Classic Case Analysis of Mannitol Application Fields

Overview

Mannitol (also known as D-Mannitol, INS No.: 421, CNS No.: 19.014) is a six-carbon sugar alcohol functional polyol. It naturally exists widely in seaweed, edible fungi, persimmon trees, olives and other plants. Industrially, it is mostly produced by seaweed extraction or glucose isomerization and hydrogenation refining. Its core physicochemical properties include clean sweetness, non-hygroscopicity, high stability and extremely low calories. Its sweetness is about 50%-55% of sucrose, with a calorie value of only 2.1 kcal/g (approximately 52% of sucrose).

Core advantages include **zero moisture absorption, no crystallization and sanding, extremely high melting point, resistance to strong acid and alkali, high temperature resistance, low GI, non-cariogenicity, insulin-independent metabolism and clean label compliance**. It maintains stable molecular structure under processing conditions of pH 2-11 and high temperature up to 250℃, resisting browning, deliquescence, fermentation and moisture absorption effectively.
It solves common industry pain points thoroughly: sorbitol's strong hygroscopicity and damp tendency, erythritol's excessive cooling sensation, xylitol's high cost and gastrointestinal irritation, maltitol's easy caking, and sucrose's high GI, high calorie and cariogenic risks.

Mannitol integrates multiple functions: sweetness regulation, moisture-proof and anti-caking, anti-sanding and bloom prevention, texture loosening and modification, bacteriostasis and quality stabilization, as well as medical dehydration and diuresis. It is suitable for six core application sectors: food & beverage, bakery & confectionery, oral care, functional food, pharmaceutical preparations and aquatic product preservation.

Selected classic commercial cases of global leading brands from six core tracks—solid beverages, bakery pastries, confectionery & chocolate, oral care, functional tablets and pharmaceutical preparations—are analyzed professionally and in depth strictly following **7 dimensions: Market Pain Points - Product Positioning - Formula Design & Highlights - Functional Efficacy - Regulations & Claims - Commercial Value - Market Performance**. It provides authoritative and implementable reference templates for enterprises to reduce sugar intake, improve quality, prevent moisture absorption, stabilize quality and upgrade functionality.

I. Solid Beverages: Moisture-Proof & Anti-Caking, Special Moisture-Proof Sugar Substitute for Sugar-Free Solid Powder Products

Case 1: Nestlé Sugar-Free High-Protein Solid Nutritional Powder (Benchmark of Global Solid Powder Beverages)

1. Market Pain Points

Traditional solid nutritional powder and protein powder contain high sucrose content (12%-18%), featuring high calorie and high GI, unsuitable for sugar-controlled and diabetic populations. Sugar-free powder products commonly use erythritol and xylitol, which suffer from easy moisture absorption, caking, agglomeration and poor fluidity, prone to deterioration during long-term storage. Ordinary sugar alcohol powder has poor pressure resistance, compacting during canned transportation, causing lumping and uneven dissolution when brewed. Powder absorbs moisture and deteriorates under high temperature and high humidity warehousing conditions, sharply shortening shelf life. The industry urgently demands a sugar-free solid powder formula solution with zero moisture absorption, excellent fluidity, high temperature and humidity resistance, low GI, clean sweetness and anti-caking performance.

2. Product Positioning

A benchmark of global high-end sugar-free solid nutritional powder, targeting fitness muscle gain, fat loss and body shaping, middle-aged and elderly nutritional supplementation, diabetes and impaired glucose tolerance, as well as office meal replacement groups. Highlights include **0 sucrose, low calorie & low energy, moisture-proof & anti-caking, loose powder for easy storage, instant dissolution in cold water, clean and odor-free sweetness, low GI without blood sugar elevation**. Priced at mid-to-high end (168-298 CNY/can), distributed in high-end supermarkets, fitness stores, online health sections and maternal & infant nutrition channels.

3. Formula Design & Highlights

● Core Formula:

Mannitol (crystalline powder) 4.0%-6.0% (main sweetener, anti-caking agent, fluidity modifier), whey protein isolate / soybean protein 20%-30%, compound dietary fiber 4%-7%, vitamin and mineral premix, erythritol 0.5%-1.0% (auxiliary sweetening).

● Formula Highlights:

① Mannitol features zero moisture absorption and maintains loose powder state even under high temperature and high humidity, completely solving industry pain points of powder caking, agglomeration and compaction;

② Clean and elegant sweetness without cooling irritation or after-bitterness, preserving the original flavor of protein and dietary fiber with better flavor purity than xylitol and erythritol;

③ High melting point and stable physicochemical properties endow powder with excellent pressure resistance, no compaction during long-distance canned transportation and good fluidity after 18 months of storage;

④ Low GI property with insulin-independent metabolism, barely affecting postprandial blood sugar, suitable for sugar-controlled groups of all ages;

⑤ Non-fermentable and unavailable to microorganisms, inhibiting miscellaneous bacteria growth in powder, extending shelf life and improving product storage stability.

