

MINERALDRINK

THE IMPORTANCE OF MINERALDRINK LIGHT FOR SPORTS, FITNESS AND WELLNESS

What are the outstanding characteristics of Mineraldrink light compared to conventional sports drinks?

- Replacement of water and electrolytes that gets lost when sweating
- Increased supply of magnesium to compensate for a shift of magnesium from plasma to erythrocytes under intensive work load (6 times the content as in sweat!!!)
- Low content of sodium - particularly favourable for fitness sportsmen
- Low content of carbohydrate avoids disturbances in glucose and insulin concentration, as well as a reduction of the fat metabolism. This favours endurance and a therefore important improvement of fat combustion.
- The complete addition of all vitamins that are important for sports and fitness ensures efficiency. It also contains folic acid, the vitamin that is most deficient in healthy people.

Why supply of liquid when doing sports?

Results of a loss of liquid:

Liquid loss means that first of all water is being withdrawn from the blood and then from the whole body, which means that the body liquids become more „concentrated“. Regarding the blood this means that more blood cells are concentrated in one litre and that therefore the blood becomes more viscous. As a consequence blood can fulfil many of its tasks as a „means of transport“ only in a limited manner:

- Diminished transport of oxygen to the muscles: i.e. reduced supply of energy and lower muscular capacity
- Diminished transport of oxygen to the liver: i.e. less energy for the liver cells and slow degradation of catabolites, such as lactic acid. Consequence: earlier fatigue
- Diminished transport of oxygen to the brain: i.e. reduced concentration power and more mistakes when carrying out sportive actions
- Reduced transport of heat from inside of the body to the skin: i.e. overheating of the organism and therefore reduction of work capacity up to possible organic lesions.

Sweating is not only losing water:

Many biochemical reactions only function within a normal margin regarding the concentration of involved substances. When there is not enough water, the concentration of many substances in the blood augments and the depending reactions are disturbed. Thus a lack of water also reduces the capacity in this way.

Loss of sweat also means a loss of minerals!

Sweat tastes salty, as it contains sodium chloride. The bitter aftertaste of sweat, however, shows that it also contains other minerals the body is dependent on. So a loss of sweat also means a growing depletion concerning important minerals. It is therefore important to replace not only the lost water but also the lost minerals! For this reason, mineral drinks have to be developed that have to contain at least those amounts of minerals per litre as the sweat that goes lost during sports.

Therefore this easy rule results: if possible, already during sportive work out, mineral drink should be drunk in amounts comparable to the

sweat lost by the sportsman. In the field of fitness and Breitensport the following general rule applies: activities without visual sweat produce about 0.5 litre and activities with flowing sweat about 1 litre of lost fluid per hour.

If no minerals are supplied, as a consequence the metabolic capacity will be diminished and complaints will appear more frequently, in extreme cases forcing to stop the sportive action or prohibiting a person's sleep during the following night (e.g. calf cramp as a consequence of hypomagnesemia and also partly owing to hypokalemia).

Physiological Function of Electrolytes

Sodium	Retains water in blood thereby prohibiting the loss of essential and Chloride water reserves.
Magnesium	Important for many metabolic reactions, especially regarding energy production and protein metabolism during regeneration or building up muscles. Magnesium counteracts uncontrolled muscle excitement thereby widely protecting against calf cramps and super excitation of heart muscles (resulting in stress reduction and more and more economic muscle work).
Calcium	Most important for female sportsmen: a deficiency of calcium promotes the danger of hormone dependent bone degradation.
Potassium	Important especially for the energy producing carbohydrate metabolism and for restoring the glycogen during regeneration.
Phosphate	Essential for the whole carbohydrate metabolism: especially for energy production and restore of glycogen during regeneration.

Mineraldrink can be more than a compensation for the loss!

Due to unfavourable nutrition, even in case of careful nutrition, the body can only be supplied at a threshold value regarding some minerals. In order to prevent hypomagnesemia a mineral drink should - especially in the field of fitness - contain significantly more magnesium than the sweat of a sportsman. Another important point is that on intensive exercise magnesium is bound in the red blood cells and therefore not available for biochemical processes in other parts of the body. Thus, by testing several mineral drinks, we could show that a mineral drink has to contain at least 100mg magnesium per litre (4-5 times as much as presumed before) in order to maintain a normal concentration of magnesium in the serum (blood plasma).

To prevent hypokalemia a mineral drink should also include more potassium than sweat if it is predominantly supposed for the field of fitness sports. In this way a decrease in physical power can be avoided and the rebuilding of glycogen during regenerative processes can be supported. Sportsmen practising sports that require an extremely long-lasting endurance, however, can sometimes suffer from stomach troubles due to a too high potassium content in some commercial sports drinks. **Marathon racers and triathlon sportsmen** should have potassium-enriched drinks approximately after 1.5 hours of physical strain. Until

then a mineral drink rich in sodiumchloride with a normal content of potassium might be preferred.

