



OSELAN[®]

Optimal Sea Elements and Nutriment

VITALITY, CARDIOMETABOLIC AND
BONE HEALTH



A UNIQUE INGREDIENT



ORIGIN

OSELAN is a seawater concentrate, obtained through a unique production process, giving it both a high content of valuable sea minerals and a lower concentration of sodium chloride (NaCl). Moreover, this active powder is derived from a co-product of salt harvesting: it is a Clean Label ingredient derived from a renewable resource.



This unique production process is based on 2 successive stages of concentration by evaporation:

1st step: natural water evaporation during salt marshes process

The raw material used is the remaining water of the last basin from a salt marsh. This water, named “brine”, is depleted from NaCl and still rich in seawater electrolytes.

2nd step: spray drying of the brine

Spray drying is a method allowing the production of a dry powder from a liquid or slurry by rapidly drying with a hot gas. This is the preferred method of drying many thermally-sensitive materials such as foods and pharmaceuticals.

COMPOSITION AND BIOAVAILABILITY

Silicon, bromide, boron and magnesium contents are particularly high: their concentration factor is over 80! OSELAN's compositional analysis has shown that it contains at least 22 minerals and trace elements.

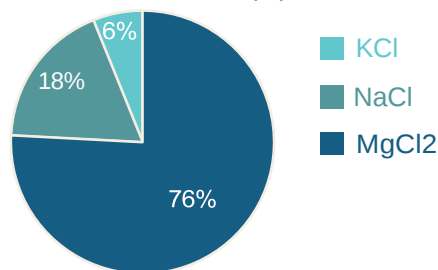
Concentrations of the 10 more concentrated chemical elements of OSELAN:

Chemical elements	Seawater* (mg/kg)	OSELAN** (mg/kg)	Concentration factor
Chloride	18 980	372 857	X 20
Magnesium	1 290	107 970	X 84
Sodium	10 770	79 644	X 7
Potassium	399	30 678	X 77
Sulfur	5 024	21 328	X 4
Bromide	64.6	6 090	X 94
Boron	4.5	392	X 87
Calcium	400	167	Depletion
Silicon	0.14	28	X 200
Strontium	8	4	Depletion

* For a standard Seawater with salinity concentration of 35 g/L

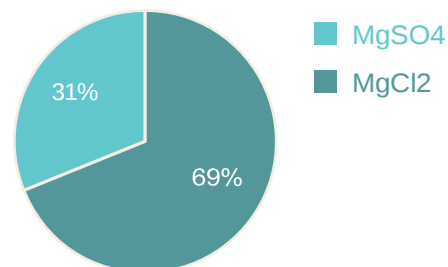
** Average value based on a 3 batches analysis

Chloride distribution (%)



OSELAN's high chloride content combined with its low sodium chloride concentration allows easy access to the chloride digestive health claim.

Magnesium distribution (%)



The high magnesium content of OSELAN allows easy access to the various nutritional and health claims associated with this mineral.

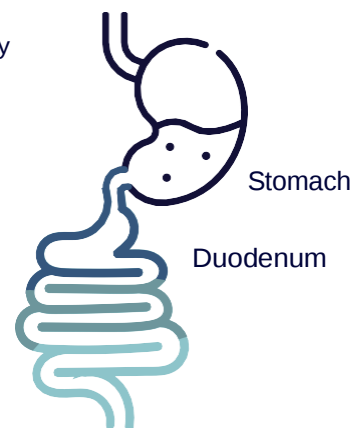
In order to evaluate the solubility of magnesium in OSELAN, ICP-OES (Inductively Coupled Plasma Emission Spectroscopy) determinations were performed on the material entering the NUDIV (static model of human *in vitro* digestion developed by Nuwen working with RGG as well as on the soluble parts leaving the different compartments:

Magnesium solubility (%)

(n=3)

99%

89%



Stomach

Duodenum

Magnesium solubilization rates measured for OSELAN are very good throughout the digestive tract, suggesting a good bioavailability.

