Nucleotide Product Specification Sheet

Ⅰ. Product Definition

Nucleotides are a class of small biological molecular compounds condensed from nitrogenous bases, pentose ribose and phosphate groups via glycosidic bonds and phosphate ester bonds, serving as the basic structural units of intracellular nucleic acids (DNA/RNA). Food-grade nucleotides mostly refer to **5'-mononucleotide** flavor-enhancing and nutrition-fortified derivatives. The mainstream industrial product is **Disodium 5'-Ribonucleotide (I+G)**, compounded by fixed ratio of **Disodium 5'-Inosinate (IMP)** and **Disodium 5'-Guanylate (GMP)**.

Classified by application properties into two categories:

1. Flavor-type Nucleotides

Centered on IMP and GMP, it delivers powerful umami multiplication, flavor enhancement and off-taste masking effects, acting as a core flavor enhancer in the food industry.

2. Nutrition-type Nucleotides

Covers complex nucleotides such as cytidylate, uridylate and adenylate. It participates in body metabolism, intestinal development and immune regulation, widely applied in infant formula food, health products and functional food.

This product is manufactured using yeast ribonucleic acid (RNA) or starch fermented saccharides as raw materials, through enzymatic hydrolysis and cleavage, separation and purification, refining and crystallization, drying and sieving. It is a compliant food additive/nutrition fortifier that meets national standards and Codex Alimentarius quality and safety specifications.

Ⅱ. Basic Product Information

- Product Name: **Disodium 5'-Ribonucleotide** (Alternative Name: Flavor Disodium Ribonucleotide, I+G)
- English Name: Disodium 5'-Ribonucleotide
- CAS No.: 4691-65-0
- CNS No.: 12.004
- INS No.: 635
- E No.: E635
- Executive Standard: GB 1886.171-2016 National Food Safety Standard – Food Additive Disodium 5'-Ribonucleotide
- Product Grade: Food Grade (Premium Grade)
- Production Process: Produced from starch, saccharides or yeast RNA via fermentation/enzymolysis, separation, refining and drying

III. Main Ingredients

- **Disodium 5'-Inosinate (IMP)**: ≥ 50.0%
- **Disodium 5'-Guanylate (GMP)**: ≥ 50.0%
- **Total Content (IMP+GMP)**: 97.0% ~ 102.0% (on dry basis)

IV. Physicochemical Indexes (GB 1886.171-2016)

1. Sensory Requirements

- Appearance: Colorless to white crystals or crystalline powder
- Odor: Odorless with a special umami taste
- Taste: Presents strong synergistic umami with monosodium glutamate

2. Physicochemical Parameters

- Loss on Drying: ≤ 25.0%
- pH (10g/L Aqueous Solution, 25℃): 7.0 ~ 8.5
- Transmittance (5% Aqueous Solution): ≥ 95.0%
- Heavy Metals (as Pb): ≤ 10mg/kg
- Arsenic (As): ≤ 3mg/kg
- Lead (Pb): ≤ 4mg/kg
- Ammonium Salts (as NH_4^+): ≤ 0.05%
- Other Nucleotides: Compliant with standard provisions

3. Microbiological Indexes

- Total Aerobic Count: ≤ 1000CFU/g
- Coliforms: ≤ 30MPN/100g
- Molds and Yeasts: ≤ 50CFU/g
- Salmonella: 0/25g
- Shigella: Negative

V Performance Characteristics

- Solubility: Freely soluble in water (25g/100mL at 20℃), slightly soluble in ethanol, diethyl ether and acetone
- Stability: Stable under normal temperature and dry conditions, tolerant to general food processing temperature; easily decomposed by strong acid and strong alkali
- Umami Synergy: Remarkable umami enhancement when compounded with Monosodium Glutamate (MSG) at a ratio of 1:5 ~ 1:20

VI. Functions & Applications

Classified into flavor type and nutrition type by application properties, with respective functions and application scenarios as follows:

1. Flavor-type Nucleotides (Core: IMP & GMP, Mainstream Type of This Product)

1.1 Core Functions

- **Umami Multiplication**

With mild inherent umami, its umami intensity can be increased by 8-10 times when compounded with MSG, presenting natural and mellow compound umami, solving the problem of thin and bitter single monosodium glutamate taste.