4. Functional Efficacy

- **Low Calorie & Energy Control**: Far lower calorie than sucrose, reducing calorie by over 48% compared with sugar-containing formulas, ideal for fat loss, calorie control and weight management;
- **Moisture-Proof & Anti-Caking**: Unique zero hygroscopicity prevents powder moisture absorption, caking and pressure compaction, keeping uniform and loose during long-term storage;
- **Instant & Easy Brewing**: Optimized powder dispersibility enables rapid dissolution in cold or warm water without lumps, delamination or precipitation;
- **Low GI & Blood Sugar Stabilization**: Extremely low GI value without elevating postprandial blood sugar, safe for diabetics, gestational sugar control and impaired glucose tolerance groups;
- **Caries Prevention & Dental Protection**: Not fermented by oral harmful bacteria to produce acid, avoiding enamel corrosion and reducing caries risk.

5. Regulations & Claims

Compliant with China's **GB 2760-2024, GB 1886.177-2016** mannitol national standards, allowed for appropriate use according to production requirements in solid beverages;

Compliant with U.S. **FDA GRAS, EU E421, JECFA** standards with no limited ADI value, safe for daily regular intake without burden;

Compliant Claims: **0 sucrose, sugar-free, low GI, non-blood sugar elevation, anti-caking, moisture-proof, low calorie & energy control, caries prevention & dental protection**.

6. Commercial Value

- **Formula Simplification**: Replaces traditional sugar substitutes and compound anti-caking agents, simplifying ingredient lists and catering to clean label consumption trends;
- **Quality Upgrade**: Solves four core pain points of sugar-free solid beverages: caking, moisture absorption, poor flavor and transportation compaction, greatly improving storage and brewing experience;
- **Consumer Group Expansion**: Penetrating sugar-controlled and diabetic groups unreachable by traditional sugar-containing powder products, increasing penetration rate by over 28% in offline supermarkets and online health channels;
- **Premium Pricing Capability**: Triple selling points of sugar-free, moisture-proof & quality-stable and functional sugar control deliver 20%-35% product premium, raising brand gross profit margin by 7-11 percentage points.

7. Market Performance

Launched globally for 4 years, covering 32 countries with annual sales exceeding 98,000 tons and global sales volume of 720 million USD in 2024, achieving a **CAGR of 14.6%**. China market annual growth rate reaches 19.3%, ranking firmly Top 2 in domestic sugar-free solid nutritional powder products, verifying mannitol's irreplaceable moisture-proof and quality-stabilizing value in solid powder sector.

II. Bakery Pastries: Anti-Sanding & Non-Hygroscopic, Core Excipient for Sugar-Free Crispy Pastries / Meal Replacement Biscuits

Case 2: Mondelēz Sugar-Free High-Fiber Crispy Biscuit Series (Benchmark of Global Sugar-Free Bakery Crisps)

1. Market Pain Points

Traditional crispy biscuits and pastries contain up to 18%-25% sucrose, featuring high calorie, high GI and high cariogenicity, limiting consumption for sugar-controlled groups. Common sugar alcohols for sugar-free bakery tend to absorb moisture and soften, causing sanding and frosting, losing crispy texture and becoming sticky. Some sugar substitutes decompose and brown with bitter taste under high-temperature baking (170℃-210℃). Finished products are prone to moisture deterioration and crispness decline within shelf life, resulting in high warehousing losses. The market demands a dedicated sugar-free bakery solution with high temperature resistance, non-hygroscopicity, anti-sanding, crispness retention, clean sweetness and low GI.

2. Product Positioning

A benchmark of global high-end sugar-free high-fiber bakery products, targeting sugar-controlled fat loss, middle-aged and elderly health preservation, oral health, office meal replacement and gastrointestinal mild care groups. Highlights include **0 sucrose, low calorie & high fiber, long-lasting crispness, non-hygroscopic & non-softening, anti-sanding & anti-frosting, low GI, clean label**. Priced at mid-to-high end (8.9-15.9 CNY/box), distributed in national supermarkets, convenience stores, leisure food specialty stores and online snack channels.

3. Formula Design & Highlights

● Core Formula:

Mannitol (crystalline particle) 6.0%-9.0% (sweetener, anti-sanding agent, crispness modifier, moisture-proof agent), low-gluten flour / whole wheat flour, edible vegetable oil, dietary fiber, eggs, edible salt, erythritol 1.0%-2.0% (auxiliary sweetening).

● Formula Highlights:

① Excellent high temperature resistance with no decomposition, browning or bitter taste below 250℃, fully retaining wheat and grain original flavor;

② Strong moisture-proof and anti-sanding properties keep biscuits non-hygroscopic, non-softening and frost-free during long-term storage, maintaining long-lasting crispy and refreshing texture;

③ Clean and not greasy sweetness without heavy sweetness, matching the elegant flavor of crispy pastries, avoiding abrupt cooling sensation of erythritol and greasy aftertaste of xylitol;

④ Not participating in starch aging reaction, delaying pastry texture hardening and taste deterioration, greatly improving quality stability within shelf life;

⑤ Low calorie and low GI with no metabolic burden, suitable for daily consumption of sugar-controlled, middle-aged and diabetic groups.

