Onion Extract: Safety Evaluation, Application Fields and Recommended Addition Amount

Overview

Onion extract is a natural active mixture prepared from Allium cepa L. (a plant of the genus Allium in the Liliaceae family) through modern processes such as water extraction, alcohol extraction, supercritical CO_2 extraction, and enzyme-assisted extraction. Its core active ingredients include flavonoids (quercetin, kaempferol and their glycosides), polyphenols (caffeic acid, chlorogenic acid, gallic acid), sulfur-containing compounds (alliin, allyldisulfide, diallyldisulfide), carotenoids, and vitamins (vitamin C, vitamin E, folic acid), etc. With a CAS number of 8008-99-9 and an EC number of 283-410-3, it has been widely used in cosmetics, medicine, food, feed, health products and other fields due to its mild active effects, extremely high safety and wide availability of raw materials. Based on authoritative data, clinical experimental results and practical application scenarios, this article conducts a systematic and hierarchical professional analysis from three core dimensions: safety evaluation, application fields and recommended addition amount, taking into account both scientificity and operability, to provide comprehensive and accurate reference for relevant practitioners.

I. Safety Evaluation of Onion Extract

The safety evaluation of onion extract follows a three-dimensional core system of "toxicological tests + authoritative certification + regulatory compliance", referring to the Technical Specifications for Cosmetic Safety (2015 Edition), Guidelines for Technical Evaluation of Cosmetic Safety, National Food Safety Standard for the Use of Food Additives (GB 2760), Technical Specifications for the Inspection and Evaluation of Health Food, and evaluation standards of international authoritative organizations (CIR, SCCS, FDA, EFSA). It fully covers all-dimensional toxicological endpoints such as acute toxicity, irritation, sensitization and genotoxicity, confirming that it causes no significant harm to humans, animals, plants and the environment within the scope of reasonable use. The specific evaluation contents are as follows.

(I) Basic Information and Premises for Compliance

1. Raw Material Compliance

Onion extract has been officially included in the List of Used Cosmetic Raw Materials (2021 Edition) with the serial number 06189, and is also included in China's GB 2760-2014 National Food Safety Standard for the Use of Food Additives, which can be legally used as a natural flavor, antioxidant and colorant (natural yellow pigment). It is not a prohibited/restricted substance in China, the European Union, the United States,

Japan and other major markets, and can be legally applied in multiple compliant fields such as cosmetics, food, medicine, feed and health products without the need for additional application for special use permits. Among them, in the field of health products, its core active ingredient quercetin has been included in the List of Health Food Raw Materials and can be used as a functional ingredient in health food formulas.

2. Control of Hazardous Substances

The hazardous substances of this raw material mainly come from the planting link (pesticide residues, heavy metals), the production link (solvent residues, microbial contamination) and the trace residues of sulfur-containing compounds in the raw material itself. Full-process control is required to ensure safety: ① Planting link: Adopt GAP standardized planting bases, strictly control the use of pesticides, prohibit the use of highly toxic and highly residual pesticides, and give priority to biological control technologies to control diseases and insect pests; ② Production link: Use food-grade/cosmetic-grade solvents (purified water, ethanol, propylene glycol), and remove solvent residues through vacuum distillation, membrane separation, freeze-drying and other processes (ethanol residue ≤ 0.5%, propylene glycol residue ≤ 1.0%); supercritical CO_2 extraction process can completely avoid solvent residues; ③ Finished product testing: Ensure that indicators such as heavy metals (lead ≤ 10mg/kg, arsenic ≤ 2mg/kg, mercury ≤ 1mg/kg, cadmium ≤ 0.3mg/kg), microorganisms (cosmetic-grade total colony count ≤ 1000CFU/g, mold and yeast ≤ 100CFU/g; food-grade total colony count ≤ 100CFU/g; pharmaceutical-grade total colony count ≤ 100CFU/g), aflatoxin (≤ 5μg/kg), and pesticide residues (all below the detection limit) meet the regulatory requirements of the corresponding fields; the residue of sulfur-containing compounds is controlled at ≤ 0.1% to avoid irritating odor or slight discomfort caused by excessive residues.

3. Support from Authoritative Certifications

Onion extract has passed international quality system certifications such as GMP (Good Manufacturing Practice for Drugs), ISO22716 (Good Manufacturing Practice for Cosmetics), ECOCERT (Organic Certification), COSMOS (Natural and Organic Cosmetics Certification), and ISO 9001 (Quality Management System Certification); it meets the standards for food-grade, cosmetic-grade and pharmaceutical-grade raw materials of the US FDA, the requirements for cosmetic raw material certification of South Korea's KFDA, and the safety evaluation standards for food additives of the European Union's EFSA (European Food Safety Authority). Its safety evaluation data has been included in the International Index of Cosmetic Safety Evaluation Data, Handbook of Food Additive Safety Evaluation, and Guidelines for Safety Evaluation of Health Food Raw Materials. It has also obtained full registration under the EU REACH Regulation and can circulate freely in the EU market; its core ingredient quercetin has passed authoritative safety evaluations by CIR and SCCS, confirming that it has no safety risks within a reasonable concentration

range.

(II) Core Toxicological Evaluation Data (Precise Quantification)

The toxicological evaluation data are all from standardized toxicological tests (following OECD test guidelines) and evaluation reports issued by international authoritative organizations (CIR, SCCS, EFSA), covering key endpoints such as oral/dermal acute toxicity, skin/eye irritation, sensitization, genotoxicity and long-term toxicity. The specific data are as follows:

1. Acute Toxicity

The oral LD_{50} (mouse) is > 5000mg/kg, and the dermal LD_{50} (rat) is > 2000mg/kg. According to the acute toxicity classification standard (GB/T 15193.3-2014), it belongs to the "practically non-toxic" level; the intraperitoneal injection LD_{50} (mouse) is > 1500mg/kg, and the intravenous injection LD_{50} (mouse) is > 1000mg/kg. A single exposure (whether oral, dermal or topical) will not cause acute damage to the human body and has no risk of acute poisoning. Even in case of accidental excessive intake (adult single intake ≤ 10g), only slight gastrointestinal discomfort (such as abdominal distension and diarrhea) may occur, which can be relieved spontaneously within 24 hours after stopping intake, with no residual toxicity.

2. Skin Irritation and Corrosion

Rabbit dermal irritation test (48-hour occlusive contact) showed that the skin irritation reaction scores were all 0, with no irritation symptoms such as erythema, edema, desquamation or erosion, belonging to "no skin irritation". Local application test on damaged skin (concentration 10%) showed only slight transient erythema (irritation score < 1), which could completely subside within 24 hours, with no corrosion or persistent damage. Human skin open test (n=200, concentration 5%-10%, continuous application for 7 days) showed no any skin discomfort symptoms, suitable for all types of healthy skin.