CLAIMS AND FORMS

OSELAN amounts needed to comply with the different claims:

Claims according to EU Regulation N° 1169/2011	For food supplements	For beverages*	For food products* (other than beverage)
Magnesium source	416 mg	0.2 %	0.4 %
High in magnesium	832 mg	0.4 %	0.8 %
Chloride source	1.25 g	0.6 %	1.3 %

These data are given as an indication for adults ≥ 18 years old.

* Definition of the various categories of beverages according to the "Guidance document describing the food categories in Part E of Annex II to Regulation (EC) N°1 333/2008 on Food Additives".

The magnesium/chloride health claims can be used when the finished product is admitted at least as a magnesium/chloride source (EU Regulation N° 432/2012).



Stick pack



Sachet



Tablet



Food



Drink

Dosage: ≤ 2 g/day

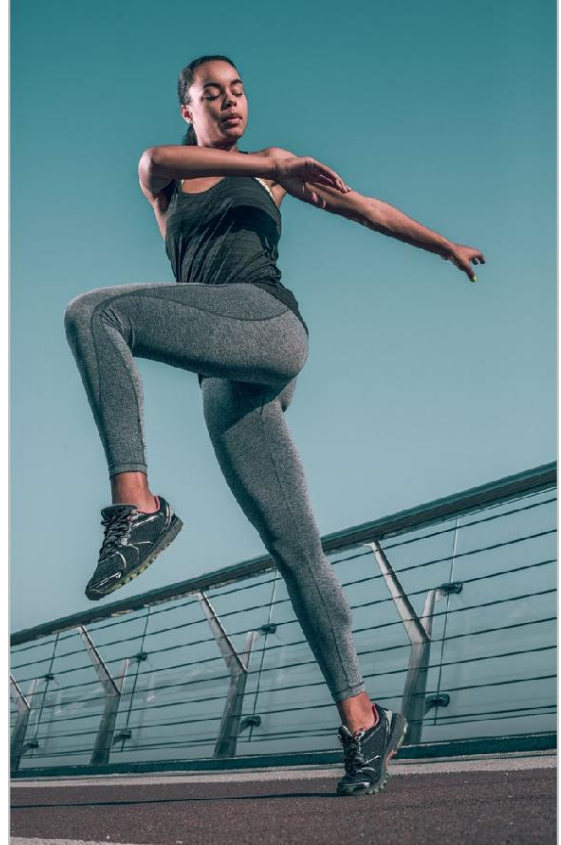
VITALITY: POST-WORKOUT RECOVERY

Electrolytes are naturally occurring salts in our body fluids. When we sweat, we lose electrolytes in the sweat. If they are removed too quickly, our body does not have the ability to restore them as quickly as they are lost. Reintroducing them into our bodies prevents dehydration.

In the last 10 years, several *in vivo* studies in humans have shown that a rehydration protocol with drinks high in minerals and trace elements:

- improves rehydration after dehydrating exercise ^{[1] [2]}
- decreases the recovery time of muscle power ^{[1] [2] [3]}
- decreases recovery time for respiratory power ^[3]
- could improve sports performance ^{[4] [5]}

Therefore, the use of OSELAN in your sports/vitality drinks, or its integration in sticks to be diluted in an existing drink, is perfectly adapted to this health topic



CARDIOMETABOLIC HEALTH



Cardiometabolic health is a relatively new term that encompasses both cardiovascular disease and metabolic disease, including type II diabetes and metabolic syndrome. Studies on the effects of marine minerals and trace elements in the area of cardiometabolic health are relatively recent. *In vitro*, *in vivo* and clinical studies have shown very promising results in this area, including:

- improvement of blood and liver cholesterol levels ^[6]
- prevention of obesity ^[7]
- treatment of diabetes ^{[7] [8]}

