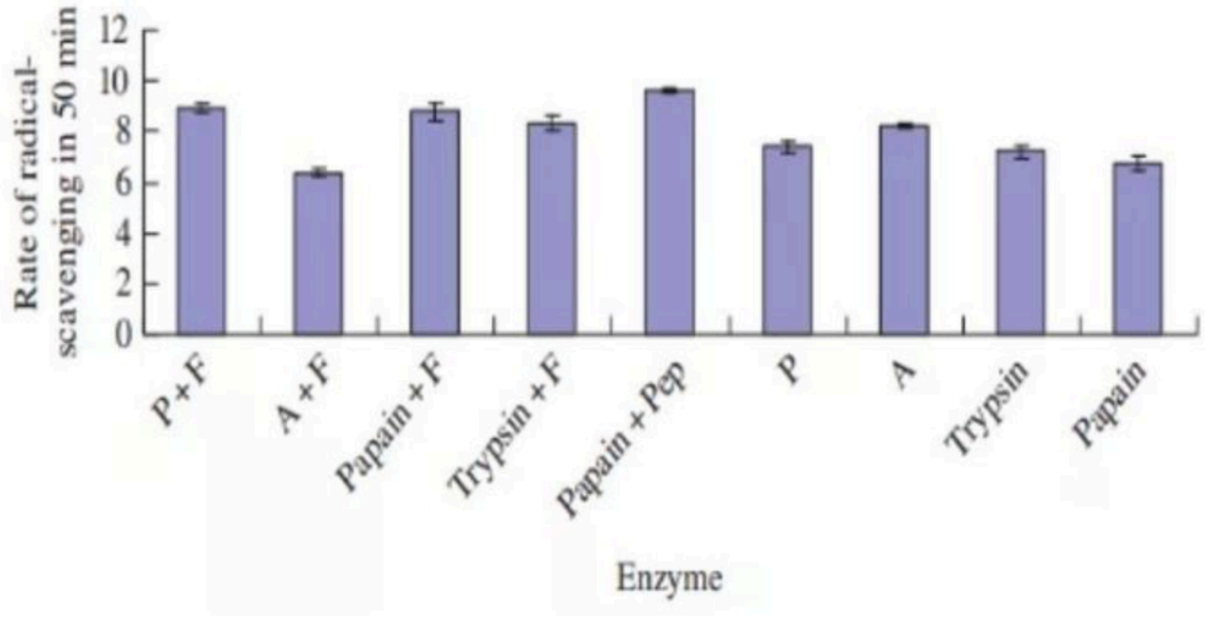
牦牛骨胶原蛋白肽 Yak bone collagen peptide

- **抗氧化** Antioxidant

牦牛骨胶原蛋白肽均具有DPPH自由基清除能力。经木瓜蛋白酶PSM500和肽酶R水解的牦牛骨胶原蛋白肽对DPPH自由基具有最有效的清除活性。此外，复合蛋白酶与风味蛋白酶、木瓜蛋白酶与风味蛋白酶水解的牦牛骨胶原蛋白肽具有相对高效的自由基清除活性。

All yak bone collagen peptides exhibit DPPH radical scavenging activity. Yak bone collagen peptides hydrolyzed by papain PSM500 and peptidase R showed the most effective DPPH radical scavenging activity. In addition, yak bone collagen peptides hydrolyzed by compound proteases combined with flavor protease, as well as by papain and flavor protease, demonstrated relatively high free radical scavenging activity.



▲外文期刊《Functions of Different Yak Bone Peptides》

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牦牛骨胶原蛋白肽 Yak bone collagen peptides

● 增强免疫力 Enhance immunity

脾脏和胸腺是体内重要的免疫器官，与人体免疫和细胞免疫均有密切联系。上述实验表明，与对照组相比，模型组脾脏、胸腺指数显著降低。各胶原蛋白肽组脾脏、胸腺指数与模型组相比均有显著提高。其中，中肽组的脾脏指数与高肽组分别达到最高，表明牦牛骨胶原蛋白肽可提高UVB损伤小鼠机体免疫水平。

The spleen and thymus are important immune organs in the body and are closely associated with both general and cellular immunity. The above experiments showed that, compared with the control group, the spleen and thymus indices in the model group were significantly decreased. In the collagen peptide groups, the spleen and thymus indices were significantly increased compared with the model group. Among them, the medium-peptide group and high-peptide group achieved the highest spleen index, indicating that yak bone collagen peptides can enhance the immune function of mice damaged by UVB.

表 3-15 水解产物对 UVB 损伤小鼠免疫器官脏器指数的影响($n=10, x = \bar{x} \pm S.D.$)

Tab. 3-15 Effect of the hydrolysate on index of immune organs in UVB irradiated mice

($n=10, x = \bar{x} \pm S.D.$)

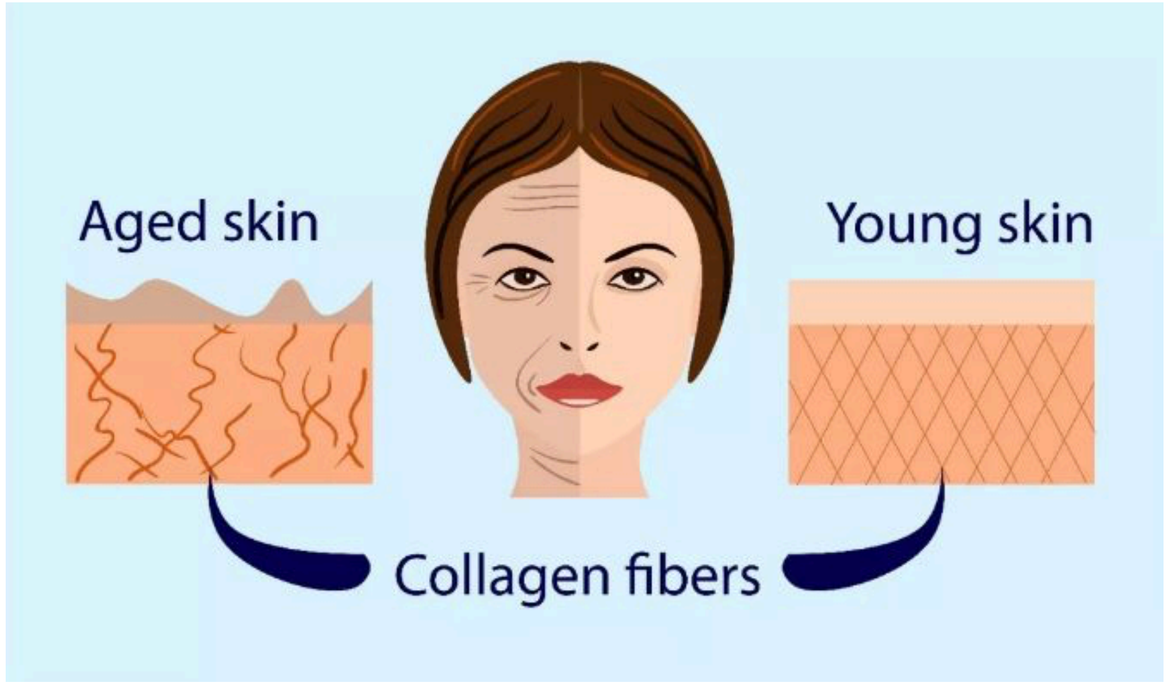
组别	脾脏指数/mg·gBW^{-1}	胸腺指数/mg·gBW^{-1}
对照组	3.874 ± 0.469^{b}	1.873 ± 0.463^{b}
模型组	3.399 ± 0.321^{a}	1.512 ± 0.210^{a}
低肽组	4.024 ± 0.462^{bc}	1.829 ± 0.302^{b}
中肽组	4.316 ± 0.275^{c}	1.926 ± 0.243^{b}
高肽组	4.153 ± 0.538^{bc}	2.265 ± 0.344^{c}

▲硕士学位论文《微波辅助水解制备骨胶原肽及其抗皮肤UVB损伤的研究》

牦牛骨胶原蛋白肽Yak bone collagen peptide

- **延缓衰老**Delay aging

牦牛骨胶原蛋白肽中的有效成分激活人体皮肤中胶原合成酶，促进人体胶原的合成，增加皮肤新鲜胶原的含量。25岁之后，人体合成胶原的能力下降，流失的胶原多于生成的胶原，皮肤就会出现松弛、老化现象。
坚持使用牦牛骨胶原蛋白肽，可以增加肌肤弹性
The active components in yak bone collagen peptides activate collagen-synthesizing enzymes in human skin, promoting the production of collagen and increasing the content of fresh collagen in the skin. After the age of 25, the body's ability to synthesize collagen declines, and collagen loss exceeds collagen production, leading to skin sagging and aging.
Consistent use of yak bone collagen peptides can help increase skin elasticity.



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营养价值 Nutritional Value

鳕鱼 Cod

餐桌上的"营养师"
鳕鱼肉味甘美、营养丰富。肉中蛋白质比三文鱼、鲳鱼、鲥鱼、带鱼都高，而肉中所含脂肪和鲨鱼一样只有0.5%，要比三文鱼低17倍，比带鱼低7倍；肝脏含油量高，除了富含普通鱼油所有的DHA、DPA外，还含有人体所必需的维生素A、D、E和其他多种维生素。鳕鱼肝油中这些营养成分的比例，正是人体每日所需要量的最佳比例。因此，北欧人将它称为餐桌上的"营养师"。

"The Nutritionist" on the Dining Table
Cod has sweet and delicate-tasting meat and is rich in nutrients. Its protein content is higher than that of salmon, pomfret, shad, and ribbonfish, while its fat content is only 0.5%, similar to that of shark, which is 17 times lower than salmon and 7 times lower than ribbonfish. The liver, however, is rich in oil and, in addition to containing all the common fish oil components such as DHA and DPA, also provides essential vitamins A, D, and E, as well as various other vitamins. The proportions of these nutrients in cod liver oil closely match the optimal daily requirements for the human body. For this reason, Northern Europeans refer to it as the "nutritionist" on the dining table.

