Operating Guidelines for the Addition Methods of Aloe Extract in Application Fields

I. Overview of Aloe Extract: Characteristics and Application Advantages

1.1 Chemical Composition and Physicochemical Properties

Aloe Extract is mainly derived from plants of the genus *Aloe* (such as *Aloe barbadensis Miller* and *Aloe arborescens*). Its core active ingredients include aloe polysaccharides, flavonoids, phenols (aloin, isobarbaloin), amino acids and minerals. Industrial production mainly adopts solvent extraction methods (water extraction, ethanol extraction), complying with GB 18187-2000 *Brewed Soy Sauce* (supporting raw material standard) and relevant specifications for food additives. Its composition endows the following core physicochemical properties:

1.1.1 Physical Properties

Normally pale yellow to tan powder (or viscous liquid) with slight inherent aloe aroma and no odor; good water solubility (solubility of powder ≥20 g/100 mL at 25 °C); liquid extract can be directly miscible with polar solvents such as water and ethanol; bulk density of powder is 0.45–0.65 g/cm³ with medium fluidity, requiring compounding with carriers to improve dispersibility; particle size is mostly 60–100 mesh, which can be uniformly dispersed in solid, liquid and semi-solid systems.

1.1.2 Chemical Stability

Optimal stability in the pH range of 5.0–7.5. More than 90% activity can be retained after heating at 80 °C for 30 minutes in neutral environment. It is prone to degradation in acidic environment (pH < 4.0), resulting in decreased aloin content, and temperature shall be controlled ≤ 60 °C. Polysaccharide polymerization is easy to occur in alkaline environment (pH > 8.0), affecting solubility. It has no antagonism with common food and cosmetic additives (preservatives, emulsifiers, pigments), and contact with strong oxidants shall be avoided.

1.1.3 Hygroscopicity and Storage Characteristics

The critical relative humidity of powdered aloe extract is 70%, with medium hygroscopicity at room temperature and easy moisture absorption and caking. Liquid extract shall be sealed and protected from light to prevent oxidative browning. It is sensitive to light and heat as a whole. Long-term exposure to ultraviolet or high temperature environment will lead to degradation of active ingredients and deepening of color.

1.2 Efficacy and Application Value

Aloe extract has multiple effects such as nutrition, skin care and health care, and is a commonly used functional raw material in food, cosmetics, health products, medicine and other fields. The core effects are as follows:

1.2.1 Skin Care Effects

Aloe polysaccharides can lock skin moisture (moisturizing rate increased by 30%–40%) and relieve dryness and redness; phenolic components have anti-inflammatory and soothing effects, improving skin sensitivity and redness after sunburn; flavonoids can inhibit tyrosinase activity, assist in brightening skin tone, suitable for various skin care products.

1.2.2 Health Care Effects

Aloe polysaccharides can regulate intestinal flora balance, promote the proliferation of beneficial bacteria and relieve mild constipation; have mild immunoregulatory effects and enhance body resistance; at the same time, they can assist in protecting gastric mucosa and reducing damage to gastric mucosa caused by irritant substances (intake shall be controlled).

1.2.3 Food Functional Properties

It can be used as a natural food additive with moisturizing, thickening and antioxidant effects to extend food shelf life; slight aloe flavor can enrich product taste, suitable for healthy food development; some active ingredients can assist in inhibiting the growth of harmful bacteria in food and improving food safety.

1.2.4 Pharmaceutical Auxiliary Effects

As pharmaceutical excipients or auxiliary ingredients, it has anti-inflammatory and healing-promoting effects and can be used for external preparations (such as ointments for scalds and dermatitis); in oral preparations, it can assist in regulating intestinal function and improve patient tolerance, complying with pharmaceutical-grade excipient standards.

1.3 Main Application Fields

Relying on the above characteristics and effects, aloe extract has been widely used in many fields. The core application scenarios include:

1.3.1 Cosmetics Field

Including skin care products (toners, emulsions, creams, facial masks), personal washing products (shampoos, shower gels), sunscreens, focusing on moisturizing, soothing and repairing effects, suitable for all skin types (especially sensitive skin).

1.3.2 Food Industry

Including beverages (fruit juices, plant protein drinks, functional drinks), baked foods (bread, cakes, biscuits), dairy products (yogurt, milk drinks), candies (gummies, jellies), with both functional and flavor-improving effects.

1.3.3 Health Products Field

As functional ingredients for capsules, tablets, granules, oral liquids and other dosage forms, focusing on intestinal health and immune regulation, and can be used in combination with probiotics, vitamins, etc.

1.3.4 Pharmaceutical Field

As excipients for external preparations (such as ointment bases), auxiliary ingredients for oral preparations, or used in foods for special medical purposes to assist in improving intestinal and skin-related problems.

1.3.5 Other Fields

Including feed additives (improving skin health and intestinal function of livestock and poultry), daily necessities (toothpaste, mouthwash, assisting in cleaning and soothing oral mucosa).

II. Application in Cosmetics Field: Production Process and Precautions

The core functions of aloe extract in cosmetics are moisturizing, soothing and repairing, suitable for various dosage forms. The key is to control addition temperature and pH value, avoid degradation of active ingredients, and ensure product safety and efficacy.

2.1 Application in Skin Care Products (Toner, Emulsion, Cream, Facial Mask)

2.1.1 Production Process

Toner

1. Pretreatment: Put purified water, glycerin (5%–8%), propylene glycol (3%–5%) into the mixing tank, stir at 60–70 °C for 10–15 minutes to dissolve evenly;
2. Add aloe extract: Cool to below 45 °C, add aloe extract (addition amount 2%–8%), stir for 20 minutes (speed 400 rpm) to ensure uniform dispersion;
3. Mixing and filtration: Add preservative (phenoxyethanol, 0.3%–0.5%), essence (0.1%), adjust pH to 5.5–6.5, filter with 0.22 μm filter membrane to remove impurities;
4. Filling: Fill into glass bottles in aseptic environment and seal.

Emulsion / Cream

1. Aqueous phase preparation: Purified water, aloe extract (3%–10%), hyaluronic acid (0.1%–0.3%), glycerin, stir to dissolve at 65–70 °C, keep warm for standby;
2. Oil phase preparation: Squalane, stearic acid, emulsifier (Tween-80, 2%–3%), heat and melt at 70–75 °C, stir evenly;
3. Emulsification: Slowly pour oil phase into aqueous phase, stir at high speed (1500 rpm) for 15–20 minutes, keep emulsification temperature at 65–70 °C;
4. Cooling and mixing: Cool to below 45 °C, add preservatives and essence, stir for 10 minutes, adjust pH to 5.5–7.0, continue cooling to room temperature;
5. Filling: Aseptic filling and sealed storage.

Facial Mask (Sheet / Wash-off)

1. Sheet mask: Purified water, aloe extract (5%–15%), glycerin, xanthan gum (0.2%–0.4%), stir to dissolve at 50–60 °C, add preservatives and essence, adjust pH to 5.5–6.5, filter and pour into mask cloth, seal;
2. Wash-off mask: Aloe extract (8%–20%), vaseline (5%–10%), emulsifier, glycerin, emulsify at 60–65 °C, add thickener (sodium carboxymethyl cellulose, 0.3%) after cooling, stir evenly and fill into tubes.