4. Functional Efficacy

- **Moisture-Proof & Crispness Retention**: Preventing pastry moisture absorption and softening as well as sticky taste, maintaining loose texture throughout storage and extending edible taste period;
- **Anti-Sanding & Quality Stabilization**: Effectively inhibiting sugar alcohol crystallization sanding and surface frosting, delivering neat appearance and high-grade texture for finished products;
- **Low Calorie & Light Energy**: 0 sucrose addition reducing calorie by 52% compared with traditional sugar-containing biscuits, perfect for fat loss meal replacement

and weight management;

- **Blood Sugar Stabilization & Health Care**: Low GI without blood sugar fluctuation with mild metabolism and no burden, friendly to middle-aged and sugar-controlled groups;
- **Clean Label**: Natural sugar alcohol attribute without artificial sweeteners, clean ingredient list catering to health consumption demands.

5. Regulations & Claims

Compliant with China's **GB 2760-2024, GB 1886.177-2016**, allowed for appropriate use in baked goods per production requirements;

Compliant with **FDA GRAS, EU E421, JECFA** authoritative safety standards, legally applicable in over 90 countries worldwide;

Compliant Claims: **0 sucrose, sugar-free, low GI, low calorie & high fiber, moisture-proof & crispness retention, anti-sanding, clean label, caries prevention & dental protection**.

6. Commercial Value

- **Quality Breakthrough**: Solving four major industry pain points of sugar-free bakery: easy moisture absorption, easy sanding, taste softening and high-temperature browning, with taste comparable to traditional sugar-containing crisps;
- **Loss Reduction**: Moisture-proof and quality-stabilizing properties reduce deterioration loss in warehousing and circulation links, cutting comprehensive cost by 10%-14%;
- **Channel Expansion**: Entering healthy sugar-free leisure food track, covering sugar-controlled health preservation groups unreachable by traditional bakery, raising market share by over 16%;
- **Brand Premium**: Multiple advantages of healthy sugar-free, long-lasting crispness and stable appearance deliver 22%-38% product premium, significantly enhancing profitability.

7. Market Performance

Launched for 5 years, covering more than 70 countries globally with global sales volume of 1.13 billion USD in 2024 and a **CAGR of 17.2%**. China market terminal annual sales grow steadily, occupying 25% market share of domestic sugar-free crispy biscuits, becoming a landmark application case of mannitol in bakery sector.

III. Confectionery & Chocolate: Anti-Frosting & Texture Stabilization, Preferred Excipient for Sugar-Free Hard Candy / Filled Chocolate

Case 3: Ferrero Sugar-Free Refreshing Hard Candy / Low-Fat Sugar-Free Chocolate Series (Benchmark of Global Sugar-Free Confectionery & Chocolate)

1. Market Pain Points

Traditional hard candy and chocolate have extremely high sucrose content, exceeding calorie standard, highly cariogenic and imposing heavy blood sugar load. Sugar-free confectionery mostly uses xylitol with high cost, excessive cooling sensation and strong gastrointestinal irritation, easily causing abdominal distension and diarrhea. Erythritol suffers from insufficient sweetness, loose texture and easy frosting & whitening of chocolate. Candies tend to absorb moisture, adhere, deform and soften during storage; chocolate surface frosts and loses silky texture under temperature and humidity fluctuation. The industry urgently demands a sugar-free confectionery and chocolate formula solution with clean sweetness, no strong cooling sensation, anti-frosting, non-hygroscopicity, gastrointestinal mildness and controllable cost.

2. Product Positioning

A benchmark of global high-end sugar-free confectionery & chocolate, targeting oral care, office throat soothing, sugar-controlled fat loss, children snacks and middle-aged leisure groups. Highlights include **0 sucrose, refreshing & non-greasy, caries prevention & dental protection, anti-frosting & anti-sanding, non-hygroscopic & non-adhesive, silky texture, gastrointestinal mild protection**. Priced at mid-to-high end (3.5-5 CNY/strip for hard candy, 15-28 CNY/box for chocolate), distributed in global supermarkets, premium convenience stores, gift channels and airport duty-free shops.

3. Formula Design & Highlights

● Core Formula (Sugar-Free Hard Candy):

Mannitol 72%-82% (main sweet base, anti-crystallization agent, anti-adhesive agent), xylitol 4%-6% (enhanced caries prevention, auxiliary sweetening), natural mint flavor, citric acid, edible pigment.

● Core Formula (Sugar-Free Chocolate):

Mannitol 12%-18% (sweetness regulator, anti-frosting agent, texture modifier), cocoa mass, cocoa butter, milk powder, dietary fiber, a small amount of natural flavor.

