Special Salts

Functional Minerals

Jungbunzlauer

From nature to ingredients®

Special Salts

A unique range of high-purity organic mineral sources

Jungbunzlauer is the global market leader for Special Salts which are functional minerals mainly derived from citric acid or gluconic acid. The fully reacted products are manufactured in Europe by neutralisation of these acids with the appropriate alkaline mineral source. The resulting organic minerals are known for their high bioavailability, and are used because of their ability to support human health in different applications of food, beverage, dietary supplements or pharmaceutical products.

Jungbunzlauer mineral salts and their benefits for human health*

Ca	**Tricalcium Citrate** **Calcium Lactate Gluconate**	Needed for normal growth and development of bone in children May reduce the loss of bone mineral density and thereby the risk of bone fracture in post-menopausal women Maintenance of normal bones and teeth Normal blood clotting Normal muscle function Normal neurotransmission Role in the process of cell division and specialisation Normal energy-yielding metabolism Normal function of digestive enzymes
Mg	**Trimagnesium Citrate**	Maintenance of normal bones and teeth Normal energy-yielding metabolism Electrolyte balance Normal muscle function (incl. the heart muscle) Normal functioning of the nervous system Role in the process of cell division Normal protein synthesis Reduction of tiredness and fatigue Normal psychological function
K	**Tripotassium Citrate** **Potassium Gluconate**	Maintenance of normal blood pressure Normal muscle function Normal functioning of the nervous system
Zn	**Zinc Citrate**	Normal function of the immune system Normal DNA synthesis Role in the process of cell division Protection of cells from oxidative stress Maintenance of normal bones Normal cognitive function Normal fertility and reproduction Normal macronutrient and carbohydrate metabolism Normal acid-base metabolism Normal metabolism of vitamin A Normal metabolism of fatty acids Maintenance of normal vision Maintenance of normal skin, hair and nails Normal protein synthesis Maintenance of normal testosterone levels in blood

*Health claims according to latest wording (status 01.01.2014) of Art. 13.1 or 14 health claims list of Regulation (EC) No 1924/2006.

Calcium Salts

Calcium is the most abundant mineral in the human body, contributing approximately 1kg of body weight. In addition to its importance for the constitution of bones and teeth it influences the human health as a secondary messenger molecule for signal transmission within the cells, for blood coagulation and also for the muscle function. Recommended dietary allowance for adults are 800 mg/d in Europe and 1000 mg/d in the USA, respectively.

Tricalcium Citrate

is one of the most important calcium salts used in dairy products, baby food, beverages, processed fruits, clinical nutrition, tablets and other calcium-fortified products. Its main characteristics are neutral taste, high calcium content (21%) and excellent bioavailability.

$$(C_6H_5O_7)_2Ca_3 \cdot 4\ H_2O$$

Tricalcium Citrate	Particle size	Main applications
Type GN	min. 98% < 850 µm	Dietary supplements and
	min. 60% < 170 µm	pharmaceutical applications (tablets)
Type TB	min. 98% < 500 µm	
	max. 50% < 100 µm	Excipient for direct compression
	max. 30% < 63 µm	
Type N	min. 99% < 355 µm	Dietary supplements (capsules, mineral
	min. 50% < 100 µm	blends), confectionary
Micronised powder (Type M)		
M 7090	min. 90% < 70 µm	Baby food (especially infant formula),
M 2090	min. 90% < 20 µm	beverages, clinical nutrition, confectionary,
M 1098	min. 98% < 10 µm	fruit preparations, dairy and soy products

Tricalcium citrate displays specific functionality such as increasing the firmness in processed food due to its chelating or gelling properties. Ultrafine micronised grades of tricalcium citrate were developed to provide a neutral taste and mouthfeel profile and excellent dispersion characteristics in applications with very high calcium content. Tricalcium citrate GN shows excellent compressibility thus making it the preferred choice for calcium supplements. Tricalcium citrate TB is designed to function as a direct compression excipient having exceptional compression characteristics, good flowability and good tolerability.