《鳕鱼胶原肽保湿护肤效果的研究报告》

Research Report on the Moisturizing and Skincare Effects of Cod Collagen Peptide

鳕鱼皮胶原肽保湿护肤效果的研究

Study on the Moisturizing and Skin-Care Effects of Cod Skin Collagen Peptides

李幸

中国海洋大学

Li Xing

Ocean University of China

摘要 / Abstract：

水产胶原是一种从水生动物中提取出的胶原。我国渔业资源极其丰富，但同时也产生了大量的水产副废弃物。在这些水产废弃物中，鱼皮是提取胶原很好的原料，鱼皮干物质中70%以上为胶原。

Aquatic collagen is a type of collagen extracted from aquatic animals. China's fishery resources are extremely abundant, but they also generate a large amount of aquatic by-products. Among these by-products, fish skin is an excellent raw material for collagen extraction, with over 70% of the dry matter of fish skin being collagen.

本文以鳕鱼皮中提取的胶原蛋白为原料，通过酶解、分离，得到不同分子量段的胶原肽，对其保湿护肤效果和透皮吸收性进行了研究，开拓了水产废弃物的应用领域，为开发新型保湿产品、推动水产高值化利用的发展提供了科学依据。

This study uses collagen extracted from cod skin as the raw material. Through enzymatic hydrolysis and separation, collagen peptides of different molecular weight ranges were obtained. Their moisturizing and skin-care effects, as well as transdermal absorption, were studied, expanding the application of aquatic by-products and providing a scientific basis for developing new moisturizing products and promoting the high-value utilization of aquatic products.

本文以鳕鱼皮胶原蛋白为原料，用碱性蛋白酶对其进行不同时间的酶解，得到不同分子量段的胶原水解液，经过超滤装置分离纯化，冷冻干燥得到分子量段为 Mr>10kDa、6kDa<Mr<10kDa、3kDa<Mr<6kDa、1kDa<Mr<3kDa、Mr<1kDa 的五种胶原肽，胶原肽冻干粉的纯度均在90%左右。

Cod skin collagen was used as the raw material and hydrolyzed with alkaline protease for different durations to obtain collagen hydrolysates of different molecular weight ranges. After ultrafiltration purification and freeze-drying, five molecular weight ranges of collagen peptides were obtained: Mr>10 kDa, 6 kDa<Mr<10 kDa, 3 kDa<Mr<6 kDa, 1 kDa<Mr<3 kDa, and Mr<1 kDa. The purity of the freeze-dried collagen peptides was approximately 90%.

对梯级胶原肽和胶原蛋白进行体外吸湿性、保湿性的研究，得到分子量越小的胶原肽体外吸湿保湿性越好的结论，其中 Mr<1kDa 的胶原肽保湿效果最好。体表保湿实验进一步证实了胶原肽用于人体皮肤有较好的保湿作用。

The in vitro hygroscopicity and moisturizing properties of graded collagen peptides and collagen protein were studied. It was concluded that the smaller the molecular weight of the collagen peptide, the better its in vitro moisture absorption and retention. Among them, collagen peptides with Mr<1 kDa had the best moisturizing effect. Skin surface moisturizing experiments further confirmed that collagen peptides have good moisturizing effects on human skin.

对不同浓度梯级胶原肽和胶原蛋白进行体外透皮吸收实验，探讨了不同因素对透皮吸收性能的影响，得出了透皮吸收动力学方程，发现：各样品单位面积的累积透过量随时间增加，2h 内透皮透过率较大，2h 后透皮速率减小，并趋于稳定，从2h后的透皮吸收曲线得到透皮动力学方程；分子量越小的胶原肽透皮性越好。

In vitro transdermal absorption experiments were conducted on graded collagen peptides and collagen protein at different concentrations to investigate the effects of various factors on transdermal absorption performance. A transdermal absorption kinetic equation was derived. It was found that the cumulative permeation per unit area of each sample increased over time, with higher transdermal rates within the first 2 hours. After 2 hours, the transdermal rate decreased and stabilized. The kinetic equation was obtained from the transdermal absorption curve after 2 hours. Collagen peptides with smaller molecular weights exhibited better transdermal properties.

《大西洋鳕鱼皮多肽体外抗氧化活性研究》

Study on the In Vitro Antioxidant Activity of Atlantic Codfish Skin Polypeptides

大西洋鳕鱼皮多肽体外抗氧化活性研究

Study on Antioxidant Activity of Atlantic Codfish Skin Polypeptides in vitro

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摘要 / Abstract

[目的 Objective]

探讨大西洋鳕鱼皮多肽的体外抗氧化活性。

The research aimed to discuss the antioxidant activity of Atlantic codfish skin polypeptides in vitro.

[方法 Methods]

选取胰蛋白酶酶解鳕鱼皮，分别以氨基氮滴定法测定总氮含量为筛选指标，进一步进行 DPPH 自由基清除率、ABTS 离子螯合能力的体外抗氧化活性测试。

Atlantic codfish skin was hydrolyzed using trypsin, and amino nitrogen titration method and DPPH free radical scavenging rate were used as screening indicators.

超滤液分成 5 段分别进行 DPPH 自由基清除率、ABTS 离子螯合能力体外测定。

The ultrafiltrate was divided into 5 segments to test DPPH free radical scavenging rate, ABTS free radical force, and ferrous ion chelating ability in vitro.

筛选胰蛋白酶酶解鳕鱼皮的最佳条件为料液比 1:1，加酶量 2 500 U/g，45 ℃，pH 9.0。

The optimum conditions for trypsin enzymatic hydrolysis of Atlantic codfish skin were: solid-liquid ratio 1:1, enzyme dosage 2,500 U/g, temperature 45 ℃, and pH 9.0.

分子量小于 5 kD 时，DPPH 自由基清除能力、ABTS 自由基清除能力和 Fe^{2+} 离子螯合能力最强。

When the molecular weight was less than 5 kD, DPPH free radical scavenging ability, ABTS free radical scavenging ability, and Fe^{2+} ion chelating ability were strongest.

[结论 Conclusion]

胰蛋白酶水解后获得的大西洋鳕鱼皮多肽具有较好的体外抗氧化活性。

After trypsin digestion, the obtained Atlantic codfish skin polypeptides showed good antioxidant activity in vitro.

关键词 / Key words

鳕鱼皮；多肽；胰蛋白酶；抗氧化

Codfish skin; Polypeptides; Trypsin; Antioxidant

《鳕鱼皮胶原蛋白肽果汁饮料抗紫外线照射引起的皮肤光老化》

"Anti-Photoaging Effects of Cod Skin Collagen Peptide Juice Beverage Against UV-Induced Skin Aging"

鳕鱼皮胶原蛋白肽果汁饮料抗紫外线照射引起的皮肤光老化

Effect of Fruit Juice Drink Containing Collagen Polypeptides from Pacific Cod (Gadus macrocephalus) Skin on UV Irradiation–induced Skin Photoaging

摘要 Abstract

为研究鳕鱼皮胶原蛋白肽果汁饮料（CJD）对紫外线诱导的皮肤光老化的调节作用，

To investigate the regulatory effect of a fruit juice drink containing collagen polypeptides from Pacific cod skin (CJD) on UV-induced skin photoaging,

将ICR雄性小鼠随机分为正常组（NC）、模型组（MC）、CJD低剂量组（CJD-L）、中剂量组（CJD-M）和高剂量组（CJD-H）。

male ICR mice were randomly divided into a normal control group (NC), a model group (MC), and low-, medium-, and high-dose CJD groups (CJD-L, CJD-M, CJD-H).

通过观察各组小鼠皮肤的表观特征，结合HE染色，以及皮肤中羟脯氨酸和水分含量来评价CJD对皮肤光老化的防护作用；

The protective effects of CJD against skin photoaging were evaluated by observing skin appearance, histological analysis using hematoxylin-eosin (HE) staining, and measuring hydroxyproline and moisture content in the skin;

同时测定皮肤组织和血清中总超氧化物歧化酶（T-SOD）、过氧化氢酶（CAT）和谷胱甘肽过氧化物酶（GSH-Px）的活力，以及丙二醛（MDA）含量。

additionally, the activities of total superoxide dismutase (T-SOD), catalase (CAT), and glutathione peroxidase (GSH-Px), as well as malondialdehyde (MDA) levels in skin tissue and serum, were determined.

结果显示，与MC组相比，CJD中剂量和高剂量组可显著改善紫外线诱导的皮肤光老化症状（$p<0.05$），

Results showed that compared with the MC group, medium- and high-dose CJD significantly improved UV-induced skin photoaging symptoms ($p < 0.05$),

表现为显著降低皮肤皱纹程度（$p<0.01$），

including a marked reduction in wrinkle formation ($p < 0.01$),

并显著提高皮肤组织和血清中T-SOD、GSH-Px、CAT的活力（$p<0.05$），

and significantly increased the activities of T-SOD, GSH-Px, and CAT in both skin tissue and serum ($p < 0.05$),

同时降低MDA含量（$p<0.05$）。

while decreasing MDA levels ($p < 0.05$).

研究表明，鳕鱼皮胶原蛋白肽果汁饮料对紫外线引起的皮肤光老化具有保护作用，

These findings indicate that the collagen polypeptide fruit juice drink derived from cod skin has protective effects against UV-induced skin photoaging,

能够有效预防和延缓皮肤老化。

and can effectively prevent and delay skin aging.

关键词 Keywords

鳕鱼皮，胶原蛋白肽，紫外线照射，皮肤光老化，抗氧化酶

Cod skin; collagen polypeptides; ultraviolet irradiation; skin photoaging; antioxidant enzymes

鳕鱼胶原蛋白肽—全面提升肌肤品质

"Cod Collagen Peptides — Comprehensive Enhancement of Skin Quality"

报告结论 Report Conclusions

1.保湿：
鳕鱼小分子胶原肽可快速透过角质层的屏障进入到皮肤中，起到保湿作用。
Moisturizing:
Low-molecular-weight collagen peptides from cod can quickly penetrate the stratum corneum barrier and enter the skin, providing moisturizing effects.