2.1.2 Precautions

▲ Temperature control: Aloe extract shall be added below 45 °C to avoid degradation of active ingredients and deepening of color caused by high temperature; emulsification temperature shall not exceed 75 °C to prevent polysaccharide polymerization;

▲ pH adaptation: Optimal pH range for skin care products is 5.5–7.0. Deviation from this range will reduce stability of aloe extract and may irritate skin; stability test shall be conducted in advance for acidic (pH < 5.0) or alkaline (pH > 7.5) systems;

▲ Addition amount control: 2%–10% for ordinary skin care products, 3%–5% for sensitive skin products to avoid skin stinging and redness caused by excessive amount; addition amount in facial masks can be appropriately increased (5%–15%), but shall be matched with soothing ingredients (such as panthenol);

▲ Antiseptic and antioxidant: Aloe extract contains natural nutrients and is easy to breed microorganisms, so sufficient preservatives shall be added; vitamin E (0.1%–0.2%) can be added to delay oxidative browning;

▲ Skin type adaptation: Sensitive skin products shall use deacetylated aloe extract (reducing irritation), and avoid adding irritating ingredients such as alcohol and essence.

2.2 Application in Washing Products (Shampoo, Shower Gel)

2.2.1 Production Process

Shampoo

1. Pretreatment: Purified water, sodium laureth sulfate (AES, 15%–20%), cocamidopropyl betaine (CAB, 5%–8%), stir to dissolve at 60–65 °C to form basic system;
2. Add aloe extract: Cool to below 45 °C, add aloe extract (3%–8%), stir for 20 minutes, add humectant (panthenol, 2%–3%);
3. Mixing: Adjust pH to 5.5–6.5, add preservatives, essence, thickener (hydroxyethyl cellulose, 0.3%–0.5%), stir evenly;
4. Filtration and filling: Filter with 100-mesh sieve to remove impurities, aseptically fill into plastic bottles.

Shower Gel

1. Basic system preparation: Purified water, AES (12%–18%), CAB (4%–6%), stir to dissolve at 60 °C, add ethylene glycol distearate (pearlescent agent, 2%–3%), keep warm for 30 minutes;
2. Add aloe extract: Cool to below 40 °C, add aloe extract (2%–6%), stir for 15 minutes, add humectants and preservatives;
3. Setting: Adjust pH to 5.5–7.0, stir until the system is uniform and pearlescent, cool to room temperature and fill.

2.2.2 Precautions

▲ Surfactant compatibility: Aloe extract has good compatibility with anionic and non-ionic surfactants; avoid compatibility with cationic surfactants to prevent precipitation;

▲ Foam control: Aloe extract may slightly reduce foam volume; AES dosage can be appropriately increased (1%–2%), or foam enhancer (such as cocamide DEA) can be added;

▲ Stability test: Layering may occur during long-term storage of washing products; thickeners shall be added to improve stability; storage temperature is controlled at 5–35 °C, avoid direct sunlight;

▲ Irritation control: Addition amount of aloe extract in shampoo and shower gel shall be ≤ 8% to avoid irritating scalp and skin; dipotassium glycyrrhizinate (0.1%–0.2%) can be matched to enhance soothing effect.

2.3 Application in Other Cosmetics (Sunscreen, Hand Cream)

2.3.1 Sunscreen

- Production process: In sunscreen system (physical sunscreen such as zinc oxide, chemical sunscreen such as ethylhexyl methoxycinnamate), cool to below 45 °C and add aloe extract (3%–5%), stir evenly, adjust pH to 5.5–6.5, which can assist in soothing skin irritation caused by sun protection and improve product mildness;
- Precautions: Avoid direct mixing with high-concentration chemical sunscreens (> 10%); pre-dissolve in advance to prevent degradation of active ingredients.

2.3.2 Hand Cream

- Production process: Vaseline, lanolin, glycerin as basic oil phase, heat and melt at 65 °C, add aloe extract (5%–10%) and emulsifier, cool after high-speed emulsification, add preservatives and essence;
- Precautions: Addition amount can be appropriately increased to enhance moisturizing and repairing effect; avoid excessive oil to prevent stickiness.

III. Application in Food Field: Production Process and Precautions

Aloe extract can exert moisturizing, antioxidant, flavor-improving and functional effects in foods, suitable for liquid, solid and semi-solid foods. The core is to control processing temperature and pH value, ensure food safety and efficacy stability, and strictly comply with food additive usage specifications.

3.1 Application in Beverages (Fruit Juice, Plant Protein Drink, Functional Drink)

3.1.1 Production Process

Fruit Juice Beverage

1. Pretreatment: Dilute concentrated fruit juice (30%–40%) to target concentration with purified water, add white granulated sugar (5%–8%), citric acid (0.1%–0.2%), stir to dissolve;
2. Add aloe extract: Cool to below 60 °C, add aloe extract (0.5%–3%), stir for 15–20 minutes (speed 500 rpm) to ensure complete dissolution;
3. Mixing and sterilization: Adjust pH to 4.5–6.0, add preservative (potassium sorbate, 0.05%–0.1%), essence, adopt UHT sterilization (135 °C, 3–5 seconds);
4. Filling: Cool to below 25 °C, aseptically fill into PET bottles or aluminum cans, seal.

Plant Protein Drink (Soy Milk, Almond Milk)

1. Basic system preparation: Mix plant protein (soy milk concentration 8%–10%) with purified water, homogenize (20–25 MPa) to remove precipitation;
2. Add aloe extract: Add aloe extract (1%–4%), emulsifier (glyceryl monostearate, 0.2%–0.3%), stir for 20 minutes;
3. Sterilization and filling: Pasteurization (65 °C, 30 minutes) or UHT sterilization, fill after cooling to avoid secondary pollution.

Functional Drink (Intestinal Health, Moisturizing Drink)

1. Pre-dissolution: Mix aloe extract (2%–5%) with 5 times purified water, stir at 60 °C for 20 minutes to ensure no particles;
2. Compounding: Add probiotics (such as *Bifidobacterium lactis*), prebiotics (fructo-oligosaccharide, 3%–5%), stir evenly, adjust pH to 5.0–6.5;
3. Sterilization and packaging: Adopt ultra-high pressure sterilization (600 MPa, 5 minutes) to retain activity of probiotics and aloe, aseptic filling.

3.1.2 Precautions

▲ Temperature control: For acidic beverages (pH < 4.5), add aloe extract after cooling to below 60 °C after sterilization to avoid degradation of active ingredients caused by high temperature and acidic environment; UHT sterilization time shall be ≤ 5 seconds to reduce degradation;

▲ Taste optimization: Aloe extract has slight bitterness; sweeteners (erythritol, steviol glycosides) can be matched to adjust taste and avoid covering the original flavor of fruit juice; when addition amount exceeds 3%, fruit powder (5%–8%) shall be matched to neutralize bitterness;

▲ Stability control: In fruit juice beverages with pulp, aloe extract may adsorb pulp particles; homogenization (25 MPa) shall be adopted to ensure suspension and avoid precipitation; storage temperature of liquid beverages ≤ 25 °C, avoid direct sunlight to prevent browning;

▲ Compliance: Food-grade aloe extract shall comply with GB 2760, addition amount strictly follows regulations (≤ 5% in beverages), label shall mark “Contains aloe ingredients, daily intake not more than 30 g”.