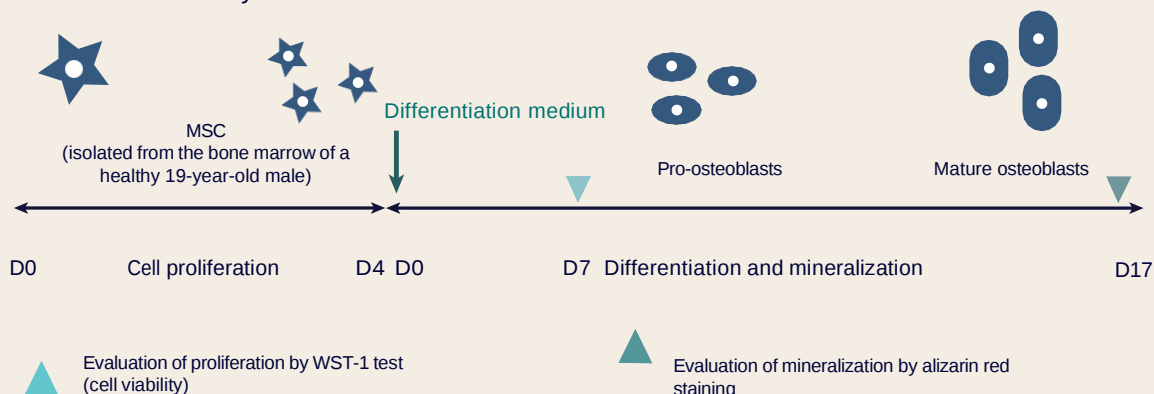
Therefore, regular supplementation with OSELAN would be of interest in the new nutritional strategies for the prevention of cardiometabolic diseases.

BONE HEALTH

Bones store about 60% of the body's magnesium. Magnesium intake is positively correlated with higher bone mineral density in women and men. High dietary magnesium intake has also been shown to reduce the risk of osteoporotic fractures in middle-aged women and men^[9].

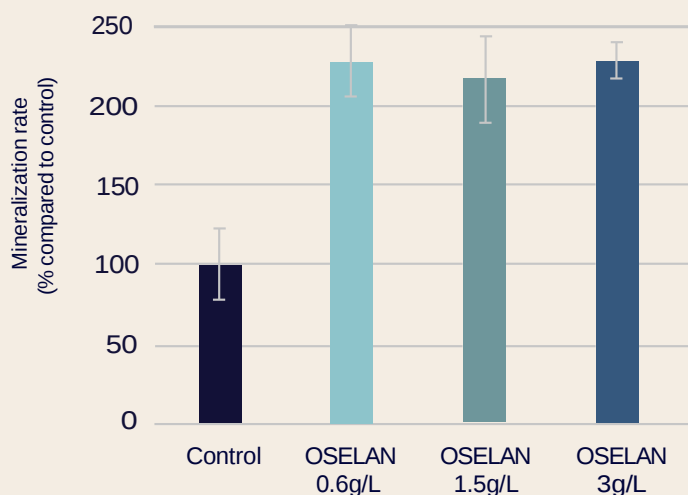
However, very few published studies ^{[10][11]} have investigated the benefits of marine minerals and trace elements in the field of bone mineralization. Therefore, in order to evaluate the impact of supplementation with OSELAN on bone health, Nuwen, conducted an *in vitro* study with this ingredient and bone cells, the osteoblasts.

Osteoblasts are bone-forming cells. The primary function of the osteoblast is to synthesize and mineralize bone matrix during skeletal growth, bone matrix turnover in adults and bone repair throughout life. The objective of this study was to evaluate the effects of OSELAN on the proliferation and differentiation of bone marrow stem cells into osteoblasts. This study was conducted as follows:



Tested conditions:

- Control: cells treated with minimal concentrations of differentiation factors
- OSELAN 0.6 g/L: cells treated with minimal concentrations of differentiation factors supplemented with 0.6 g/L of OSELAN (i.e. 0.072 g/L of Mg – hardness of 296)
- OSELAN 1.5 g/L: cells treated with minimal concentrations of differentiation factors supplemented with 1.5 g/L of OSELAN (i.e. 0.180 g/L of Mg – hardness of 739)
- OSELAN 3 g/L: cells treated with minimal concentrations of differentiation factors supplemented with 3 g/L of OSELAN (i.e. 0.360 g/L of Mg – hardness of 1,478)



Tests carried out in quadruplicate

The results of this study showed that supplementation with OSELAN at least doubled the rate of mineralization compared to the control condition!

At the concentrations tested, no dose effect was visible, meaning that even a low concentration of OSELAN was sufficient to enhance bone mineralization.

The results of this study with OSELAN demonstrate its value for use in formulas targeting bone health, from bone growth to osteoporosis alleviation.



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