2.有效抑制水分和胶原的流失：
通过实验发现鳕鱼胶原肽对提高衰老皮肤水分和胶原的含量有很好的效果，能有效抑制水分和胶原的流失。
Inhibiting moisture and collagen loss:
Experiments show that cod collagen peptides effectively increase moisture and collagen content in aged skin, thereby reducing their loss.

3.清除自由基，增加SOD活性：
鳕鱼胶原肽还有良好的清除自由基的能力，能显著增加皮肤SOD的活性，并有效抑制MDA的产生。
Free radical scavenging and increasing SOD activity:
Cod collagen peptides have strong free radical scavenging ability, significantly enhance SOD activity in the skin, and effectively inhibit MDA production.

4.抑制透明质酸流失，保持皮肤水润、健康：
鳕鱼小分子胶原肽能有效抑制透明质酸的降低，并对皮肤中的水分含量、轻脯氨酸均有明显的提高，对保持皮肤水润、健康起到了良好的功效。
Reducing hyaluronic acid loss and maintaining skin hydration and health:
Low-molecular-weight cod collagen peptides can effectively inhibit the reduction of hyaluronic acid and significantly increase skin moisture content and hydroxyproline levels, helping maintain hydrated and healthy skin.

5.改善皮肤粗糙、松弛、出现皱纹、胶原纤维减少、排列紊乱等：
通过对小鼠皮肤外观和内部组织形态学的观察，发现鳕鱼小分子胶原肽还能有效修复衰老造成的皮肤粗糙、松弛、出现皱纹、胶原纤维减少、排列紊乱等现象。
Improving roughness, laxity, wrinkles, and collagen fiber disorder:
Observations of mouse skin appearance and histological structure show that cod collagen peptides can effectively repair aging-related skin issues such as roughness, looseness, wrinkles, reduced collagen fibers, and disorganized structure.

6.有效改善光老化：
鳕鱼皮胶原蛋白肽能有效改善光老化小鼠皮肤组织的损伤程度，为从分子生物学角度确证胶原蛋白肽预防和延缓皮肤光老化的作用奠定了理论基础。
Improving photoaging:
Collagen peptides from cod skin can effectively reduce UV-induced damage in photoaged mouse skin, providing a theoretical basis (from a molecular biology perspective) for preventing and delaying skin photoaging.

总结：
可见鳕鱼胶原肽是一种对皮肤有多重保护作用的物质，不仅在补水保湿方面发挥着优良的效果，还能抵抗衰老对皮肤造成的结构功能上的损伤，在化妆品中有很高的应用价值。
Conclusion:
It can be seen that cod collagen peptides provide multiple protective effects for the skin. They not only offer excellent hydration and moisturizing benefits but also help resist structural and functional damage caused by aging, making them highly valuable for cosmetic applications.

《鳕鱼皮寡肽对人胃癌细胞 BGC823 增殖影响的实验研究》

Experimental Study on the Effects of Cod Skin Oligopeptides on the Proliferation of Human Gastric Cancer BGC823 Cells

图4 不同浓度 CSO 作用 BGC-823 各组细胞周期（a：对照组；b：20 mg/ml 组；c：40 mg/ml 组；d：60 mg/ml 组）

Figure 4 Effect of different concentrations of CSO on the cell cycle of BGC-823 cells (a: control group; b: 20 mg/ml group; c: 40 mg/ml group; d: 60 mg/ml group)

表3 BGC-823 分布周期比较（%）

Table 3 Comparison of BGC-823 cell cycle distribution (%)

组别	G_0/G_1 期	S 期	G_2/M 期
20 mg/ml	68.32 ± 9.26	21.71 ± 7.54	9.96 ± 2.68*
40 mg/ml	72.40 ± 8.45	20.67 ± 7.65	6.93 ± 1.25*
60 mg/ml	79.74 ± 10.21*	10.42 ± 5.36*	9.84 ± 3.79*
对照组	61.13 ± 10.23	23.04 ± 8.64	15.83 ± 5.89

*注：与对照组比较，P<0.05

*Note: Compared with the control group, P<0.05

株海洋蓝藻的抗癌作用研究后，认为海洋蓝藻具有一定的细胞毒性，是一类很有前途的具有潜在抗癌活性的海洋生物。

After studying the anti-cancer effects of marine blue algae, it is believed that marine blue algae possess certain cytotoxicity, being a type of marine organism with potential anti-cancer activity.

CSO 是以水解、酶解蛋白和蛋白质多肽吸收理论为基础研发的一种全新海洋功能性食品，产品不仅实现了边角料高附加值利用和产业化问题，而且针对人体营养学需要，利用水解蛋白技术，研究鱼皮胶原蛋白肽在抗癌作用和增强免疫力生理功能，在满足人体氨基酸需求的同时又满足对肿瘤患者在放疗、化疗、术后恢复的抗癌辅助作用提供理论依据。

CSO is a novel marine functional food developed based on the theory of enzymatic hydrolysis and protein/peptide absorption. The product not only realizes high-value utilization and industrialization of by-products but also meets human nutritional needs. Using hydrolyzed protein technology, it studies the anti-cancer effects and immune-enhancing physiological functions of fish skin collagen peptides, providing theoretical support for adjuvant anti-cancer therapy in patients undergoing radiotherapy, chemotherapy, and postoperative recovery while meeting amino acid requirements.

为了研究开发新型海洋生物抗癌药物，充分利用海洋深加工下脚料，本课题组从深海鲑鱼皮中提取藻肽，并通过体外细胞培养、显微镜观察、CCK-8 流式细胞术等实验方法，研究不同浓度（20、40、60、80 mg/ml）CSO 体外对 BGC-823 增殖及细胞周期与凋亡情况的影响。

To explore and develop new marine bioactive anti-cancer agents and fully utilize deep-sea processing by-products, this research group extracted CSO from deep-sea salmon skin. Using in vitro cell culture, microscopy, CCK-8, and flow cytometry, the effects of different concentrations (20, 40, 60, 80 mg/ml) of CSO on BGC-823 proliferation, cell cycle, and apoptosis were studied.

结果显示，CSO 能抑制 BGC-823 增殖，且随着 CSO 浓度增加，增殖抑制更加明显。采用 CCK-8 法检测 CSO 作用后 BGC-823 24、48、72h 增殖情况变化，发现 OD 值随着 CSO 的浓度增加而降低，24、48、72h 的 IC_{50} 分别是 87.34、68.14、44.55 mg/ml，可见药物对细胞的抑制率随着浓度增加而增高，上述结果表明，CSO 对 BGC-823 的增殖有抑制作用，且呈时间、量效关系。

The results showed that CSO inhibited BGC-823 proliferation, and the inhibitory effect became more pronounced with increasing CSO concentration. Using the CCK-8 method to measure changes in BGC-823 proliferation at 24, 48, and 72 hours after CSO treatment, OD values decreased with increasing CSO concentration. The IC_{50} values at 24, 48, and 72 hours were 87.34, 68.14, and 44.55 mg/ml, respectively, indicating that the inhibition rate increased with concentration. These results suggest that CSO inhibits BGC-823 proliferation in a time- and dose-dependent manner.

CSO 细胞周期实验发现，BGC-823 细胞随着 CSO 浓度增加，晚期凋亡细胞的比率增加，而活细胞比率降低。60 mg/ml 的 CSO 加药后，细胞的晚期凋亡率平均值甚至从对照组的 1.81% 达到 55.84%，活细胞比率平均值从对照组的 86.62% 降低至 24.18%，说明高浓度 CSO对于 BGC-823 细胞凋亡进展有显著影响。

Cell cycle experiments showed that with increasing CSO concentration, the proportion of late apoptotic BGC-823 cells increased, while the proportion of viable cells decreased. After treatment with 60 mg/ml CSO, the average late apoptosis rate increased from 1.81% in the control group to 55.84%, and the average viability decreased from 86.62% to 24.18%, indicating that high concentrations of CSO significantly affect BGC-823 apoptosis.

同时 CSO 的细胞周期实验检测发现，当 CSO 药物浓度达到 60 mg/ml 时，G_0/G_1 期细胞分布对照组的 61.13% 提升至 79.74%，而 S 期和 G_2/M 期细胞分布由对照组的 23.04% 和 15.83% 降低至 10.42% 和 9.84%，表明随着药物浓度的增大，S 期细胞的数量明显降低，细胞均被抑制在 G_0/G_1 期，导致了细胞增殖的停滞。

At the same time, cell cycle analysis showed that at a CSO concentration of 60 mg/ml, the G_0/G_1 phase increased from 61.13% in the control group to 79.74%, while the S and G_2/M phases decreased from 23.04% and 15.83% in the control group to 10.42% and 9.84%, respectively. This indicates that with increasing concentration, the number of S-phase cells significantly decreased, with cells arrested in the G_0/G_1 phase, resulting in proliferation arrest.

课题组应用酶法从鲑鱼皮中提取 CSO，通过 BGC-823…

The research group applied enzymatic hydrolysis to extract CSO from salmon skin, and through BGC-823...

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《鳕鱼皮胶原蛋白肽制备及其对肝细胞损伤的保护作用》

Preparation of Cod Skin Collagen Peptides and Their Protective Effects on Liver Cell Injury

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目的：研究鳕鱼皮胶原蛋白肽的制备工艺及不同浓度的鳕鱼皮胶原蛋白多肽对经LPS诱导损伤的Chang Liver细胞的修复作用。
Objective: To study the preparation process of cod skin collagen peptides and the repair effects of different concentrations of cod skin collagen peptides on Chang Liver cells injured by LPS.

方法：以料液比、加酶量、酶解时间和酶解温度为因素，以MTT试验所得细胞OD值为指标，通过正交试验筛选最佳酶解工艺，并采用超滤、阴离子交换、分子层析对其纯化。
Methods: Using solid-liquid ratio, enzyme dosage, hydrolysis time, and temperature as factors, and OD value from MTT assay as the indicator, the optimal enzymatic hydrolysis process was determined by orthogonal experiments. Ultrafiltration, anion exchange, and molecular chromatography were used for purification.

