Smoking and Hypoxia: Contribution to vascular dysfunction in chronic obstructive pulmonary disease

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Chronic obstructive pulmonary disease (COPD) is considered one of the most common hypoxemic respiratory diseases and a major health concern worldwide. Current therapies alleviate the symptoms, although there are no effective treatments for its cardiovascular morbidities, particularly pulmonary hypertension. Although the main risk factor is smoking, it is unclear whether the hypoxic condition after the emphysema develops further contribute to the development of pulmonary hypertension. Previous results from our group have analyzed the direct effects of tobacco smoke and/or hypoxia on the pulmonary artery, focusing on smooth muscle cells. We observed alterations in the voltage-dependent K+ channel, an exacerbated production of reactive oxygen species and a diminished antioxidant response. This contributes in part to reducing the activation of the NO signaling pathway and, consequently, to reducing vasodilatation. We have delved into the molecular pathways involved in vascular impairment and addressed their contribution to calcium signaling and cellular contractile machinery in pulmonary arteries. In addition, we have investigated the possible counteraction of these effects to improve vascular tone homeostasis. Our findings reveal adverse effects on the contractile apparatus of pulmonary artery smooth muscle cells induced by tobacco smoke and hypoxia. The onset of these effects stems from heightened oxidative stress and calcium dysregulation.