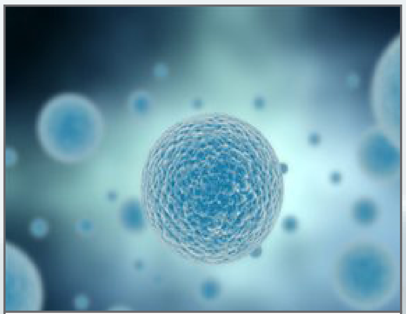
EYTELIA
we are silicium.

ALL THE STRENGHT OF SILICON

DEDICATED TO HUMANS, ANIMALS AND PLANTS


DRUGS POTENTIATION


SKIN HEALTH


COSMETIC ADJUVENT


BONES REMODELING AND REPAIR


SPORT'S FRIENDS

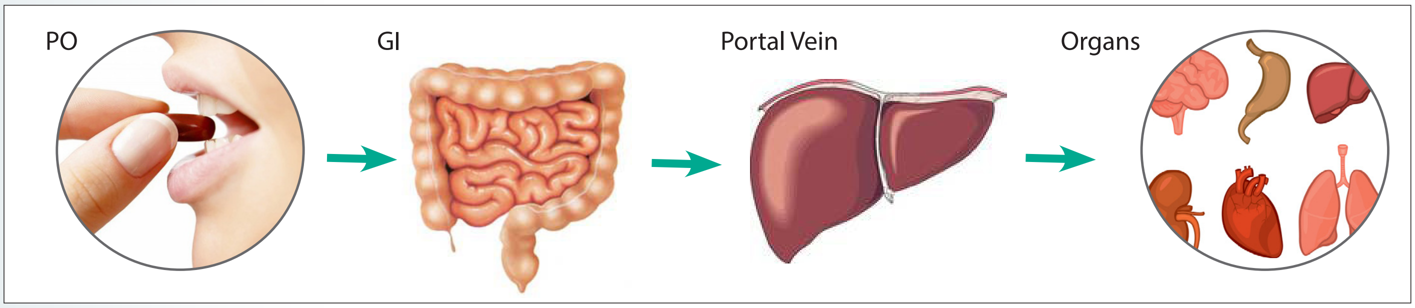

HAIR & NAILS HEALTH


PLANT GROWTH


NATURAL PLANT PROTECTION


NUTRITIONNAL FOOD BIOFORTIFICATION

SAFETY AND TOXICOLOGICAL DATAS



Silicon is the second most abundant element in the Earth's crust after carbon. In nature, Silicon (Si) exists in forms such as silicon dioxide (silica) or silicates and orthosilic acid (OSA) in water and fluids.

OSA is the most really available source of Si to men but when the concentration of orthosilicic acid in water becomes higher than 0.1%, silica forms.

As silicon occurs naturally in food and water, there is of course no evidence that silicon could produce adverse effects.

The NOAEL of dietary silica was determined to be 50000ppm demonstrating a huge margin safety. From this, the safe upper level for humans is calculated as 1750 mg/day for a typical adult male (70 kg)[1].

The EFSA's "Scientific Panel on Food Additives and Nutrient Sources added to Food" concluded in 2009 that the use of silicon dioxide up to 1500 mg silicon/day and of silicic acid to supply up to 200 mg silicon/day, added to food supplements, is of no safety concern[2].

As silicon dioxide/silicic acid convert to orthosilicic acid upon hydration, all existing toxicity studies are applicable for all orthosilicic acid containing molecules.

Because, for humans, the probable lethal dose of oral ingested silica or magnesium trisilicate is over 15 g/kg bw and is between 0.5 and 5 g/kg bw for sodium silicates, WHO set no limit for the Acceptable Daily Intake of silicon dioxide and magnesium or calcium silicates for man[3].

In light of the available data, the Food and Nutrition Board in the United States has not established a maximum tolerable level for silicon in humans, nor did the EFSA.

(1) Martin KR, 2007, The chemistry of silica and its potential health benefits. J. Nutr. Health Aging. 11(2), 94-7.

(2) EFSA, 2009. Calcium silicate and silicon dioxide/silicic acid gel added for nutritional purposes to food supplements. Scientific opinion of the Panel on Food Additives and Nutrient Sources Added to Food. EFSA Journal 1132, 1-24.