Calcium Lactate Gluconate

is a mixture of calcium lactate and calcium gluconate that can be used in dietary supplements as well as in food applications according to the regulations for the individual salts. In effervescent tablets it displays excellent solubility and calcium bioavailability. In food and beverages, the outstanding characteristics of calcium lactate gluconate include high solubility and neutral taste, enabling new applications in a wide range of premium products. Besides a grade with 10% calcium, Jungbunzlauer supplies calcium lactate gluconate with 13% calcium content.

Applications of Calcium Lactate Gluconate

- Clear and cloudy fruit juices
- Carbonated beverages
- Near-to-water drinks
- Dairy drinks
- Instant beverages
- Confectionary
- Concentrates and pre-blends
- Effervescent tablets, instant dietary supplements

$$(C_3H_5O_3)_2Ca + (C_6H_{11}O_7)_2Ca \cdot H_2O$$

Magnesium Salts

Magnesium is the fourth most abundant mineral in the human body and is essential in a variety of biological functions, such as intervention in enzymatic reactions, its role in membranes and its function in neuromuscular responses. Additionally, magnesium is important in the development and maintenance of our skeleton. The RDA levels for magnesium are 375 mg/d in the European Union and 400 mg/d in the USA. Jungbunzlauer offers two different hydration forms of trimagnesium citrates: trimagnesium citrate anhydrous and trimagnesium citrate nonahydrate.

Trimagnesium Citrate Anhydrous

has the best initial solubility (200 g/l) among all other organic magnesium salts. Due to its known high bioavailability and its neutral taste it is used for food and beverage fortification and in pharmaceutical applications and infant formula as a magnesium source. Based on its high mineral content (16%) the cost in use of trimagnesium citrate anhydrous is significantly lower compared to other organic magnesium salts.

$(C_6H_5O_7)_2Mg_3$

An agglomerated trimagnesium citrate anhydrous is available for direct compression of tablets. Being an excellent desiccant, it is commonly used to stabilise dry blends and to protect water sensitive ingredients.

Trimagnesium citrate anhydrous is produced according to GMP guidelines, a Certificate of Suitability of Monographs of the European Pharmacopoeia (CEP) is available.

Trimagnesium Citrate Nonahydrate

is used in all applications where lower solubility or reactivity is required. With a solubility of only 16 g/l it is used in products where free magnesium ions could influence the product stability or where low hygroscopicity is needed.

$(C_6H_5O_7)_2Mg_3 \cdot 9\ H_2O$

Applications of Trimagnesium Citrates

Food
- Dairy products
- Desserts
- Confectionary
- Instant preparations
- Dietetic food

Beverages
- Fruit juices
- Near-to-water drinks
- Sports beverages
- Instant drink mixes

Nutritional and Pharmaceutical Products
- Food supplements
- Clinical nutrition
- Pharmaceutical tablets and solutions
- Infant formula

Potassium Salts

Potassium is a key mineral in the human body, influencing blood pressure levels, neural transmittance and also glycogen storage in muscles. Potassium fortified food helps to maintain low blood pressure. Recommended dietary allowances for potassium are 2000 mg/d in Europe and 3500 mg/d in the USA.

Tripotassium Citrate

is a highly soluble buffering salt for sodium-free pH-control in beverages and numerous food products. It is recommended in all dietetic food products which require buffering and a low sodium content. As a sequestering agent, it complexes cations such as calcium, magnesium and heavy metals, improving the stability of food and beverages during processing, heat treatment and storage.

For applications as API Jungbunzlauer tripotassium citrate is produced according to GMP guidelines and is offered with a US Drug Master File type II (DMF 14847) and a Certificate of Suitability of Monographs of the European Pharmacopoeia (CEP).