3.2 Application in Baked Foods (Bread, Cake, Biscuit)

3.2.1 Production Process

Bread

1. Raw material mixing: Dry mix high-gluten flour, yeast and salt evenly, add water and butter, stir at low speed for 5 minutes in dough mixer to form gluten;
2. Add aloe extract: Add aloe extract (1%–3%, based on flour mass), stir at high speed for 10 minutes to ensure uniform dispersion; maltodextrin (1%–2%) can be

matched to improve dispersibility;

3. Fermentation: Primary fermentation (temperature 38 °C, humidity 85%, 60 minutes), divide dough, proof for 15 minutes, secondary fermentation (38 °C, humidity 85%, 40 minutes);
4. Baking: Oven temperature 180–190 °C (top heat 190 °C, bottom heat 180 °C), bake for 25–30 minutes, cool to room temperature and seal.

Cake

1. Batter preparation: Whisk eggs and white granulated sugar at high speed until volume expands 3–4 times, add low-gluten flour and baking powder, mix evenly;
2. Add aloe extract: Add aloe extract (2%–4%, based on flour mass) and milk, mix until no particles;
3. Baking: Brush oil on mold, pour in batter, oven temperature 170–180 °C, bake for 30–35 minutes, demold after cooling;
4. Decoration (optional): Apply cream containing aloe extract (addition amount 3%–5%) on cake surface to improve flavor and functionality.

Biscuit

1. Dough mixing: Mix low-gluten flour, white granulated sugar and milk powder evenly, add melted butter and egg liquid, stir at low speed for 10 minutes to form uniform dough;
2. Add aloe extract: Add aloe extract (1%–2%), stir for 5 minutes, let dough stand for 30 minutes (relax gluten);
3. Forming and baking: Calender into 1–2 mm thin slices, die-cut, oven temperature 170–180 °C, bake for 10–12 minutes, cool and seal.

3.2.2 Precautions

▲ Temperature control: Baking temperature ≤ 190 °C; over-temperature will cause carbonization of aloe extract, degradation of active ingredients and burnt odor; bottom heat can be reduced by 5–10 °C in late bread baking to prevent over-browning at the bottom;

▲ Dough adjustment: Aloe extract has certain hygroscopicity; for every 1% aloe extract added, water addition shall be increased by 0.2%–0.4% to avoid too dry or too sticky dough; biscuit dough hardness shall be controlled to avoid forming difficulties;

▲ Flavor control: Bitterness of aloe extract will be weakened after baking; a small amount of honey (2%–3%) or vanilla extract (0.1%) can be matched to further neutralize bitterness and improve flavor;

▲ Storage: Baked foods shall adopt moisture-proof packaging (aluminum-plastic composite bag), storage environment humidity ≤ 60% to avoid softening and deterioration caused by moisture absorption of aloe extract.

3.3 Application in Dairy Products (Yogurt, Milk Drink)

3.3.1 Production Process

Yogurt

1. Pretreatment: Mix raw milk and whey protein powder in proportion, add white granulated sugar (5%–7%), homogenize at 50–60 °C, 20–25 MPa to ensure uniform system;
2. Sterilization and cooling: Pasteurization (65 °C, 30 minutes), cool to 42 °C, inoculate *Lactobacillus bulgaricus* and *Streptococcus thermophilus*;
3. Add aloe extract: Add aloe extract (1%–4%), stir for 5 minutes, ferment for 4–6 hours (aloe polysaccharides can promote probiotic proliferation, viable count increased by 20%–30%);
4. Post-ripening: Cool to 2–6 °C, refrigerate for 12 hours to improve product smoothness.

Milk Drink

1. Basic system preparation: Mix milk (30%–40%) with purified water, add emulsifier (polyglycerol fatty acid ester, 0.2%–0.3%), homogenize (20 MPa);
2. Add aloe extract: Cool to below 60 °C, add aloe extract (2%–5%), white granulated sugar, essence, stir evenly;
3. Sterilization and filling: UHT sterilization (135 °C, 4 seconds), aseptic filling after cooling to avoid microbial contamination.

3.3.2 Precautions

▲ pH adaptation: pH drops to 4.0–4.5 after yogurt fermentation, aloe extract has good stability in this range, no additional adjustment required; acidic milk drinks (pH < 3.8) shall be added after sterilization to reduce degradation;

▲ Addition amount control: Exceeding 4% in yogurt may cause bitter taste and flatulence, recommended to control at 1%–3%; addition amount in milk drinks ≤ 5% to avoid affecting stability of milk system;

▲ Microbial synergy: When compounded with probiotics, ratio of aloe extract to probiotics is controlled at 8:1 to avoid excessive fermentation leading to sour and astringent taste;

▲ Storage: Yogurt shall be stored under refrigeration (2–6 °C), shelf life 7–14 days; milk drink storage temperature ≤ 25 °C, avoid direct sunlight to prevent browning and layering.

3.4 Application in Other Foods (Candy, Jelly)

3.4.1 Candy (Gummy, Hard Candy)

- Production process: For gummies, add aloe extract (3%–6%) after gelatin and agar dissolve (60 °C), stir evenly, add sweeteners and essence, pour into mold for setting; for hard candies, boil sugar to 125–130 °C, cool to below 100 °C and add aloe extract (2%–4%), stir to dissolve and set;
- Precautions: Add after cooling in late hard candy boiling to avoid high-temperature degradation; moisture content of gummies (15%–20%) shall be controlled to avoid adhesion caused by moisture absorption of aloe extract.

3.4.2 Jelly

- Production process: Heat and dissolve purified water and jelly powder (agar/ carrageenan, 1%–2%), add aloe extract (2%–5%), white granulated sugar, citric acid, stir evenly, pour into mold, cool and set;
- Precautions: Adjust pH to 4.5–5.5 to improve jelly stability; exceeding 5% may cause soft jelly texture, appropriately increase jelly powder dosage.

IV. Application in Health Products Field: Production Process and Precautions

Aloe extract in health products focuses on intestinal health and immune regulation effects. Common dosage forms include capsules, tablets, granules and oral liquids. It is necessary to balance efficacy stability and taking convenience, and strictly comply with health product raw material technical requirements.

4.1 Application in Capsules

4.1.1 Production Process

▲ Raw material preparation: Select health product-grade aloe extract (purity ≥ 90%, aloe polysaccharide content ≥ 20%), mix with microcrystalline cellulose (filler, ratio 8:2), magnesium stearate (lubricant, 0.5%) according to formula;

▲ Mixing process: Pre-mix by equal increment method, put into V-type mixer, speed 200 rpm, mix for 15–20 minutes (coefficient of variation of mixing uniformity CV ≤ 3%);

▲ Capsule filling: Use fully automatic capsule filling machine in clean workshop (humidity ≤ 55%, temperature 20–25 °C), fill 0# or 1# capsules (200–500 mg aloe extract per capsule), filling accuracy ± 2%;

▲ Quality inspection: Sampling test capsule appearance, weight difference (± 7.5%), disintegration time limit (complete disintegration within 30 minutes), package after qualification.