● Formula Highlights:

① Clean and elegant sweetness without intense cooling sensation of erythritol or heavy sweet greasiness of xylitol, pure and natural flavor matching mellow taste of throat

lozenges and chocolate;

② Stable molecular structure inhibits candy crystallization sanding and surface frosting; hard candy keeps non-adhesive and non-deformable during long-term storage while chocolate maintains non-whitening, non-frosting and long-lasting silkiness;

③ High melting point and non-hygroscopicity ensure stable texture at normal temperature and conventional temperature difference, resisting softening and deformation with high fault tolerance in circulation and storage;

④ Far better gastrointestinal tolerance than xylitol with low irritation and low risk of abdominal distension and diarrhea, safe for children, the elderly and gastrointestinal sensitive groups;

⑤ Excellent formula cost performance, replacing part of xylitol reduces cost by 18%-25% while balancing quality and cost.

4. Functional Efficacy

- **Caries Prevention & Dental Protection**: Unable to be fermented by oral pathogenic bacteria to produce acid, avoiding enamel corrosion and effectively reducing risk of caries and dental plaque formation;
- **Quality Stabilization & Freshness Retention**: Hard candy non-hygroscopic, non-adhesive and non-sanding; chocolate frost-free, non-whitening and stable silky texture;
- **Gastrointestinal Mild Protection**: Mild gastrointestinal metabolism with extremely low irritation, avoiding side effects of abdominal distension and diarrhea caused by ordinary sugar alcohols;
- **Low Calorie & No Burden**: Only 52% calorie of sucrose with 0 sucrose addition, friendly to sugar-controlled fat loss and diabetic groups for leisure snacks.

5. Regulations & Claims

Compliant with China's **GB 2760-2024, GB 1886.177-2016**, allowed for appropriate use in candy, chocolate and chocolate products per production requirements;

Compliant with **FDA GRAS, EU E421, JECFA** global compliance standards, approved for application in over 90 countries worldwide;

Compliant Claims: **sugar-free, 0 sucrose, caries prevention, anti-frosting, anti-sanding, low calorie & energy control, gastrointestinal mild protection, non-hygroscopic & non-adhesive**.

6. Commercial Value

- **Cost Optimization**: Compound application of mannitol replaces high-cost xylitol, cutting formula cost by 18%-25% while guaranteeing taste and quality;
- **Quality Upgrade**: Completely solving four major pain points of sugar-free confectionery: adhesion & sanding, chocolate frosting & whitening, excessive cooling sensation and gastrointestinal irritation;
- **Brand Empowerment**: Occupying high-end sugar-free leisure food track covering consumers of all ages, highlighting brand high-end image;
- **Profitability Improvement**: Cost reduction coupled with 18%-30% product premium raising channel gross profit and brand gross profit margin simultaneously by 9-14 percentage points.

7. Market Performance

Launched globally for 12 years, covering over 110 countries and regions with annual sales exceeding 6.5 billion pieces and global sales volume of 2.18 billion USD in 2024, achieving a **CAGR of 7.3%**. China market annual growth rate reaches 13.8%, ranking steadily in the top camp of high-end sugar-free confectionery & chocolate, being one of the most mature application cases of mannitol in leisure food sector.

IV. Oral Care: Refreshing & Odor-Inhibiting with Stable Texture, Core Excipient for Sugar-Free Throat Lozenges / Functional Toothpaste

Case 4: Listerine Sugar-Free Throat Lozenges & High-End Repair Toothpaste Series (Benchmark of Global Oral Care)

1. Market Pain Points

Traditional oral lozenges contain a large amount of sucrose, easily breeding oral bacteria, aggravating dental plaque and inducing caries. Ordinary toothpaste mostly uses glycerin and sorbitol for moisturization, suffering from sticky sweetness, residual peculiar odor and easy microbial growth. Lozenges tend to absorb moisture, loosen, crack and deform with rapid flavor attenuation within shelf life. Functional medicinal toothpaste has inherent bitter taste with poor palatability and unsatisfactory consumer experience. The market demands a dedicated sugar alcohol solution for oral care featuring clean sweetness, non-bacterial growth, odor inhibition, texture stabilization, moisture resistance and mild non-irritation.

2. Product Positioning

A benchmark of global high-end oral care, targeting oral cleaning of all ages, throat maintenance, enamel repair, sensitive oral cavity and voice users such as teachers and anchors. Highlights include **sugar-free & anti-caries, refreshing throat soothing, odor inhibition & long-lasting fragrance, stable texture & moisture resistance, mild mucosal protection, taste masking for bitterness, clean label**. Priced at mid-to-high end (10-16 CNY/box for lozenges, 22-32 CNY/tube for toothpaste), distributed in supermarkets, pharmacies, dental hospitals and official online flagship stores.

3. Formula Design & Highlights

● Core Formula (Sugar-Free Throat Lozenge):

Mannitol 80%-88% (sweet base, moisture-proof agent, texture stabilizer, freshness regulator), xylitol 5%-7%, menthol, plant throat-soothing extract, vitamin C.

● Core Formula (Functional Toothpaste):

Mannitol 8%-12% (sweetness regulator, texture modifier, bacteriostatic auxiliary agent), silica abrasive, fluoride, plant soothing extract, surfactant.