(3) WHO, 1974. Silicon Dioxide and Certain Silicates. Seventeenth Report of the Joint FAO/WHO Expert Committee on Food Additives, Wld. Hlth. Org. techn. Rep. Ser. No. 539. http://www.inchem.org/documents/jecfa/jecmono/v05je04.htm

NATURAL SOURCES[4, 5]

(4) Powell, J., McNaughton, S.A., Jugdaohsingh, R., Anderson, S.H., Dear, J., Khot, F., Mowatt, L., Gleason, K.L., Sykes, M., Thompson, R.P., Bolton-Smith, C., Hodson, M.J., 2005, A provisional database for the silicon content of foods in the United Kingdom. Br. J. Nutr. 94(5), 804-12.

(5) Pennington JAT, 1991. Silicon in foods and diets. Food Addit. Contam. 8(1), 97-118.

REASONS TO SUPPLY

SI CONTENT VS SI ABSORPTION

More important than Si content is the bioavailability of Si foods content. Silicon in grains and grain products are readily absorbed (mean urinary excretion of 49±34% of intake – range 10-100%).

Except for green beans and raisins, the silicon in vegetables and fruits is less readily bioavailable (mean urinary excetion of 21±29% of intake – range 0-40%). For example, silicon uptake is low (2.1±1.2% of intake) for bananas which are high in silicon (5.4 mg Si/100g edible portion).

On the contrary, compared to Si-rich food sources, Si containing beverages have lower Si content but higher Si bioavailability[6]. The main form of silicon in beverages is orthosilicic acid (OSA).

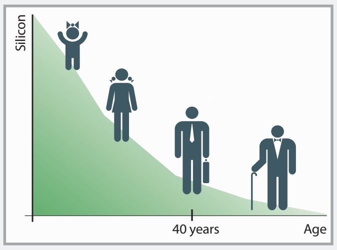
OSA has high bioavailability properties (approximately 50%). These characteristics of OSA make them essential contributors of Si in human diet.

1

Silicon from food is poorly bioavailable and refined food contains increasingly less silicon

2

Silicon intake decreases with age



3

Silicon deprivation leads to fragile bones and cartilage

Since the 70s, it is known that silicon deprivation leads to abnormally shaped bones and cartilagenous tissue. Both were restored upon supplementation with soluble silicon [7,8,9].

In US and British populations the mean silicon intakes are estimated to 20-50 mg with differences between men and women (the intake is lower for women and also for elderly) [6,10].

Silicon intake decreases with age to less than 20 mg silicon/day (18.6 ± 4.6 mg silicon/day for elderly British women in an unrelated randomised controlled intervention study).

To cover our silicon needs, relative contributions are 55% from water, coffee and beer, 14% from grain products and 8% from vegetables.

But our food is more and more refined and so our silicon intake decreases. Moreover the population is aging and more and more people lack of silicon.

(6) Jugdaohsingh, R., Anderson, S. H., Tucker, K. L., Elliott, H. et al., Dietary silicon intake and absorption. Am. J. Clin. Nutr. 2002, 75, 887–893.
(7) Carlisle EM, 1980(a), A silicon requirement for normal skull formation in chicks. J Nutr 110, 352-359.
(8) Carlisle EM, 1980(b), Biochemical and morphological changes associated with long bone abnormalities in silicon deficiency. J Nutr 110, 1046-1055.
(9) Calomme MR, Vanden Berghe DA, 1997, Supplementation of calves with stabilized orthosilicic acid. Effect on the Si, Ca, Mg, and P concentrations in serum and the collagen concentration in skin and cartilage. Biol Trace Elem Res 56, 153-165.
(10) Bellia JP, Birchall JD, Roberts NB, 1994, Beer: a dietary source of silicon. Lancet. 343 (8891), 235.

EYTELIA: A SPECIFIC INDUSTRIAL PROCESS

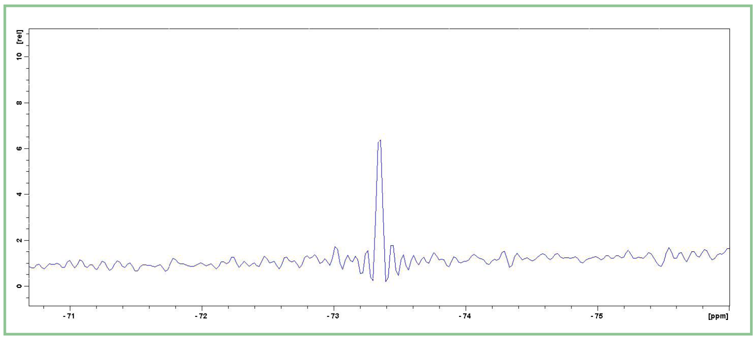
ONLY MONOMERIC FORMS OF SILICON ARE HIGHLY BIOAVAILABLE

Why decrease polymerization risks ?