4.1.2 Precautions

▲ Raw material purity: Health product-grade aloe extract shall comply with *Technical Requirements for Health Food Raw Materials*, heavy metals (Pb ≤ 0.1 mg/kg, As ≤ 0.05 mg/kg) and microorganisms (total bacterial count ≤ 100 CFU/g) shall strictly meet standards; aloe polysaccharide content ≥ 20% to ensure efficacy;

▲ Humidity control: Aloe extract has strong hygroscopicity; workshop humidity > 55% is easy to cake and cause mold jamming of filling machine, dehumidification equipment shall be turned on, raw materials shall be stored sealed;

▲ Fluidity optimization: If angle of repose of aloe extract > 40°, 1%–2% silicon dioxide can be added to improve fluidity and ensure uniform filling;

▲ Packaging and storage: Adopt aluminum-plastic blister packaging with desiccant inside, store in cool and dry place (temperature ≤ 25 °C, humidity ≤ 55%), shelf life 24 months; label shall mark suitable crowd (people with intestinal discomfort, low immunity), unsuitable crowd (pregnant women, infants).

4.2 Application in Tablets

4.2.1 Production Process

▲ Raw material pretreatment: Aloe extract (purity ≥ 90%) sifted through 100-mesh sieve, mixed with lactose (diluent, ratio 7:3), hypromellose (binder, 2%);

▲ Granulation: Add 50%–60% ethanol solution to make soft material, granulate through 16-mesh sieve, dry at 50–60 °C for 2–3 hours (moisture controlled at 3%–5%);

▲ Sizing and tableting: Dry granules sifted through 20-mesh sieve for sizing, add 1% magnesium stearate and mix for 10 minutes, tablet with rotary tablet press (pressure 8–10 kN, tablet hardness 5–7 kgf, friability ≤ 1%);

▲ Coating (optional): Adopt gastric-soluble coating powder, coating temperature 40–45 °C, weight gain 3%–5% to improve stability.

4.2.2 Precautions

▲ Granulation control: Binder dosage shall be accurate; too little causes loose granules, too much causes delayed disintegration; drying temperature ≤ 60 °C to prevent degradation of active ingredients of aloe extract;

▲ Disintegration optimization: Add 5%–10% crospovidone (disintegrant) to ensure disintegration time limit ≤ 15 minutes for easy absorption;

▲ Dosage design: Recommended daily intake for adults 1–3 g (as aloe extract), single dose 500 mg–1 g per tablet, mark “1–3 times a day, 1–2 tablets each time, take with

meals";

▲ Stability monitoring: Regularly test tablet hardness and disintegration time limit during storage to avoid performance degradation caused by moisture absorption; avoid taking with spicy and greasy food.

4.3 Application in Granules (Solid Drink Type)

4.3.1 Production Process

▲ Raw material mixing: Put aloe extract (addition amount 20%–40 g/100 g), erythritol (sweetener, 30%), fructooligosaccharide (synergistic prebiotic, 10%), essence (0.1%) into three-dimensional mixer, speed 300 rpm, mix for 20 minutes;

▲ Granulation (optional): Add 3% povidone solution for granulation (18-mesh sieve), dry at 60 °C to moisture ≤ 5%, package after sizing;

▲ Quantitative packaging: Adopt fully automatic granule packaging machine, packaging specification 10 g/bag or 15 g/bag (2–6 g aloe extract per bag), aluminum-plastic composite film packaging.

4.3.2 Precautions

▲ Solubility guarantee: High concentration (> 30%) of aloe extract dissolves slowly; particle size shall be controlled at 40–60 mesh, or consumers are advised to brew with warm water at 60–70 °C and stir until completely dissolved;

▲ Taste optimization: Match steviol glycosides (0.03%) and fruit powder (5%) to adjust taste, neutralize slight bitterness of aloe, ensure refreshing taste after brewing;

▲ Mixing uniformity: Trace ingredients (such as vitamin C) shall be pre-mixed with a small amount of aloe extract first to avoid uneven content;

▲ Storage and moisture-proof: Granules shall be used up within 1 month after opening, unopened products stored in environment with humidity ≤ 60% to avoid moisture absorption and caking.

4.4 Application in Oral Liquids

4.4.1 Production Process

▲ Pre-dissolution: Mix aloe extract (addition amount 5%–10 g/100 mL) with purified water at 1:5, stir at 60 °C for 20 minutes to dissolve, ensure no particles;

▲ Mixing: Add 0.2% citric acid (adjust pH 4.5–5.5), 0.1% potassium sorbate (preservative), sweetener, stir evenly;

▲ Filtration and filling: Filter with 0.22 μm filter membrane to remove impurities, aseptic filling (10 mL/piece), pasteurization (65 °C, 30 minutes);

▲ Packaging: Label, box, store in cool and dry place.

4.4.2 Precautions

1. pH control: pH of acidic oral liquid ≥ 4.5 to avoid degradation of aloe extract and reduce gastrointestinal irritation;
2. Antiseptic and antioxidant: Oral liquids are easy to breed microorganisms, sufficient preservatives shall be added; add vitamin E (0.1%–0.2%) to delay oxidative browning of aloe extract;
3. Filling and sealing: Seal immediately after filling to prevent microbial contamination and loss of active ingredients; storage temperature ≤ 25 °C, avoid direct sunlight, shelf life 12 months.

V. Application in Pharmaceutical Field: Production Process and Precautions

Aloe extract is mainly used as excipient for external preparations and auxiliary ingredient for oral preparations in pharmaceutical field. It shall comply with *Chinese Pharmacopoeia* standards, focus on purity, biocompatibility and preparation stability, and strictly control impurity content.

5.1 Application in External Preparations (Scald Ointment, Dermatitis Ointment)

5.1.1 Production Process

▲ Oil phase preparation: Mix vaseline, lanolin, liquid paraffin in proportion, heat and melt at 70–75 °C, stir evenly, keep warm for standby;

▲ Aqueous phase preparation: Purified water, pharmaceutical-grade aloe extract (5%–10%, purity ≥ 95%), glycerin, stir to dissolve at 65–70 °C, add preservative (benzalkonium bromide, 0.02%–0.05%);

▲ Emulsification: Slowly pour aqueous phase into oil phase, stir at high speed (1500 rpm) for 15–20 minutes, keep emulsification temperature at 65–70 °C to form uniform ointment base;

▲ Cooling and filling: Cool to below 40 °C, add active pharmaceutical ingredients (such as silver sulfadiazine for scald ointment), stir evenly, fill into aluminum tubes and seal.

5.1.2 Precautions

▲ Purity requirements: Pharmaceutical-grade aloe extract shall comply with excipient standards of *Chinese Pharmacopoeia* 2025 Edition, heavy metals and related substances (total impurities ≤ 0.5%) strictly controlled; aloin content ≥ 15% to ensure anti-inflammatory and healing-promoting effects;

▲ Aseptic treatment: External preparations shall be aseptically treated (γ-ray sterilization, dose 25 kGy), bacterial endotoxin ≤ 10 EU/g to avoid skin infection;

▲ Compatibility: Conduct compatibility test with active pharmaceutical ingredients (store at 40 °C, 75% RH for 1 month) to confirm no interaction and no effect on efficacy;

▲ Irritation: External preparations shall pass skin irritation test (no erythema, edema), addition amount of aloe extract for preparations used in sensitive parts shall be reduced (3%–5%).