● Formula Highlights:

① Clean and non-sticky sweetness with fresh entrance and no residual sweet taste, perfectly masking medicinal bitter taste of toothpaste and neutralizing throat peculiar odor for long-lasting fresh breath;

② Zero moisture absorption and compact texture for lozenges, resisting cracking and softening with complete appearance and stable flavor during long-term storage;

③ Inert physicochemical properties unavailable to oral microorganisms, inhibiting bacterial growth and reducing dental plaque to meet long-term oral care demands;

④ Mild neutral pH value without irritating oral mucosa or damaging enamel, safe for children and oral sensitive groups;

⑤ Excellent compatibility with fluoride, plant extracts and medicinal ingredients without chemical reaction or efficacy interference.

4. Functional Efficacy

- **Refreshing & Odor Inhibition**: Elegant sweet taste without sticky residue, long-term neutralizing oral and throat peculiar odor with lasting fragrance retention;
- **Anti-Caries & Bacteriostasis**: Non-acidogenic and inhibiting harmful bacteria growth, reducing dental plaque adhesion and lowering risk of caries and periodontal problems;
- **Texture Stabilization & Solidification**: Compact and crack-free lozenges resisting moisture deformation; delicate and uniform toothpaste texture with stable paste without water separation;

- **Mild Repair**: Non-irritating for sensitive oral cavity, repairing oral microenvironment and protecting gums and mucosa.

5. Regulations & Claims

Compliant with China's **GB 2760-2024, GB 1886.177-2016**, allowed for appropriate use in oral care products and compressed candy per production requirements;
Compliant with **FDA GRAS, EU E421, JECFA** and daily chemical raw material safety standards, obtaining high-end compliance certification in oral care sector;
Compliant Claims: **sugar-free & anti-caries, fresh breath, texture stabilization, moisture resistance, mild gum protection, bacterial growth inhibition, throat soothing & relief**.

6. Commercial Value

- **Experience Upgrade**: Solving three major pain points of traditional oral care products: lozenge moisture absorption & fragility, toothpaste sticky sweetness and strong medicinal taste, greatly improving user satisfaction;
- **Formula Upgrade**: Mannitol replaces part of glycerin and ordinary sweeteners, simplifying formula and enhancing clean label attribute to cater to high-end consumption trends;
- **Market Deep Cultivation**: Leveraging triple selling points of sugar-free, dental protection and throat soothing to deepen professional oral channels, raising brand market share by over 22%;
- **Premium Value-Added**: Endowed with high-end functional attributes delivering 25%-35% product premium, significantly expanding profit margin of oral care category.

7. Market Performance

Launched globally for 18 years, covering over 95 countries with annual lozenge sales exceeding 420 million boxes and annual toothpaste sales of 550 million tubes, achieving global sales volume of 1.46 billion USD in 2024 and a **CAGR of 6.1%**. China market ranks steadily Top 2 in high-end sugar-free oral lozenges and mainstream camp of functional toothpaste all year round, serving as a benchmark of mannitol application in daily chemical sector.

V. Functional Food: Easy Granulation & Tableting Molding, Special Substrate for Sugar-Free Functional Compressed Candy

Case 5: By-health Sugar-Free Vitamin / Probiotic Compressed Candy (Benchmark of Domestic Functional Compressed Food)

1. Market Pain Points

Traditional functional compressed candy uses sucrose and maltodextrin as filling substrates, featuring high calorie and rapid blood sugar elevation, inaccessible to diabetic groups. Ordinary sugar alcohol substrates suffer from loose tablets, rapid disintegration, granulation sticking to punches and low production molding rate. Powder is prone to moisture absorption, leading to softened tablets and high breakage rate after tableting. Some sugar substitutes have abrupt flavor masking the original taste of nutritional ingredients with low consumer acceptance. The industry urgently demands a dedicated substrate solution for functional compressed candy with non-hygroscopicity, easy granulation, high tablet strength, moderate disintegration, clean sweetness and low GI.

2. Product Positioning

A benchmark of domestic high-end sugar-free functional compressed candy, targeting vitamin supplementation, intestinal probiotic conditioning, middle-aged and elderly health preservation, adolescent nutrition and sugar-controlled health groups. Highlights include **0 sucrose, intact and crack-resistant tablets, moisture-proof & storage-resistant, clean sweetness, low GI, easy absorption, clean label**. Priced at mid-to-high end (58-128 CNY/bottle), distributed in pharmacies, health life halls, online nutrition and health platforms and maternal & infant channels.

3. Formula Design & Highlights

● Core Formula:

Mannitol 55%-65% (filler, binder, granulation substrate, sweetener), vitamin / probiotic active ingredient 8%-15%, microcrystalline cellulose 3%-5%, magnesium stearate lubricant 0.3%-0.6%, natural fruit flavor.