通过试剂盒法检测其对Chang Liver细胞内抗氧化酶和细胞上清液中转氨酶变化情况，采用Hoechst 33258染色法和Annexin V-FITC/PI双染流式细胞术观察其对损伤细胞的作用。
The effects on intracellular antioxidant enzymes and transaminases in the cell supernatant were measured using kits. Hoechst 33258 staining and Annexin V-FITC/PI flow cytometry were used to observe the effects on damaged cells.

最优酶解条件：以胰蛋白酶为水解酶，酶解温度50℃，pH 6，加酶量2000 U/g，酶解时间8 h。
Optimal hydrolysis conditions: trypsin as the enzyme, temperature 50°C, pH 6, enzyme dosage 2000 U/g, hydrolysis time 8 h.

经纯化得到蛋白肽GM2-2-3、GM2-2-3对LPS诱导损伤的Chang Liver细胞具有明显保护作用。
The purified peptides GM2-2-3 showed significant protective effects on LPS-induced damaged Chang Liver cells.

细胞内SOD、CAT、GSH-Px活性上升，MDA含量下降，并呈剂量依赖性；细胞上清液中AST、ALT、ALP、γ-GT、LDH活性下降。
The activities of SOD, CAT, and GSH-Px increased, while MDA content decreased in a dose-dependent manner. Activities of AST, ALT, ALP, γ-GT, and LDH in the supernatant decreased.

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鳕鱼皮；胶原蛋白肽；制备技术；肝损伤
Cod skin; collagen peptides; preparation technology; liver injury

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《鳕鱼皮寡肽减轻霍奇金淋巴瘤 患者化疗毒性反应的效果研究》
Study on the Effects of Cod Skin Oligopeptides in Reducing Chemotherapy-Induced Toxic Reactions in Patients with Hodgkin's Lymphoma

鳕鱼皮寡肽减轻霍奇金淋巴瘤患者化疗毒性反应的效果研究

Study on the Effects of Cod Skin Oligopeptides in Reducing Chemotherapy Toxic Reactions in Patients with Hodgkin's Lymphoma

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目的：探讨鳕鱼皮寡肽（CSP）减轻霍奇金淋巴瘤（HL）患者化疗毒性反应的效果。
Objective: To investigate the effect of cod skin oligopeptides (CSP) in reducing chemotherapy-induced toxic reactions in patients with Hodgkin's lymphoma (HL).
方法：选择HL患者50例，分为干预组和对照组各25例，两组均接受相同的化疗方案和其他常规治疗与护理。干预组在此基础上于化疗第1天开始口服CSP。
Methods: Fifty HL patients were selected and divided into an intervention group and a control group (25 cases each). Both groups received the same chemotherapy regimen along with routine treatment and care. The intervention group additionally received oral CSP starting from the first day of chemotherapy.
比较两组患者化疗后骨髓抑制和消化道反应以及化疗后Karnofsky生活质量评分差异。
The differences in bone marrow suppression, gastrointestinal reactions, and Karnofsky Performance Status (KPS) scores after chemotherapy were compared between the two group
结果：干预组患者化疗后WBC、Hb抑制程度低于对照组（P＜0.05），PLT抑制程度比较差异无统计学意义（P＞0.05）。
两组患者化疗后消化道反应比较差异无统计学意义（P＞0.05）。
Results: After chemotherapy, the levels of WBC and Hb suppression in the intervention group were lower than those in the control group (P<0.05), while there was no statistically significant difference in PLT suppression (P>0.05). There was also no statistically significant difference in gastrointestinal reactions between the two groups (P>0.05).
化疗前两组患者Karnofsky生活质量评分比较差异无统计学意义（P＞0.05），化疗后干预组患者高于对照组（P＜0.05）。
Before chemotherapy, there was no significant difference in Karnofsky scores between the two groups (P>0.05). After chemotherapy, the intervention group had higher scores than the control group (P<0.05).
结论：CSP可作为HL患者化疗期间的营养补充剂，具有增效减毒的效果。
Conclusion: CSP can be used as a nutritional supplement during chemotherapy in HL patients, showing effects of enhancing efficacy and reducing toxicity.

关键词：胶原蛋白肽；霍奇金淋巴瘤；化学治疗；毒性反应；研究
Keywords:Collagen peptides; Hodgkin's lymphoma; chemotherapy; toxic reactions; study

《鱼胶原蛋白肽功能活性研究进展》

Research Progress on the Functional Activities of Fish Collagen Peptides

鱼胶原蛋白肽功能活性研究进展

Research Progress on the Functional Activities of Fish Collagen Peptides

摘要:胶原蛋白肽是胶原蛋白经酶解或其他方式得到的一类小分子肽，具有分子量小、易吸收等特点。近年来，随着人们对健康和美容的关注，鱼胶原蛋白肽在食品、医药及化妆品等领域的应用越来越广泛。本文综述了鱼胶原蛋白肽的功能活性及其研究进展，为其进一步开发利用提供参考。

Abstract:Collagen peptides are small molecular peptides obtained from collagen through enzymatic hydrolysis or other methods. They are characterized by low molecular weight and easy absorption. In recent years, with increasing attention to health and beauty, fish collagen peptides have been widely used in food, pharmaceutical, and cosmetic fields. This paper reviews the functional activities and research progress of fish collagen peptides, providing a reference for their further development and application.

关键词:鱼胶原蛋白肽；功能活性；研究进展

Keywords:Fish collagen peptides; Functional activity; Research progress

1 胶原蛋白与胶原蛋白肽 Collagen and Collagen Peptides

胶原蛋白是动物体内含量最丰富的一种蛋白质，广泛存在于皮肤、骨骼、软骨等组织中，具有重要的结构和功能作用。胶原蛋白肽是胶原蛋白经水解后得到的小分子肽，具有良好的溶解性和生物活性，更易被人体吸收利用。

Collagen is the most abundant protein in animals and is widely found in skin, bones, cartilage, and other tissues, playing important structural and functional roles.Collagen peptides are small molecular peptides obtained from the hydrolysis of collagen. They have good solubility and biological activity and are more easily absorbed and utilized by the human body.

2 鱼胶原蛋白肽的功能活性 Functional Activities of Fish Collagen Peptides

2.1 抗氧化活性 Antioxidant Activity

鱼胶原蛋白肽具有较强的抗氧化能力，能够清除自由基，减少氧化损伤，从而延缓衰老过程。

Fish collagen peptides have strong antioxidant capacity, which can scavenge free radicals, reduce oxidative damage, and delay aging.

2.2 抗肿瘤活性 Antitumor Activity

研究表明，鱼胶原蛋白肽对某些肿瘤细胞具有抑制作用，能够影响癌细胞的增殖与分化过程。

Studies have shown that fish collagen peptides can inhibit certain tumor cells and affect the proliferation and differentiation of cancer cells.

2.3 降血压活性 Antihypertensive Activity

鱼胶原蛋白肽中含有血管紧张素转化酶抑制肽（ACE抑制肽），能够抑制ACE活性，从而起到降血压的作用。

Fish collagen peptides contain angiotensin-converting enzyme (ACE) inhibitory peptides, which can inhibit ACE activity and thus help lower blood pressure.

2.4 改善皮肤功能 Skin Improvement Function

鱼胶原蛋白肽能够促进皮肤胶原蛋白的合成，提高皮肤弹性，减少皱纹，同时增强皮肤的保湿能力。

Fish collagen peptides can promote collagen synthesis in the skin, improve elasticity, reduce wrinkles, and enhance skin hydration.

2.5 促进骨骼健康 Bone Health Promotion

鱼胶原蛋白肽富含甘氨酸、脯氨酸等氨基酸，有助于促进钙的吸收，提高骨密度，对预防骨质疏松具有一定作用。

Fish collagen peptides are rich in amino acids such as glycine and proline, which help promote calcium absorption, increase bone density, and contribute to the prevention of osteoporosis.

3 结论 Conclusion

鱼胶原蛋白肽具有多种生物活性，在抗氧化、抗肿瘤、降血压、美容护肤及骨骼健康等方面具有良好的应用前景。未来应进一步加强其作用机制及临床应用研究，以推动其在食品及医药领域的发展。

Fish collagen peptides possess multiple biological activities and show great application potential in antioxidant, antitumor, antihypertensive, skincare, and bone health fields. Future research should further explore their mechanisms and clinical applications to promote their development in food and pharmaceutical industries.

鳕鱼胶原蛋白肽——针对重大疾病和老慢病

Cod Collagen Peptides — Targeting Major Diseases and Chronic Conditions

报告结论 Report Conclusion

1.抑制癌细胞，缓解放化疗导致的后遗症。Inhibition of Cancer Cells and Alleviation of Side Effects from Radiotherapy and Chemotherapy

鳕鱼胶原蛋白肽不仅是人体营养的需求，在抗癌作用和增强免疫力生理功能，在满足人体氨基酸需求的同时又满足对肿瘤患者在放疗、化疗、术后恢复的抗癌辅助作用提供理论依据。鳕鱼胶原蛋白肽能抑制胃癌细胞的增殖，且随着鳕鱼胶原蛋白肽浓度增高，增殖抑制更加明显，且呈时间、量效关系。

Cod collagen peptides are not only a nutritional requirement for the human body but also provide theoretical support for anticancer effects and enhancement of immune function. While meeting the body's amino acid needs, they serve as an adjunct in anticancer therapy for tumor patients during radiotherapy, chemotherapy, and postoperative recovery. Cod collagen peptides can inhibit the proliferation of gastric cancer cells, and as the concentration of cod collagen peptides increases, the inhibitory effect becomes more pronounced, showing a clear time- and dose-dependent relationship.

2.对肝细胞损伤的保护作用 Protective Effect on Hepatocyte Injury

当肝脏细胞膜破裂时,鳕鱼胶原蛋白肽会迅速保护肝脏细胞，使氧化损伤得肝脏细胞明显减轻，细胞内SOD、CAT、GSH-PX活性明显上升，鳕鱼皮胶原蛋白肽具有对肝细胞损伤的保护作用。

When the liver cell membrane is damaged, cod collagen peptides rapidly protect hepatocytes, significantly reducing oxidative damage. The activities of intracellular SOD, CAT, and GSH-Px are markedly increased. Cod skin collagen peptides therefore exhibit a protective effect against hepatocyte injury.

