Heme Oxygenase as A Molecule Changing Traffic Light from Red (heme) to Green (biliverdin)

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Heme oxygenase (HO), which presents in all life forms from algae to human, is a vital and important enzyme because of its relationship with oxygen and its product carbon monoxide (CO). After its discovery in 1968(1), it has been realized that HO might have important functions beyond recycling heme. By degrading heme molecule to biliverdin, it also produces equimolar amounts of iron (Fe+2) and CO, which is a colorless, odorless diatomic gas like nitric oxide (NO) (Figure). Its similarity to NO is not only of their physicochemical but also functional properties. Since CO also behaves as a neurotransmitter and makes its action through both cyclic guanosine monophosphate (cGMP) dependent and cGMP independent pathways (2), recent studies focused on the role of HO in neurodegenerative diseases (3,4). In this issue of Disease and Molecular Medicine, a study by Cataloglu et al. (5) reports HO activity in patients with Alzheimer’s disease. Cataloglu et al. measured leukocyte HO activities in patients with Alzheimer’s disease and healthy controls. They found that HO activity in patients with Alzheimer’s disease was significantly higher than those in healthy controls. Since Cataloglu et al. use highly sensitive kinetic fluorometric measurement method for determination of HO activity, the reliability of their results is expected to be stronger than those studies using spectrophotometric

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techniques. With this study, it is demonstrated for the first time that changes in the peripheral levels of HO activity could be important in the pathogenesis of Alzheimer’s disease. However, whether increased HO activity contributes to disease progression or it is a protective response that limits neurodegeneration is not clear and future studies are needed to reveal the exact role of HO in Alzheimer’s disease.

In the future, HO could be the molecule of interest for both understanding disease mechanisms and developing new therapeutic approaches to the neurodegenerative disorders, especially for Alzheimer’s disease.

Conflict of interest statement

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References