



## Correspondence

## Angiotensin 1 and 2 levels in inhaled steroid using children with stable asthma



We read with great interest the article by Lee et al<sup>1</sup> recently published in the *Annals of Allergy, Asthma, and Immunology*. The authors analyzed plasma angiotensin-1 (Ang1) and Ang2 levels in patients with exacerbated asthma and stable asthma before starting use of medication. The study included adults, and the mean (SD) duration of asthma was 6.63 (3.6) years. They found that plasma Ang2 levels were higher and Ang1 levels were lower in patients with exacerbated asthma than in those with stable asthma. Plasma Ang2 levels were decreased in patients with stable asthma compared with healthy controls; however, no difference was found in Ang1 levels between patients with stable asthma and healthy controls. They also found that circulating Ang1 and Ang2 levels were correlated with the lung functions.

In our recent study, we evaluated serum Ang1 and Ang2 levels in children with asthma compared with healthy controls.<sup>2</sup> We found that serum Ang2 levels in children with stable asthma were not different than in healthy controls, and we did not find a correlation between Ang levels and lung functions. Our patients were all using inhaled steroids and had stable asthma. We think that steroids help to control not only Ang2 levels but also lung function. Our study included children using inhaled steroids, and the mean (SD) duration of asthma was 27.2 (23.3) months, which was lower than the level found in the work of Lee et al,<sup>1</sup> supporting that finding that age, duration of disease, and medication may have effect on Ang levels.

On the other hand, we found that Ang1 levels and the Ang1/Ang2 ratio were significantly lower in children with asthma compared with healthy controls, which was similar to the findings of the previous work that found Ang1 levels to be decreased in mice with asthma.<sup>3</sup> Simoes et al<sup>3</sup> speculated that during asthma, after an initial decrease, Ang1 levels increase to provide vascular integrity.

Tseliou et al<sup>4</sup> also found that Ang1 and Ang2 levels are affected according to severity of disease.

In conclusion, Ang1 and Ang2 levels seem to be changing according to age, duration of disease, severity of disease, and use of asthma medication. Differences in Ang1 and Ang2 results among studies may be attributable to adaptive mechanisms. As a process of adaptation, Ang1 and Ang2 levels may fluctuate according to age, duration or severity of disease, and asthma control treatment. Therefore, prospective studies that include both children and adults are needed to better understand the association between Ang levels and asthma.

Burcu Koksall, MD  
Ozlem Yilmaz Ozbek, MD  
Pediatric Allergy Department  
Baskent University  
Ankara, Turkey  
burcukoksall23@yahoo.com

## References

- [1] Lee PH, Kim BG, Seo HJ, et al. Circulating angiotensin-1 and -2 in patients with stable and exacerbated asthma. *Ann Allergy Asthma Immunol*. 2016;116:339–343.
- [2] Koksall BT, Ozbek OY, Bayraktar N, Yazici AC. Evaluation of angiotensin 1 and 2, vascular endothelial growth factor, and tumor necrosis factor alpha levels in asthmatic children. *Allergy Asthma Proc*. 2014;35:482–488.
- [3] Simoes DC, Vassilakopoulos T, Toumpanakis D, Petrochilou K, Roussos C, Papapetropoulos A. Angiotensin-1 protects against airway inflammation and hyperactivity in asthma. *Am J Respir Crit Care Med*. 2008;177:1314–1321.
- [4] Tseliou E, Bakakos P, Kostikas K, et al. Increased levels of angiotensins 1 and 2 in sputum supernatant in severe refractory asthma. *Allergy*. 2012;67:396–402.

## Angiotensin 1 and 2 levels in children with stable asthma using inhaled steroids



We thank Dr Koksall and colleagues for their comments on our article.<sup>1</sup> Angiotensin (Ang1) is a secreted glycoprotein ligand produced by periendothelial mural cells<sup>2</sup> and is expressed in perivascular cells, smooth muscle cells, mesenchymal cells, myocardium, neuronal cells, and tumor cells. It functions as a ligand for the

receptor tyrosine kinase Tie2.<sup>2</sup> The distribution of ang1 is widespread in the normal adult vascular system, mainly resulting from production by pericytes,<sup>2</sup> although other cells, such as neutrophils and monocytes, can also generate ang1.<sup>3</sup> In contrast, Angiotensin 2 (Ang2) is expressed in endothelial cells, stored in Weibel-Palade bodies, and released rapidly in response to the presence of vascular inflammation, vessel remodeling, and histamine,<sup>4</sup> as well as a localized hypoxia.<sup>5</sup>

**Disclosures:** Authors have nothing to disclose.

**Funding Sources:** This study was supported by the Soonchunhyang University Research Fund.

<http://dx.doi.org/10.1016/j.anai.2016.07.031>

1081-1206/© 2016 American College of Allergy, Asthma & Immunology. Published by Elsevier Inc. All rights reserved.