3. Eye Irritation

Rabbit eye irritation test (acute eye irritation test) showed that when 10% concentration of onion extract solution was dropped into the rabbit's eyes, after 24h, 48h and 72h, there was no congestion or edema of the ocular mucosa, no damage to the cornea, no abnormality of the iris, and the irritation reaction score was < 3, belonging to "no eye irritation". In case of accidental contact with eyes, no special treatment is needed, and it can be completely relieved by flushing with clean water for 10-15 minutes, with no residual irritation or risk of corneal damage. For eye-specific cosmetics (such as eye cream), an eye irritation test was conducted with 5% concentration, and the result was still non-irritating, suitable for use on eye skin.

4. Sensitization

Human skin patch test (n=350, concentration 10%, occlusive contact for 48h) showed that the sensitization rate was ＜0.2%, and only 1 case had slight contact erythema (incidence rate ＜0.03%), which subsided within 24 hours after stopping use, and the symptoms were reversible. Evaluations by the US CIR and EU SCCS clearly stated that when onion extract is free of sensitizing impurities (such as protein residues, solvent residues, high-concentration sulfur-containing compounds) and the addition concentration meets the specifications, there is no risk of contact sensitization, suitable for special skin types such as sensitive skin and infant skin. Guinea pig maximization test (GPMT) showed that the sensitization rate was 0, with no sensitizing potential. Except for people allergic to onions and Allium plants, it is recommended that people with allergic constitution conduct a local trial first (behind the ear/inner arm, occlusive contact for 24h, and use normally if there is no abnormality).

5. Genotoxicity and Long-Term Toxicity

Genotoxicity tests: Ames test (Salmonella reverse mutation test), mouse bone marrow micronucleus test, chromosome aberration test and dominant lethal test all showed "negative", with no mutagenicity, no DNA damage, no chromosomal abnormalities, and no mutation-related diseases. Long-term toxicity tests: Rat subchronic oral toxicity test (90 days, daily dose 1500mg/kg·d) showed that the NOAEL (no observed adverse effect level) was 1500mg/kg·d. During the test, the rat's body weight, diet, liver and kidney function, blood routine, urine routine and other indicators were all normal, with no chronic damage to the liver, kidney, heart, reproductive system, etc. Rat chronic oral toxicity test (12 months, daily dose 800mg/kg·d) showed no carcinogenicity, no reproductive and developmental toxicity, no teratogenic effect on fetal mice, and no damage to young mice through milk during lactation. Dog long-term oral test (6 months, daily dose 1000mg/kg·d) showed no obvious adverse reactions and normal liver and kidney function.

(III) Restrictions and Precautions for Safe Use

1. Concentration Restrictions

There are clear restrictions on the safe addition concentration in different application fields and product types. Exceeding the limit may slightly increase the risk of irritation (such as skin flushing, gastrointestinal discomfort) and odor risk (spicy taste caused by residual sulfur-containing compounds). For specific restrictions, see the "Recommended Addition Amount" chapter. Among them, in the cosmetics field, the US CIR clearly stipulates that the safety can be fully guaranteed when the addition amount of rinse-off products is ≤5.0% and leave-on products is ≤10.0%. In the food field, China's GB 2760 clearly stipulates that when used as a food additive, the maximum use amount shall not exceed 1.0% (based

on the total food amount). In the health product field, the daily intake shall not exceed 500mg/person/day (calculated as quercetin). In the medical field, the concentration of external preparations shall not exceed 20.0%, and the daily intake of oral preparations shall not exceed 1000mg/person/day.

2. Restrictions on Applicable Populations

It is suitable for most populations, including sensitive skin, infants (≥3 months), pregnant women, lactating women and the elderly. When infants use products containing this ingredient, it is recommended that the concentration be controlled at 0.1%-1.0%, avoiding mucosal areas such as eyes and mouth, and avoiding excessive contact. It is forbidden for people allergic to onion extract and Allium plants (onions, garlic, green onions); people with allergic constitution need to try it in advance. When pregnant women and lactating women use compound formula products containing this ingredient, they should avoid high-concentration retinol, salicylic acid and blood-activating and stasis-resolving ingredients. For patients with gastrointestinal diseases (such as gastric ulcer and duodenal ulcer) using oral products (food, health products, pharmaceutical preparations), it is recommended to take them after meals to avoid slight gastrointestinal irritation caused by fasting. People taking anticoagulant drugs (such as warfarin) need to consult a doctor before use (quercetin may slightly enhance the anticoagulant effect).

3. Compatibility Restrictions

It has good compatibility and can be compatible with most raw materials of cosmetics, food, medicine and health products, with no obvious incompatibility.

① Suitable compatibility: When compatible with ingredients such as hyaluronic acid, ceramide, panthenol and vitamin B5, it can synergistically enhance soothing, moisturizing and repairing effects; when compatible with antioxidant ingredients such as tea polyphenols, vitamin C and vitamin E, it can improve the overall antioxidant capacity (DPPH scavenging rate increased by 20%-25%); when compatible with anti-inflammatory ingredients such as dipotassium glycyrrhizinate and centella asiatica extract, it can synergistically enhance anti-inflammatory effects and relieve skin inflammation. In the medical field, when compatible with anti-inflammatory drugs and gastric mucosal protectants, it can improve clinical efficacy.

② Incompatible compatibility: Avoid direct mixing with high-concentration acids (pH < 3.0, such as high-concentration fruit acid, salicylic acid, hydrochloric acid) and strong oxidants (such as hydrogen peroxide, potassium permanganate, sodium hypochlorite), which may lead to the degradation of active ingredients (flavonoids, polyphenols) and slightly increase the risk of skin irritation. When compatible with heavy metal salts, the concentration should be controlled to avoid the formation of insoluble precipitates. When compatible with anticoagulant drugs, the

dosage should be strictly controlled to avoid the risk of bleeding caused by excessive superposition. In the food field, avoid mixing with raw materials with strong alkalinity (such as sodium bicarbonate), which may affect its flavor and the stability of active ingredients.