3.增强免疫必不可少得营养制剂 Essential Nutritional Supplement for Immune Enhancement

鳕鱼胶原蛋白肽可作为肿瘤患者化疗期间的营养补充剂，具有增效减毒的效果，且不增加患者的胃肠道负担，继而发挥增强患者体力和改善患者生活质量的作用。

Cod collagen peptides can be used as a nutritional supplement for tumor patients during chemotherapy. They have the effect of enhancing efficacy while reducing toxicity, without increasing the burden on the gastrointestinal tract. As a result, they help improve patients' physical strength and enhance their quality of life.

4.保护血管内皮细胞 Protection of Vascular Endothelial Cells

血管内皮细胞损伤被认为是动脉粥样硬化发病早期的关键环节。鱼皮胶原蛋白肽对血管内皮细胞损伤具有一定的保护和修复作用，并且在一定浓度范围内其作用随多肽浓度的增加而增强。

Damage to vascular endothelial cells is considered a key early event in the development of atherosclerosis. Fish skin collagen peptides have certain protective and reparative effects on vascular endothelial cell injury, and within a specific concentration range, their effects increase with higher peptide concentrations.

5.改善骨质疏松 Improvement of Osteoporosis

鳕鱼胶原蛋白肽富含甘氨酸、脯氨酸和羟脯氨酸，它们增强人体对钙的吸收。经常服用胶原蛋白肽可以提高人体骨骼的强度，防止骨质疏松。临床研究也表明，每天服用10g鱼胶原蛋白肽可以明显降低骨关节炎的疼痛。

Cod collagen peptides are rich in glycine, proline, and hydroxyproline, which enhance the body's absorption of calcium. Regular intake of collagen peptides can improve bone strength and help prevent osteoporosis. Clinical studies have also shown that daily consumption of 10 g of fish collagen peptides can significantly reduce pain associated with osteoarthritis.

营养价值 Nutritional Value

抗氧化 Antioxidation

当分子量小于5kD时，大西洋鳕鱼皮多肽显现出较高的自由基清除能力、也在与Fe2+螯合方面具有活性。表明经胰蛋白酶酶解获得的大西洋鳕鱼皮多肽，存在较好的抗氧化活性。

When the molecular weight is less than 5 kDa, Atlantic cod skin peptides exhibit strong free radical scavenging ability and also show activity in chelating Fe^{2+}. This indicates that Atlantic cod skin peptides obtained through trypsin hydrolysis possess good antioxidant activity.

皮肤保湿 Skin Moisturizing

胶原肽是一种对皮肤具有多重保护作用的物质，不仅在补水保湿方面发挥着优良的效果，还能抵抗衰老对皮肤造成的结构功能上的损伤。

Collagen peptides are substances that provide multiple protective effects on the skin. They not only deliver excellent hydration and moisturizing benefits, but also help resist structural and functional damage to the skin caused by aging.

资料来源：《大西洋鳕鱼皮多肽体外抗氧化活性研究》阎洁；《鳕鱼皮胶原肽保湿效果的研究》李幸

Sources:"Study on the In Vitro Antioxidant Activity of Atlantic Cod Skin Peptides" by Yan Jie;"Study on the Moisturizing Effect of Cod Skin Collagen Peptides" by Li Xing.

营养价值 Nutritional Value

预防、延缓光老化

鳕鱼皮胶原蛋白肽能有效改善光老化小鼠皮肤组织的损伤程度。胶原蛋白肽经口服后，会在皮肤处特异性富集并被利用，并且促进皮肤基质胶原的合成，通过抑制胶原降解过程中关键酶的表达来抑制胶原的降解代谢。

Prevention and Delay of Photoaging

Cod skin collagen peptides can effectively improve the degree of skin tissue damage in photoaged mice. After oral administration, collagen peptides are specifically accumulated and utilized in the skin, promoting the synthesis of dermal matrix collagen. They also inhibit collagen degradation metabolism by suppressing the expression of key enzymes involved in the collagen degradation process.

资料来源：《鳕鱼皮胶原蛋白肽果汁饮料抗紫外线照射引起的皮肤光老化》初鑫

Source: "Study on the Protective Effect of Cod Skin Collagen Peptide Juice Beverage Against UV-Induced Skin Photoaging" by Chu Xin.

牛骨胶原蛋白肽 Ox Bone Collagen Peptides

《本草纲目》记载牛骨，甘，温，无毒，烧灰，治吐血，鼻洪，崩中，带下，肠风，主关节。牛骨中蛋白含量为16%～25%，其中胶原蛋白是主要蛋白，占总蛋白的80%～90%，牛骨中的胶原蛋白经过酶解、分离纯化等手段得到的胶原蛋白肽，具有抗高血压、保护骨健康、抗菌、抗氧化和免疫调节等功效，对于改善人体健康具有重要意义。

According to the Compendium of Materia Medica, ox bone is sweet in taste, warm in nature, and non-toxic. When burned to ash, it is used to treat hematemesis, epistaxis, abnormal uterine bleeding, vaginal discharge, intestinal wind, and is beneficial for the joints.

The protein content of ox bone ranges from 16% to 25%, with collagen being the main protein, accounting for 80%–90% of the total protein. Collagen peptides obtained from ox bone collagen through enzymatic hydrolysis, separation, and purification exhibit antihypertensive, bone-protective, antibacterial, antioxidant, and immunomodulatory effects, and are of significant importance for improving human health.

摘自：《牛骨胶原蛋白肽功效研究进展》鲁速

Excerpt from: "Research Progress on the Effects of Ox Bone Collagen Peptides" by Lu Su.

营养价值 Nutritional Value

牛骨胶原蛋白肽功效研究进展

Research Progress on the Effects of Ox Bone Collagen Peptides

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研究表明胶原蛋白肽对骨质疏松缓解发挥积极作用[9,10]，刘俊丽等研究发现0.3mg/ml的牛骨胶原蛋白能显著促进人成骨细胞的增殖，是一种良好的防治骨质疏松的营养补充剂[9]。Ye等制备了一种新型促成骨细胞增殖的牦牛骨胶原蛋白，发现在0.5mg/ml的浓度下处理96h，成骨细胞增值率高达175.4%，通过质谱鉴定，发现有28条肽来自I型胶原蛋白α1链，有31条肽来自I型胶原蛋白α2链[10]。叶孟亮等通过去卵巢骨质疏松大鼠模型发现分子量小于3k Da的牦牛骨胶原蛋白肽在100、200、500mg/kg的剂量下可以让大鼠骨弹性载荷和断裂载荷明显上升，显著提高大鼠骨小梁数目、密度、厚度和骨体积分数，降低了骨小梁间距[11]。此外，已有临床实验证明，绝经后骨质疏松妇女口服补充胶原蛋白肽能够调节骨代谢平衡，通过增强骨合成，降低骨吸收，使身体骨量增加，减少绝经后骨质疏松妇女的骨质流失[12]。

Studies have shown that collagen peptides play an active role in alleviating osteoporosis [9,10]. Liu Junli and others found that 0.3 mg/ml of ox bone collagen can significantly promote the proliferation of human osteoblasts, serving as a good nutritional supplement for the prevention and treatment of osteoporosis [9]. Ye et al. prepared a novel ox bone collagen that promotes osteoblast proliferation and found that at a concentration of 0.5 mg/ml for 96 hours, osteoblast proliferation increased by as much as 175.4%. Mass spectrometry identification revealed that 28 peptides originated from the α1 chain of type I collagen and 31 peptides from the α2 chain of type I collagen [10]. Ye Mengliang and others, using an ovariectomized osteoporosis rat model, found that ox bone collagen peptides with molecular weight less than 3 kDa at doses of 100, 200, and 500 mg/kg significantly increased the elastic load and fracture load of rat bones, markedly improved trabecular number, density, thickness, and bone volume fraction, and reduced trabecular spacing [11]. Furthermore, clinical studies have shown that oral supplementation of collagen peptides in postmenopausal women with osteoporosis can regulate bone metabolism balance, enhance bone formation, reduce bone resorption, increase overall bone mass, and decrease bone loss in postmenopausal osteoporotic women [12].

- **缓解骨质疏松**

牛骨胶原蛋白肽能显著促进人成骨细胞的增殖，是一种良好的预防骨质疏松的营养补充剂。

Relieve Osteoporosis

Bovine bone collagen peptides can significantly promote the proliferation of human osteoblasts and serve as an effective nutritional supplement for preventing osteoporosis.

营养价值 Nutritional Value

牛骨胶原蛋白肽功效研究进展

Research Progress on the Effects of Ox Bone Collagen Peptides

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胶原蛋白肽可以在营养美容产品中作为生物活性成分使用，能改善皮肤的基本状况和皮肤构造，可改善皮肤屏障功能，诱导胶原蛋白和透明质酸的合成以及促进成纤维细胞生长和迁移，有助于伤口愈合和修复紫外线UV对皮肤的伤害[13]。Asserin等研究发现，连续8周每天口服鱼源和猪源胶原蛋白肽10g，真皮中的胶原蛋白密度增加，而真皮胶原蛋白网络的断裂显著降低，皮肤水合作用显著增加[14]。Wang J 等研究发现，剖宫产后的大鼠，以每千克体重口服1.125g剂量的胶原蛋白肽可以加快胶原蛋白沉积和增加组织血管生成，促进伤口收缩，从而改善愈合情况[15]。Tanaka等发现按照每天每千克体重口服摄入0.2g剂量的胶原蛋白肽(提自罗非鱼鳞片)可抑制由UV-B辐射产生的皮肤水分减少和表皮增生，以及可溶性I型胶原蛋白降低等皮肤问题[16]。

Collagen peptides can be used as bioactive ingredients in nutritional and beauty products. They improve the basic condition and structure of the skin, enhance skin barrier function, induce the synthesis of collagen and hyaluronic acid, and promote fibroblast growth and migration, thereby aiding wound healing and repairing skin damage caused by UV radiation [13].Asserin et al. found that daily oral administration of 10 g of fish- and porcine-derived collagen peptides for 8 consecutive weeks increased collagen density in the dermis, significantly reduced breaks in the dermal collagen network, and significantly improved skin hydration [14]. Wang J et al. reported that in post-cesarean rats, oral administration of collagen peptides at a dose of 1.125 g per kilogram of body weight accelerated collagen deposition, increased tissue angiogenesis, and promoted wound contraction, thereby improving healing [15].Tanaka et al. found that daily oral intake of collagen peptides at a dose of 0.2 g per kilogram of body weight (derived from tilapia scales) inhibited UV-B-induced decreases in skin moisture, epidermal hyperplasia, and reductions in soluble type I collagen, addressing various skin problems [16].