5.2 Application in Oral Preparations (Intestinal Regulation Drugs, Auxiliary Preparations)

5.2.1 Production Process

▲ Raw material pretreatment: Pharmaceutical-grade aloe extract (purity ≥ 95%) sifted through 100-mesh sieve, mixed with active pharmaceutical ingredients, lactose (diluent), disintegrant in proportion;

▲ Granulation and drying: Add binder (hypromellose) to make soft material, dry at 50–60 °C after granulation, moisture controlled at 3%–5%;

▲ Tableting and coating: Add lubricant after sizing, tablet (pressure 7–9 kN), adopt enteric coating (avoid gastric acid destroying active ingredients), coating temperature 40–45 °C;

▲ Quality inspection: Test content uniformity (deviation ≤ ± 5%), disintegration time limit (enteric-coated tablets disintegrate within 30 minutes in artificial intestinal fluid), dissolution rate (dissolution ≥ 80% in 45 minutes).

5.2.2 Precautions

▲ pH adaptation: Oral preparations shall be released in intestinal tract; enteric coating shall ensure no disintegration in gastric acid (pH < 3.0) and rapid disintegration in intestinal fluid (pH > 7.0) to avoid degradation of aloe extract in gastric acid;

▲ Dosage control: Daily intake of aloe extract in oral pharmaceutical preparations ≤ 3 g to avoid diarrhea and abdominal pain caused by excessive amount;

▲ Storage conditions: Store in cool and dry place (temperature 2–8 °C, refrigeration) to avoid moisture absorption and oxidation, shelf life 24 months;

▲ Contraindicated crowd: Pregnant women, lactating women, infants and patients with intestinal ulcer are prohibited, label shall clearly mark contraindications and adverse

reactions.

5.3 Application in Foods for Special Medical Purposes

- **Production process**: Mix aloe extract (addition amount 8%–12 g/100 g) with whey protein, medium-chain triglycerides, vitamins and minerals to make liquid or powder formula, aseptic filling after UHT sterilization;
- **Precautions**: Comply with standards for foods for special medical purposes; for patients with intestinal diseases, addition amount controlled at 8%–10% to avoid intestinal irritation; powder shall be easy to brew without precipitation, pH of liquid formula controlled at 5.0–6.5.

VI. Application in Other Fields: Production Process and Precautions

6.1 Application in Feed Field

6.1.1 Production Process

▲ Mixing: Mix feed-grade aloe extract (purity ≥ 85%) with feed base (corn flour, soybean meal, 80%), vitamins and minerals, stir in twin-shaft mixer at 300 rpm for 20 minutes to ensure uniform dispersion;

▲ Granulation: Make mixed materials into pellet feed (particle size 3–5 mm) through granulator (temperature 80–90 °C, ring die compression ratio 1:8), cool to room temperature and package.

6.1.2 Precautions

▲ Addition amount control: 1%–2% in broiler feed (improve survival rate and skin health), 2%–3% in sow feed (improve lactation performance), 0.5%–1% in aquatic feed (promote growth and regulate intestinal tract);

▲ Heat resistance: Granulation temperature ≤ 90 °C; over-temperature causes degradation of aloe extract and loss of efficacy;

▲ Storage: Feed stored in dry and ventilated place (humidity ≤ 65%) to avoid caking and deterioration caused by moisture absorption of aloe extract.

6.2 Application in Daily Necessities (Toothpaste, Mouthwash)

6.2.1 Production Process

Toothpaste

1. Basic system preparation: Calcium carbonate (abrasive), glycerin, sodium carboxymethyl cellulose (thickener), purified water, stir and mix at 60 °C to form uniform paste;
2. Add aloe extract: Cool to below 45 °C, add aloe extract (2%–5%), fluoride, essence, stir for 20 minutes to ensure uniformity;
3. Degassing and filling: Vacuum degassing (remove bubbles), fill into toothpaste tubes and seal.

Mouthwash

1. Pre-dissolution: Mix aloe extract (1%–3%) with purified water, ethanol (10%–15%), stir at 60 °C for 15 minutes to dissolve evenly;
2. Mixing: Add menthol (0.1%–0.2%), preservative (chlorhexidine, 0.05%), adjust pH to 5.5–6.5, stir evenly;
3. Filtration and filling: Filter with 0.22 μm filter membrane, aseptically fill into glass bottles and seal.

6.2.2 Precautions

▲ Compatibility: In toothpaste, aloe extract has good compatibility with abrasives and fluorides; avoid compatibility with strong oxidants;

▲ Irritation: Ethanol content in mouthwash should not be too high (≤ 15%) to avoid irritating oral mucosa together with aloe extract; addition amount ≤ 3% to prevent bitter taste;

▲ Stability: Daily necessities shall be stored in cool and dry place, avoid direct sunlight to prevent oxidation and deepening of color of aloe extract.

VII. General Precautions During Production of Aloe Extract

7.1 Raw Material Selection and Quality Control

1. Purity classification: Food grade ≥ 85%, cosmetic grade ≥ 90%, health product grade ≥ 90% (aloe polysaccharide ≥ 20%), pharmaceutical grade ≥ 95% (aloin ≥ 15%), industrial grade ≥ 80%, select according to demand to avoid “low-grade high-use”;
2. Source compliance: Prioritize suppliers with FSSC 22000, BRCGS certification; raw materials shall provide COA, clearly indicate heavy metals, microorganisms,

aloe polysaccharide/aloin content and other indicators;

3. Impurity control: Food-grade and cosmetic-grade heavy metals Pb ≤ 0.5 mg/kg, As ≤ 1.0 mg/kg; pharmaceutical-grade Pb ≤ 0.1 mg/kg, As ≤ 0.05 mg/kg; avoid unqualified products caused by excessive impurities.

7.2 Process Parameter Control

1. Temperature control: Over-temperature will lead to degradation of active ingredients and deepening of color of aloe extract; real-time temperature control (error ± 2 °C) is required.
2. Cosmetic processing: Addition temperature ≤ 45 °C, emulsification temperature ≤ 75 °C;
3. Food processing: Baking ≤ 190 °C, sterilization ≤ 135 °C (UHT), acidic beverage addition ≤ 60 °C;
4. Pharmaceutical processing: Granulation ≤ 60 °C, aseptic treatment ≤ 135 °C;
5. Industrial processing: Feed granulation ≤ 90 °C;
6. pH control: Stable pH range 5.0–7.5; processing time ≤ 30 minutes in acidic (pH < 4.0), avoid long-term storage in alkaline (pH > 8.0) to prevent polysaccharide polymerization and activity decline;
7. Mixing uniformity: Mix in three-dimensional/V-type mixer for 15–30 minutes, CV ≤ 5% for food-grade and cosmetic-grade, CV ≤ 3% for pharmaceutical-grade to avoid product quality differences caused by uneven local concentration.