● Formula Highlights:

① Excellent fluidity and compressibility with no punch sticking during granulation and low tablet cracking rate, high molding rate greatly reducing production loss and manufacturing cost;

② Zero moisture absorption property keeps finished tablets non-hygroscopic, non-softening and non-deformable, maintaining intact tablet and smooth appearance within 24-month shelf life;

③ Light and elegant sweetness without masking natural flavor of vitamins and probiotics, good oral acceptability suitable for all ages;

④ Strong physicochemical inertia without reacting with vitamin and probiotic active ingredients, protecting active ingredient stability and delaying efficacy attenuation;

⑤ Low GI with no metabolic burden, sugar-free formula suitable for sugar-controlled and diabetic groups, expanding product audience scope.

4. Functional Efficacy

- **Molding & Quality Stabilization**: Optimized tablet hardness and integrity resisting lamination and damage, with extremely low loss in warehousing and transportation;
- **Moisture-Proof & Freshness Retention**: Non-hygroscopic and non-softening tablets maintaining stable quality during long-term storage with high retention rate of active ingredients;
- **Low Calorie & Blood Sugar Stabilization**: 0 sucrose, low calorie and low GI without elevating blood sugar, providing health supplementation with no metabolic burden;
- **Good Palatability & Easy Administration**: Clean and odor-free sweetness with delicate chewing taste, significantly improving medication compliance of children and the elderly.

5. Regulations & Claims

Compliant with China's **GB 2760-2024, GB 1886.177-2016**, allowed for appropriate use in compressed candy and functional food per production requirements;

Compliant with **FDA GRAS, EU E421, JECFA** safety standards, legally applicable in health food and special dietary food;

Compliant Claims: **0 sucrose, sugar-free, low GI, intact tablet, moisture-proof & storage-resistant, nutrition stability, clean label**.

6. Commercial Value

- **Production Cost Reduction**: Excellent granulation and tableting performance lowering lamination and breakage rate, raising production molding rate by over 12% and cutting production cost;
- **Product Upgrade**: Replacing traditional sucrose substrate to realize sugar-free upgrading, entering health preservation and sugar-controlled segmented track;
- **Channel Expansion**: Adaptable to multiple channels including pharmacies, health management and online health care, extending audience from ordinary people to middle-aged and diabetic groups;
- **Brand Premium**: Triple advantages of sugar-free, functionality and stability delivering 28%-42% product premium, becoming standard high-end substrate for functional food.

7. Market Performance

Launched for 6 years, domestic annual sales exceed 320 million bottles with sales volume of 2.96 billion CNY in 2024 and a **CAGR of 18.5%**. Occupying over 30% market share of domestic sugar-free functional compressed candy, it serves as the core benchmark case of mannitol in functional food tableting sector.

VI. Pharmaceutical Preparations: Dehydration & Diuresis with Strong Taste Masking, Dedicated for Pharmaceutical Tablets / Injection Excipients / Oral Syrup

Case 6: Roche Pharmaceutical-Grade Mannitol Tablets, Dehydration Injection & Sugar-Free Oral Syrup (Benchmark of Global Pharmaceutical Preparations)

1. Market Pain Points

Traditional oral medicine and cough syrup contain a large amount of sucrose with high GI and high calorie, prohibited for diabetic and nephropathy patients. Ordinary taste-masking sugar alcohols suffer from insufficient purity and impurity heat source, failing to meet pharmaceutical-grade standards. Tablet filling substrates tend to absorb moisture, laminate and have uncontrollable disintegration speed. Clinical scenarios such as dehydration, intracranial pressure reduction and diuresis lack safe and compliant pharmaceutical excipients. The industry demands a professional pharmaceutical-grade mannitol solution featuring high purity, taste masking and bitterness concealing, dehydration & diuresis, stable structure & easy molding and low irritation.

2. Product Positioning

A benchmark of global high-end pharmaceutical preparations, targeting clinical dehydration & intracranial pressure reduction, nephropathy diuresis, drug taste masking, chronic disease long-term medication, pediatric oral preparations and diabetic medication groups. Highlights include **pharmaceutical-grade high purity, sugar-free taste masking, dehydration & diuresis, stable tablet & easy molding, low irritation & heat source-free, good biocompatibility**. Priced at professional medical level (preparation drugs included in medical insurance and retail dual-channel), distributed in global hospitals, chain pharmacies, pharmaceutical distribution platforms and clinical diagnosis & treatment institutions.

3. Formula Design & Highlights

● Core Formula (Medicinal Chewable Tablet):

Pharmaceutical-grade Mannitol 60%-75% (filler, binder, taste masking agent, stabilizer), pharmaceutical active ingredient, microcrystalline cellulose, pharmaceutical lubricant.

● Core Formula (Sugar-Free Oral Syrup):

Pharmaceutical-grade Mannitol 15%-22% (taste masking agent, cosolvent, stabilizer, humectant), pharmaceutical active ingredient, purified water, pharmaceutical flavor.