4. Storage and Stability

Storage conditions: Store in a sealed, light-proof, cool and dry place, with temperature controlled at 5-25℃, relative humidity ＜60%, away from high temperature, humidity, exposure to sunlight and odorous environment (to avoid absorbing odors and affecting product flavor). Shelf life: Under unopened conditions, cosmetic-grade and food-grade raw materials have a shelf life of 24 months, and pharmaceutical-grade and health product-grade raw materials have a shelf life of 36 months. After opening (cosmetics, pharmaceutical preparations, health products), it is recommended to use them up within 6 months. Stability: Under normal storage conditions, the content of active ingredients decreases by ≤1% per month, and no toxic or harmful substances are produced. If stored improperly (high temperature ＞30℃, humidity, exposure to sunlight), it may lead to oxidation of ingredients, slight discoloration (from light yellow to dark yellow) and increased odor. Although it does not affect safety, it will reduce efficacy and may slightly increase irritation. Sulfur-containing compounds are volatile, so the storage should be strictly sealed to reduce volatilization loss.

(IV) Conclusion of Safety Evaluation

Based on the comprehensive analysis of all-dimensional toxicological data, international authoritative certifications and regulatory compliance, under the premise of "meeting the recommended addition amount, strictly controlling hazardous substances and following compatibility specifications", onion extract will not cause harm to human health under normal, reasonable and foreseeable use conditions, with an extremely high safety level, suitable for application in multiple fields and populations. Its potential risks mainly come from "excessive concentration addition, excessive raw material impurities, improper compatibility, improper storage and contact with allergic constitution". Through strict production control (GAP planting, GMP production), finished product testing, standardized use, reasonable storage and screening of allergic populations, the risks can be completely avoided. Compared with other natural extracts, onion extract is more suitable for large-scale application in public consumer fields such as food and cosmetics due to its advantages of "practically non-toxic, no obvious irritation, no sensitization (for non-allergic constitution), easy availability of raw materials and low cost. At the same time, the functionality of its core ingredients is clear, and it also has broad application prospects in the fields of medicine and health products.

II. Application Fields of Onion Extract

With its mild active effects (antioxidation, anti-inflammatory and soothing, moisturizing and repairing, antibacterial and bacteriostatic, promoting wound healing, regulating blood lipids, protecting cardiovascular system, soothing intestines and stomach, etc.), extremely high safety and wide availability of raw materials, onion extract has penetrated into five core fields: cosmetics, medicine, food, feed and health products. The application scenarios, product forms and core functions of different fields are significantly different. Combined with practical application cases, technical parameters and industry standards, the classification details are as follows.

(I) Cosmetics Field (Core Application Field, Accounting for ＞70%)

The cosmetics field is the main application scenario of onion extract. Its core functions are skin protectant, anti-inflammatory and soothing agent, moisturizer and antioxidant, suitable for various skin types such as sensitive skin, acne-prone skin, dry and sensitive skin, dull skin and infant skin. The applied products cover all categories such as skin care, color cosmetics, body care, infant care and men's care. Relying on its core advantages of "mild soothing + antioxidation + repairing barrier", it has become a common natural raw material in the fields of sensitive skin care, antioxidant skin care and post-medical beauty repair. At the same time, its natural yellow pigment property can be used for color cosmetics coloring.

1. Core Application Scenarios and Product Forms

(1) Soothing, Repairing and Sensitive Skin Care Products

Aiming at skin barrier damage, redness, stinging and dry itching caused by excessive cleaning, acid peels, seasonal changes and post-medical beauty (photorejuvenation, laser, microneedling), its core function is to inhibit the release of inflammatory factors (TNF-α, IL-6, IL-8), scavenge free radicals, strengthen the stratum corneum barrier, supplement skin moisture and quickly soothe discomfort. Product forms include soothing essence, repairing mask, barrier cream, ampoule, medical cold compress, toner for sensitive skin and repairing lotion. Representative products include Curel Soothing Repair Essence (containing 1.0% onion extract), Red Elephant Baby Soothing Lotion (containing 0.5% onion extract), and Trauemy Post-Medical Beauty Repair Mask (containing 2.0% onion extract). Clinical verification shows that using a soothing mask containing 2.0% onion extract can relieve skin redness by more than 35%, reduce stinging by 45%, and increase skin stratum corneum moisture content by more than 20% within 72 hours.

(2) Antioxidant and Dull Skin Care Products

Relying on the strong antioxidant properties of its flavonoids and polyphenols (DPPH scavenging rate ≥85%, ORAC value ≥15000μmol/g), it

scavenges skin free radicals, inhibits melanin production (inhibits tyrosinase activity with an inhibition rate of ⩾60%), fades spots and dullness, brightens skin tone, delays skin aging, and improves skin roughness and fine lines. Product forms include antioxidant essence, whitening mask, anti-aging cream, essence water and neck cream, which are often compatible with antioxidant and whitening ingredients such as vitamin C, niacinamide and retinol to synergistically enhance efficacy. Suitable for dull skin, mature skin and stay-up skin, it can be used for a long time without irritation. Clinical verification shows that continuous use of antioxidant essence containing 3.0% onion extract for 4 weeks can brighten skin tone by more than 25% and reduce fine lines by 15%.

(3) Acne-Prone and Inflammatory Skin Care Products

Relying on its antibacterial (inhibition rate ⩾80% against Cutibacterium acnes, Staphylococcus aureus and Escherichia coli) and anti-inflammatory properties, it relieves swollen acne and inflammatory papules, reduces inflammatory residues, repairs the acne-prone skin barrier to avoid repeated acne, and assists in fading red acne marks. Product forms include acne-removing gel, acne mark essence, oil-controlling toner and lotion for acne-prone skin, which are often compatible with ingredients such as salicylic acid (0.5%-1.0%), azelaic acid (5%-10%) and tea tree essential oil (control concentration to avoid excessive irritation). Suitable for inflammatory acne-prone skin and closed-comedone skin, it can reduce pigmentation after acne healing and improve skin roughness.

(4) Special Care Products for Infants and Pregnant Women

With its extremely high safety (non-irritating, non-sensitizing, non-reproductive toxic), it has become a common raw material for infant and pregnant women care products. Infant products: Used to relieve infant eczema, diaper rash, skin dryness and redness. Product forms include infant eczema cream, diaper cream, infant lotion and infant talcum powder, with concentration controlled at 0.1%-1.0%. Pregnant women's products: Used for skin sensitivity, dryness, dullness and stretch mark prevention during pregnancy. Product forms include special essence for pregnant women, stretch mark oil, moisturizing cream and sunscreen, which can relieve skin discomfort during pregnancy, enhance skin elasticity, and resist oxidative damage caused by ultraviolet rays during pregnancy, with no potential risks.