7.3 Storage and Packaging Requirements

1. Storage conditions: Temperature 20–25 °C, pharmaceutical-grade refrigeration (2–8 °C); humidity ≤ 60% (solid), ≤ 55% (health products, cosmetics); store away from light, ultraviolet accelerates oxidative browning;
2. Packaging materials: Aluminum-plastic composite film for food/health products/cosmetics (oxygen transmission rate ≤ 5 mL/(m^2·24h)), cardboard barrel with plastic liner for industrial grade; sealed glass or plastic barrels for liquid extract;
3. Shelf life management: Unopened solid 24 months, 3–6 months after opening; unopened liquid 12 months, 1 month after opening (refrigeration); expired products are prohibited.

7.4 Regulatory Compliance and Safety

1. Domestic regulations: Food grade complies with GB 2760, GB 18187-2000; cosmetic grade complies with *Cosmetic Safety Technical Specifications* (2022 Edition); health product grade complies with *Technical Requirements for Health Food Raw Materials*; pharmaceutical grade complies with *Chinese Pharmacopoeia* 2025 Edition;
2. International regulations: US FDA GRAS certification, EU EC No. 1223/2009; export products shall verify target country regulations in advance to ensure compliance;
3. Safe intake: Daily intake for adults ≤ 3 g (as aloe extract), excessive amount may cause diarrhea and abdominal pain; prohibited for infants, pregnant women, lactating women and patients with intestinal ulcer;
4. Label specification: Food and cosmetics mark "aloe extract" and addition amount; health products mark suitable/unsuitable 人群 and daily intake; pharmaceutical products mark contraindications, adverse reactions, usage and dosage.

VIII. Differentiation Strategies of Aloe Extract in Different Application Fields

8.1 Differentiation Strategy in Cosmetics Field

Core logic: Focus on "efficacy segmentation + skin type adaptation", combine active ingredient characteristics of aloe extract, design differentiated addition schemes, raw material selection and efficacy enhancement combinations for different skin care needs, skin types and product dosage forms, balance mildness and efficacy to build core competitiveness of products.

8.1.1 Differentiation of Raw Material Selection

1. Sensitive skin special products: Select deacetylated aloe extract (remove irritating ingredients, reduce sensitization rate), purity ≥ 95%, prioritize small molecule aloe polysaccharides (molecular weight ≤ 5000 Da) to enhance skin penetration and reduce stinging; match alcohol-free and fragrance-free formula, suitable for sensitive skin, redness skin and post-operation repair scenarios.
2. Moisturizing and anti-dry products: Select aloe extract with high polysaccharide content (aloe polysaccharide ≥ 25%), can be compounded with hyaluronic acid and ceramide to form dual effects of "moisturizing + barrier repair", suitable for dry skin and autumn/winter products, addition amount can be increased to 8%–12% (in facial masks and creams).

3. Brightening and soothing products: Select aloe extract with high flavonoid and phenol content (aloin ≥ 10%), compound with vitamin C, niacinamide and other brightening ingredients to inhibit tyrosinase activity, relieve irritation caused by brightening ingredients, suitable for oily skin and dull skin products, addition amount controlled at 5%–8%.
4. Washing products special: Select surfactant-resistant aloe extract (specially modified) to avoid precipitation caused by reaction with anionic surfactants, improve water solubility, suitable for dosage forms such as shampoo and shower gel, ensure long-term storage stability.

8.1.2 Differentiation of Addition Scheme

1. Dosage form adaptation: Liquid products such as toner and essence water use liquid aloe extract (concentration 50%–80%), direct dissolution without additional pretreatment, addition amount 2%–5%; semi-solid products such as emulsion and cream use powdered extract, match maltodextrin to improve dispersibility, addition amount 3%–10%; facial mask products use high-activity extract, addition amount 5%–15%, match panthenol and dipotassium glycyrrhizinate to enhance soothing effect.
2. Efficacy enhancement: For post-sun repair products, aloe glycoside derivatives can be compounded in aloe extract (enhance anti-inflammatory and soothing), addition amount 3%–5%; for anti-early aging products, compound with peptides and pro-xylane, aloe extract as auxiliary repair ingredient, addition amount 4%–6%, reduce irritation of anti-aging ingredients.
3. Mildness optimization: Sensitive skin products adopt “low-temperature addition + low-speed stirring” process, addition temperature ≤ 40 °C, stirring speed 300 rpm to avoid destroying active ingredients and reduce skin irritation; 0.1%–0.2% dipotassium glycyrrhizinate can be added to neutralize slight irritation of aloe extract.

8.1.3 Differentiation of Market Positioning

High-end products: Select organic certified aloe extract (comply with USDA organic certification), emphasize “natural and additive-free”, compound with high-end repair ingredients (such as squalane, ergothioneine), addition amount 8%–12%, focus on “mild repair + high-end experience”;

Mid-end products: Select conventional cosmetic-grade extract (purity ≥ 90%), focus on single efficacy (such as moisturizing, soothing), addition amount 5%–8%, outstanding cost performance;

Affordable products: Select cost-effective cosmetic-grade extract (purity ≥ 90%), addition amount 2%–5%, match basic moisturizing ingredients to meet daily care needs.

8.2 Differentiation Strategy in Food Field

Core logic: Focus on "compliance + taste adaptation + function enhancement", combine food dosage form characteristics (liquid, solid, semi-solid) and consumer group needs (children, the elderly, healthy people), differentially select aloe extract purity, addition amount and compounding scheme, balance safety, taste and functionality, comply with food additive usage specifications.

8.2.1 Differentiation of Raw Material Selection

1. Children's food (jelly, gummy): Select food-grade aloe extract (purity ≥ 85%), remove bitter ingredients (debittered), aloe polysaccharide ≥ 15%, avoid adding irritating ingredients to ensure mild taste and adapt to children's taste needs; at the same time control heavy metal content (Pb ≤ 0.3 mg/kg) to meet children's food safety standards.
2. Functional food (intestinal health, antioxidant drink): Select high-activity food-grade extract (purity ≥ 90%, aloe polysaccharide ≥ 20%), prioritize water extraction process extract (retain more water-soluble active ingredients), suitable for compounding with probiotics and prebiotics to enhance intestinal regulation effect.
3. Baking and dairy products: Select heat-resistant aloe extract (microencapsulated), resistant to baking temperature of 180–190 °C to avoid degradation of active ingredients; at the same time improve hygroscopicity to prevent softening of baked foods and layering of dairy products.
4. Fruit juice beverage: Select liquid aloe extract (concentration 60%–70%), good water solubility, easy to mix with fruit juice, reduce precipitation; at the same time select low-bitterness extract to avoid affecting fruit juice taste.

8.2.2 Differentiation of Addition Scheme

1. Taste adaptation: Addition amount 0.5%–3% in liquid beverages (fruit juice, milk drink), match sweeteners (erythritol, steviol glycosides) to neutralize slight bitterness; addition amount 1%–4% in baked foods, use baking process to weaken bitterness, match honey and vanilla extract to further optimize taste; addition amount 2%–6% in candy and jelly, after debittering treatment, match fruit flavor essence to improve palatability.
2. Function enhancement: For intestinal health food, aloe extract compounded with probiotics (ratio 8:1), addition amount 2%–5% to promote probiotic proliferation; for antioxidant food, compounded with vitamin C and tea polyphenols, aloe extract addition amount 3%–4% to synergistically improve antioxidant effect; for moisturizing drink, addition amount 2%–5%, match food-grade hyaluronic acid to enhance moisturizing effect.
3. Dosage form adaptation: For liquid food (beverage, milk drink), liquid aloe extract directly added, sterilized after stirring evenly; for solid food (bread, biscuit), powdered extract dry mixed with raw materials, adjust water addition (0.2%–0.4% water increase per 1% extract); for semi-solid food (yogurt, jelly), powdered extract

pre-dissolved before adding to avoid precipitation.

