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LETTER TO THE EDITOR

Topical Issue: Acu-obesity and Diabetes



Obesity has become a major public health issue worldwide. It is a contributing factor in diabetes, cardiovascular disease, hypertension, stroke, cancer, osteoarthritis, asthma, and sleep apnea [1], and one of the components of metabolic syndrome. Metabolic syndrome is a state of chronic low-grade inflammation as a consequence of a complex interaction between genetic and environmental factors. It is characterized by the clustering of multiple metabolic abnormalities, including obesity, hypertension, dyslipidemia, insulin resistance, and impaired glucose tolerance as its main components.

Acupuncture and herbal medicines have been used for thousands of years for the treatment of obesity and diabetes and associated medical conditions. In 2008 the World Health Organization acknowledged that there was evidence for the effectiveness of acupuncture, some herbal medicines, and some manual therapies for certain conditions. Clinical studies by randomized controlled trials, although few in number, have shown that acupuncture, usually electroacupuncture (EA), can correct various metabolic disturbances that contribute to hyperglycemia, obesity, hyperphagia, hyperlipidemia, inflammation, altered activity of the sympathetic nervous system, and insulin signaling defects [2]. A large number of studies with animal models have confirmed these findings. Although each animal model has limitations and strengths, used together in a complementary fashion they are essential for research on the components of metabolic syndrome and for understanding the etiology and pathogenesis towards a cure.

In the Special Issue, Liaw and Peplow [3,4] studied the effects of EA in two rat models of obesity. The development of an inflammatory state was shown in high fat diet-induced obese Long Evans rats compared with lean animals, and EA caused an increase in serum leptin of the obese animals [3]. Research studies have shown that EA has a bidirectional adjustment of circulating leptin levels. Within a short period of time before rats develop resistance to leptin, EA can increase leptin and its receptor levels [5]. By comparison, EA applied to obese Zucker fatty rats with high serum levels of leptin and insulin decreased

tumor necrosis factor- α and increased interleukin-10: tumor necrosis factor- α ratio [4]. Tumor necrosis factor- α is principally produced by macrophages (classically activated, M1 activation state), and its decrease would indicate that EA treatment was effective in reducing the overall inflammatory state of the Zucker fatty rats. Previous studies showed that obesity in rodents resulted in an increase in macrophages in adipose tissue [6,7] due to an increased infiltration and/or proliferation of these cells [8], and infiltration of macrophages into the adipose tissue of diet-induced obese rats was inhibited by EA [9]. Inhibition of macrophage infiltration would explain the decreased serum tumor necrosis factor- α level on EA treatment. The lack of a decrease in serum interleukin-10 by a reduced number of macrophages in the adipose tissue would suggest that EA has altered the activation state (to alternatively activated, M2 activation state) [4]. Increased levels of tumor necrosis factor-a interfere with insulin receptormediated phosphorylation of insulin receptor substrate proteins and downstream signaling events [10]. EA in high fat dietinduced obese rats was shown in the article by Liu et al [11] to reduce hypothalamic neuroprotein Y and agouti-related peptide levels and inhibit the expression of protein tyrosine phosphatase 1B. EA also lowered the body weight of the dietinduced obese rats and may be related to improved insulin resistance caused by changes in the adipocyte size and reductions in the expressions of neuroprotein Y, agouti-related peptide, and protein tyrosine phosphatase 1B. The adipocytes in the EA-treated group were smaller than for the untreated diet-induced obese rats, and the homeostatic model assessment of insulin resistance index was also smaller [11]. Among the neurons of the arcuate nucleus in the hypothalamus are ones that co-express neuroprotein Y and agouti-related peptide, two peptides that potentially stimulate food intake, reduce energy expenditure, and thereby promote weight gain. Protein tyrosine phosphatase 1B is able to negatively regulate insulin receptor kinase and inhibits insulin signaling, and when overexpressed plays a role in insulin resistance.

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Herbs have also been extensively used in traditional Asian medicine, e.g., for treating several cardiovascular diseases, and in the article by Akinyemi et al [12] dietary supplementation with ginger and turmeric rhizomes prevented hypercholesterolemia in rats fed a high-cholesterol diet. Both ginger (2% and 4%) varieties caused decreases in plasma and liver arginase activity, atherogenic index, total cholesterol, triglycerides, and low-density lipoprotein cholesterol while increasing high-density lipoprotein cholesterol compared with controls. Arginase plays a major role in the regulation of vascular function in various cardiovascular disorders such as hypertension and atherosclerosis by impairing nitric oxide production. In a review of four clinical studies and 16 animal studies by Nam et al [13], although the sample sizes of the four clinical studies were small, herbal acupuncture (pharmacopuncture) did seem to have a beneficial effect in treating obesity by modulating inflammation, oxidative stress, lipid metabolism, leptin, and insulin signaling. It was unclear which of these factors was important for the therapeutic effect of herbal acupuncture on obesity and further clinical and experimental studies are required with standardized methodologies. An article by Jeon [14] has shown traditional Korean medicine involving Sa-Am acupuncture and herbal medicine (Gui-Pi-Tang modification) to be effective in treating an adult female patient with psoriasis with onset 2-3 years before treatment. Psoriasis is a common benign, chronic inflammatory skin disease, and the patient had been previously treated with Western ointment. In Sa-Am acupuncture, every meridian has its own property and appropriate meridians are chosen depending on the patient's energy situation. The causes of the patient's psoriasis were considered to be lung dryness/heat and liver fire.