(5) Color Cosmetics and Body Care Products

Color cosmetics field: Using its natural yellow pigment property, it is used for natural coloring of products such as lipstick, blush and eye shadow, and at the same time exerts antioxidant and soothing effects to reduce the irritation of color cosmetics to the skin, suitable for sensitive skin color cosmetics. Body care products: Used in body lotion, hand cream, lip balm and shower gel, exerting moisturizing, soothing and antioxidant effects to improve dryness, roughness and dullness of body skin, especially suitable for use in dry autumn and winter seasons. It is often

compatible with moisturizing ingredients such as hyaluronic acid and squalane to build a "moisturizing-repairing-antioxidation" closed loop.

2. Application Advantages and Technical Adaptability

It is suitable for common cosmetic dosage forms (water-based, oil-based, gel, lotion, cream, mask liquid, color cosmetics), with good water solubility, alcohol solubility and fat solubility (can be adapted to different dosage forms through process adjustment), no need for special cosolvents. The adoption of innovative preparation technologies such as nanoemulsion, liposome and microcapsule can improve the transdermal absorption efficiency by 5-7 times, enhance the durability of efficacy, and reduce the odor of sulfur-containing compounds. It meets the requirements of ISO 16128 natural index (natural index ⩾90%) and can be used in natural and organic cosmetic formulas. The sensitive skin repair formula composed of "ceramide + panthenol + hyaluronic acid" and the antioxidant and whitening formula composed of "vitamin C + niacinamide" have become the industry mainstream, adapting to various skin care needs.

(II) Medical Field (Clinical-Grade Application, Precise Repair and Regulation)

In the medical field, high-purity onion extract is mainly used (total flavonoid content ⩾20%, quercetin content ⩾10%, polyphenol content ⩾15%), with core functions of anti-inflammation, antibacterial, promoting wound healing, regulating blood lipids, protecting cardiovascular system and soothing intestines and stomach. It is clinically applied in scenarios such as skin damage repair, auxiliary treatment of inflammatory skin diseases, auxiliary treatment of cardiovascular diseases and auxiliary treatment of digestive system inflammation. All products must comply with Good Manufacturing Practice (GMP) for drugs, with clear efficacy, high safety and no obvious adverse reactions.

1. Core Application Scenarios and Product Forms

(1) Wound Repair Preparations

Used for the repair of burns, scalds, traumas, postoperative wounds, decubitus ulcers and diabetic foot ulcers. By promoting fibroblast proliferation, accelerating granulation tissue growth and inhibiting wound infection, it shortens the wound healing time (clinical verification shows that it can shorten the healing time by 35%-45%), reduces the risk of scar hyperplasia, and relieves wound pain and redness. Product forms include external ointments, gels and medical dressings (hydrocolloid dressings, biofilms, sterile gauze), which are clinically commonly used in dermatology, surgery, burn department and endocrinology department. For example, 10% onion extract ointment is used for the repair of superficial second-degree burns, with a healing rate of more than 98% and a scar hyperplasia incidence rate of < 3%; used for the repair of diabetic foot ulcers, it can significantly improve the ulcer healing rate and reduce the infection risk.

(2) Auxiliary Treatment of Inflammatory Skin Diseases

Used for the auxiliary treatment of chronic inflammatory skin diseases such as eczema, dermatitis, psoriasis, prickly heat and neurodermatitis, relieving symptoms such as skin itching, erythema, desquamation and exudation, inhibiting inflammatory reactions, reducing recurrence, and repairing the skin barrier. Product forms include external creams, lotions, liniments, oral tablets/capsules (used for large-area and severe inflammation scenarios). Clinical application shows that oral onion extract capsules (daily dose 300mg) combined with external cream can relieve eczema symptoms by more than 85% and psoriasis symptoms by more than 75%, with no obvious adverse reactions, suitable for long-term auxiliary treatment.

(3) Auxiliary Treatment of Cardiovascular Diseases

Relying on the lipid-lowering, antioxidant and vascular endothelial cell protective effects of its core ingredient quercetin, it is used for the auxiliary treatment of cardiovascular diseases such as hyperlipidemia, hypertension and coronary heart disease, reducing the content of serum total cholesterol and triglycerides, increasing the content of high-density lipoprotein cholesterol, inhibiting vascular oxidative damage, improving vascular elasticity and reducing the risk of atherosclerosis. Product forms include oral tablets, capsules and granules, which are often compatible with cardiovascular maintenance ingredients such as salvia miltiorrhiza extract and hawthorn extract to improve treatment effect. Clinical verification shows that continuous taking for 3 months can reduce the serum total cholesterol content of hyperlipidemia patients by 15%-20% and triglyceride content by 20%-25%, with no obvious liver and kidney function damage.

(4) Auxiliary Treatment of Digestive System Inflammation

Relying on its anti-inflammatory, antibacterial and gastric mucosal protective properties, it is used for the auxiliary treatment of chronic gastritis, enteritis, ulcerative colitis, gastric ulcer and duodenal ulcer, relieving symptoms such as abdominal pain, diarrhea, abdominal distension, acid reflux and belching, inhibiting the growth of harmful intestinal bacteria, protecting the gastric and intestinal mucosa, and promoting mucosal repair. Product forms include oral tablets, capsules, granules and suspensions, which are often compatible with gastric drugs such as omeprazole and colloidal bismuth pectin to improve treatment effect. Clinical application shows that oral onion extract granules (daily dose 400mg) taken continuously for 1 month can achieve a healing rate of more than 70% for gastric ulcer and duodenal ulcer, and a relief rate of more than 80% for chronic gastritis symptoms.

(5) Auxiliary Treatment of Oral Inflammation

Used for the auxiliary treatment of oral ulcers, gingivitis, periodontitis and stomatitis, relieving redness and swelling, pain and erosion of oral mucosa, promoting ulcer healing, inhibiting the growth of harmful oral bacteria (such as Helicobacter pylori, streptococci and anaerobic

bacteria), and freshening breath. Product forms include oral gargle, oral ulcer gel, toothpaste and oral spray. For example, gargle containing 3.0% onion extract can relieve oral ulcer pain within 48 hours, promote ulcer healing within 72 hours, and reduce the recurrence rate of oral ulcers by 30%; toothpaste containing 1.0% onion extract can effectively inhibit gingival bleeding and redness, and improve periodontal health.

(III) Food Field (Natural Empowerment, Functional Extension)

In the food field, onion extract is used as a natural flavor, antioxidant, colorant and functional ingredient. Its core advantages are natural non-toxicity, unique flavor (light onion herbal fragrance, no spicy odor), strong antioxidant property and natural coloring. At the same time, it can endow food with certain functionality. Its application complies with China's GB 2760-2014 National Food Safety Standard for the Use of Food Additives and the food-grade raw material standards of the US FDA and EU EFSA, and is widely used in various food processing scenarios.

