CITRIZORB®

A range of **natural organic metabolic** food chain minerals that your body can recognise and utilise.

NUTRIGOLD® LIMITED

The gold standard in nutritional excellence



The Nature And Production Of **CITRIZORB®** Natural Metabolic Food Chain Minerals

What is citric acid?

Citrizorb® minerals are formed from citric acid, which belongs to the group of organic acids known as "tricarboxylic acids". This is because it's molecule contains three of the chemical groupings "carboxyl" and it is these that render the citric acid, acidic. Each of these carboxyls can link to an atom of a metallic mineral, such as potassium, giving three potassium atoms carried by the citrate molecule. The fact that three potassium atoms combine with just one molecule of citric acid gives potassium citrate a high concentration of the elemental metal, potassium (meaning grams of potassium per 100g of potassium citrate). This is helpful when it comes to manufacturing supplements because it means one can get more of the metal, in citrate form, inside a capsule of a given size than would be the case with, say, potassium gluconate or orotate or Food Form or state minerals. When metals are linked in this manner the product is referred to as a mineral citrate (Citrizorb®), whereas when the metal is absent you have just free citric acid.

For those who follow chemical formulae, citric acid has the formula, when written in a linear fashion,
CH2.COOH.COH.COOH.CH2.COOH.
Note that -COOH is the carboxyl group.

Where is it found?

Citric acid was first isolated from lemon juice and crystallized in 1784 by the renowned early chemist, Scheele. When we realize that this was only about 12 years after the discovery of oxygen we appreciate that citric acid has a long and revered history amongst chemical compounds. Most others were discovered long after this date. Prior to that the entire chemical world laboured under an archaic and hopelessly misleading theory known as the "Phlogiston Theory". The fact that the discoverer sourced citric acid from lemons forged an immediate association between the acid and those fruit known as citrus fruits, namely, citrons; lemons, limes, oranges and grapefruit. These are, indeed, good natural sources of citric acid but it can also be found in pineapples, pears, peaches, figs, currants, cranberries, beets and some other fruits and plant tissues. Hence the occurrence of the acid in any substantial concentration in nature is closely connected with fruit. Most importantly, it is an entirely natural substance and is so widely accepted as a natural food additive that hundreds of thousands of tons of it are produced annually worldwide and used mainly by the food industry (70% of world production).

It's uses in foods -

Citric acid has gained the respect of the food industry for it's properties as a natural food additive. Although many food additives are viewed to have questionable health issues, citric acid is often a preferred food additive because of it's long standing reputation as a safe natural ingredient. The roles of citric acid in the food industry include a main role as an acidulant and secondary roles as flavour enhancer, preservative, preventer of turbidity and oxidation, bestowing a "cool" taste, colour modifier, inverter of sucrose sugar in confectionery, neutralizer, emulsifier in ice cream and a producer of effervescence. It is used mainly for beverages, wines, confectionery, jams and jellies, frozen foods and dairy products. Non-food industries that use it are pharmaceuticals (12% of world production), cosmetics, detergents, tanning and textiles and it can be used in treatment of boiler water. The United States and Europe, including the UK, are the principal world producers, since the requirement arises out of a "sophisticated" food industry manufacturing many formulated products.



How is citric acid produced?

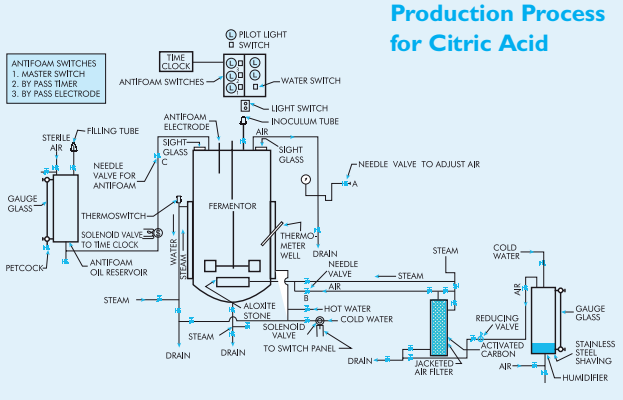
Production of citric acid commercially began in 1860 in England using, as a source, calcium citrate imported from Italy. The ultimate source of the starting material was the Italian citrus fruit industry. France, Germany and the USA had followed suit by 1880, with the Italians still providing the raw material. Italy began to produce citric acid itself in 1913 and by 1922 had gained a stranglehold over world production, of which it accounted for some 90%. Their cartel charged very high prices.