Tripotassium citrate is used in nutritional applications like infant formula and pharmaceutical/OTC products as a potassium source. Being a systemic alkaliser, it is used in pharmaceuticals as an active ingredient e.g. for the treatment of kidney stones.
Added to dentifrices, it is clinically proven to reduce pain for people with sensitive teeth and may also serve as a sequestering agent.

$$(C_6H_5O_7)K_3 \cdot H_2O$$

Tripotassium Citrate	
Applications	**Functions**
Food and beverages	Sodium replacement, sodium-free pH-regulation Potassium fortification Sequestering/stabilising agent Emulsifying salt
Dietary supplements	Potassium source
Clinical nutrition, baby food	Potassium source, stabilising agent
Pharmaceuticals	Prevention and treatment of kidney stones, bladder infection and hypokalemia
Dentifrice	Reduce sensitivity to pain of teeth, sequestering agent

Potassium Gluconate

is used as an alternative to sodium salts in food as well as a potassium supplement in dietetic food products and can help to maintain healthy blood pressure. It is supplied as an anhydrous, non-hygroscopic salt displaying mildly alkaline and highly soluble (450 g/l) characteristics. Potassium gluconate shows excellent compressibility and is commonly used in potassium tablets.

$$C_6H_{11}O_7K$$

Zinc Salts

The WHO estimates that a large part of the world's population fails to reach the recommended daily allowance of zinc which is 10 mg/d in Europe and 15 mg/d in the USA. As an important trace element in the human body and a component in over 200 enzymes, it is involved in more enzymatic reactions than any other mineral. Zinc affects virtually all aspects of the immune system and plays an essential role in hormonal functions. Furthermore, zinc supports the majority of healthy bodily functions including sensory functions of smell, taste and sight. Jungbunzlauer offers two different hydration forms of zinc citrates: zinc citrate dihydrate and zinc citrate trihydrate.

Zinc Citrate

is an organic zinc salt and represents a fully reacted and nutritionally functional chelate of zinc and citrate. Among other organic zinc salts it stands out because of its high zinc content (31%) and neutral taste.

Due to the wide variety of proven effects on human health and its high bioavailability zinc citrate is often used in functional foods, infant formula and dietary supplements.

Zinc citrate is used in dental care products such as toothpaste, mouthwash and chewing gum due to its anti-microbial and anti-inflammatory effects and its ability to reduce or inhibit the formation of dental plaque and tartar. Thanks to its contribution in maintaining healthy skin, hair and nails it is frequently used in beauty products (topical and oral).

$(C_6H_5O_7)_2Zn_3 \cdot 2\ H_2O$

$(C_6H_5O_7)_2Zn_3 \cdot 3\ H_2O$

Zinc Citrate	
Applications	**Functions**
Oral care products	Anti-plaque, anti-tartar, anti-inflammatory and anti-malodour effects
Cosmetics	Anti-bacterial and anti-inflammatory effects
Functional foods and beverages	Zinc fortification
Dietary supplements	Zinc source

Specifications

Jungbunzlauer Special Salts are high-purity organic sources of calcium, potassium, magnesium and zinc. These functional minerals are generally recognised as safe (GRAS) or have a self-affirmed GRAS status. They meet the parameters of the specification of the current European and US Pharmacopeia, the Food Chemicals Codex or European food additive regulations. Tripotassium citrate and trimagnesium citrate from Ladenburg plant are produced according to (current) Good Manufacturing Practice and are available as Active Pharmaceutical Ingredients. For further information please consult our separate product sheets. Special Salts are part of PharmaChoices product portfolio, for additional information see separate brochure.

