What role do the biofactors vitamin B_1 and vitamin B_{12} play in diabetic neuropathy?

On the occasion of this year's Healthy Eating Day with its focus on diabetes mellitus, the Society for Biofactors (GfB) points out that in diabetic neuropathy – as one of the sequelae of diabetes – patients can benefit from the targeted supply of the biofactors vitamin B_1 and vitamin B_{12}.

More than one in three diabetics develop peripheral diabetic neuropathy, which is characterised by pain, paraesthesias or numbness.[1] Neuropathy can impair the quality of life of patients due to the sometimes severe pain and promote the development of diabetic foot syndrome.

In the development of diabetic neuropathy, potential risk factors are not only elevated blood glucose levels, oxidative stress, inflammatory reactions and changes in the blood flow to the smallest blood vessels[2], but also high blood pressure, elevated concentrations of cholesterol and triglycerides, smoking and alcohol.[3] Furthermore, there are significant links between lowered vitamin B_1 blood levels and complications of diabetes that affect the small blood vessels and can lead to circulatory problems.[4,5]

"The peripheral nervous system reacts to vitamin B_1 deficiency by developing polyneuropathy. Patients may experience sensory disturbances, above all in the feet, such as tingling, burning and numbness, as well as neuropathic pain," stresses Prof. Dr. Karlheinz Reiners, a specialist in neurology and member of the Scientific Advisory Board of the Society for Biofactors (GfB). Diabetics are at particularly high risk – both for the development of vitamin B_1 deficiency and diabetic neuropathy.[6]

For the compensation of vitamin B_1 deficiency in diabetics with neuropathy, fat-soluble benfotiamine has been shown to have a significantly higher level of bio-availability compared to water-soluble thiamine.[7,8] By compensating for a deficiency, benfotiamine can alleviate the symptoms of neuropathy. Among diabetics with neuropathy, benfotiamine has been shown to improve the nerve conduction velocity and clinical symptoms.[9,10]

Vitamin B_{12} deficiency – an unnerving problem

In type 2 diabetics, almost all of whom are treated with the oral antidiabetic drug metformin, there is also the danger that diabetic neuropathy may also become worse due to the long-term metformin therapy.[11] Here, the reduced vitamin B_{12} uptake into the body under metformin probably plays the decisive role.[12]

"A vitamin B_{12} deficiency can also result in neurological diseases," warns Prof. Reiners. Possible complaints were deep sensitivity disorders with numbness, a tingling sensation and painful paraesthesias in

the hands and feet, unsteadiness when walking and standing, as well as a constriction or cuffed feeling in the lower legs and ankles.[13]
If vitamin B_{12} deficiency is suspected, it should be checked by means of a blood test and, if there is evidence of a deficiency, this should be corrected by targeted supplementation, as the damage is often irreversible, especially if the deficiency state has been present for a prolonged period.[14]

Diabetic neuropathy: pay attention to the biofactor status

In addition to drug therapy and an optimised lifestyle, the use of the biofactors vitamin B_1 and vitamin B_{12} should be considered in the treatment of diabetic neuropathy as a secondary disease of diabetes mellitus. The compensation of deficiency states by means of supplements can have a positive influence on the development of diabetic neuropathy.

Further information on the B vitamins and other biofactors can be found here.

Bibliography:

[1] German Health Report: Diabetes 2019. Publisher: Deutsche Diabetes Gesellschaft (DDG) and diabetes-DE – Deutsche Diabetes-Hilfe. Editorial Office of the Diabetes-Journal, Mainz, 2019

[2] Bönhof GJ et al.: Emerging biomarkers, tools, and treatments for diabetic polyneuropathy. Endocrine Review 2018. DOI: 10.1210/er.2018-00107

[3] Nationale VersorgungsLeitlinie Neuropathie bei Diabetes im Erwachsenenalter (National Health Care Guideline Neuropathy in Adult Diabetes.) www.leitlinien.de>nvl>dm-neuropathy-1aufl-vers4-lang.de. 2011, last modified 2015, page 21

[4] Nix WA et al.: Vitamin B status in patients with type 2 diabetes mellitus with and without incipient nephropathy. Diabetes Research and Clinical Practice 2015, 107: 157-165

[5] Thornalley PJ: The potential role of thiamine (Vitamin B1) in diabetic complications. Current Diabetes Reviews 2005, 1: 1-12

[6] Reiners K et al.: Sensomotorische diabetische Neuropathien. (Sensorimotor diabetic neuropathies) Diabetologe 2006, 2: 92-103

[7] Schreeb KH et al.: Comparative bioavailability of two vitamin B_1 preparations: benfotiamine and thiamine mononitrate. Eur J Clin Pharmacol 1997, 52(4): 319-320

[8] Loew D: Pharmacokinetics of thiamine derivatives especially of benfotiamine. Int J Clin Pharm Ther 1996, 34(2): 47-50

[9] Stirban A: Therapie der diabetischen Neuropathie. 27. Kongress der Föderation der Internationalen Donau-Symposia über Diabetes mellitus. Diabetes-Congress-Report 2013, 2: 4-10 (Therapy of diabetic neuropathy. 27th Congress of the Federation of International Danube Symposia on Diabetes Mellitus. Diabetes Congress Report 2013, 2: 4-10)

[10] Raj V et al.: Therapeutic potential of benfotiamine and its molecular targets. Eur Rev Med Pharmacol Sci 2018, 22: 3261-3273

[11] Wile DJ: Association of Metformin, elevated homocysteine and methylmalonic acid levels and clinically worsened diabetic peripheral neuropathy. Diabetes Care 2010, 33(1): 156-161

[12] Alvarez M et al.: Vitamin B12 deficiency and diabetic neuropathy in patients taking metformin: a cross-sectional study. Endocrine Connections 2019, 8: 1324–1329

[13] Wolffenbuttel BHR et al.: The many faces of cobalamin (vitamin B12) deficiency. Mayo Clin Proc Inn Qual Out 2019; 3(2): 200-214

[14] Aroda V et al.: Long-term Metformin use and vitamin B12 deficiency in the diabetes prevention program outcomes study. J Clin Endocrinol Metab 2016; 101: 1754-1761