- **Flavor Enhancement**

Stratifies the inherent flavor of food, highlights the original taste of ingredients (e.g., meat aroma of meat products, fresh taste of seafood, sweet and crisp taste of vegetables), making flavor richer and longer-lasting.

- **Off-taste Masking**

Effectively masks bitterness, astringency, fishy odor and peculiar tastes in food (e.g., beany flavor of soybean products, fishy odor of meat products, burnt bitterness of condiments) to optimize taste profile.

- **Salt Reduction & Efficacy Improvement**

Maintains umami intensity while reducing food salt content, supporting the development of low-sodium food and conforming to the healthy diet trend.

1.2 Application Scope & Recommended Dosage

- Condiments: Soy sauce, oyster sauce, chicken essence, chicken powder, compound seasonings, sauces, brine materials, soup base; Recommended dosage: 0.1% ~ 0.5%
- Instant Food: Seasoning packets of instant noodles, instant rice and self-heating food; Recommended dosage: 0.2% ~ 0.6%, compound ratio with MSG 1:(5 ~ 20)
- Meat Products: Ham, sausage, canned food, marinated food and meatballs; Recommended dosage: 0.05% ~ 0.3% for meat aroma enhancement and fishy odor masking
- Snacks: Potato chips, puffed food, nuts, soybean products and spicy strips; Recommended dosage: 0.03% ~ 0.2% for flavor enhancement and taste optimization
- Catering & Others: Hot pot base, barbecue seasonings, soup materials and pre-made dishes; Moderate dosage per production demand, adaptable to various flavor requirements

2 Nutrition-type Nucleotides (Compound Nucleotides including Cytidylate, Uridylate, Adenylate, etc.)

2.1 Core Functions

- **Participate in Body Metabolism**

As a precursor for nucleic acid synthesis, it participates in cell division, growth and repair, helping maintain normal

physiological functions of the body.

- **Regulate Intestinal Health**

Promotes proliferation of beneficial intestinal bacteria (e.g., Bifidobacterium), inhibits the growth of harmful bacteria, repairs intestinal mucosa, optimizes intestinal flora balance and improves intestinal absorption capacity.

- **Enhance Immunity**

Participates in the synthesis and activation of immune cells (lymphocytes, macrophages), boosts body resistance and reduces infection risks.

- **Nutrition Supplementation**

Suitable for special populations (infants, the elderly, postoperative recovery crowds), supplementing required nucleotides to support growth, development and physical recovery.

2.2 Application Scope & Recommended Dosage

- **Infant Formula Food:**

Infant milk powder, rice cereal and complementary food; Used within limits in accordance with GB 10765-2021 and GB 10767-2021; total compound nucleotide content shall comply with corresponding product standards.

- **Health Products & Functional Food:**

Immunity-regulating and intestinal health health products in oral liquid, tablet and capsule forms; Recommended daily dosage: 0.1 ~ 0.3g (calculated as pure nucleotide).

- **Food for Special Medical Purpose:**

Nutritional supplements for postoperative, weak and elderly groups; Moderate addition per product formula demand to assist physical recovery.

- **Others:**

Functional beverages and nutritional meal replacements; Added moderately according to product positioning for nutrition supplementation and added value improvement.

Ⅶ. Safety

- LD_{50}: Oral administration in rats > 10g/kg (bw)
- ADI: Not specified (JECFA, FDA, EFSA)
- GRAS: Recognized as Generally Recognized As Safe by US FDA
- Metabolism: Decomposed into bases, ribose and phosphate in vivo, participating in normal purine metabolism with no residue and cumulative toxicity

Ⅷ Packaging Specifications

- Inner Packaging: Food-grade polyethylene bag / Aluminum foil bag (sealed and moisture-proof)
- Outer Packaging: 25kg fiber drum / Carton (10kg×2 bags/carton)

- Packaging Dimension: Φ38×50cm (25kg drum)

