

## THE IMPACT ON HUMUS WATER ON PARAMETERS OF ENDOTHELIAL DYSFUNCTION IN HYPERGLYCEMIC CONDITIONS.

Katarzyna Szot <sup>1</sup>, Krzysztof Góralczyk <sup>1</sup>, Małgorzata Michalska <sup>1</sup>, Natallia Veryho <sup>2</sup>,

Jacek Chojnowski <sup>2</sup>, Irena Ponikowska <sup>2</sup>, Danuta Rość <sup>1</sup>

<sup>1</sup> Department of Pathophysiology, Nicolaus Copernicus University in Toruń, Collegium Medicum in Bydgoszcz, Skłodowskiej-Curie Street No 9, Bydgoszcz, Poland

<sup>2</sup> Department of Balneology and Physical Medicine, Nicolaus Copernicus University in Toruń, Collegium Medicum in Bydgoszcz, Leśna 3 Cieclocinek, Poland

### Abstract

**Introduction:** Humus water (HW) containing humus acids with sources in Poland are originally bacteriologically pure, physically and chemically stable. Because of the physicochemical properties of humus acids of adsorption, complexity and ion exchange, they present numerous therapeutic activities. Hyperglycemia is recognized as a primal factor responsible for the vascular endothelium damage in diabetic patients and is associated with expression of adhesion molecules, such as selectin E (E-selectin) and vascular cell adhesion molecule - 1 (VCAM-1).

**Material and methods:** Endothelial cells (HUVEC line - Human Umbilical Vein Endothelial Cells) were cultured in accordance the standard method. The study was conducted in four groups: control group 1 – culture medium without impact of glucose and HW ; 2 - an appropriate volume of HW was added to obtain its 1% solution in the culture medium; 3- 30 mM/L glucose added to the culture medium to imitate hyperglycemic condition; 4 – glucose and HW in the medium. The cells were counted by Buerker hemocytometry. The concentration of soluble form of E-selectin and VCAM-1 in the supernatant was measured by ELISA test and analyzed per number of cells.

**Results:** The lowest number of HUVECs was observed in group 3 cultured under hyperglycemic conditions while the number of cells in group 4 with glucose and humus water reached the level similar to the control group. Meanwhile, the concentration of soluble form E-selectin and VCAM-1 was higher in group 3 with glucose and decreased concentration was observed with addition of HW in group 4.

Table 1. Influence of HW on number of endothelial cells and secretion of adhesion molecules. Results are presented as mean (M); standard deviation (SD); median (Me) and the inter-quartile range (IQR).

		1 Control Group	2 Group +1% HW	3 Group +30 mM/L glucose	4 Group + 30 mM/L glucose + 1% HW	p
Number of cell (Nx10 <sup>5</sup> )	M	4.21	4.44	3.39	4.24	0.0062
	SD	0.63	0.81	0.90	0.87	(3 vs 4)
E-selectin/10 <sup>5</sup>	Me	0.09	0.08	0.13	0.11	0.0546
	IQR	0.08-0.11	0.06-0.13	0.09-0.16	0.07-0.17	
VCAM-1/10 <sup>5</sup>	Me	0.10	0.10	0.16	0.14	0.0806
	IQR	0.07-0.23	0.09-0.48	0.12-0.22	0.10-0.41	

**Conclusions:** Humus water improve endothelial functions impaired by hyperglycemia conditions. It appears that the adverse effects of high glucose concentration on vascular endothelial cells may be reduced by adding of HW. The present study reveals that HW exerts important beneficial effects also by reducing the expression of adhesion molecules.