Orthosilicic acid (OSA), the simplest silicic acid, present in most plants and animal's body fluids is highly bioavailable (approximately 50%)[11]. At neutral pH, it is uncharged and its solubility is limited to 2 mM. In aqueous solution (pH = 7), monosilicic acid remains soluble for long periods at concentrations of approximately 100 ppm [12]. In higher concentrations, OSA polymerizes into polysilicic acid, in a structure that is dependent on the pH of the medium as well as the concentration of Si. These polycondensed forms are poorly bioavailable (approximately 7%) [6].

An efficient stabilization process is necessary

To be absorbed in humans, OSA must be effectively stabilized in order to limit polymerization. Indeed, the bioavailability of Si from monomeric silicic acid is high (around 40% of a Si dose excreted after ingestion) whereas a marginal increase is detected after ingestion of oligomeric or polymeric silica (no excretion detectable)[13].



Due to an efficient stabilization, Organic Silicium bio-activated by Eytelia is only on monomeric forms as demonstrated by ^{29}Si NMR analysis.

We have developed Organic Silicium bio-activated, a molecule of OSA obtained through an unique process of stabilization that maintains OSA exclusively in a monomeric form.

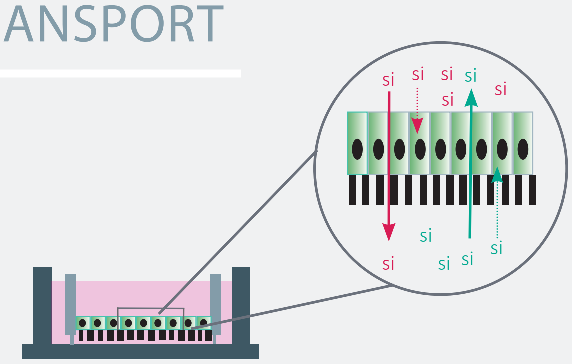
After ^{29}Si NMR analysis, an unique signal (at – 73.3ppm) corresponding to monomeric silicic acid is detected.

Organic Silicium bio-activated is highly bioavailable. Organic Silicium bio-activated ingestion accounted for around 25% of the ingested dose of Si after 6 hours[14]. This value is lower than the 40% excretion commonly observed after OSA ingestion because the bond that stabilized OSA has to be first broken to release OSA and to allow Si delivery. This allows a delay and prolonged delivery of OSA. Similar lower rates of urinary excretion have been previously reported for another stabilized form of OSA (choline-stabilized OSA)[15].

(11) Reffitt, D. M., Jugdaohsingh, R., Thompson, R. P., Powell, J.J., Silicic acid: its gastrointestinal uptake and urinary excretion in man and effects on aluminium excretion. J. Inorg. Biochem. 1999, 76, 141–147.
(12) Annenkov, V. V., Danilovtseva, E. N., Likhoshway, Y. V., Patwardhan, S. V. et al., Controlled stabilisation of silicic acid below pH 9 using poly(1-vinylimidazole). J. Materials Chem. 2008, 18, 553–559.
(13) Jugdaohsingh, R., Reffitt, D. M., Oldham, C., Day, J. P. et al., Oligomeric but not monomeric silica prevents aluminum absorption in humans. Am J. Clin. Nutr. 2000, 71, 944–949.
(14) Marcowycz, A., Housez, B., Maudet, C., Cazaubiel, M., Rinaldi, G., Croizet, K., Digestive absorption of silicon, supplemented as orthosilicic acid–vanillin complex. Mol. Nutr. Food Res. 2015, 59, 1584-9
(15) Sripanyakorn, S., Jugdaohsingh, R., Dissayabutr, W., Anderson, S. H. et al., The comparative absorption of silicon from different foods and food supplements. Br. J. Nutr. 2009, 102, 825–834.

