

Reactive oxygen species and Covid-19

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EDITORIAL

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Reactive oxygen species (ROS) are compounds that commonly found in the body. Naturally, these compounds are produced by cells in a process of electron transport during energy formation or ATP production in mitochondria. Besides, ROS are also produced by immunological cells such as leukocytes (neutrophils) and macrophages to kill pathogens through NADPH oxidase pathway.¹

The body continually maintains ROS levels in a homeostasis state to prevent damages to DNA structure, proteins and lipids. In an adverse condition, ROS may induce activation of a transcription factor such as Nuclear factor-erythroid-2 related factor 2 (Nrf2). This activated protein will translocate to the intra-nuclear then attach to ARE. Eventually, it leads to activation of genes that play an essential role in antioxidants production. Therefore, adequate antioxidant production is needed to prevent damages to body cells induced by ROS.^{2,3}

SARS-COV2 infection (a virus that causes Covid-19) increases ROS levels that may occur through Nrf2 inhibition and activation of NF-KB pathway. The Nrf2 inhibition will reduce numbers of antioxidants, while activation of NF-KB will increase ROS production through the inflammatory process. Hence, high levels of ROS that are not matched by the production of these antioxidants will result in extensive damage to cells.⁴

Some comorbidities such as obesity, hypertension, Diabetes Mellitus (DM) and smoking may worsen the Covid-19 clinical presentation. Furthermore, these diseases also appear present with higher levels of ROS extracellularly due to its increased production along with decreased antioxidant production. Increased production of ROS in DM occurs from the formation of advanced glycation end products (AGEs) by hyperglycemia.⁵ Meanwhile, in smokers, their body had already contained pro-inflammatory agents, various compounds in cigarettes may directly enhance the ROS levels in the body.⁶ Another condition such as obesity, a chronic low-grade inflammatory process that is stimulated by adipokines will eventually increase the ROS levels.⁷ Also, hypertensive patients are commonly associated with high levels of ROS, accompanied by low levels of antioxidants.⁸ Therefore, the presence of comorbidities associated with elevated ROS levels will increase morbidity and mortality in patients with Covid-19.

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