

Letter to the Editor



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The role of garlic in the prevention of ischemia-reperfusion injury: A new mechanism

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I read with great interest the article by Sener *et al.* [1]. They discuss that garlic inhibits migration of neutrophils. I would like to complete the discussion of Sener *et al.* [1] by introducing a major route through which garlic could suppress the activity of neutrophils.

The recent focus on ischemia-reperfusion injury has been on interaction between neutrophils and endothelial cells. The injury attributed to plugging of the microvasculature by neutrophils may initiate the cascade of injury by releasing free radicals, enzymes, and cytokines and physically injuring the endothelium and obstructing the capillaries, thus impairing oxygen supply to the tissue. Also transendothelial migration of neutrophils, with release of reactive oxygen species and cytokines, causes further damage to the injured tissue [2, 3]. However, a key component in the pathogenesis of reperfusion syndrome is the upregulation of surface adhesion molecules on the vascular endothelium and their subsequent interaction with the activated neutrophils [4]. The most important adhesion protein identified

on neutrophils is the integrin lymphocyte function-associated antigen-1 (LFA-1; CD11a/CD18), which is the ligand for intercellular adhesion molecule-1 (ICAM-1) expressed on the endothelium. The LFA-1/ICAM-1 interaction is crucial for the ingress of neutrophils into the inflammatory sites [5, 6]. Garlic downregulates the expression of ICAM-1 and LFA-1, and through binding to LFA-1, they interfere with ICAM-1–LFA-1 interaction [7, 8]. This important mechanism should be borne in mind as the major mechanism for garlic-induced inhibition of neutrophil activity.

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References

- [1] Sener, G., Sakarcan, A., Yegen, B. C., Role of garlic in the prevention of ischemia-reperfusion injury. *Mol. Nutr. Food Res.* 2007, **51**, 1345–1352.
- [2] Siemionow, M., Arslan, E., Ischemia/reperfusion injury: a review in relation to free tissue transfers. *Microsurgery* 2004, **24**, 468–475.
- [3] Askar, I., Oktay, M. F., Gurlek, A., Bac, B., Protective effects of some antineoplastic agents on ischemia-reperfusion injury in epigastric island skin flaps. *Microsurgery* 2006, **26**, 193–199.
- [4] Tosa, Y., Lee, W. P., Kollias, N., Randolph, M. A., May, J. W. Jr., Monoclonal antibody to intercellular adhesion molecule 1 protects skin flaps against ischemia-reperfusion injury: an experimental study in rats. *Plast Reconstr Surg.* 1998, **101**, 1586–1594.
- [5] Haskard, D. O., Lee, T. H., The role of leukocyte-endothelial interactions in the accumulation of leukocytes in allergic inflammation. *Am. Rev. Respir. Dis.* 1992, **145**, 10–13.
- [6] Chen, P. L., Easton, A., Apoptotic phenotype alters the capacity of tumor necrosis factor-related apoptosis-inducing ligand to induce human vascular endothelial activation. *J. Vasc. Res.* 2007, **45**, 111–122.
- [7] Son, E. W., Mo, S. J., Rhee, D. K., Pyo, S., Inhibition of ICAM-1 expression by garlic component, allicin, in gamma-irradiated human vascular endothelial cells via downregulation of the JNK signaling pathway. *Int. Immunopharmacol.* 2006, **6**, 1788–1795.
- [8] Rassoul, F., Salvetter, J., Reissig, D., Schneider, W., *et al.*, The influence of garlic (*Allium sativum*) extract on interleukin 1alpha-induced expression of endothelial intercellular adhesion molecule-1 and vascular cell adhesion molecule-1. *Phytomedicine* 2006, **13**, 230–235.

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