This provided a business incentive to try to produce citric acid by other means. As early as 1893 Wehmer had recognized that citric acid not only occurs in fruit but is also produced by some micro organisms. Could it ever be that using microbes of some kind could circumvent dependence upon the citrus industry? This could be an attractive business proposition but would require some technology that was simply not available at the end of the Nineteenth century. Although Wehmer's attempt to produce citric acid with the mould Penicillium was unsuccessful, he nonetheless established the basis for the subsequent reorganization of the citric acid industry.

In 1923 a plant was opened in New York to make citric acid by a fungal fermentation technique developed by Currie. This broke the power of the Italian cartel and today Italy is only a very minor producer of citric acid.

The habit of obtaining the acid from citrus fruit quickly disappeared as being uneconomic and all production came to be based upon fermentation methods. The earlier methods of citric acid fermentation were called "surface cultures" in which the mould was grown upon the surface of a liquid growth medium containing nutrients for the fungus. The growth medium contained sugary mixtures and was spread in a shallow layer in wide-open pans. This was subsequently replaced by a much more efficient method called "submerged culture" in which the mould was distributed through the entire volume of the growth medium in huge cylindrical vats or "fermenters" kept stirred during operation by fast rotors driven by very powerful motors. The most successful fungus to emerge from this development was the mould Aspergillus niger and although other organisms have also been used, this tends to take pride of place within the industry.

Production Process for Citric Acid



The biochemical mechanism for production

It is interesting to ask why this organism accumulates citric acid. With the Aspergillus growing on molasses or beet sugar, it's energy production will be most efficient when it can break down the sugar fully to carbon dioxide and water via an oxidative process. Citric acid is an intermediate metabolite in the process. For the organism to stop at that point is inefficient because the citric acid that it produces still contains the greater part of the energy available from the sugary starting material. It emerges that for the first 24 hours of growth the organism does break down sugar completely and obtains the full energy available from doing so. However, as this happens the medium acidifies and the actions of the mould's enzymes are changed. With acidification, the enzyme that forms citric acid (citrate condensing enzyme) increases it's activity while the enzymes that break down citric acid are inhibited. These are the enzymes isocitric dehydrogenase and aconitase. These relate to stages in the "citric acid cycle".

There follows a surge in citric acid production together with a loss of the power for the onward conversion of citric acid into other products, exactly the conditions required for citric acid accumulation. The fermentation techniques have become very sophisticated because the economic incentives are large. Nowadays certain known enzyme inhibitors are added to the medium to accentuate the inhibition of those enzymes that normally catalyse the onward conversion of citric acid. The technique requires, therefore, deliberately rendering the organism less efficient in producing it's own metabolic energy so that it will, instead, make the citric acid we want.

Harvesting

Once the medium in which the organism has grown has reached an optimum citric acid concentration, the medium is harvested and the mould is filtered off. Hence the product contains none of the mould that produced the acid. The citric acid is then removed by adding a calcium source and obtaining a precipitate of calcium citrate. The calcium citrate is removed, again by filtration and washing, and citric acid is recovered by adding sulphuric acid. This precipitates calcium sulphate whilst the citric acid stays in solution, from which it can be crystallized. The resulting acid can be rendered very pure. Obtaining citric acid in this way is efficient and yields of it, based upon the amount of sugar supplied, can approach quite close to 100%. The acid is really no less "natural" made in this way than obtained from fruit, since it is still the product of an organism, not synthetic. Ways exist to synthesize citric acid but these have never been attractive to exploit commercially. Anyone who might be worried about mould allergies can be assured that the purified citric acid has been passed through several rigorous stages of separating and purification and that all traces of the mould itself should have been removed at the first stage.



Performance of citrate minerals

The result of this process is a highly absorbable hypoallergenic carrier for minerals that fits directly into our metabolic food chain and offers one of the purist, most concentrated, cost effective, non toxic, mineral supplements available in our health market.
It holds many natural advantages over other forms of mineral supplementation. For example; The form we refer to as Food Matrix minerals (minerals that purport to resemble the form in which they occur in foods) that are now being offered by many companies in the field, are by definition very bulky and therefore patients may need to swallow many more tablets daily. It makes this form not very customer friendly and in many cases not very cost effective and often they come with a strong smell or taste! The main electrolytes, magnesium, potassium and calcium, as far as we are aware, have no scientifically proven absorption advantages in the Food Matrix form, over the more concentrated, high absorption, Citrizorb® electrolytes. It is also worth mentioning that many of the Food Matrix type materials offer their minerals in the form of mineral enriched yeasts, this is, in our view, of some concern when working with allergy sensitive clients. Much of the comparative absorption research that has been used to support the sales of these Food Matrix type mineral preparations compares their material with very poorly absorbed inorganic materials like oxides or carbonates. We have yet to see one that compares their material with organic minerals like citrates.

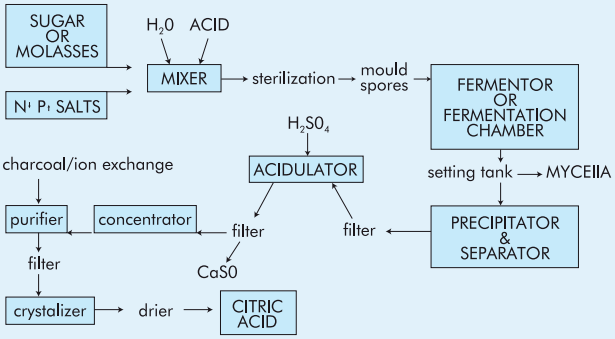
Did you know?

In a 1990 human study, magnesium absorption from magesium citrizorb® exceeded the absorption from magnesium carbonate by more than fourfold, an important fact when choosing your mineral supplementation.

Citrizorb® minerals – here to stay

Citrates are also one of the few mineral forms to be almost completely included in the EEC Positive List for food supplements. A real advantage when looking at the long term future of the industry.

Flow Sheet for Citric Acid Production



BIOACTIVE CITRIZORB® MINERAL FORMULAE

CODE	VEG	PRODUCT DESCRIPTION	UNIT SIZE
NC012	V	Magnesium (Citrizorb®) Caps 100mg (Gross 500mg)	60
NC013	V	Magnesium (Citrizorb®) Caps 100mg (Gross 500mg)	120
NC020	V	Zinc (Citrizorb®) 15mg Caps (Elemental weight)	60
NC026	V	Potassium (Citrizorb®) 150mg Caps (Elemental weight)	60
NC028	V	Calcium (Citrizorb®) 100mg Caps (Elemental weight)	60
NC030	V	*Nutrimin (Trace Minerals - Citrizorb®) Caps	60
NC032	V	*Supamag Plus (Citrizorb®) Caps	60
NC050	V	*Supamag Plus (Citrizorb®) Caps	180

Citrizorb® mineral values are normally stated as the elemental not gross weights.
* See overleaf for full details

Citrizorb® Newsletter

The properties of other mineral forms like gluconate, aspartate, carbonate or oxides are fully explained in our more complete newsletter; Citrizorb® – "The truth about mineral supplementation". In this newsletter we have also set out the principal advantages of using citrate as a very highly suitable ligand for carrying minerals into the body. Citrizorb® minerals are suitable for people with sensitivities to: yeast, citrus, gluten, wheat and dairy produce.

Citrizorb®... the natural choice for people who have allergy sensitivities.

To order your copy, call us today on

0845 603 5675

or log on to www.nutrigold.co.uk



CITRIZORB® FORMULAE

FEATURING THE ACTIZORB® MULTICOMPLEX

SUPAMAG PLUS

This formulation makes up the backbone of most naturopathic nutritional regimes. Supamag delivers Magnesium with a balanced range of B vitamins and trace elements. These not only work as a daily multi, but also support the synergistic effects that help to maximise the absorption of our natural Magnesium Citrizorb® mineral.

TYPICAL CONTENT	MG PER CAPSULE	% EU RDA
Vitamin A	2.5mg	313%
Thiamin (B1)	5mg	358%
Riboflavin (B2)	5mg	312.5%
Niacin (B3)	10mg	56%
Pantothenic Acid (B5)	20mg	334%
Pyridoxine (B6)	5mg	250%
Vitamin B12	5mcg/µg	500%
Folic Acid	25mcg/µg	12.5%
Biotin	30mcg/µg	20%
Magnesium	50mg	17%
Zinc	3mg	20%
Iodine	25mcg/µg	66%
Manganese	1mg	*
Selenium	25mcg/µg	*
Molybdenum	34mcg/µg	*
Chromium	25mcg/µg	*
Choline	25mg	*
Inositol	25mg	*
Para Amino Benzoic Acid	10mg	*
Bioflavanoids	20mg	*

*= No EU RDA Established. Mineral weights stated are elemental not gross.