	Calcium		Magnesium		Potassium		Zinc
	Tricalcium Citrate	**Calcium Lactate Gluconate**	**Trimagnesium Citrate Anhydrous**	**Trimagnesium Citrate Nonahydrate**	**Tripotassium Citrate**	**Potassium Gluconate**	**Zinc Citrate Dihydrate or Trihydrate**
Synonym	Calcium Citrate	Calcium Lactogluconate	Magnesium Citrate	Magnesium Citrate	Potassium Citrate	Potassium Salt of D-Gluconic Acid	Trizinc Citrate
Molecular formula	$(C_6H_5O_7)_2Ca_3 \cdot 4\ H_2O$	$(C_3H_5O_3)_2Ca + (C_6H_{11}O_7)_2Ca \cdot H_2O$	$(C_6H_5O_7)_2Mg_3$	$(C_6H_5O_7)_2Mg_3 \cdot 9\ H_2O$	$(C_6H_5O_7)K_3 \cdot H_2O$	$C_6H_{11}O_7K$	$(C_6H_5O_7)_2Zn_3 \cdot 2\ H_2O$ or $3\ H_2O$
Molecular weight	570.5 g/mol	218.2 g/mol + 448.6 g/mol	451.1 g/mol	613.3 g/mol	324.4 g/mol	234.3 g/mol	610.4 g/mol or 628.4 g/mol
Mineral content	21%	10% or 13%	16%	12%	36%	17%	31% or 32%
Solubility	1 g/l	400 g/l	200 g/l	16 g/l	1780 g/l	450 g/l	2.6 g/l
CAS No.	5785-44-4	814-80-2 + 18016-24-5	3344-18-1	153531-96-5	6100-05-6	299-27-4	5990-32-9 546-46-3
E-number	E333	E327 + E578			E332	E577	
Quality*	USP FCC	Food Grade	USP Ph. Eur. CEP	USP Ph. Eur.	USP DMF FCC Ph. Eur. CEP	USP FCC	USP (dihydrate)
Standard granulations	Powder (GN, N), Micronised powder (M)	Powder	Powder Granular (GN)	Powder	Coarse (G) Medium (M) Fine (F)	Powder	Powder
Standard net weight	20 kg (GN), 25 kg (N), 10, 15, 20 kg (M)	15 kg (10% Ca) 20 kg (13% Ca)	20 kg	25 kg	25 kg	20 kg	25 kg
Main functions in food, personal care and pharmaceuticals	Calcium fortification, supplementation, firming agent, acidity regulator	Calcium fortification, supplementation, against calcium deficiency	Magnesium fortification, supplementation, desiccant	Magnesium fortification, supplementation	Potassium fortification, sodium-free buffering agent	Potassium fortification, supplementation	Zinc fortification, supplementation, anti-microbial/ anti-plaque effect in oral care products

* Monographs in United States Pharmacopeia (USP), Food Chemicals Codex (FCC) and European Pharmacopoeia (Ph. Eur.)
Certificate of Suitability of Monographs of the European Pharmacopoeia (CEP), US Drug master File (DMF)

Jungbunzlauer Group

Jungbunzlauer is represented in all major markets. Our global network of sales companies and distributors covers more than 130 countries.

EUROPE

AUSTRIA – Vienna/Pernhofen
FRANCE – Marckolsheim
GERMANY – Ladenburg
NETHERLANDS – Papendrecht
SWITZERLAND – Basel

AMERICA

CANADA – Port Colborne
USA – Boston
MEXICO – Mexico City

ASIA

INDIA – Mumbai
SINGAPORE – Singapore
JAPAN – Tokyo

From nature to ingredients®

Jungbunzlauer is one of the world's leading producers of biodegradable ingredients of natural origin. The Swiss-based, international company's roots date back to 1867. Today, Jungbunzlauer specialises in citric acid, xanthan gum, gluconates, lactics, specialties, special salts and sweeteners for the food, beverage, pharmaceutical and cosmetic industry as well as for various other industrial applications.

Jungbunzlauer's products are manufactured utilising fermentation technology, a natural process. All its products can be used, transported and disposed of in a secure and ecologically safe way. The Group operates manufacturing plants in Austria, Canada, France and Germany.

A worldwide network of sales companies and distributors with a thorough understanding of target markets and client requirements underlie Jungbunzlauer's high level of market and customer proximity. Committed to its rigorous quality standards, Jungbunzlauer guarantees for the excellence and sustainability of its products and services.

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