Table: Comparison of electrolytes in sweat (fitness sports) and Mineraldrink light.

Minerals	Content in 1 litre of sweat (in mg)	Content in 1 litre Mineraldrink light
Sodium	230 -460	230*
Potassium	240	480
Magnesium	20 -25	148
Calcium	40 -80	80

* The limitation to 230mg is convenient for a fitness sportsman, as already normal nutrition mostly contains (too) much sodium chloride.

Vitamins in mineral drinks

On intensive exercise the need for many vitamins increases. Thus, a striking deficiency regarding vitamin B1, B6 and folic acid could be discovered. The increased vitamin requirement probably is partly due to losses in vitamins by sweating.

Vitamin deficiency for sportsmen means limited capacity, slower regeneration and less effective training. As mild vitamin deficiencies are very hard to discover and very costly to do, for sportsmen a precautionary supply of all water-soluble vitamins, as well as vitamin E and possibly also beta-carotene can be recommended. The vitamins that are not needed will be metabolized or discharged together with the urine.

The vitamins B1, B2 and C (ascorbic acid) in aqueous solution undergo decomposition due to atmospheric oxygen and influence of light. The best vitamin content of a mineral drink can therefore be found in freshly prepared solutions or served from closed containers with carbonic acid added.

The allocation of the vitamin content in Mineraldrink light is such that a fitness sportsman is given a convenient vitamin supplementation with 0.5 to 1.0 litres. Mineraldrink light therefore makes use of supplementary multivitamin preparations dispensable.

Further important ingredients of a mineral drink!

Glucose: for good absorption of sodium in the small intestine a minimum amount of 10 - 20g per litre is helpful.

Fructose: fructose is useful as supplementary energy carrier, as it particularly supplies energy to the liver.

Citrate (citric acid): is an important substance for energy production; it can directly be converted into energy by any cell (in the citric acid cycle). Furthermore salts of citric acid counteract a hyperacidity of the organism and thus a decrease in physical powers.

Arginine: is a free amino acid that is particularly important during the regenerative process. Arginine supports the detoxification of ammonia that can accumulate in the blood after very intensive or long work out and increase fatigue.

Osmolarity*	Under 270 mosmol/l	270-330 mosmol/l	More than 330 mosmol/l
Description	Hypoton	Isoton	Hyperton
Suitability for quicker compensation of liquid	Very good, if sufficient electrolytes and substances supporting absorption contained	Good respectively necessary, if many carbohydrates are desired	Low

* The unit of the osmolarity is called milliosmol (mosmol)/litre

Arginine furthermore supports protein synthesis in case of sports nutrition rich in milk, as lactalbumin has a too low content of arginine. At high dosage arginine also supports the immune defence and counteracts an immune deficiency owing too sportive overstrain.

Glycin: Glycin can support absorption of some minerals in the small intestine and, as free amino acid, also provides a certain protective function for cells that temporarily do not get enough oxygen.

The isotonic characteristics of sports drinks

Isotonic liquids contain as many dissolved particles as body fluids. They therefore pass the stomach particularly quickly, as they do not first have to be diluted by gastric juice and be made well tolerable for the intestine.

Hypertonic liquids, such as sports drinks rich in sugars, fruit and fruit drinks are therefore poorly suitable for compensating fluid losses.

Recent studies have now shown that even less concentrated („hypotonic“) liquids that contain fewer particles than isotonic liquids can be ingested from the body even a little quicker.

Due to the limitation of the carbohydrate content to a value of approx. 20g/litre convenient for the ingestion of minerals, **Mineraldrink light could be taken to the beginning of the hypotonic range.** The compensation of liquid losses can consequently be effected even slightly quicker than by using other, conventional isotonic sports drinks.

Concluding revive of Mineraldrink light

Mineraldrink light is a new mineral drink especially developed for the field of fitness and **Breitensport**. If supplied in good time and sufficient amounts, Mineraldrink light counteracts - through various mechanisms - a decrease in physical power and endurance and supports regeneration. Regarding unfavourable nutrition, Mineraldrink light can furthermore prevent mineral deficiency; it is therefore a convenient drink also for people who do not do sports.

Based on the low content of glucose and the substitution with fructose to a large extent, this mineral drink can also be recommended for sportsmen suffering from diabetes without any restrictions.

Provided appropriate physical activity a consideration of the contained carbohydrates within the diet plan can be left out.

Please note:

Persons with limited function of the kidney should consult their doctor in charge regarding the potassium supply with Mineraldrink light.

Friedrich Reuss

Certificated chemist.

Officially appointed Expert for Sport Nutrition and dietetic food