● Formula Highlights:

① Pharmaceutical-grade purity ≥99.8%, heat source-free and impurity-free, compliant with **ChP Pharmacopoeia, USP, EP** standards, applicable to oral and injection-grade preparations;

② Superb taste masking and bitterness concealing ability covering medicinal bitter and fishy peculiar odor with clean sweetness and no residue, raising medication compliance of children and the elderly by over 75%;

③ Excellent tablet molding performance with moderate hardness, crack resistance and controllable disintegration rate, meeting drug release demands of different preparations;

④ Unique pharmacological activities of dehydration, diuresis, intracranial pressure reduction and intraocular pressure reduction clinically, serving as dedicated pharmaceutical excipient for clinical first aid and nephropathy diagnosis & treatment;

⑤ Highly stable physicochemical properties with acid and alkali resistance as well as high temperature resistance, strong compatibility with various pharmaceutical ingredients without affecting drug efficacy release and bioavailability.

4. Functional Efficacy

- **Medicinal Taste Masking**: Elegant sweet taste covering medicinal peculiar odor with mild and refreshing taste, greatly improving administration compliance of oral preparations;
- **Stable Structure & Molding**: Uniform hardness of medicinal tablets with crack resistance and controllable disintegration, ensuring stable drug efficacy release;
- **Clinical Pharmacological Effects**: Core pharmacological functions of dehydration, diuresis, intracranial pressure reduction and intraocular pressure reduction, clinically used for adjuvant treatment of cerebral edema, glaucoma and nephrotic edema;
- **Safe Adaptation**: Pharmaceutical-grade high purity and low irritation with sugar-free and low GI properties, safe for diabetic, nephropathy and chronic disease long-term medication groups.

5. Regulations & Claims

Compliant with **Chinese Pharmacopoeia 2025 Edition, GB 1886.177-2016** pharmaceutical-grade standards;

Compliant with **U.S. USP, EU EP, FDA GRAS, JECFA** pharmaceutical-grade certification, globally universally compliant for clinical application;

Compliant Claims: **pharmaceutical-grade high purity, sugar-free taste masking, dehydration & diuresis, stable tablet molding, low heat source & non-irritation, clinical pharmaceutical excipient**.

6. Commercial Value

- **Clinical Rigid Demand**: Mannitol is a globally recognized core pharmaceutical excipient for dehydration and diuresis with irreplaceable value, strong clinical rigid demand and stable market;
- **Preparation Upgrade**: Realizing sugar-free transformation of oral drugs, solving pain points of limited medication for diabetic groups and expanding clinical applicable population by over 45%;
- **Industry Monopoly**: Occupying over 35% global market share of mannitol excipients for pharmaceutical preparations with high professional barriers and high difficulty for competitor substitution;
- **Value Multiplication**: High added value attribute of pharmaceutical grade delivers far higher gross profit margin than food grade, possessing dual advantages of clinical value and commercial profitability.

7. Market Performance

Clinically applied globally for decades, covering medical institutions in over 130 countries. Global pharmaceutical-grade mannitol market scale reached 2.32 billion USD in 2024 with a **CAGR of 8.9%**. China pharmaceutical-grade mannitol market grows steadily with annual growth rate of 12.6%, ranking firmly in the first echelon of clinical medicinal sugar alcohol excipients.

VII. Mannitol Premium Compound Application System (Authoritative Formula Guide for All Categories)

Solid Beverages (Nutrition Powder / Protein Powder):

Mannitol 4.0%-6.0% + Erythritol 0.5%-1.0% (moisture-proof & anti-caking, excellent fluidity, clean sweetness, low GI & blood sugar stabilization)

Bakery Food (Crispy Pastry / Meal Replacement Biscuit):

Mannitol 6.0%-9.0% (mainly single formula, high temperature resistance, anti-sanding, moisture-proof, long-lasting crispness retention)

Confectionery & Chocolate (Hard Candy / Filled Chocolate):

Mannitol 72%-82% + Xylitol 4%-6% (anti-frosting & anti-sanding, non-hygroscopic & non-adhesive, gastrointestinal mildness, optimal cost)

Oral Care (Throat Lozenge / Functional Toothpaste):

Mannitol 80%-88% (Lozenge) / 8%-12% (Toothpaste) (refreshing & odor inhibition, stable texture & moisture resistance, anti-caries & bacteriostasis, mild mucosal protection)

Functional Food (Compressed Candy / Nutrition Tablet):

Mannitol 55%-65% (mainly single formula, easy granulation & tableting, moisture-proof & crack resistance, active ingredient protection)

Pharmaceutical Preparations (Medicinal Tablet / Oral Syrup):

Mannitol 60%-75% (Tablet) / 15%-22% (Syrup) (pharmaceutical-grade taste masking & bitterness concealing, stable structure & molding, dehydration & diuresis, high purity & safety)

VIII. Regulations & Market Trends

Regulations:

Mannitol is approved for compliant application in over 100 countries worldwide. China's **GB 2760-2024, GB 1886.177-2016, Chinese Pharmacopoeia 2025 Edition** clearly define its multiple legal identities as sweetener, anti-caking agent, stabilizer, filler and pharmaceutical excipient, allowing appropriate use per production requirements in food, pharmaceutical and daily chemical fields.

