

Characteristics of Airborne PM_{2.5} from Nursery Pig House and its Mechanism of Inducing Inflammatory Response in Alveolar Macrophages

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Abstract – The microorganisms contained in PM_{2.5} from livestock houses can spread over long distances through airborne transmission. Fine particulate matter (PM_{2.5}) from livestock houses is harmful not only to the health and welfare of animals but also to the farmers working inside. As an important pollution source in the atmosphere environment, PM_{2.5} can threaten public health. PM_{2.5} collected from nursery pig house was studied. It included particulates of various morphologies, and the concentration of endotoxin was as high as to 681.80 EU/mg. To investigate the ability of PM_{2.5} from the nursery pig house to induce an immune response, porcine alveolar macrophages 3D4/21 cells were studied. The results showed that PM_{2.5} can induce cell death, ROS production and inflammatory cytokines release (IL-1 β , IL-18, TNF- α and COX-2) by activating TLR4/MyD88 pathway and NLRP3 inflammasome. Furthermore, the downstream signaling pathways of TLR4/MyD88, MAPK and NF- κ B, participated in NLRP3 inflammasome activation. To further study the role of endotoxin present in PM_{2.5} and the oxidative stress induced by PM_{2.5}, polymyxin B (PMB) and N-acetylcysteine (NAC) were used to neutralize the effects of the endotoxin and inhibit the production of ROS, respectively. The results showed endotoxin and ROS played important roles in PM_{2.5}-induced immune responses. This study suggests that PM_{2.5} from pig house is a significant risk for immune response in alveolar macrophages.

Keywords: PM_{2.5}; Airborne microorganisms; Pig house; Alveolar macrophages