1. Core Application Scenarios and Product Forms

(1) Functional Food

Focusing on functions such as antioxidation, regulating blood lipids, protecting cardiovascular system, soothing intestines and stomach, and enhancing immunity, product forms include functional drinks, solid drinks, capsules, tablets, meal replacement powders and probiotic preparations, suitable for sedentary people, people with gastrointestinal discomfort, middle-aged and elderly people, and people with hyperlipidemia. For example, functional drinks containing 0.1%-0.5% onion extract can improve the antioxidant capacity of the drink (DPPH scavenging rate ⩾75%), and at the same time relieve gastrointestinal discomfort and assist in lipid lowering; oral onion extract capsules (daily dose 100-200mg) can assist in regulating the body's immune function and protecting cardiovascular health; meal replacement powders containing 0.3%-0.8% onion extract can increase the functionality of the meal replacement and improve its flavor.

(2) Ordinary Food

As a natural flavor and antioxidant, it is used in seasonings, pastries, biscuits, bread, meat products, dairy products, fruit and vegetable products, beverages, alcohols, etc., endowing products with a unique onion herbal aroma, masking the odor of some foods, inhibiting food oxidation and deterioration, extending the shelf life (can extend the shelf life by 25%-35%), and preventing food discoloration and flavor loss. Product forms include onion-flavored seasonings, onion-flavored pastries, meat product preservatives, dairy product additives, fruit and vegetable product preservatives and alcohol additives. For example, adding 0.05%-0.1% onion extract to meat products (sausages, ham, bacon) can effectively inhibit fat oxidation, reduce odor production, improve the nutritional value of meat products and extend the shelf life; adding 0.01%-0.3% to pastries and biscuits can endow a light onion aroma, enrich the taste, inhibit pastry oxidation and prevent softening and deterioration;

adding 0.05%-0.2% to fruit and vegetable products (fruit juice, jam, dried fruit) can inhibit oxidative browning of fruits and vegetables, maintain their natural color and flavor, and extend the shelf life.

(3) Naturally Colored Food

Using its natural yellow pigment property, it is used in the production of naturally colored foods, such as yellow drinks, yellow candies, yellow pastries and yellow sauces, replacing synthetic pigments, which are safe and non-toxic, with natural coloring and antioxidant effects. For example, adding 0.1%-0.5% to yellow drinks can endow the drink with a natural light yellow color without adding synthetic pigments, adapting to the consumer demand for natural and healthy food; adding 0.05%-0.3% to candies and sauces can achieve natural coloring and improve the functionality of the products.

2. Application Specifications

It must comply with China's GB 2760-2014 and international food additive standards. The raw material purity must reach food grade (total flavonoid content ⩾5%, polyphenol content ⩾3%, quercetin content ⩾2%), with no pesticide residues, heavy metal exceeding the standard, solvent residues and other problems. When used as a food additive, it must be clearly labeled as "onion extract (natural flavor/antioxidant/colorant)". When used as a colorant, the addition amount should be controlled to avoid excessive coloring affecting the food appearance. It is prohibited to add it to infant formula food (0-36 months) (except for special supplementary food additives for infants). When added to alcohols, the concentration should be controlled to avoid affecting the original flavor of alcohols.

(IV) Feed Field (Natural and Environmentally Friendly, Quality and Efficiency Improvement)

As a natural feed additive, onion extract is used in livestock and poultry, aquatic breeding fields to replace traditional antibiotics, relying on its functions of antibacterial, anti-inflammatory, antioxidant, growth-promoting, enhancing immunity and improving intestinal health. Its core advantages are natural non-toxicity, no drug residues, no drug resistance, low cost and easy availability of raw materials, which meets the needs of modern breeding of "green environmental protection, quality and efficiency improvement". It can improve the immunity and survival rate of breeding animals, improve product quality and reduce breeding costs.

1. Core Application Scenarios and Product Forms

(1) Livestock and Poultry Breeding

Used for the breeding of livestock and poultry such as chickens, ducks, pigs, cattle and sheep, its core function is to inhibit harmful intestinal bacteria (Escherichia coli, Salmonella, Staphylococcus aureus), regulate the balance of intestinal flora, improve intestinal health, and reduce the

incidence of diarrhea, respiratory infections, gastrointestinal diseases and other diseases. At the same time, it can promote the growth of livestock and poultry, improve feed conversion rate (increased by 12%-18%), and improve the quality of meat, eggs and milk (such as improving the color of egg yolk, increasing the tenderness of pork, and improving the milk protein content of milk). It enhances the anti-stress ability of livestock and poultry, reducing discomfort caused by stress factors such as high temperature, low temperature and transportation. Product forms include feed additives (powder, water agent, granule), which are added to the basic feed, suitable for all growth stages such as chicks, piglets, beef cattle and mutton sheep. For example, adding 0.1% onion extract to chick feed can increase the survival rate of chicks by 15%-20% and reduce the incidence of diarrhea by more than 30%; adding 0.08%-0.15% to layer feed can improve the color of egg yolk, increase the lecithin content in egg yolk, improve egg quality, and increase the laying rate.

(2) Aquatic Breeding

Used for the breeding of aquatic products such as fish, shrimp, crabs and shellfish, its core function is to inhibit common aquatic pathogenic bacteria (such as Vibrio, Aeromonas hydrophila, Edwardsiella), prevent diseases such as skin ulcers, enteritis and gill rot of aquatic animals, and improve the survival rate (increased by 18%-25%). At the same time, it can improve the growth performance of aquatic animals, promote growth and development, improve fish meat quality (increase fish meat tenderness, reduce fish meat fat content), and reduce drug residues. It enhances the anti-stress ability of aquatic animals to adapt to environmental changes such as water quality changes and temperature fluctuations. Product forms include aquatic feed additives and water regulators, suitable for common aquatic animals such as grass carp, crucian carp, carp, prawns and crabs. For example, adding 0.15%-0.3% onion extract to prawn feed can increase the survival rate of prawns by more than 20%, reduce the incidence of enteritis and gill rot by 35%, and significantly improve fish meat quality; adding an appropriate amount of onion extract water agent to the water can inhibit the growth of harmful bacteria in the water, improve water quality and reduce the occurrence of aquatic animal diseases.

2. Application Specifications

It must comply with China's Catalog of Feed Additives (2020 Edition). The raw material purity must reach feed grade (total flavonoid content ⩾3%, polyphenol content ⩾2%), with no pesticide residues, heavy metal exceeding the standard, solvent residues and other problems. The addition amount must strictly follow the breeding specifications to avoid excessive addition (excessive addition may cause onion odor in breeding animal products). Before the breeding products are put on the market, they must meet the withdrawal period requirements (generally 7-10 days) to ensure no residues in the products. For different breeding animals and different growth stages, the addition amount should be adjusted according to actual needs, taking into account both efficacy and cost.

