



## Homocysteine induced upregulation of cell surface molecules in human peripheral blood mononuclear cells and U937 monocyte like cells

Yusuf ELMA\*<sup>1</sup>, İshak Özel TEKİN<sup>2</sup>, Nilgun SOLAK<sup>3</sup>, Tunç Hakan SİPAHİ<sup>4</sup> & Emine YILMAZ CAN<sup>1</sup>

<sup>1</sup>Department of Medical Pharmacology, Faculty of Medicine, Zonguldak Bülent Ecevit University, Kozlu 67600, Zonguldak, Turkey

<sup>2</sup>Department of Immunology, Faculty of Medicine, Zonguldak Bülent Ecevit University, Kozlu 67600, Zonguldak, Turkey

<sup>3</sup>Department of Dermatology, Ankara Memorial Hospital, Ankara 6690, Turkey

<sup>4</sup>Ministry of Health, Ankara 6690, Turkey

*Received 27 March 2025; revised 11 September 2025*

Hyperhomocysteinemia is recognised as an independent risk factor for atherosclerosis; however, its underlying mechanisms remain unclear. The chemotaxis and accumulation of leukocytes, including monocytes and T cells, are critical events in the initiation and progression of atherosclerosis. This study aimed to investigate the effects of homocysteine (Hcy) on activation markers in lymphocytes and monocytes by analysing cell surface molecules using human peripheral blood mononuclear cells (PBMCs) and U937 monocyte like cells. Flow cytometry was employed to assess the expression of CD3, CD11a, CD27, CD45, and HLA-DR in peripheral blood lymphocytes, as well as CD11a, CD11c, CD14, CD45, CD63, CD71, HLA-DR, and ICAM-1 (CD54) in peripheral blood monocytes following a 24-hour incubation with Hcy at concentrations of 5, 25, and 50 µg/mL. In addition, CD71 and ICAM-1 expression was evaluated in U937 cells after exposure to Hcy at 25, 50, 100, and 200 µg/mL. Treatment of PBMCs with Hcy resulted in a dose-dependent increase in CD11a, CD45, and HLA-DR expression on both lymphocytes and monocytes. Additionally, CD3 and CD27 were upregulated in lymphocytes, while CD11c, CD14, CD63, CD71, and ICAM-1 were upregulated in monocytes. Similarly, exposure of U937 cells to Hcy led to a significant, dose-dependent increase in CD71 and ICAM-1 expression. Homocysteine significantly enhances the expression of cell surface molecules involved in activation, inflammation, antigen presentation, and leukocyte extravasation in lymphocytes and monocytes. These findings suggest that homocysteine-induced activation of immune cells could play a role in the pathogenesis of inflammatory conditions such as atherosclerosis.

**Keywords:** Activation marker, Adhesion, Atherosclerosis, Flow cytometry, Immune cells, Inflammation