

THE EFFECTS OF POLYFRUCTANS ON ALKALINE PHOSPHATASE ACTIVITY IN POLYMORPHNUCLEAR LEUKOCYTES

Ilmara Vina, Aija Zilevica, Rita Treimane*, Aerna Karsakevich, Svetlana Gonta

Institute of Microbiology and Biotechnology, University of Latvia
Kronvalda boulevard 4, LV-1586, Riga, LATVIA

*Latvian Medical Academy, Dzirciema str. 16, LV-1007, Riga, Latvia

Alkaline phosphatase [EC 3.1.3.1.] (AP) was discovered in the membranes of cells where active transport processes take place. In polymorphnuclear leukocytes (PMNL) AP is located in secretory vesicles [1]. We have demonstrated previously, that bacterial polyfructan levan (L) causes alteration of penetration in cells membranes [2]. This raised our interest in the study of the influence of L and its structural analogues on AP activity. Detection of AP activity is used for differential diagnosis of chronic myelocytic leukemia (CML): leukemic cells have a low activity of AP, while that in neutrophils of healthy donors is higher. We are presently studying nonspecific modulation of PMNL phagocytosis by bacterial polyfructans levan and its chemical derivatives *in vitro* using leukocytes from healthy volunteers and patients with CML.

Materials and methods. We evaluated the alteration of PMNL AP activity by L, synthesized by *Zymomonas mobilis* 113 S, its periodate oxidized forms (LO) and subsequently reduced levan (LOR). All fructans were used in a concentration of 5 mg/ml. The activity of AP was analyzed in PMNL cells by using AS-naphtol phosphate. Concurrently, the percentage of active PMNL was measured.

Results. The AP activity in PMNL of healthy volunteers was 88-106 units, in CML patients only 24 units (23-27 %). Reduced AP activity in leukemia patients is a consequence of AP messenger RNA deficiency [3]. By testing the influence of polyfructans on the AP level positive effects of variable extent were found. According to our data, if compared to the control (100 % level). L increases the activity of AP PMNL by 188,2 % in healthy donors, and by 144,1 % in patients with CML; LO increases the activity of AP by 130,0-160,7 % in healthy donors and by 102,2 % in CML patients; LOR had the most significant effect of AP activity: increases it of 215,3 %-230,5 % and 127,3 % in healthy donors and CML patients, respectively. After treatment with polyfructans, the percentage of active cells was as follows: L increased the number of cells containing active AP to 117,3 %, LO to 106,4 %, LOR to 123,1 %. The above provides evidence that the increase of the amount of phagocytic cells, which are the source of AP, do not explain the significant increase of AP activity. The diverse structures, chemistry of bonding to the surface of PMNL cells and the possible mechanism of AP activation will be discussed.

Conclusion. Bacterial polyfructan levan and its derivatives have a direct influence on the AP activity of polymorphnuclear leukocytes; among the L chemically modified forms studied, the most active was LOR.

References

1. Tsuruta, T., Tani, K., Hoshika, A., Asano, S. *Leuk. Lumphoma.* 32 (3-4), 237-247, 1999.
2. Vina, I., Karsakevich, A., Bekers, M. In: *Book of Abstracts, XIIIth Intern. Symp. on Medicinal Chemistry, Paris, 19-23 Sept.*, 169, 1994.
3. Dotti, G., Garantini, E., Borleri, G., Masuhara, K., Spinelli, O., Barbui, T., Rambaldi, A. *Br. J. Haematol.* 105 (1), 163-172, 1999.