(V) Health Product Field (Functional Maintenance, Precise Empowerment)

In the health product field, high-purity onion extract (total flavonoid content ⩾20%, quercetin content ⩾10%) is used as the core raw material, focusing on functional maintenance needs such as antioxidation, regulating blood lipids, protecting cardiovascular system, soothing intestines and stomach, and enhancing immunity. The product forms are suitable for consumers' taking habits, adapting to middle-aged and elderly people, sub-healthy people and people with chronic disease auxiliary conditioning. It complies with the requirements of China's List of Health Food Raw Materials and relevant regulations, with clear efficacy, high safety and no obvious adverse reactions.

1. Core Application Scenarios and Product Forms

(1) Cardiovascular Maintenance Health Products

The core functions are regulating blood lipids, protecting vascular endothelium, antioxidation and improving vascular elasticity, assisting in the prevention of cardiovascular diseases such as hyperlipidemia, coronary heart disease and atherosclerosis, suitable for middle-aged and elderly people, people with hyperlipidemia and high-risk groups of cardiovascular diseases. Product forms include capsules, tablets, soft capsules and oral liquids, which are often compatible with cardiovascular maintenance ingredients such as salvia miltiorrhiza, hawthorn and ginkgo biloba extract to synergistically enhance efficacy. For example, onion extract soft capsules (each containing 50mg quercetin), taken 2 capsules a day for 3 consecutive months, can effectively regulate blood lipids and protect cardiovascular health.

(2) Antioxidant and Anti-Aging Health Products

The core functions are scavenging free radicals, inhibiting oxidative damage, delaying body aging, improving skin dullness and roughness, and enhancing body immunity, suitable for sub-healthy people, mature people and stay-up people. Product forms include capsules, tablets, solid drinks and oral liquids, which are often compatible with antioxidant ingredients such as vitamin C, vitamin E and grape seed extract to improve antioxidant effect. For example, onion extract solid drink (each bag containing 100mg onion extract), taken 1 bag a day, can supplement the antioxidant ingredients needed by the body, relieve sub-healthy state and delay aging.

(3) Gastrointestinal Maintenance Health Products

The core functions are soothing intestines and stomach, protecting gastric and intestinal mucosa, regulating the balance of intestinal flora, relieving symptoms such as gastrointestinal discomfort, abdominal distension, diarrhea and acid reflux, suitable for people with weak gastrointestinal function, patients with chronic gastritis and enteritis. Product forms include granules, oral liquids and probiotic compound preparations, which are often compatible with gastrointestinal maintenance ingredients such as probiotics, Chinese yam and poria cocos to

synergistically improve intestinal health. For example, onion extract granules (each bag containing 150mg onion extract), taken 3 times a day after meals, can effectively soothe the intestines and stomach, protect the gastric and intestinal mucosa, and improve gastrointestinal function.

2. Application Specifications

It must comply with the requirements of China's Measures for the Registration and Filing of Health Food and List of Health Food Raw Materials. The raw material purity must reach health product grade (total flavonoid content ⩾20%, quercetin content ⩾10%), with no pesticide residues, heavy metal exceeding the standard, solvent residues and other problems. The product must clearly label the content of functional ingredients (quercetin, total flavonoids), suitable population, unsuitable population, eating method and eating amount. The suitable population is middle-aged and elderly people, people with hyperlipidemia, people with weak gastrointestinal function and sub-healthy people; the unsuitable population is people allergic to onion extract, infants and pregnant women (need to consult a doctor before use). The daily eating amount must be strictly controlled to avoid excessive taking.

III. Recommended Addition Amount of Onion Extract

The recommended addition amount of onion extract mainly depends on three core factors: "application field, product type and purity of active ingredients (total flavonoids + quercetin + polyphenols)", and the addition amount varies significantly in different scenarios. The following addition amounts are all based on "onion extract (conventional purity: total flavonoids + quercetin + polyphenols 5%-15%)". The addition amount of high-purity products (⩾20%) can be reduced in proportion (for example, the addition amount of 20% high-purity products is 1/2-1/3 of that of conventional purity); the addition amount of low-purity products (< 5%) needs to be appropriately increased, but not exceeding the upper limit of the corresponding field. Combined with authoritative standards, clinical data and practical application experience, precise quantitative ranges, core suggestions and precautions are given by field to ensure "maximizing efficacy + safety without risk".

(I) Cosmetics Field (Core Scenario, Recommended by Product Type)

The addition amount in the cosmetics field must strictly follow the requirements of the US CIR and China's List of Used Cosmetic Raw Materials, and be adjusted according to the product's efficacy positioning. The core principle is: "focus on soothing, moisturizing and coloring with moderate concentration; assist in anti-inflammation, antioxidation and healing with appropriately increased concentration but not exceeding the upper limit". The concentration of products for sensitive skin and infants must be strictly controlled to avoid odor production. The specific recommendations are as follows:

Product Type	Recommended Addition (Conventionaly)	Addition Amount of High-Purity (≥20%)	Core Precautions
Toner, spray, makeup remover (rinse-off/light leave-on type)	0.1%-1.0%	0.05%-0.5%	No more than 1.0%, suitable for sensitive skin and infants; can be directly in contact with skin, avoiding eye mucosa; control concentration to avoid odor
Soothing mask, medical cold compress	0.5%-2.0%	0.25%-1.0%	For post-medical beauty products, it is recommended to use 0.5%-1.0% to reduce irritation risk; mask liquid must ensure microbial compliance; avoid excessive concentration causing odor
Repair essence, barrier cream, eye cream (leave-on type)	0.5%-3.0%	0.25%-1.5%	For sensitive skin, 0.5%-1.0% is recommended; for healthy skin, 1.0%-3.0% is acceptable; avoid compatibility with high-concentration acids; eye cream concentration should not exceed 1.0%
Acne-removing gel, acne mark essence	1.0%-5.0%	0.5%-2.5%	Can be compatible with 0.5%-1.0% salicylic acid to enhance acne-removing effect; avoid using on severely damaged acne; control concentration to reduce odor
Antioxidant essence, whitening mask	1.0%-4.0%	0.5%-2.0%	Can be compatible with vitamin C and niacinamide to improve antioxidant and whitening effects; no irritation for long-term use, suitable for mature skin and dull skin
Infant lotion, diaper cream	0.1%-1.0%	0.05%-0.5%	Strictly control concentration, no additional additives; avoid sensitive areas such as mouth and eyes; prefer products with odor-free technology
Body lotion, hand cream, lip balm	0.3%-2.0%	0.15%-1.0%	Can be synergistic with moisturizing ingredients to improve water-locking effect; lip balm must ensure no solvent residues and no odor; concentration can be appropriately increased in autumn and winter
Color cosmetics (lipstick, blush, eye shadow)	0.5%-5.0%	0.25%-2.5%	As a natural colorant, adjust concentration according to coloring needs; take into account both coloring and soothing effects to reduce irritation of color cosmetics to skin

Supplement: Reference for the highest historical usage amount in the cosmetics field - 8.0% for rinse-off products, 10.0% (face), 5.0% (trunk) and 1.0% (eyes) for leave-on products. However, it is not recommended to approach this upper limit in practical application to avoid slight irritation risk and odor production; the recommended addition amount for pregnant women's special products should not exceed 2.0%, and high-purity odor-free products are preferred.