AN EFFICIENT SI TRANSPORT

We first provide evidences that Organic Silicium bio-activated is transported across the human intestinal wall by a mechanism of passive diffusion via the paracellular route. An intracellular accumulation of Si by a mechanism of facilitated diffusion implying transporters allowing a bidirectional transport like the aquaglyceroporins is also present[16].



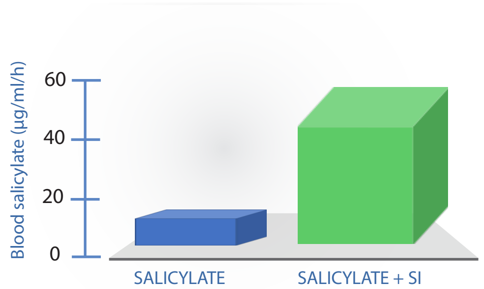
(16) Sergent, T., Croizet, K., Schneider, Y.J. 2017, In vitro investigation of intestinal transport mechanism of silicon, supplied as orthosilicic acid-vanillin complex. Mol Nutr Food Res. 61(2)

POTENTIALISATION PROPERTIES

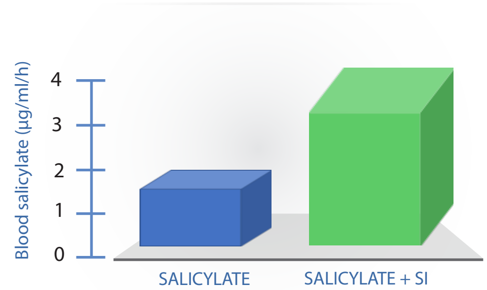
ENHANCE THE ABSORPTION OF MOLECULES

Pads soaked with potassium salicylate with or without an organic form of silicon were applied on Guinea pigs shaved legs. Blood content of salicylate was measured after 1 hour of application[17].

An organic form of silicon allows to enhance the cutaneous absorption of a phenolic molecules such as salicylic acid.



CUTANEOUS ABSORPTION OF SALICYLIC ACID
Aqueous patch



CUTANEOUS ABSORPTION OF SALICYLIC ACID
Aqueous patch with LVEF*

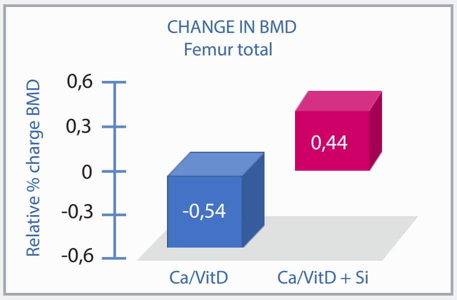
* Low Voltage Electrical Fields

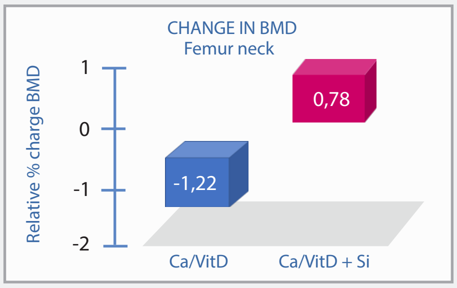
(17) Gueyne J, 1962, Therapie. XVII, 549-557.

ENHANCE THE EFFICIENCY OF MOLECULES

After 12 months of combined silicon and Ca/vit D treatment, BMD (Bone Mineral Density) at the total femur and femoral neck were respectively 0.98% and 2.0% higher, compared to Ca/vitD alone.

Combined therapy of silicon and Ca/vitD3 had a potential beneficial effect on bone structure. Silicon confers some additional benefit over Ca/vitD3 treatment[18].





(18) Spector, T.D., Calomme, M.R., Anderson, S. H., Clement, G., Bevan, L., Demeester, N., Swaminathan, R,. Jugdaohsingh, R., Vanden Berghe, D.A., Powell, J.J., 2008, Choline-stabilized orthosilicic acid supplementation as an adjunct to Calcium/Vitamin D3 stimulates markers of bone formation in osteopenic females: a randomized, placebo-controlled trial. BMC Musculoskeletal disorders, 9, 85

ORGANIC SILICIUM *bio·activated*

HUMAN AND TECHNICAL PROPERTIES OF SILICON & ORGANIC SILICIUM BIO-ACTIVATED FROM EYTELIA

EYTELIA
we are silicium.

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