Ⅸ. Storage & Transportation

- Storage: Store in sealed, cool, dry and ventilated place (Temperature ≤25℃, Relative Humidity ≤65%); Keep away from moisture, sunlight, peculiar odor and pollution, and toxic and harmful substances.
- Transportation: Non-dangerous goods; Avoid rain soaking, sun exposure and damage by sharp objects; Keep packaging intact during transportation with careful handling.
- Shelf Life: 24 months (unopened original package under specified storage conditions)

Ⅹ. Test Methods

Tested in accordance with GB 1886.171-2016 and relevant national standard methods:

- Content (IMP+GMP): High Performance Liquid Chromatography (HPLC)
- Loss on Drying: 105℃ Constant Weight Method
- pH: Potentiometric Method (10g/L aqueous solution at 25℃)
- Heavy Metals, Arsenic, Lead: Atomic Absorption Spectrophotometry / Colorimetric Method
- Microorganisms: GB 4789 Series Methods (Total plate count, coliforms, etc.)

Ⅺ. Labelling Requirements

Product labels shall mark the following contents in compliance with GB 7718-2011 National Food Safety Standard – General Principles for Prepackaged Food Labelling:

Product name, specification, net content, production date, batch number, shelf life, executive standard, production license number, manufacturer name and address, contact information, storage conditions, instructions for use and warning words (if necessary).

Nucleotide Nutritional Facts Table (Food Grade)

Product Name: Compound 5'-Nucleotide (Food Grade, Mixed Monomer)

Recommended Dosage: Added per product formula (calculated as total nucleotide content, compliant with GB 14880-2012 National Food Safety Standard – Standard for Uses of Food Nutrition Fortifiers and GB 28050-2011 **National Food Safety Standard** – General Principles for Nutrition Labelling of Prepackaged Food)

Nutritional Facts (Per 100 g)

Nutritional Ingredient	Content per 100g	Content per 100 kcal	Unit	NRV%
Energy	385±5	100	kcal	19.3%
Carbohydrates	96.0±1.0	24.9±0.3	g	32.0%
Compound Nucleotides (Total)	≥98.0	≥25.4	g	—
— 5'-Cytidine Monophosphate (5'-CMP)	19.0±1.5	4.9±0.4	g	—
— 5'-Uridine Monophosphate (5'-UMP)	18.5±1.5	4.8±0.4	g	—
— 5'-Adenosine Monophosphate (5'-AMP)	18.0±1.5	4.7±0.4	g	—
— 5'-Guanosine Monophosphate (5'-GMP)	17.5±1.5	4.5±0.4	g	—
— 5'-Inosine Monophosphate (5'-IMP)	17.0±1.5	4.4±0.4	g	—
Protein	0.0	0.0	g	0.0%
Fat	0.0	0.0	g	0.0%
Dietary Fiber	0.0	0.0	g	0.0%
Sodium	≤50.0	≤13.0	mg	≤2.5%

Nutritional Labelling Instructions

1. **Basis of Labelling**: This nutritional facts table is compiled strictly in accordance with GB 28050-2011, GB 14880-2012 and ISO 21424:2020 international standard requirements.
2. **Unit Explanation**: Core content is labelled on a **per 100g** basis, supplemented with **per 100 kcal** content (compliant with Codex Stan 72-1981 Rev.2023 international regulations); Energy unit adopts kcal (kJ can be marked synchronously, 1kcal≈4.184kJ) to meet the demands of international export markets.
3. **Numerical Specification**: Rounding of content values follows GB/T 8170 Rules of Rounding Off Numerical Values and Expression and Judgement of Limit Values; Error range meets precision requirements of food-grade raw materials. "—" indicates no unified national Nutrient Reference Value (NRV) for the corresponding nutritional ingredient, labelled in accordance with standard provisions.
4. **Special Labelling**: If applied to infant formula food and EU export products, additional compliant labelling shall be supplemented (e.g., mark INS/E numbers of each nucleotide monomer for EU market: 5'-GMP corresponds to E627, 5'-IMP corresponds to E631).
5. **Testing Specification**: The detection of total nucleotide content and monomer content adopts High Performance Liquid Chromatography (HPLC), complying with GB 5413.40-2016 (domestic) and ISO 21424:2020 (international) testing standards to ensure authentic and compliant data.