NUTRIMIN

This unique trace element formulation delivers an exciting range of high absorption trace minerals. Nutrimin can be used to it's best effect in conjunction with Multi B Complex and Magnesium and Calcium Citrizorb®.

TYPICAL CONTENT	MG PER CAPSULE	% EU RDA
Zinc	5mg	100%
Iodine	25mcg/µg	134%
GTF Chromium	50mcg/µg	*
Manganese	1mg	*
Molybdenum	50mcg/µg	*
Selenium	30mcg/µg	*
Silica	7mg	*

*= No EU RDA Established. Mineral weights stated are elemental not gross.

The range of special **ACTI**ZORB® complexes are designed to provide broad-spectrum supplementation with minerals and vitamins in a way not met by ordinary off-the-shelf multi-products. The labels of combined multi mineral and multi vitamin formulae may seek to give the impression that they contain an adequate spread of supplementary minerals but actually fail to do so because the levels of such minerals are too low. Mineral supplements are bulky and multi-products that offer all the main essential minerals in a single daily tablet or capsule are unlikely to reach satisfactory standards of intake. The key factor then becomes to supply mineral formulae with several capsules recommended daily. The less frequently used minerals such as silicon, boron and molybdenum are included, as are the anti-oxidant vitamins C, E and Vitamin K. These formulae can be used quite simply as straight-forward multiple formulae providing broadspectrum nutrition but in addition they are designed to be used optionally within a naturopathic system. This system focuses upon the fact that many of the nutrients in the formulae increase the activity of detoxification enzymes and hence support the eliminative processes. The differences between the individual formulae influence how strongly and in what manner the eliminatory processes are stimulated. All four formulae have the same basic constituents but are then modulated by the inclusion of extra calcium and/or choline and Inositol. These are the "modulating nutrients".

Magnesium Complex / Calcium, Magnesium Complex
Contains the basic constituents with or without the inclusion of calcium.

Magnesium Lipotrope Complex/ Calcium, Magnesium Lipotrope Complex
These are derived from the above two formulae but with the addition of extra choline and inositol. These extra constituents provide additional support to both liver function and the handling of lipids in the body.

WHAT ARE ELEMENTAL WEIGHTS

When talking about minerals there are two types of weight that can be stated. The first is gross weight, which indicates the total weight of the mineral salt. i.e. Magnesium Citrate 625mg. The second is elemental weight which indicates the amount of active magnesium you would receive – in this example approximately 100mg. When buying mineral supplements it is always important to understand if the label is stating gross or elemental weights. In most cases with the Citrizorb® Range of minerals we state elemental weight (the active part of the products).

UNITS OF MEASURE

MEASUREMENT	ABBREVIATION	CONVERSION
Grams	g	1g = 1000mg
Milligrams	mg	1mg = 1000µg
Micrograms	µg or mcg	1000µg = 1mg
International Units	iu	Depends on the fat soluble vitamin



CITRIZORB®

THE NATURAL CHOICE FOR MINERAL SUPPLEMENTATION

Our team of nutritional experts are proud to introduce the Nutrigold Citrizorb® Mineral Formulae. These products offer complementary practitioners the opportunity to work with some of the most biologically active minerals available in a form that the body can utilise to it's full potential, as nature intended.

The Citrizorb® mineral Formuale are suitable for people who have sensitivities to : yeast, lactose ,dairy produce, citrus fruit, gluten, wheat and nuts , Free from: artificial preservatives, artificial colours,artificial flavours, salt, sugar, gmo free.

THE CITRIZORB® CHECKLIST

- ✔ Organic mineral
- ✔ Fits into metabolic pathways
- ✔ Appears in mother's breast milk
- ✔ Suitable for vegans and vegetarians
- ✔ Works synergistically with other nutrients
- ✔ Low toxicity – unlike many other forms offered
- ✔ One of the highest absorption minerals on the market
- ✔ Backed by 100's of scientific research papers

The nutrigold "Citrizorb®" range of products

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NUTRIGOLD® LIMITED

For more information about Citrizorb visit **www.nutrigold.co.uk**