



## Editorial

## Serum oxidative stress and chronic obstructive pulmonary disease



The classical definition of chronic obstructive pulmonary disease (COPD) is a chronic and progressive airflow limitation, secondary to sustained inflammation of the lungs due to inhalation of noxious particles. It is well-established that COPD is not only associated with pulmonary inflammation, but also with systemic inflammation. Oxidative stress has been determined to play a central role in the pathogenesis of COPD, and smoking is the primary environmental factor that can increase the likelihood that COPD may develop. However, only one third of smokers will develop COPD,<sup>1</sup> suggesting that the pathogenesis of COPD depends on the interaction between oxidants and antioxidants. Can et al<sup>2</sup> conducted a case-control study intended to analyze the role of oxidative stress and serum lipid level in patients with stable COPD to elucidate an important clinical question about the systemic oxidative stress and the progress of COPD. For decades, an imbalance between oxidants and antioxidants has been identified in smokers and COPD.<sup>3</sup> However, many studies focused on the oxidant/antioxidant imbalance of the pathogenesis of COPD, whereas less attention has been paid to the role of the serum lipid and ischemia modified albumin (IMA) levels associated with this condition. A previous epidemiological study<sup>4</sup> supported the relationship between COPD and atherosclerotic cardiovascular disease. Furthermore, the present study has demonstrated the importance of serum IMA and oxidized-low density lipoprotein (ox-LDL) in stable COPD patients. Can et al<sup>2</sup> discovered that serum IMA, ox-LDL and total oxidant status (TOS) were significantly increased and high density lipoprotein cholesterol (HDL-C) levels were significantly reduced in patients with COPD compared with healthy control subjects. Moreover, there was no statistical difference between COPD and healthy control subjects for the levels of serum total antioxidant status (TAS), triglycerides, total cholesterol, and LDL-C.

A growing body of evidence indicates that the oxidant/antioxidant imbalance plays a key role in enhancing chronic inflammation and development of COPD.<sup>5,6</sup> However, COPD patients do not manifest an atherogenic lipid pattern and their increased risk of atherosclerosis could be attributable to different factors.<sup>7,8</sup> The role of serum lipid profiles in COPD still remains controversial. The present study shows significantly higher serum IMA, TOS, ox-LDL, and lower HDL-C levels in stable COPD patients compared with controls; but this is not the case for serum triglycerides, total cholesterol,

and LDL-C levels. Therefore, we may hypothesize that the chronic pulmonary inflammatory component of COPD may play a central position in initiating systemic endothelial dysfunction through changes in serum oxidative stress rather than a modification of the serum lipid pattern. The significant correlation between the increased serum concentrations of oxidative parameters (IMA, ox-LDL, and TOS) and COPD severity according to the Global initiative for chronic Obstructive Lung Disease (GOLD) stages observed in this study, also supports the hypothesis that the regulation of oxidant/antioxidant balance could be affected in the disease progression of COPD patients.

Oxidative stress plays an important part in the pathogenesis of COPD. It is noteworthy that the present study showed elevated TOS and normal TAS levels in COPD patients. TAS was measured to evaluate the efficiency of all antioxidants. The major antioxidants in the lung include mucin, glutathione, uric acid, proteins (especially albumin), and ascorbic acid. Oxidants are produced in the lungs by inflammatory cells, especially neutrophils and macrophages. There is strong evidence that supports the idea of an increased burden of oxidants in the lungs of patients with stable COPD.<sup>3</sup> However, the overwhelming oxidative stress in COPD is caused by an increased burden of oxidants and an unequal level of antioxidants. In COPD patients, antioxidants are not enough to neutralize the excessive load of oxidants, since a normal TAS level is observed in this study. A previous study<sup>9</sup> also indicated that protective antioxidants are significantly depleted in alveolar macrophages of COPD patients.

IMA is a sensitive marker in acute ischemic conditions, especially in myocardial ischemia, skeletal ischemia, and stroke. It is now well-recognized that cardiovascular death contributes significantly to the mortality of COPD. This is the first study to evaluate the relationship between serum IMA and COPD patients. In the present study, IMA levels are increased positively in patients with GOLD stages II, III, and IV, compared with controls. Can et al<sup>2</sup> concluded that IMA is a useful marker for the evaluation of chronic inflammation and oxidative stress in COPD. The mechanism of increased serum IMA levels in COPD is not fully understood. Despite being a limited study, this research by Can et al<sup>2</sup> is an indication that serum IMA levels might be applied to evaluate the risk of COPD. More research is needed regarding the effect of hypoxia on serum IMA levels. The major limitation of the

present study was the small sample size, wherein only 51 patients with stable COPD were enrolled, so the results of this study need to be treated circumspectly. Future research is obviously required, but this is an exciting first step.

### Conflicts of interest

The authors declare that there are no conflicts of interest related to the subject matter or materials discussed in this article.

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