- **改善皮肤及愈合伤口**
  改善皮肤的基本状况和皮肤构造，可改善皮肤屏障功能，诱导胶原蛋白和透明质酸的合成以及促进纤维细胞生长和转移，有助于伤口愈合和修复紫外线UV对皮肤的伤害。

  Improvement of Skin and Wound Healing
  Improves the basic condition and structure of the skin, enhances skin barrier function, induces the synthesis of collagen and hyaluronic acid, and promotes fibroblast growth and migration. This contributes to wound healing and helps repair skin damage caused by UV radiation.

牛骨胶原蛋白肽功效研究进展

Research Progress on the Effects of Ox Bone Collagen Peptides

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Gao等研究发现，口服牛骨胶原蛋白肽可调节环磷酰胺诱导的免疫抑制BALB/c小鼠的先天性（NK细胞活力和细胞因子浓度）和适应性（脾淋巴细胞增殖和免疫球蛋白浓度）免疫功能，低剂量的牛骨胶原蛋白肽摄入减少了内部器官的收缩并增加了白细胞的浓度[17]。表明胶原蛋白肽可增加先天免疫力和适应性免疫力，从而预防或改善免疫抑制。

Gao et al. found that oral administration of bovine bone collagen peptides can regulate both innate immunity (NK cell activity and cytokine levels) and adaptive immunity (splenic lymphocyte proliferation and immunoglobulin levels) in cyclophosphamide-induced immunosuppressed BALB/c mice. Low-dose intake of bovine bone collagen peptides reduced organ atrophy and increased white blood cell counts [17]. This indicates that collagen peptides can enhance innate and adaptive immunity, thereby preventing or improving immunosuppression.

- **增加免疫**
  牛骨胶原蛋白肽可增加先天免疫和适应性免疫力，从而预防或改善免疫抑制。
  Immune Enhancement
  Bovine bone collagen peptides can enhance innate and adaptive immunity, thereby preventing or improving immunosuppression.

牛骨胶原蛋白肽功效研究进展

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多肽的抗氧化活性与他们的氨基酸组成、结构、疏水性、分子量等都有关，胶原蛋白肽氨基酸组成中的甘氨酸(Gly)、丙氨酸(Aa)、脯氨酸(Pro)、蛋氨酸(Met)、半胱氨酸(Cys)、酪氨酸(Tyr)含量使其具有螯合和清除自由基的能力[18]。Ku等发现牛骨胶原蛋白肽DPPH(1,1-二苯基-2-三硝基苯肼)自由基清除率高达72.81%，超氧阴离子自由基清除活性高达11.88±0.59 SOD U/g，具有较强抗氧化能力[19]。王晨等利用酶解得到牛骨胶原蛋白，发现在80g/L浓度下，其对超氧阴离子清除率可达63.86%，对羟基自由基清除率为99.55%，具有较好抗氧化性[20]。目前对于牛骨胶原蛋白肽的抗氧化活性研究较少，胶原蛋白肽的抗氧化活性研究较多的来自鱼源[21,22]

The antioxidant activity of peptides is related to their amino acid composition, structure, hydrophobicity, molecular weight, and other factors. The content of glycine (Gly), alanine (Ala), proline (Pro), methionine (Met), cysteine (Cys), and tyrosine (Tyr) in collagen peptides gives them the ability to chelate and scavenge free radicals [18]. Ku et al. found that bovine bone collagen peptides had a DPPH (1,1-diphenyl-2-picrylhydrazyl) free radical scavenging rate of up to 72.81% and superoxide anion radical scavenging activity of 11.88 ± 0.59 SOD U/g, demonstrating strong antioxidant capacity [19]. Wang Chen et al. prepared bovine bone collagen by enzymatic hydrolysis and found that at a concentration of 80 g/L, the superoxide anion scavenging rate reached 63.86% and the hydroxyl radical scavenging rate reached 99.55%, showing excellent antioxidant properties [20]. Currently, studies on the antioxidant activity of bovine bone collagen peptides are limited, while most research on the antioxidant activity of collagen peptides comes from fish sources [21,22].

- **抗氧化**
  牛骨胶原蛋白肽自由基清除率高达72.81%，具有较强的抗氧化能力。
  Antioxidant
  Bovine bone collagen peptides have a free radical scavenging rate of up to 72.81%, demonstrating strong antioxidant capacity.

牛骨胶原蛋白肽功效研究进展

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目前，抗菌肽成为对常规抗生素产生耐药性细菌的新克星，它能迅速杀死广泛的传染源并调节先天和适应性免疫，是保鲜剂研究的一个新方向[23]。抗菌肽既具有抗感染化合物作用，又能穿透细胞，将药物内化到细菌和真核细胞[24,25,26]。牛骨胶原蛋白含有较多的脯氨酸，已有研究表明其具有抑菌作用[27,28]。张顺亮等研究发现，风味蛋白酶和中性蛋白酶的酶解液对金黄色葡萄球菌有抑菌效果，抑菌圈直径为6.03和7.97mm，动物复合蛋白酶、风味蛋白酶和胰蛋白酶对肠炎沙门氏菌具有抑菌效果，其抑菌圈直径分别为8.67、9.10、9.03mm[27]。PierPaolo等通过在火鸡制品中添加1.5%的骨胶原蛋白肽，菌落数明显减少[28]。

At present, antimicrobial peptides have become a new solution against bacteria resistant to conventional antibiotics. They can rapidly kill a wide range of pathogens and modulate both innate and adaptive immunity, representing a new direction in preservative research [23]. Antimicrobial peptides not only act as anti-infective compounds but also penetrate cells, delivering drugs into bacterial and eukaryotic cells [24,25,26]. Bovine bone collagen is rich in proline, and studies have shown that it possesses antibacterial activity [27,28]. Zhang Shunliang and colleagues found that hydrolysates of flavor protease and neutral protease exhibited antibacterial effects against Staphylococcus aureus, with inhibition zone diameters of 6.03 mm and 7.97 mm, respectively. Hydrolysates of animal composite protease, flavor protease, and trypsin showed antibacterial activity against Salmonella enterica, with inhibition zones of 8.67 mm, 9.10 mm, and 9.03 mm, respectively [27]. PierPaolo and colleagues reported that adding 1.5% bone collagen peptides to turkey products significantly reduced colony counts [28].

- **抑菌**
  牛骨胶原蛋白肽含有较多的脯氨酸，研究表明具有抑菌作用。
  Antibacterial
  Bovine bone collagen peptides are rich in proline, and studies have shown that they possess antibacterial activity.

牛骨胶原蛋白肽功效研究进展

Research Progress on the Effects of Ox Bone Collagen Peptides

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蔡丽华等通过酶解、超滤等手段制备得到分子量小于5000Da的牛骨胶原蛋白肽，它是一种竞争性抑制剂，可以与ACE结合从而减少ACE酶催化ACE-I转化为导致血压升高的ACE-，由此可以起到降压作用【29,30,31】。Lafarga等以牛骨胶原蛋白为原料，通过多肽数据库和计算机模拟软件预测牛骨胶原蛋白肽是具有ACE-1抑制活性的多肽，并经化学合成后验证其体外活性，发现脯氨酸含量丰富的胶原蛋白是制备ACE抑制肽的优质来源，说明牛骨胶原蛋白肽具有促进心脏健康作用【32】。

Cai Lihua and colleagues prepared bovine bone collagen peptides with a molecular weight below 5000 Da using enzymatic hydrolysis and ultrafiltration. These peptides act as competitive inhibitors that can bind to ACE, thereby reducing the ACE-catalyzed conversion of ACE-I to ACE-, which causes an increase in blood pressure. This indicates a potential antihypertensive effect [29,30,31]. Lafarga and colleagues used bovine bone collagen as a raw material and, through peptide databases and computer simulation software, predicted that bovine bone collagen peptides possess ACE-1 inhibitory activity. After chemical synthesis and in vitro activity verification, they found that collagen rich in proline is an excellent source for producing ACE-inhibitory peptides, suggesting that bovine bone collagen peptides may promote cardiovascular health [32].

- **降压、促进心脏健康**
  牛骨胶原蛋白肽含丰富脯氨酸，抑制血管紧张素，起到降压作用，促进心脏健康作用。
  Antihypertensive and Cardioprotective Effects
  Bovine bone collagen peptides are rich in proline, inhibit angiotensin, thereby exerting antihypertensive effects and promoting heart health.

山药肽粉 Yam Peptide Powder

身体虚弱、气血不足、气短者、贫血、神经衰弱者
Individuals with physical weakness, Qi and blood deficiency, shortness of breath, anemia, or neurasthenia

补气 健脾
《神农本草经》山药性平不燥，用于脾胃虚弱，食少体倦，肺虚久咳，肾虚梦遗精滑，小便频数等症。”
《本草纲目》中记载:"益肾气，健脾胃，止泄痢，化痰，润皮毛"。
Tonify Qi and Strengthen the Spleen
According to the Shennong Bencao Jing, yam is neutral in nature and not drying. It is used for spleen and stomach weakness, poor appetite and fatigue, chronic cough due to lung deficiency, kidney deficiency with nocturnal emissions, and frequent urination.
The Compendium of Materia Medica records: “It benefits kidney Qi, strengthens the spleen and stomach, stops diarrhea, resolves phlegm, and nourishes the skin and hair.

