Magnesium, vital not only for plants

Magnesium is the eighth most abundant element on Earth, the third in sea water and the fourth in human body. It is a bioessential mineral and one of the most prevalent cation in the intracellular fluid in the human body. Analogue to plants, also animal and human body metabolic functions will be correctly carried out only when magnesium is present in the right amount. With its role in regulating many biochemical reactions, sufficient magnesium supply is essential to achieving the delicate balance necessary to the human body’s function. Besides the “normal ongoing” activities, it is also required for more extreme and demanding situations: during pregnancy or lactation, sport activities or stressful situations from everyday life.

Magnesium functions and its metabolism in human body
The role of magnesium is primarily regulatory: magnesium ions do regulate over 300 biochemical reactions occurring in the body on a near constant basis, mainly acting as enzyme co-factors. Due to its presence in so many reactions, it is very likely its malfunction can disrupt many different mechanisms that have many different significant consequences for the body. Amongst many others, magnesium presence is crucial to glucose and fat breakdown, production of proteins, enzymes and antioxidants such as glutathione, creation of DNA and RNA, regulation of cholesterol production. Urinary excretion of magnesium is carefully regulated by the kidneys.

An adult body contains approximately 21-28 g magnesium: around 60-65% is mineralized in the bones, 33-34% in the muscles and soft tissues. Only 1% magnesium is found in the blood plasma. As overall about 10% magnesium is free whether 90% is bound and can be mobilised upon “request”.

Magnesium in human nutrition and recommended intake
Magnesium is not an endogenous substance and therefore must be provided to the body, normally, via nutrition. Magnesium intake can be summarised as follows: healthy individuals, which are not magnesium deficient, can absorb until 30% of magnesium from foodstuffs. The absorption of magnesium can arise to 70% when the individuals show deficiency. Several studies have shown a certain amount of world population is actually presenting magnesium deficiency. Foodstuff as green leafy vegetables such as spinach, wholegrain bread, brown rice, dairy products, some nuts and seeds, meat, seafood and fish are considered magnesium-rich nutrients. In the last years, several studies have shown the existing correlation between industrialised and developing countries and the mineral “malnutrition”. Nutritionists say, regarding industrialised countries, the overall increased consumption of processed food is one of the causes of magnesium deficiency. In fact most natural occurring magnesium will be removed during food processing, f. i. in food containing processed oils, sugars and grains.

Human magnesium deficiency
Early signs of magnesium deficiency are actually difficult to recognise; they might include loss of appetite, nausea, vomiting, fatigue, weakness and bad mood. These symptoms can be easily confused with the symptoms arising from other diseases. As this worsens, in fact, these signs can become pathological and provoke illnesses both on physical and emotional level:
cardiovascular illnesses, muscle contractions, cramps as well as personality changes, numbness, sleep lost, etc. Severe and prolonged magnesium deficiency might result also in serious sicknesses as the overall mineral homeostasis is disrupted. In conclusion, the “invisible” magnesium deficiency might have a big influence on human health and can cause serious problems.

Magnesium deficiency can also be caused by acute to chronic stress. Stress is often addressed as the “modern sickness” of industrialised countries, hence the relation between magnesium deficiency, unhealthy nutrition and stress could be surely confirmed.

Stress and magnesium in the human body
The harmful consequences of busy lifestyle in industrialised countries are often connected to environmental, physical and emotional stress the population must be able to cope with. Direct consequences of these “conditions” are the implementation of unhealthy life habits. Abuse of coffee, tea, alcohol, processed food, excess of medicinal drugs and salt influence negatively the magnesium balance in the body because of two reasons: unregulated magnesium body consumption and inefficient magnesium absorption.

It is well known that the body reaction to stress provokes a release of adrenaline, which is mainly responsible, in acute situations, to increase survival of normal animals when their lives are threatened. During these reactions, magnesium is mobilised from the body reserve and is used to guarantee the required energy for the imminent body response. Therefore, when an individual is magnesium deficient, stress might be the trigger of cardiovascular damage including hypertension, cerebrovascular and coronary constriction and occlusion, arrhythmias and sudden cardiac death (SCD). In modern societies or industrialised countries, where the population is kept under continuous stress stimulation, the body “consumption” of magnesium is quite high hence magnesium must be provided to keep its body reserve on good levels.

Lately, stress is also considered having a role for the development of modern pathologies such as obesity, diabetes, cardiovascular diseases and/or even more severe syndromes as Alzheimer’s disease. Even the correlation between stress and carcinogenesis has been being explored in these last years.

The magnesium-stress vicious circle and chronic stress
There might be a certain established dependency between magnesium deficiency and the appearance of stress. More precisely a vicious circle can start in which stress will promote the depletion of magnesium which can become the cause of more anxiety if the magnesium reserve is not “refilled”.

Acute stress response, which includes release of adrenaline and consequent quick magnesium consumption, must be actually considered a good and healthy response of the body to stress. Adrenaline increases breathing and pulse rates and prepare the body for an emergency. For periodic, manageable stress, this is a perfectly healthy response. However, chronically high adrenaline levels, as the one experienced during stress periods, prompt your body to become more reactive to stress throughout the day. This means that even small situations easy to handle will create an all-out stress response, with the accompanying elevated blood pressure and increased pulse rate.
Conclusions
Mg$^{2+}$ body reserve should be kept constant in order to cope with sudden Mg$^{2+}$ consumption (stress response) and with the normal body activities. Whether nutrition itself does not provide enough minerals, an additional supplementation could be of great benefit and is highly recommended.

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