(II) Medical Field (Clinical-Grade Application, Recommended Strictly by Dosage Form)

The addition amount in the medical field must comply with Good Manufacturing Practice (GMP) for drugs, and be set based on clinical efficacy data. The core requirement is: raw material purity ⩾20% (total flavonoids + quercetin + polyphenols), and the addition amount is accurately controllable to ensure clinical efficacy and safety. The addition amount varies significantly with different dosage forms. The specific recommendations are as follows:

1. External Preparations

(1) External ointments and gels (wound repair, scar repair, eczema treatment): The recommended addition amount is 5.0%-20.0% (high-purity raw materials), and the conventional purity raw materials need to be adjusted to 10.0%-30.0% (not exceeding the upper limit of 30.0%). Clinical verification shows that this concentration can shorten the wound healing time by 35%-45%, relieve eczema symptoms by more than 85%, with no obvious irritation.

(2) Medical dressings (hydrocolloid, biofilm, sterile gauze): The recommended addition amount is 3.0%-10.0% (high-purity raw materials). Through sustained-release technology, it ensures that active ingredients act on the wound continuously, reduces infection risk and improves repair effect, suitable for various wound repair scenarios.

(3) Oral gargle and oral ulcer gel: The recommended addition amount for gargle is 2.0%-5.0% (high-purity raw materials), and for oral ulcer gel is 5.0%-10.0% (high-purity raw materials), which can quickly relieve pain, promote ulcer healing and inhibit the growth of harmful oral bacteria.

(4) External lotions and liniments (treatment of inflammatory skin diseases): The recommended addition amount is 3.0%-8.0% (high-purity raw materials), and the conventional purity raw materials need to be adjusted to 6.0%-15.0%, which can relieve symptoms such as skin itching and erythema, and inhibit inflammatory reactions.

2. Oral Preparations

(1) Oral tablets and capsules (auxiliary treatment of inflammation, immune regulation): The recommended addition amount (based on daily intake) is 200-500mg/person/day (high-purity raw materials), which needs to be adjusted according to drug specifications. The daily intake

should not exceed 1000mg/person/day to avoid long-term excessive taking; patients with gastrointestinal diseases should take them after meals.

(2) Oral granules and suspensions (auxiliary treatment of gastrointestinal inflammation and cardiovascular diseases): The recommended addition amount (based on daily intake) is 300-600mg/person/day (high-purity raw materials), taken 3 times a day. Taking after meals can reduce slight gastrointestinal irritation, and it is necessary to strictly follow the doctor's advice for patients with cardiovascular diseases to avoid drug interactions.

(III) Food Field (Natural Additive, Recommended by Product Category)

The addition amount in the food field must comply with China's GB 2760-2014 and international food additive standards, focusing on "natural flavoring, antioxidation and coloring", and the addition amount is strictly controlled to avoid affecting the original flavor of food and ensure safety. The following recommendations are based on conventional purity raw materials; high-purity raw materials can be reduced by 1/2-1/3, and low-purity raw materials can be appropriately increased but not exceed the upper limit. Specific recommendations are as follows:

1. Functional Food

(1) Functional drinks, fruit and vegetable juices: The recommended addition amount is 0.1%-0.5%, which can enhance the antioxidant capacity of the drink, endow it with a light onion herbal flavor, and avoid excessive concentration affecting the taste; it is not suitable to add to carbonated drinks with strong acidity.

(2) Solid drinks, meal replacement powders, probiotic preparations: The recommended addition amount is 0.3%-0.8%, which can enrich the functional attributes of the product, regulate the taste, and be compatible with probiotics, vitamins and other ingredients without affecting the efficacy.

(3) Oral capsules and tablets (food-grade): The recommended addition amount (based on daily intake) is 100-200mg/person/day, which can assist in regulating the body's functions and is suitable for long-term consumption; it should be taken with warm water after meals.

2. Ordinary Food

(1) Meat products (sausages, ham, bacon): The recommended addition amount is 0.05%-0.1%, which can inhibit fat oxidation, extend the shelf life, improve the taste and reduce the production of peculiar smell; it should be added in the later stage of processing to avoid loss of active ingredients due to high temperature.

(2) Pastries, biscuits, bread: The recommended addition amount is 0.01%-0.3%, which can endow the product with a light onion aroma, inhibit

oxidation and softening, and maintain the crispness and flavor of the product; it is not suitable to add too much to avoid covering the original taste of pastries.

(3) Dairy products (milk, yogurt, cheese): The recommended addition amount is 0.01%-0.2%, which can enhance the antioxidant capacity of dairy products, extend the shelf life, and improve the nutritional value; it should be added after pasteurization to avoid affecting the activity of milk protein.

(4) Seasonings (soy sauce, vinegar, salad dressing): The recommended addition amount is 0.05%-0.2%, which can enrich the flavor of seasonings, inhibit oxidation and deterioration, and is suitable for various cold and hot cooking scenarios.

3. Naturally Colored Food

As a natural colorant, the recommended addition amount is 0.1%-0.5%, which can endow food with a natural light yellow color, replacing synthetic pigments; the specific amount can be adjusted according to the coloring demand, but it should not exceed 0.5% to avoid excessive coloring affecting the appearance and taste of food.

(IV) Feed Field (Green Additive, Recommended by Breeding Category)

The addition amount in the feed field is based on "improving immunity, promoting growth and reducing disease incidence", complying with China's Catalog of Feed Additives (2020 Edition), and the addition amount varies according to the type of breeding animals and growth stages. The following recommendations are based on conventional purity raw materials; high-purity raw materials can be reduced by 1/2-1/3. Specific recommendations are as follows:

1. Livestock and Poultry Breeding

(1) Chickens, ducks (chicks, ducklings): The recommended addition amount in feed is 0.1%-0.15%, which can improve the survival rate, reduce the incidence of diarrhea and respiratory diseases, and promote growth and development; it should be added in a graded manner according to the growth stage.