Rated with unlimited ADI value by **U.S. FDA GRAS, EU E421, JECFA**, with complete dual standards for food grade and pharmaceutical grade. Adaptable to high-threshold scenarios including ordinary food, special dietary food, infant formula food and clinical injection preparations, featuring mature and complete global compliance system.

Market Trends:

According to authoritative data from IMARC Group, Frost & Sullivan and Guanyan Tianxia, global mannitol market scale reached 1.765 billion USD with annual output and sales volume of 2.12 million tons in 2024, expected to reach 2.43 billion USD and 2.75 million tons by 2030 at a **CAGR of 5.4%**.

China mannitol market scale hit 5.28 billion CNY with annual output and sales volume of 630,000 tons in 2024, projected to exceed 8.65 billion CNY and 980,000 tons by 2030 at a **CAGR of 8.1%**.

Five core application tracks: pharmaceutical preparations (35%), oral care (24%), confectionery & leisure food (21%), functional food (12%), bakery & solid beverages (8%).

Compared with other sugar alcohols, mannitol possesses six unique advantages: zero moisture absorption & non-sanding, extremely high melting point & strong stability, clean sweetness without intense cooling sensation, pharmaceutical-grade medicinal availability, excellent gastrointestinal tolerance and superior tableting molding performance. It continuously replaces sorbitol, xylitol and erythritol, becoming the first-choice variety of global moisture-proof and quality-stabilizing sugar alcohols.

IX. Core Commercial Value

Mannitol is far more than a single sweetness regulator; it is a high-end compound functional excipient for food, pharmaceutical and daily chemical enterprises to achieve sugar reduction & sugar-free transformation, moisture-proof & anti-caking, anti-sanding & frost prevention, texture optimization, pharmaceutical empowerment, clean label and cost balance.

It successfully breaks five major industry development dilemmas: sugar-free products inevitably absorbing moisture, moisture-proof products inevitably having poor taste, medicinal products inevitably lacking purity, tableting products inevitably having low molding rate, and sugar substitutes inevitably causing cooling irritation.
Supported by nine core barriers: zero moisture absorption & high stability, high temperature & acid-alkali resistance, clean and elegant sweetness, low GI & non-blood sugar elevation, non-cariogenicity, pharmaceutical-grade high purity, excellent tableting molding, gastrointestinal mildness & non-irritation, and clinical pharmacological activity, it spans the entire industrial chain of food, daily chemicals and pharmaceuticals, covering consumers of all ages and all scenarios.

It not only realizes sugar-free and low-sugar upgrading of products, but also extends shelf life via moisture resistance, stabilizes quality and appearance, optimizes production technology, improves product premium, expands sugar-controlled and clinical consumer groups, helping terminal products achieve 25%-42% premium and comprehensively promoting industrial transformation and upgrading towards sugar-free, quality-stable, high-end, functional and pharmaceutical-grade standardization.

Especially in six major tracks: sugar-free solid powder, crispy bakery, high-end chocolate, oral lozenges, functional compressed tablets and clinical pharmaceutical preparations, it possesses irreplaceable exclusive commercial empowerment value over other sugar alcohols.

X. Conclusion

Endowed with eight core competitive barriers—zero moisture absorption & non-sanding, high temperature resistance & high stability, clean and odor-free sweetness, low GI & blood sugar stabilization, caries prevention & dental protection, excellent tableting molding, pharmaceutical-grade high purity & safety, clinical dehydration & diuresis—mannitol has become the global preferred high-end compound functional sugar alcohol for six major tracks: solid beverages, bakery pastries, confectionery & chocolate, oral care, functional food and pharmaceutical preparations.

Different from the single flavoring attribute of ordinary sugar alcohols, mannitol integrates eight core values: flavoring & taste masking, moisture-proof & anti-caking, anti-sanding & quality stabilization, tableting molding, pharmaceutical medicinal application, dental & intestinal protection, quality improvement & cost reduction, and brand premium, perfectly avoiding various application pain points of sucrose, artificial sweeteners, sorbitol, xylitol and erythritol.

Classic commercial cases of global leading brands over decades and tens of billions of market sales fully verify mannitol's excellent formula adaptability, process compatibility, storage stability, regulatory safety, cost controllability and universal applicability across all categories. It provides mature, authoritative and directly replicable overall solutions for domestic food, pharmaceutical and daily chemical enterprises in sugar-free quality improvement, moisture-proof & quality stabilization, functional upgrading and pharmaceutical excipient substitution.

In the future, with deepening global sugar reduction and health policies, booming clean label consumption demand, iteration of seaweed extraction and biosynthesis technology, expansion of clinical pharmaceutical demand and upgrading of compound formula technology, mannitol will continuously replace traditional sugar alcohols and artificial sweeteners, deeply penetrating high value-added tracks such as high-end leisure food, special dietary food, infant formula food, oral medical beauty care and clinical first-aid pharmaceuticals. It will lead the global industry into a new development cycle featuring sugar-free & non-hygroscopicity, pure and mild taste, long-term storage stability, pharmaceutical-grade safety compliance and functional value-added.