山药肽粉 Yam Peptide Powder

山药为传统药食同源植物，具有数千年的食用历史，《神农本草经》中均将其列为上品，药味甘，性平，归脾、肺、肾经，具有“补脾养胃，生津益肺，补肾涩精”功效。

山药不仅对糖尿病模型动物显示出较好的降糖作用，还能够减轻肥胖糖尿病肾病模型动物的体重，改善其肾功能，对肠道微生态菌群有所调节。

研究发现，山药块茎的乙醇提取物对于高脂饮食诱导的高脂血症模型动物，能骨显著降低胆固醇和低密度脂蛋白水平，从而表现出较好的降血脂效果。

Yam is a traditional medicinal and edible plant with a history of consumption spanning thousands of years. In the Shennong Bencao Jing, it is listed as a top-grade herb. It has a sweet taste, a neutral nature, and enters the spleen, lung, and kidney meridians. Its functions include “tonifying the spleen and nourishing the stomach, generating fluids and benefiting the lungs, and tonifying the kidneys while restraining essence.”

Yam not only shows a notable hypoglycemic effect in diabetic animal models but also helps reduce body weight and improve kidney function in obese diabetic nephropathy animal models. Additionally, it can modulate the gut microbiota. Studies have found that the ethanol extract of yam tubers can significantly lower cholesterol and low-density lipoprotein levels in hyperlipidemia animal models induced by a high-fat diet, demonstrating a strong lipid-lowering effect.

摘自：《山药功能性成分及药理作用研究进展》潘景芝

Excerpt from: Research Progress on Functional Components and Pharmacological Effects of Yam by Pan Jingzhi

牡蛎低聚肽Oyster Oligopeptide

牡蛎，素有“海中牛奶”之称，营养素丰富，是男女老幼皆宜的天然保健品。每百克牡蛎肉含优质蛋白质11.3克，其中牛磺酸含量丰富，约占氨基酸总量的26%，在人类食物中是极其少见的。牡蛎突出的特点在于，矿物质锌的含量高达20-47毫克，居人类食物之冠。

医学著作《神农本草经》有记载，牡蛎味咸，归肝、胆、肾经，具有平肝潜阳、重镇安神、软坚散结、收敛固涩的功效。

Oysters, traditionally known as the “milk of the sea,” are rich in nutrients and are a natural health supplement suitable for men, women, and children. Every 100 grams of oyster meat contains 11.3 grams of high-quality protein, with a rich taurine content, accounting for about 26% of the total amino acids, which is extremely rare in human foods. A prominent feature of oysters is that their mineral zinc content reaches 20–47 mg, ranking first among human foods.

The medical text Shennong Bencao Jing records that oysters have a salty taste and enter the liver, gallbladder, and kidney meridians. They have the effects of calming the liver and subduing yang, stabilizing the mind, softening hardness and dispersing nodules, and astringing and consolidating.

资料来源：《牡蛎肉营养成分分析及安全性评价》姜画画

Source: Analysis of Nutritional Components and Safety Evaluation of Oyster Meat by Jiang Huahua

营养价值 Nutritional Value

提高机体运动耐力

动物实验研究表明，补充牡蛎肽能有效提高运动耐力作用机制包括：够增强骨骼肌等组织的抗氧化能力，减少运动时骨骼肌细胞氧自由基的生成，减轻骨骼肌组织的过氧化损伤，对骨骼肌具有保护作用。

Enhancing Physical Endurance

Animal studies have shown that supplementation with oyster peptides can effectively improve exercise endurance. The underlying mechanisms include enhancing the antioxidant capacity of skeletal muscle and other tissues, reducing the production of oxygen free radicals in skeletal muscle cells during exercise, alleviating oxidative damage to skeletal muscle tissue, and providing protective effects on skeletal muscles.

抗皮肤老化

牡蛎蛋白酶解产物能够显著提升UVB辐照后人角层细胞的活力，并呈现一定的剂量依赖关系；能促进细胞外I型胶原蛋白前体的生成，改善细胞的光老化形态。经过一定修饰的牡蛎肽可以抑制机制金属蛋白酶和促炎症细胞因子的表达，提高抗氧酶的活力以及抗炎症细胞因子表达，同样能够改善UVB辐照所导致的皮肤光老化症状。

Anti-Skin Aging

Oyster protein hydrolysates can significantly enhance the viability of human keratinocytes after UVB irradiation, showing a certain dose-dependent effect. They can promote the production of extracellular type I collagen precursors and improve the morphology of photoaged cells. Modified oyster peptides can inhibit the expression of matrix metalloproteinases and pro-inflammatory cytokines, increase antioxidant enzyme activity, and regulate the expression of anti-inflammatory cytokines, thereby alleviating skin photoaging caused by UVB exposure.

资料来源：《牡蛎肽补充和运动训练对小鼠运动耐力的影响》陶雅　资料来源：《牡蛎蛋白源抗皮肤光老化活性肽的分离纯化、鉴定及其作用机理研究》彭志兰

Source: Effects of Oyster Peptide Supplementation and Exercise Training on Exercise Endurance in Mice by Tao Ya

Source: Isolation, Purification, Identification, and Mechanistic Study of Anti-Photoaging Peptides from Oyster Protein by Peng Zhilan

营养价值 Nutritional Value

改善肾阳虚

肾阳虚证的主要发病环节为下丘脑功能紊乱，下丘脑 - 垂体 - 甲状腺轴异常引起的一系类表现和肾阳虚证类似，因此甲状腺轴的各激素水平可以间接反映肾阳虚证的状态。

有实验观察牡蛎肽的干预作用，结果显示，牡蛎肽可显著改善肾阳虚大鼠异常的T3、T4及TSH含量，对甲状腺组织也有较好的保护作用，在实验中以300mg/kg的剂量效果最好。说明牡蛎肽可改善肾阳虚模型大鼠的血清激素水平及下丘脑TRHmRNA的表达，可预防甲状腺病理变化，对改善肾阳虚证有明显的效果。

Improving Kidney Yang Deficiency

The main pathological mechanism of kidney yang deficiency involves hypothalamic dysfunction. Abnormalities in the hypothalamic–pituitary–thyroid axis produce a series of manifestations similar to those of kidney yang deficiency; therefore, the levels of hormones in the thyroid axis can indirectly reflect the state of kidney yang deficiency.

Experimental studies have observed the effects of oyster peptide intervention. Results show that oyster peptides can significantly improve the abnormal levels of T3, T4, and TSH in rats with kidney yang deficiency and provide protective effects on thyroid tissue. In the experiments, a dose of 300 mg/kg showed the best results. These findings indicate that oyster peptides can improve serum hormone levels and hypothalamic TRH mRNA expression in kidney yang deficiency model rats, prevent thyroid pathological changes, and have a significant effect on alleviating kidney yang deficiency.

资料来源：《牡蛎肽对肾阳虚大鼠下丘脑-垂体-甲状腺轴调节作用的研究》李亚

Source: Study on the Regulatory Effects of Oyster Peptides on the Hypothalamic–Pituitary–Thyroid Axis in Rats with Kidney Yang Deficiency by Li Ya

人参肽 Ginseng Peptide

身体虚弱、气血不足、气短者、贫血、神经衰弱者

Individuals with physical weakness, Qi and blood deficiency, shortness of breath, anemia, or neurasthenia

补气

《神农本草经》人参的精髓：“人参，味甘微寒，主补五脏，安精神，定魂魄，止惊悸，除邪气，明目，开心益智。久服，轻身延年。”

《本草纲目》中记载:"人参治男女一切虚症，"。

Tonify Qi

The essence of ginseng in the Shennong Bencao Jing: “Ginseng has a sweet and slightly cold taste. It mainly tonifies the five organs, calms the mind, stabilizes the soul, stops palpitations, dispels pathogenic factors, brightens the eyes, and opens the heart to enhance intelligence. Long-term use can lighten the body and prolong life.”

The Compendium of Materia Medica records: “Ginseng treats all deficiency conditions in both men and women.”

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营养价值 Nutritional Value

人参肽解酒护肝实验
Ginseng Peptide Alcohol Detoxification and Liver Protection Experiment

表 2.4　GOPs 对大鼠转棒停留时间的影响

组别（剂量 g/kg·bw）	动物数（只）	体重（g）	转棒停留时间（min）	30min 未掉只数
模型对照组	10	401.46±26.66	0.27（0.20-0.35）	0
乳清蛋白（0.2500）	10	422.10±11.53	4.27（0.38-30.00）	3
GOPs（0.0625）	10	407.56±5.64	5.84（0.45-18.20）	2
GOPs（0.1250）	10	399.40±18.18	11.10（3.30-30.00）**	4
GOPs（0.2500）	10	402.12±29.71	23.62（7.56-30.00）**	5
GOPs（0.5000）	10	420.80±22.80	11.09（6.45-30.00）**	4

注：GOPs：人参低聚肽；体重以$\bar{x}\pm s$形式表示；与模型对照组相比差异具有统计学意义：

**$P<0.01$，由 *Kruskal-Wallis* 检验分析得出；转棒停留时间用中位数（P_{25}-P_{75}）形式表示。

人参低聚肽可以降低血乙醇浓度，降低大鼠醉酒率，改善大鼠醉酒后肌肉力量及平衡协调能力，增强肝组织乙醇脱氢酶、乙醛脱氢酶及细胞色素P450的活性。
Ginseng oligopeptides can reduce blood ethanol levels and decrease the incidence of intoxication in rats, improve muscle strength and balance coordination after alcohol consumption, and enhance the activity of alcohol dehydrogenase, aldehyde dehydrogenase, and cytochrome P450 in liver tissue.