8.2.3 Differentiation of Consumer Groups

Children group: Focus on “mild and non-irritating, sweet taste”, addition amount ≤ 3%, dosage forms mainly jelly, gummy, children’s milk drink, label marked “children special, daily intake not more than 10 g”;

Elderly group: Focus on “intestinal health, easy absorption”, addition amount 2%–4%, dosage forms mainly granules, oral liquid, yogurt, compounded with dietary fiber to adapt to elderly intestinal function;

Healthy group: Focus on “natural functionality”, addition amount 3%–5%, diversified dosage forms (beverage, baking, health product), emphasize “additive-free, natural and healthy”.

8.3 Differentiation Strategy in Health Products Field

Core logic: Focus on “precise efficacy + convenient dosage form + compliance”, differentially select aloe extract purity, dosage form and compounding scheme for different health care needs (intestinal health, immune regulation) and taking crowd (adults, the elderly), ensure stable efficacy and convenient taking, strictly comply with relevant regulations of health products.

8.3.1 Differentiation of Raw Material Selection

1. Intestinal health health products: Select health product-grade aloe extract (purity ≥ 90%, aloe polysaccharide ≥ 25%), prioritize water extraction process extract, good water solubility, easy to be absorbed by human body, can promote intestinal beneficial bacteria proliferation and relieve mild constipation; compound with prebiotics such as fructo-oligosaccharide and inulin to enhance intestinal regulation effect.
2. Immune regulation health products: Select high-activity extract (purity ≥ 95%, aloe polysaccharide ≥ 30%), compound with immune enhancing ingredients such as vitamin C and zinc to synergistically improve body resistance, suitable for people with low immunity.
3. Convenient taking health products: Select microencapsulated aloe extract to cover bitterness and improve taking experience; at the same time enhance stability and extend shelf life, suitable for capsules, tablets and other dosage forms.

8.3.2 Differentiation of Dosage Form and Dosage

1. Dosage form adaptation: For convenient taking by adults, select capsules and tablets (single dose 500 mg–1 g), 1–3 times a day, take with meals; for the elderly and

people with swallowing difficulties, select granules and oral liquids (single dose 10–15 mL), brew with warm water or take directly, easy to absorb; for long-term taking crowd，select sustained-release tablets to extend active ingredient release time and improve efficacy sustainability.

2. Dosage control: For intestinal health, daily intake 1–2 g (as aloe extract) to avoid diarrhea caused by excessive amount; for immune regulation, daily intake 2–3 g, match immune enhancing ingredients to improve efficacy; for special crowd (the elderly, physically weak), daily intake 1 g, gradually adjust dosage.

8.3.3 Differentiation of Compliance and Positioning

High-end health products: Select organic certified, high-purity extract (purity ≥ 95%), compound with high-end functional ingredients (such as probiotics, peptides), emphasize "natural, efficient", label clearly mark aloe polysaccharide content and daily intake;

Mid-end health products: Select conventional health product-grade extract (purity ≥ 90%), focus on single efficacy (intestinal health), outstanding cost performance, suitable for public consumption;

Affordable health products: Select cost-effective extract (purity ≥ 90%), moderate dosage, focus on "daily health care" to meet basic needs.

8.4 Differentiation Strategy in Pharmaceutical Field

Core logic: Focus on "qualified purity + biocompatibility + drug efficacy synergy", differentially select pharmaceutical-grade aloe extract for different pharmaceutical dosage forms (external, oral) and treatment needs (scald repair, intestinal regulation), strictly control impurity content and sterility, ensure synergy with active pharmaceutical ingredients, comply with *Chinese Pharmacopoeia* standards.

8.4.1 Differentiation of Raw Material Selection

1. External preparation (scald ointment, dermatitis ointment): Select pharmaceutical-grade aloe extract (purity ≥ 95%, aloin ≥ 15%), impurity-free and aseptic, with strong anti-inflammatory and healing-promoting effects; prioritize fat-soluble extract, easy to integrate with ointment base, improve skin penetration and promote wound healing.
2. Oral preparation (intestinal regulation drug): Select pharmaceutical-grade extract (purity ≥ 95%, aloe polysaccharide ≥ 20%), enteric-coated treatment to avoid gastric acid destroying active ingredients and ensure release in intestinal tract; at the same time control irritation to avoid intestinal discomfort caused by excessive amount.
3. Food for special medical purposes: Select high-purity extract (purity ≥ 95%), suitable for patients with intestinal diseases, addition amount 8%–10% to avoid intestinal irritation, easy to absorb, dual effects of nutrition supplement and intestinal regulation.

8.4.2 Differentiation of Dosage Form and Process

1. External preparations: Adopt the process of "aseptic emulsification + γ-ray sterilization" to ensure sterility (bacterial endotoxin ≤ 10 EU/g); compound aloe extract with active pharmaceutical ingredients (e.g., silver sulfadiaziazine) at a ratio of 5:1 to synergistically enhance anti-inflammatory and healing effects; ointment forms use petrolatum and lanolin as bases to improve moisturization and repair.
2. Oral preparations: Adopt enteric coating to ensure no disintegration in gastric acid (pH < 3.0) and rapid disintegration in intestinal fluid (pH > 7.0); granulation temperature ≤ 60 °C to prevent degradation of active ingredients; daily dosage ≤ 3 g, taken in 3 divided doses to reduce intestinal irritation.
3. Foods for special medical purposes: Formulated as liquid or powder. Liquid forms have pH controlled at 5.0–6.5 for better absorption; powder forms are easy to reconstitute without precipitation, suitable for digestive absorption of patients with intestinal diseases.

8.4.3 Differentiation of Safety

External preparations: Must pass skin irritation tests to ensure no erythema or edema. For sensitive areas, aloe extract content is limited to 3%–5% to reduce irritation.

Oral preparations: Clearly label contraindicated populations (pregnant women, infants, patients with intestinal ulcers) and adverse reactions (mild diarrhea, abdominal pain), and advise medical supervision.

Foods for special medical purposes: Require clinical verification for safety and efficacy, with clear labeling of applicable populations and usage.

8.5 Differentiation Strategies in Other Fields

8.5.1 Feed Industry

Core logic: Focus on "cost control + efficacy matching". For different livestock and aquatic species, select feed-grade aloe extract and control addition levels to balance function and cost.

- Raw material selection: Feed-grade extract (purity ≥ 85%), cost-effective, heat-resistant up to 90 °C.
- Addition scheme: 1%–2% for broilers to improve survival and skin health; 2%–3% for sows to improve lactation; 0.5%–1% for aquaculture to promote growth and intestinal health.
- Formula compatibility: Combined with vitamins and minerals to enhance immunity and reduce disease.

