

Correspondence

Airborne particulate matter-associated endotoxin and proinflammatory responses

To the Editor:

The review article by Bauer et al¹ is an excellent summary of the state of the art on the role of innate immunity in air pollution-associated disease pathophysiology. However, the statement “In the context of PM, endotoxin contamination is likely one constituent that induces TLR signaling” requires further explanation.

Endotoxin is associated with ambient particulate matter (PM),² biomass burning smoke,³ and cigarette smoke.⁴ The source of endotoxin in ambient PM is associated with airborne bacteria, which are not a contamination of PM, but bacteria are very much part of the PM. Ambient endotoxin could indicate the presence of bacteria in sources such as soil dust and biomass, which contribute to PM. Ambient PM contains a significant proportion of biological particles (16%), and the fact that these components might be involved in the activation of innate immunity is neglected in the review.¹ The article cites Doz et al⁵ to show that endotoxin in cigarette smoke is not involved in the activation of Toll-like receptor (TLR) 4. Doz et al⁵ used a mouse model to study the activation of TLR4 by cigarette smoke. In the absence of supporting information, the mouse model might not be a representative model for human subjects, especially at low endotoxin concentrations.⁶ Also, Kampfrath et al⁷ reported a significant presence of endotoxin in mouse bronchoalveolar lavage fluid, and therefore a mouse model previously exposed to endotoxin might not be sensitive to low-level endotoxin in cigarette smoke. Hence, Doz et al⁵ might not support the claims by the authors.

We agree that there could exist a secondary pathway for TLR4 activation, but neglecting the role of biological components of PM, such as endotoxin (pattern recognition receptor ligands), in the innate immunity activation with the current evidence provided

in the review may not be exact. The article by Bauer et al¹ provides an excellent summary of the innate immunity pathways involved in air pollution. However, the review lacks the references to the studies related to the biological components of PM and their likely significance in innate immunity activation.

S. Gangamma, MTech^{a,b}

From ^athe Centre for Environmental Science and Engineering, Indian Institute of Technology Bombay, Mumbai, India, and ^bthe Department of Chemical Engineering, National Institute of Technology Karnataka, Surathkal, India. E-mail: gangamma@gmail.com.

Disclosure of potential conflict of interest: S. Gangamma declares that she has no relevant conflicts of interest.

REFERENCES

1. Bauer RN, Diaz-Sanchez D, Jaspers I. Effects of air pollutants on innate immunity: the role of Toll-like receptors and nucleotide-binding oligomerization domain-like receptors. *J Allergy Clin Immunol* 2012;129:14-24.
2. Tager BI, Frederick WL, Haight T, Alcorn S, Penfold B, Hammond SH. Temporal and spatial patterns of ambient endotoxin concentrations in Fresno, California. *Environ. Health Perspect* 2010;118:1490-6.
3. Semple S, Devakumar D, Fullerton DG, Thorne PS, Metwali N, Costello A, et al. Airborne endotoxin concentrations in homes burning biomass fuel. *Environ Health Perspect* 2010;118:988-91.
4. Hasday JD, Bascom R, Costa J, Fitzgerald T, Dubin W. Bacterial endotoxin is an active component of cigarette smoke. *Chest* 1999;115:829-35.
5. Doz E, Noulon N, Boichot E, Guénon I, Fick L, Bert ML, et al. Cigarette smoke-induced pulmonary inflammation is TLR4/MyD88 and IL-1R1/MyD88 signaling dependent. *J Immunol* 2008;180:1169-78.
6. Copeland S, Warren HS, Lowry SF, Calvano SE, Remick D. Acute inflammatory response to endotoxin in mice and humans. *Clin Diagn Lab Immunol* 2005;12:60-7.
7. Kampfrath T, Maisseyeu A, Ying Z, Shah Z, Deiluiis JA, Xu X, et al. Chronic fine particulate matter exposure induces systemic vascular dysfunction via NADPH oxidase and TLR4 pathways. *Circ Res* 2011;108:716-26.

<http://dx.doi.org/10.1016/j.jaci.2012.07.033>