提高免疫力实验
Immune-Enhancing Experiment

吉林人参低聚肽对小鼠单核 巨噬细胞吞噬功能的影响（$\bar{x}\pm s, n=10$）

组别	碳廓清指数（α）	巨噬细胞吞噬鸡红细胞能力	
		吞噬率（%）	吞噬指数
空白对照组	8.58±0.23*# / 7.37±0.57	最低 19.98±3.37	0.42±0.06
乳清蛋白对照组	7.84±0.28*	18.59±3.89	0.43±0.10
GOP 0.0375 g/kg BW	7.76±0.49*	21.40±3.76	0.44±0.09
GOP 0.075g/kg BW	8.06±0.27*	24.14±3.51*#	0.53±0.08*#
GOP 0.15g/kg BW	7.89±0.37*	22.48±3.85*#	0.49±0.11*
GOP 0.3 g/kg BW	8.27±0.58*#	25.00±1.93*#	0.58±0.08*#

多12.23%

增强细胞免疫和体液免疫功能 → 提高特异性免疫功能
增强单核-巨噬细胞吞噬功能 → 提高非特异性免疫功能
Enhance cellular and humoral immune functions → Improve specific immunity
Enhance monocyte–macrophage phagocytic function → Improve non-specific immunity

——人参肽功效实验：北大医学部数据
—Ginseng Peptide Efficacy Experiment: Data from Peking University Health Science Center

营养价值 Nutritional Value

增加缺氧耐受力实验
Hypoxia Tolerance Enhancement Experiment

组别 Group	剂量 Dosage	存活时间 (min) Survival Time (min)
空白对照组 Blank Control Group	0.000	36.67±3.86
乳清蛋白组 Whey Protein Group	0.150	39.91±3.99
人参肽1组 Ginseng Peptide Group 1	0.075	45.66±3.49*a
人参肽2组 Ginseng Peptide Group 2	0.150	51.55±3.06*a
人参肽3组 Ginseng Peptide Group 3	0.300	54.03±4.05*a
人参肽4组 Ginseng Peptide Group 4	0.600	56.42±8.23*a

- **常压耐缺氧存活时间显著延长**
  Normobaric Hypoxia Survival Time Significantly Prolonged

组别 Group	剂量 Dosage	存活时间 (min) Survival Time (min)
空白对照组 Blank Control Group	0.000	18.56±1.37
乳清蛋白组 Whey Protein Group	0.150	21.44±2.32
人参肽1组 Ginseng Peptide Group 1	0.075	21.46±1.29
人参肽2组 Ginseng Peptide Group 2	0.150	22.94±5.19
人参肽3组 Ginseng Peptide Group 3	0.300	26.25±4.92*a
人参肽4组 Ginseng Peptide Group 4	0.600	27.08±5.73*a

- **亚硝酸钠中毒存活时间显著延长**
  Sodium Nitrite Poisoning Survival Time Significantly Prolonged

组别 Group	剂量 Dosage	存活时间 (min) Survival Time (min)
空白对照组 Blank Control Group	0.000	20.00±0.67
乳清蛋白组 Whey Protein Group	0.150	20.10±0.88
人参肽1组 Ginseng Peptide Group 1	0.075	20.90±10.88
人参肽2组 Ginseng Peptide Group 2	0.150	22.20±0.92*a
人参肽3组 Ginseng Peptide Group 3	0.300	22.20±1.48*a
人参肽4组 Ginseng Peptide Group 4	0.600	21.80±0.92*a

- **脑缺血性缺氧存活时间显著延长**
  Cerebral Ischemic Hypoxia Survival Time Significantly Prolonged

人参肽降血糖实验
Ginseng Peptide Blood Glucose-Lowering Experiment

组别 Group	均值 Mean	标准差 Standard Deviation
空白组 Blank Group	6.95	0.21381
模型对照组 Model Control Group	9.8875	0.69783
人参肽0.0625 Ginseng Peptide 0.0625	8.7625	0.35026
人参肽0.125 Ginseng Peptide 0.125	8.0375	0.87495
人参肽0.25 Ginseng Peptide 0.25	7.8875	0.53569
人参肽0.5 Ginseng Peptide 0.5	8.4625	0.74821
人参肽1.0 Ginseng Peptide 1.0	8.075	0.50071
人参肽2.0 Ginseng Peptide 2.0	8.375	1.29256
乳清蛋白 Whey Protein	7.575	0.61818

- **正常动物组空腹血糖均值**
  Mean Fasting Blood Glucose of the Normal Animal Group

分组 Group	N	均值 Mean	标准差 Standard Deviation	均值的标准误差 Standard Error of the Mean (SEM)
空白组 Blank Group	14	6.6007	0.78056	0.20861
干预组 Intervention Group	14	6.4564	0.59465	0.15893

T检验结果，两组动物空腹血糖P>0.05,说明经过水喝高浓度人参肽溶液干预后，两组动物相互之间空腹血糖未产生明显差异。推论人参肽溶液不会影响正常人体的血糖。
T-test results showed that the fasting blood glucose between the two groups of animals had P > 0.05, indicating that after intervention with high-concentration ginseng peptide solution in drinking water, there was no significant difference in fasting blood glucose between the two groups. It can be inferred that ginseng peptide solution does not affect blood glucose levels in normal individuals.

对糖尿病具有改善作用，主要表现为抑制餐后血糖增高。
It has an improving effect on diabetes, mainly manifested in inhibiting the rise in postprandial blood glucose.

——人参肽功效实验：北大医学部数据
— Ginseng Peptide Efficacy Study: Data from Peking University Health Science Center

营养价值 Nutritional Value

抗疲劳

当机体进行长时间或强度大的活动后，体内糖原被消耗，机体开始分解蛋白质进行供能并发生一系列相关的生理生化反应，从而导致疲劳现象。研究证明大豆活性肽具有抗疲劳、促进肌肉增长和损伤修复等作用。

Anti-fatigue

After prolonged or high-intensity activity, glycogen in the body is depleted. The body then begins to break down proteins for energy, triggering a series of related physiological and biochemical reactions, which lead to fatigue. Studies have shown that soybean bioactive peptides have anti-fatigue effects and can promote muscle growth and repair of muscle damage.

调控血糖

大豆蛋白活性肽通过对α-葡萄糖苷酶的缓解抑制作用，从而迅速分解体内葡萄糖，与其它碳水化合物和糖类一起使用时不受胰岛素分泌量的影响，达到抑制血糖急速上升的效果。

Blood Glucose Regulation

Soy protein bioactive peptides regulate blood glucose by moderately inhibiting α-glucosidase, thereby promoting rapid breakdown of glucose in the body. When used together with other carbohydrates and sugars, their effect is not influenced by insulin secretion, effectively preventing a rapid rise in blood glucose levels.

资料来源：《大豆肽的功能活性及其在食品加工中的应用》王露露 《大豆肽的制备方法及其生活性研究进展》贾芳

References:"Functional Activities of Soy Peptides and Their Applications in Food Processing" by Wang Lulu "Preparation Methods of Soy Peptides and Advances in Their Bioactivity Research" by Jia Fang

维生素B1、维生素B6、维生素C、罗汉果糖苷

Vitamin B1, Vitamin B6, Vitamin C, Mogrosides (Monk Fruit Extract)

四者发挥“使”的作用，补充人体营养，共同加强以上成分的生理活性

These four act to “enhance,” supplementing human nutrition and jointly strengthening the physiological activity of the above components.

资料来源：《维生素C对炎症的治疗作用》白璐

Reference: "Therapeutic Effects of Vitamin C on Inflammation" by Bai Lu

产品优势

Product Advantages

专注小分子肽27年的工厂，
拥有中国小分子肽多项核心技术

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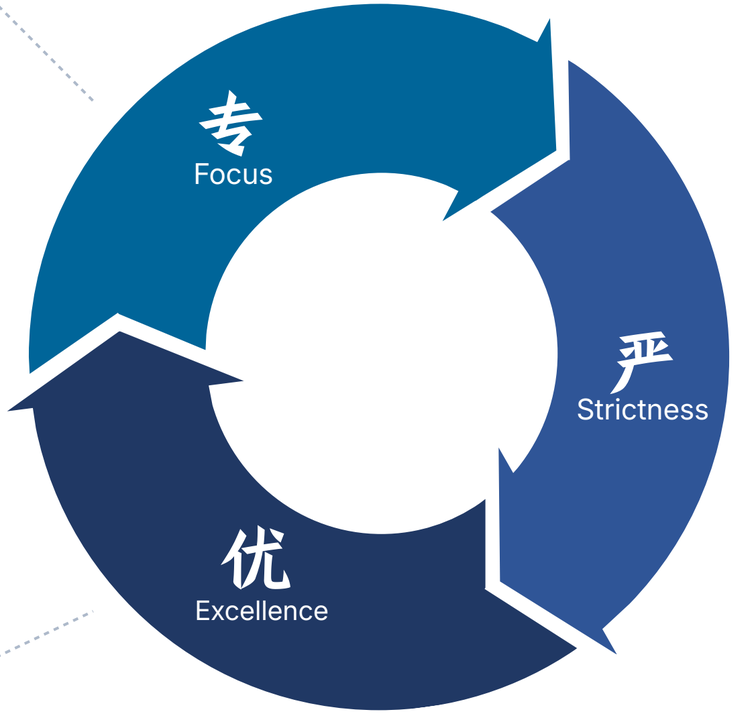

产品严把三道关
原料关：严选原料
生产关：自有技术质量关：
正规检测

Product Strictly Controlled Through Three Key Steps
Raw Materials: Carefully selected
Production: Proprietary technology
Quality: Standardized testing

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科学配伍，营养全面
小分子肽，更易吸收

Expert Team, Jointly Developed
Scientifically Formulated, Nutritionally Comprehensive
Small-Molecule Peptides for Easier Absorption

适用人群 Target Audience

骨关节疾病人群
People with bone and joint disorders

心脑血管疾病人群
People with cardiovascular and cerebrovascular diseases

常运动的老年人群
Elderly individuals who exercise regularly

营养不良人群
People with malnutrition

免疫力低下人群
People with low immunity

体重管理人群
People managing their weight

服用方法 Usage Instructions

每日3次，每次1袋。取1袋，用120mL温开水冲调饮用或随口味偏好而定。
本品若有少量沉淀为正常现象，请放心饮用。

Take 1 sachet, 3 times daily. Mix 1 sachet with 120 mL of warm water before drinking, or adjust according to personal taste preference.
A small amount of sediment in the product is normal, please feel free to consume.

谢谢您的观看

Thank you for watching

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