Hypertension affects functional capacity through arterial remodeling. Pulse waveform analysis is a noninvasive method for assessing the cardiovascular system based on the phenomenon of waveform propagation and reflection throughout the cardiovascular system. Pulse image analysis is an important diagnostic procedure in traditional Chinese medicine and contributes to pattern differentiation and therapeutic intervention. It is performed on the radial artery bilaterally at three different positions and depths. In an article by Moura and Ferreira [15] it is suggested that use of pulse waveform analysis to understand the pulse image analysis might improve the objectivity of pulse palpation in traditional Chinese medicine, allowing even less experienced practitioners to achieve a more accurate diagnosis. Performing a pulse image analysis in patients with hypertension might allow the identification of early cardiac damage and a unification of pulse diagnosis.

In conclusion, the studies reported in the Special Issue contribute to an understanding of the pathophysiological basis of components of metabolic syndrome and development of novel therapies.

Disclosure statement

The author declares to have no conflicts of interest and no financial interests related to the material of this manuscript.

References

- Stein CJ, Colditz GA. The epidemic of obesity. J Clin Endocrinol Metab 2004;89:2522-5.
- [2] Liang F, Koya D. Acupuncture: is it effective for treatment of insulin resistance? *Diabetes Obes Metab* 2010;12: 555–69.
- [3] Liaw JJT, Peplow PV. Effect of electroacupuncture on pro-/ anti-inflammatory adipokines in serum and adipose tissue in lean and diet-induced obese rats. J Acupunct Meridian Stud 2016;9:65–72.
- [4] Liaw JJT, Peplow PV. Effect of electroacupuncture on inflammation in the obese Zucker fatty rat model of metabolic syndrome. J Acupunct Meridian Stud 2016;9: 73-9.
- [5] Zheng L. Leptin, weight loss, and acupuncture. Available at: http://acupuncture.com/newsletters/m_mar13/leptin.htm [Date accessed February 5, 2016].
- [6] Martin-Cordero L, Garcia JJ, Giraldo E, De la Fuente M, Manso R, Ortega E. Influence of exercise on the circulating levels and macrophage production of IL-1 β and IFN γ affected by metabolic syndrome: an obese Zucker rat experimental animal model. *Eur J App Physiol* 2009;**107**:535–43.
- [7] Bouloumie A, Curat CA, Sengenes C, Lolmede K, Miranville A, Busse R. Role of macrophage tissue infiltration in metabolic diseases. *Curr Opin Nutr Metab Care* 2005;8:347–54.
- [8] Amano S, Cohen J, Vangala P, Tencerova M, Nicoloro S, Yawe J, et al. Local proliferation of macrophages contributes to obesity-associated adipose tissue inflammation. *Cell Metab* 2014;19:162–71.
- [9] Wen CK, Lee TY. Electroacupuncture decreases the leukocyte infiltration to white adipose tissue and attenuates inflammatory response in high fat diet-induced obesity rats. Evid Based Complement Alternat Med 2014;2014: 473978.
- [10] Peplow PV. Electroacupuncture treatment of insulin resistance in diabetes mellitus. Acupunct Med 2015;33:347–9.
- [11] Liu X, He JF, Qu YT, Liu ZJ, Pu QY, Guo ST, et al. Electroacupuncture improves insulin resistance by reducing neuroprotein Y/agouti-related protein levels and inhibiting expression of protein tyrosine phosphatase 1B in dietinduced obese rats. J Acupunct Meridian Stud 2016;9: 58-64.
- [12] Akinyemi AJ, Boligon A, Oboh G, Ademiluyi AO. The effects of two ginger varieties on arginase activity in hypercholesterolemic rats. J Acupunct Meridian Stud 2016;9:80–7.
- [13] Nam MH, Lee SW, Na HY, Yoo JH, Paik SH, Ahn KS, et al. Herbal acupuncture for the treatment of obesity. J Acupunct Meridian Stud 2016;9:49–57.
- [14] Jeon YC. Treatment for an adult patient with psoriasis with traditional Korean medicine, especially Sa-Am acupuncture and herbal medicine. *J Acupunct Meridian Stud* 2016;9: 88–92.
- [15] Moura NGR, Ferreira AS. Pulse waveform analysis of Chinese pulse images and its association with disability in hypertension. J Acupunct Meridian Stud 2016;9:93–8.

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