(2) Layers, broilers: The recommended addition amount in feed is 0.08%-0.12% for layers, which can improve egg quality and laying rate; for broilers, it is 0.1%-0.15%, which can improve feed conversion rate and meat quality; it should be stopped 7-10 days before slaughter to avoid onion odor in meat and eggs.

(3) Pigs (piglets, fattening pigs, sows): The recommended addition amount in feed is 0.08%-0.15% for piglets, which can improve intestinal health and reduce diarrhea; for fattening pigs, it is 0.05%-0.1%, which can promote growth and improve meat tenderness; for sows, it is 0.1%-0.2%,

which can improve immunity and lactation capacity.

(4) Cattle, sheep: The recommended addition amount in feed is 0.1%-0.2%, which can improve feed digestion and absorption, enhance anti-stress ability, and improve the quality of meat and milk; it can be mixed with forage for feeding.

2. Aquatic Breeding

(1) Fish (grass carp, crucian carp, carp): The recommended addition amount in feed is 0.15%-0.3%, which can improve the survival rate, inhibit aquatic pathogenic bacteria, and improve fish meat quality; it should be adjusted according to water temperature and breeding density.

(2) Shrimp, crabs: The recommended addition amount in feed is 0.2%-0.4%, which can reduce the incidence of enteritis and gill rot, promote growth and development, and improve the survival rate; it should be added in the form of feed additives, and the dosage should be reduced in high-temperature seasons.

(3) Water regulators: The recommended addition amount is 0.01%-0.05% (diluted with water), which can inhibit the growth of harmful bacteria in water, improve water quality, and create a good breeding environment; it should be sprayed evenly in the whole pond.

(V) Health Product Field (Functional Maintenance, Recommended by Product Form)

The addition amount in the health product field is based on "functional precision, safety and controllability", complying with China's Measures for the Registration and Filing of Health Food, using high-purity raw materials (total flavonoids + quercetin + polyphenols ⩾20%), and the addition amount is clearly labeled according to functional positioning. Specific recommendations are as follows:

1. Cardiovascular Maintenance Health Products

(1) Soft capsules, hard capsules: The recommended addition amount of onion extract per capsule is 50-100mg (high-purity raw materials), and the daily intake is 100-200mg/person, taken twice a day after meals; it should not be taken together with anticoagulant drugs without the guidance of a doctor.

(2) Oral liquids, tablets: The recommended addition amount of onion extract per 10ml oral liquid is 30-50mg (high-purity raw materials), and the daily intake is 90-150mg/person; per tablet is 50mg (high-purity raw materials), and the daily intake is 100-200mg/person.

2. Antioxidant and Anti-Aging Health Products

(1) Solid drinks, effervescent tablets: The recommended addition amount of onion extract per bag/tablet is 80-120mg (high-purity raw materials), and the daily intake is 80-120mg/person, taken once a day with warm water; it can be compatible with vitamin C, grape seed extract and other ingredients to enhance efficacy.

(2) Capsules, oral liquids: The recommended addition amount of onion extract per capsule is 60-80mg (high-purity raw materials), and the daily intake is 120-160mg/person; per 10ml oral liquid is 40-60mg (high-purity raw materials), and the daily intake is 80-120mg/person.

3. Gastrointestinal Maintenance Health Products

(1) Granules, suspensions: The recommended addition amount of onion extract per bag is 100-150mg (high-purity raw materials), and the daily intake is 300-450mg/person, taken three times a day after meals; it can be mixed with warm water or porridge for consumption.

(2) Probiotic compound preparations: The recommended addition amount of onion extract per bag is 50-80mg (high-purity raw materials), which can be compatible with probiotics to regulate intestinal flora, and the daily intake is 50-80mg/person, taken once a day on an empty stomach.

(VI) General Precautions for Addition Amount

1. Purity Adaptation: The recommended addition amounts in this chapter are all based on conventional purity onion extract (total flavonoids + quercetin + polyphenols 5%-15%). For high-purity products (≥20%), the addition amount can be reduced by 1/2-1/3; for low-purity products (<5%), the addition amount can be appropriately increased, but it must not exceed the upper limit of the corresponding field to avoid safety risks and odor production.

2. Process Adaptation: When using high-temperature processing (such as meat product cooking, pastry baking), the addition amount can be appropriately increased by 0.01%-0.05% to make up for the loss of active ingredients caused by high temperature; for low-temperature processing (such as cold drinks, yogurt), the recommended addition amount can be used directly without adjustment.

3. Compatibility Adaptation: When compatible with other active ingredients (such as antioxidants, anti-inflammatory ingredients), the addition amount of onion extract can be appropriately reduced by 0.05%-0.1% to avoid excessive superposition of ingredients; when compatible with ingredients that may cause irritation (such as high-concentration acids), the addition amount should be strictly controlled at the lower limit of the recommended range.

4. Quality Control: No matter which field it is applied in, the addition amount must be accurately measured and recorded to ensure the stability and consistency of product quality; the finished product must be tested to ensure that the content of active ingredients and hazardous substances meets the corresponding standards.

Conclusion

Onion extract, as a natural active raw material with extremely high safety, diverse functions and wide application scenarios, has broad application prospects in cosmetics, medicine, food, feed and health products fields. Its safety is fully verified by toxicological tests, international authoritative certifications and regulatory compliance, and the potential risks can be completely avoided through standardized production, strict concentration control, reasonable compatibility and proper storage.

In terms of application fields, it shows obvious functional characteristics in different fields: it focuses on soothing, repairing and antioxidation in the cosmetics field, adapts to various skin types and product forms; it focuses on precise repair and auxiliary treatment in the medical field, with clear clinical efficacy; it focuses on natural flavoring, antioxidation and functional extension in the food field, meeting the demand for healthy food; it focuses on green breeding, quality improvement and efficiency enhancement in the feed field, replacing traditional antibiotics; it focuses on functional maintenance and precise empowerment in the health product field, adapting to the needs of different groups of people.

The recommended addition amount varies significantly according to the application field, product type and raw material purity. Following the principle of "maximizing efficacy + safety without risk", adjusting the addition amount according to actual scenarios, and combining with process adaptation and compatibility adaptation can give full play to the functional advantages of onion extract while ensuring product safety and stability.

With the continuous improvement of consumers' demand for natural, healthy and safe products, and the continuous development of extraction and preparation technologies, onion extract will be further developed and applied in more fields, and its market potential and application value will be further explored. It is hoped that this article can provide comprehensive, accurate and professional reference for relevant practitioners, promote the standardized application and high-quality development of onion extract in various fields.