8.5.2 Daily Necessities

Core logic: Focus on “mildness + functional compatibility”.

- Raw material selection: Daily-grade extract (purity ≥ 90%), mild, compatible with toothpaste and mouthwash formulas.
- Addition scheme: 2%–5% in toothpaste for cleaning and soothing oral mucosa; 1%–3% in mouthwash with ethanol ≤ 15% to avoid irritation.
- Stability: Use oxidation-resistant extracts and avoid direct sunlight to prevent darkening.

IX. Common Problems and Solutions

9.1 Common Problems in Production

9.1.1 Uneven dispersion and precipitation

Causes: Caking due to moisture, no pre-dissolution, poor compatibility, insufficient mixing.

Solutions:

1. Sieve powder through 100-mesh before use.
2. Pre-dissolve liquid products with 5× purified water at 60 °C for 20 min.
3. Pre-mix powder with carriers (maltodextrin, MCC) at 1:2.
4. Increase stirring speed (400–1500 rpm) and time (15–30 min).
5. Avoid cationic surfactants to prevent precipitation.

9.1.2 Degradation of active ingredients and reduced efficacy

Causes: High temperature, inappropriate pH, UV exposure, strong oxidants.

Solutions:

1. Strictly control temperature: cosmetics ≤ 45 °C, baking ≤ 190 °C, sterilization ≤ 135 °C.
2. Maintain pH 5.0–7.5; shorten processing to ≤ 30 min at pH < 4.0.
3. Avoid light and use light-resistant packaging.

4. Add 0.1%–0.2% vitamin E to inhibit oxidation.
5. Use microencapsulated extract for protection.

9.1.3 Poor taste or odor (bitterness, browning)

Causes: Unremoved bitter components, oxidation, excessive addition.

Solutions:

1. Use debittered extract for food and cosmetics.
2. Add sweeteners (erythritol, steviol glycosides) or fruit powder.
3. Limit dosage: food ≤ 5%, cosmetics ≤ 10%.
4. Use antioxidants (vitamin E, tea polyphenols).
5. Use ultra-high pressure sterilization for liquids to avoid browning.

9.1.4 Poor stability (separation, caking, deterioration)

Causes: Incompatibility, insufficient thickener, high humidity/temperature, inadequate preservatives.

Solutions:

1. Select compatible extracts; use surfactant-stable types for personal care.
2. Add thickeners (xanthan gum, hydroxyethyl cellulose).
3. Use moisture-proof packaging and store at 20–25 °C, humidity ≤ 60%.
4. Add approved preservatives.
5. Store liquid extracts sealed and refrigerated, use within 1 month after opening.

9.2 Common Regulatory and Safety Issues

9.2.1 Non-compliance (labeling, dosage, purity)

Causes: Failure to follow industry regulations, incorrect labeling, excessive dosage, substandard raw materials.

Solutions:

1. Comply with GB 2760, Cosmetic Safety Specifications, Chinese Pharmacopoeia.
2. Standardize labels: declare extract name, content, applicable population, dosage, contraindications.
3. Use grade-appropriate raw materials and verify COA.

9.2.2 Safety issues (allergy, irritation, overdose)

Causes: Insufficient purity, excessive dosage, no irritation test, inappropriate population.

Solutions:

1. Conduct skin irritation and allergy tests for cosmetics and pharmaceuticals.
2. Control daily intake ≤ 3 g for adults.
3. Label contraindications for infants, pregnant women, intestinal ulcer patients.
4. Avoid irritating ingredients (alcohol, fragrance) in sensitive formulas.

X. Appendix

10.1 Summary of Aloe Extract Standards

Application	Purity	Key Indexes	Standards
Cosmetics	≥ 90%	Pb ≤ 0.5 mg/kg, As ≤ 1.0 mg/kg; Aloe polysaccharides ≥ 15%	Cosmetic Safety Technical Specification (2022)
Food	≥ 85%	Pb ≤ 0.5 mg/kg, As ≤ 1.0 mg/kg; Total plate count ≤ 1000 CFU/g	GB 2760-2014, GB 18187-2000
Health Products	≥ 90%	Pb ≤ 0.1 mg/kg, As ≤ 0.05 mg/kg; Aloe polysaccharides ≥ 20%	Technical Requirements for Health Food Raw Materials
Pharmaceutical	≥ 95%	Pb ≤ 0.1 mg/kg, As ≤ 0.05 mg/kg; Aloin ≥ 15%; Total impurities ≤ 0.5%	Chinese Pharmacopoeia 2025 Edition
Feed	≥ 85%	Pb ≤ 1.0 mg/kg, As ≤ 2.0 mg/kg; Moisture ≤ 8%	Feed Additive Standards

10.2 Recommended Formula Combinations

10.2.1 Cosmetics

- Moisturizing & repairing: Aloe extract + hyaluronic acid + ceramide
- Soothing & anti-inflammatory: Aloe extract + panthenol + dipotassium glycyrrhizinate
- Brightening & antioxidant: Aloe extract + vitamin C + niacinamide
- After-sun repair: Aloe extract + aloin derivative + centella asiatica extract

10.2.2 Food

- Intestinal health: Aloe extract + probiotics + fructooligosaccharides
- Antioxidant: Aloe extract + vitamin C + tea polyphenols
- Taste improvement: Aloe extract + erythritol + fruit powder
- Stability: Aloe extract + glyceryl monostearate + xanthan gum

10.2.3 Health Products

- Intestinal regulation: Aloe extract + probiotics + inulin
- Immunity: Aloe extract + vitamin C + zinc
- Processing aid: Aloe extract + microcrystalline cellulose + magnesium stearate

10.2.4 Pharmaceutical

- External repair: Aloe extract + silver sulfadiazine + petrolatum
- Oral intestinal regulation: Aloe extract + lactose + crospovidone
- Special medical food: Aloe extract + whey protein + medium-chain triglycerides

10.3 Storage and Transportation

1. **Storage:**
    - Solid: Cool, dry, 20–25 °C, humidity ≤ 60%, sealed, light-proof.
    - Pharmaceutical grade: 2–8 °C refrigerated.
    - Liquid: Sealed, light-proof, refrigerated; use within 1 month after opening.
2. **Transportation:**
    - Sealed packaging, avoid extrusion, moisture, heat (< 35 °C).
    - Pharmaceutical and health products: cold-chain transport.
3. **Shelf life:**
    - Solid unopened: 24 months; opened: 3–6 months.
    - Liquid unopened: 12 months; opened: 1 month (refrigerated).
    - Expired products must not be used.

10.4 Terminology

1. Aloe polysaccharides: Core active component with moisturizing, immune-modulating, and intestinal-protective effects, molecular weight 2000–10000 Da.
2. Deacetylated aloe extract: Treated to remove acetyl groups, lower irritation, suitable for sensitive skin and children's products.
3. Microencapsulated extract: Protected by microencapsulation to improve stability and mask bitterness.
4. Coefficient of variation (CV): Measures mixing uniformity. Pharmaceutical grade ≤ 3%, food/cosmetic grade ≤ 5%.
5. UHT sterilization: Ultra-high temperature instantaneous sterilization at 135–150 °C for 3–5 seconds to minimize active ingredient loss.