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Zinc Citrate –  
the versatile mineral

Jungbunzlauer

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## Zinc Citrate – the versatile mineral

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*Due to their technological and nutritional benefits, organic mineral salts play an important role in mineral fortification concepts. Jungbunzlauer's mineral salts are manufactured by the neutralization of organic acids (citric acid or gluconic acid) with the appropriate mineral alkaline source. Zinc citrate is the latest addition to Jungbunzlauer's range of high-purity and highly bioavailable organic mineral salts and received GRAS-status in the USA beginning of May 2009.*

**Zinc requirements** > The WHO Report 2002 estimates that one-third of the world's population fails to reach the recommended daily intake of zinc. Next to iron, zinc is the most

abundant trace mineral in the human body and is present in all body tissues and fluids. 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 such as in thyroid, insulin, growth, sexual and other hormones. Zinc stabilizes and maintains the structural integrity of biological membranes, and plays a pivotal role in skin and connective tissue metabolism and repair. Furthermore, zinc supports our sensory perception to smell, taste and see. Summarized, zinc represents the basis for a healthy functioning of

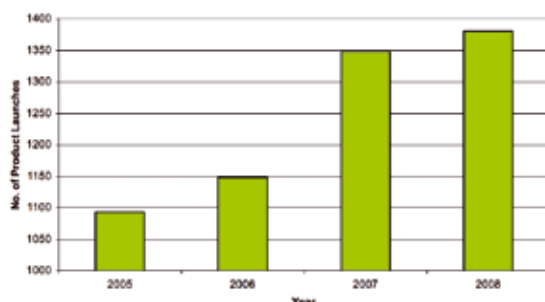
the human body. On 31 July 2008, health relationships of zinc had been compiled in the consolidated EU Commission list of Art. 13 health claims on minerals. Important examples are displayed in Figure 1.

**Figure 1: Health Relationships of zinc in food and food supplements**



**Zinc in our diet** > Natural dietary sources of zinc are primarily foods of animal origin such as meat, liver, fish, shell fish but also milk and cheese. Certain vegetables show also relevant amounts of zinc but due to nutritive factors like phytic acid the intestinal absorption is disturbed in many cases. In general the body absorbs only 20–40 % of zinc present in our diet, whereas zinc from animal source is more readily absorbed than zinc from plant origin. The recommended daily allowance (RDA) of zinc in Europe is 10mg/d and 15 mg/d in

**Figure 2: Number of product launches of foods and beverages fortified with zinc (source: Mintel gnpd database)**



the US. Since it is difficult for different parts of the population to reach adequate levels of zinc via the diet, the number of food supplements and zinc fortified foods increased over the last couple of years [Figure2]. Especially infants, children, adolescents and pregnant women or people on a strict vegetarian diet are at risk for an inadequate zinc intake. Particularly for these groups there is a growing market for zinc fortified products.

**Advantages and applications of zinc citrate**> Jungbunzlauer's zinc citrate is a highly bioavailable organic zinc salt containing 31 % of zinc and stands out among other organic zinc salts due to its high zinc content and its neutral taste [table 1].

**Table 1 Key data of organic zinc salts used in food and beverages**

Source	Zinc content	Taste
Zinc Citrate 3H <sub>2</sub> O*	31%	Neutral
Zinc Lactate*	22%	Neutral
Zinc Gluconate*	12%	Strong aftertaste
Zinc Acetate*	35%	Vinegar/bitter

\*permitted according to regulation EU 1925/2006

Zinc citrate is already used in foods and food supplements where it is claimed e.g. to promote the body's immune function, to assist bone formation and bone health or to fight common colds as zinc is well known for its ability to reduce the length and severity of colds.

Additionally there are numerous beauty foods and supplements on the market containing zinc citrate which promote especially beneficial effects for the health of hair and nails or are said to help heal skin wounds and skin conditions such as acne and eczema. Furthermore zinc citrate may also have similar effects when used as an active ingredient in topical cosmetic applications.

### Special Salts – a unique range of high-purity organic mineral salts

In addition to zinc citrate Jungbunzlauer's Special Salts comprise a unique range of high-purity organic sources of calcium, magnesium and potassium derived from citric or gluconic acid. These organic mineral salts get support from the health claims legislation world-wide, due to their effectiveness when used for food and food supplements. On top of their high bioavailability, specific benefits, such as heart health, bone health, muscle health and anti-obesity effect are exploited by the food and pharma industry for new healthy product concepts.

**Tricalcium Citrate** is one of the most important calcium salts used in beverages, dairy products, processed fruits, baby foods, clinical nutrition, tablets and other calcium-fortified products. Its main characteristics are high calcium content (21%), excellent bioavailability and neutral taste. In various human studies, tricalcium citrate proved to be among the most effective calcium salts supporting bone health as well as weight loss.

**Trimagnesium Citrate's** main features are superior bioavailability, good solubility and high mineral content. Due to its neutral taste and ease of use, it represents the preferred source for magnesium fortification of food, beverages, nutritional supplements and pharmaceuticals to promote bone, nerve and muscle health.

**Tripotassium Citrate** is recommended in all food products which require a low sodium content. Being an excellent potassium source, it is also used in dietary supplements as well as an active ingredient in pharmaceuticals and in personal care products. Tripotassium citrate's health benefits comprise heart health as well as bone health, which is due to its positive effect on the acid-base balance.

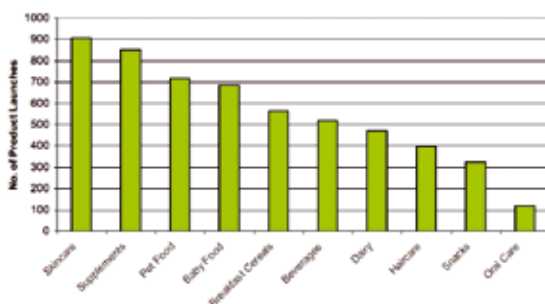
**Calcium Lactate Gluconate** is a highly absorbable calcium salt fighting calcium deficiency and osteoporosis. In pharmaceuticals it is used in effervescent tablets and instant preparations displaying excellent calcium bioavailability. In food and beverages the outstanding characteristics of calcium lactate gluconate combining high solubility (400g/L) and neutral taste lead to new applications in a wide range of products, such as in clear, carbonated or concentrated beverages as well as in dairy drinks and confectionary.

**Potassium Gluconate** is used to replace sodium-containing salts in food as well as potassium supplement in dietetic food products and can help to maintain healthy blood pressure. In pharmaceuticals it serves as potassium source against potassium deficiency or as a systemic alkaliser. Due to its neutral taste it can be used for food fortification even at high dosage levels.

Other favoured applications of zinc citrate are dental care products such as toothpastes, mouthwashes and chewing gum due to its antimicrobial and anti-inflammatory effects and its ability to reduce or inhibit the formation of dental plaque and tartar. Additionally, zinc salts aim to control bad breath and unpleasant mouth taste as zinc inhibit the bacteri-

al production of volatile sulphur compounds which are responsible for malodour. This effect of zinc citrate is also used in deodorants.

**Figure 3: Product launches 2008 containing zinc (source: Mintel gn timer database)**



**Conclusion >** This article highlights the functions of zinc in the human body and the versatile applications of zinc citrate in functional foods, food supplements and cosmetics. Since organic mineral salts receive growing interest, zinc citrate being the latest addition to Jungbunzlauer's high purity and highly bioavailable mineral salts portfolio offers new opportunities for mineral fortification concepts.

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