

<https://doi.org/10.7124/bc.000B8F>

M.V. Sabadashka, N.O. Sybirna

Ivan Franko National University of Lviv
4, Hrushevskogo Str., Lviv, Ukraine, 79005
mariya.sabadashka@lnu.edu.ua

CHANGES IN FUNCTIONAL ACTIVITY OF LEUKOCYTES UNDER ADMINISTRATION OF GRAPE POMACE EXTRACT IN RAT MODEL OF DIABETES MELLITUS

Background/Aim. Diabetes mellitus is a chronic endocrine disease caused by insufficient insulin production by the pancreas or impaired insulin action. Diabetes treatment may include the use of polyphenols, biologically active compounds naturally present in many plants. The aim of the study was to investigate changes in the functional state of leukocytes of rats with diabetes mellitus following the administration of grape pomace extract. **Methods.** Experimental diabetes mellitus was induced in male Wistar rats by a single intraperitoneal injection of streptozotocin (60 mg per 1 kg of bw). Grape pomace extract was administered orally in drinking water (45 mg of polyphenols per 1 kg of bw) for 14 days. In peripheral blood leukocyte lysates, the activity of constitutive isoforms of NO synthase (cNOS) and its inducible isoform (iNOS), as well as the content of nitrites (NO_2^-) and nitrates (NO_3^-), were determined spectrophotometrically. NADPH oxidase and myeloperoxidase activities were assessed by light microscopy. To evaluate the enzyme activities, four experimental samples of leukocyte suspensions were analysed: spontaneous assay (without yeast cells as phagocytic targets) without fMLP pretreatment ($\text{Sp}^-/\text{fMLP}^-$); spontaneous assay with fMLP pretreatment ($\text{Sp}^-/\text{fMLP}^+$); induced assay (with yeast cells) without fMLP pretreatment ($\text{Ind}^+/\text{fMLP}^-$); induced assay with fMLP pretreatment ($\text{Ind}^+/\text{fMLP}^+$). Statistical analysis of the obtained data was performed using the ANOVA tool in Microsoft Excel. **Results.** An 81% increase in iNOS activity was observed in leukocytes from diabetic rats ($p \geq 0.999$). When the extract was administered to diabetic animals, a 29% decrease in iNOS activity was observed ($p \geq 0.99$). Along with this, the activity of constitutive isoforms remained unchanged. Diabetes was also associated with an 81% increase in NO_2^- level ($p \geq 0.99$) and a 37% increase in NO_3^- level ($p \geq 0.999$) in leukocytes. The administration of the extract reduced NO_2^- level by 103% ($p \geq 0.99$) and NO_3^- level by 40% ($p \geq 0.99$) in diabetes. Administration of grape pomace extract affected the oxygen-dependent bactericidal mechanism of phagocytes. In diabetic animals, NADPH-oxidase activity decreased by 1.2-fold in $\text{Sp}^-/\text{fMLP}^-$ ($p \geq 0.95$), by 1.2-fold in $\text{Sp}^-/\text{fMLP}^+$ ($p \geq 0.95$), by 1.3-fold in $\text{Ind}^+/\text{fMLP}^-$ ($p \geq 0.95$), and by 1.3-fold in $\text{Ind}^+/\text{fMLP}^+$ ($p \geq 0.95$). Administration of the extract significantly increased myeloperoxidase activity in peripheral blood leukocytes of diabetic rats. Myeloperoxidase activity increased by 2.5-fold in $\text{Sp}^-/\text{fMLP}^-$ ($p \geq 0.95$), by 2.2-fold in $\text{Sp}^-/\text{fMLP}^+$ ($p \geq 0.95$), and by 1.7-fold in $\text{Ind}^+/\text{fMLP}^-$ ($p \geq 0.95$). However, myeloperoxidase activity remained unchanged in $\text{Ind}^+/\text{fMLP}^+$. **Conclusions.** The results indicate that grape pomace extract exerts a beneficial effect on inducible NO synthase activity, contributing to the regulation of diabetes-associated oxidative stress. Furthermore, the extract modulates both NADPH oxidase and myeloperoxidase activities, thereby enhancing bactericidal activity of leukocytes.

Keywords: diabetes mellitus, leukocytes, grape pomace extract.

Received: 28.05.2026; Accepted: 08.09.2026; Published: 29.09.2026

Citation: Sabadashka M.V., Sybirna N.O. (2026) Changes in functional activity of leukocytes under administration of grape pomace extract in rat model of diabetes mellitus. *Biopolymers & Cell*, Special issue(42), 84. <https://doi.org/10.7124/bc.000B8F>

© Publisher PH "Akademperiodyka" of the NAS of Ukraine, 2026. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited