

PM_{2.5} from a Nursery Pig House Induced Immune Response by Activating TLR4/MAPK/NF-κB Pathway in Alveolar Macrophages

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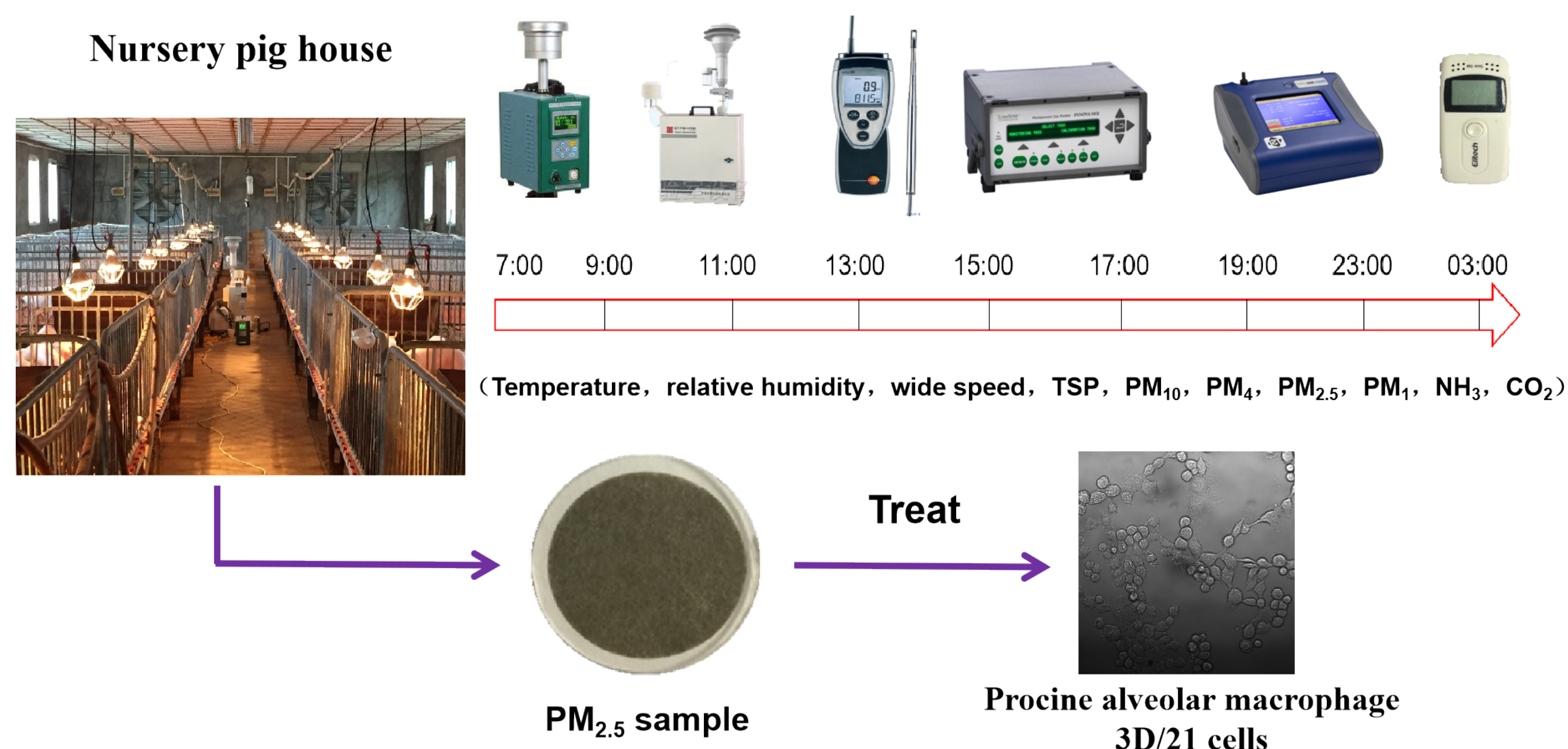


Introduction

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. The present study was aimed to investigate that the concentration of PM_{2.5} inside nursery pig house and the correlation with environmental factors, and explore the mechanism of PM_{2.5}-induced immune response in alveolar macrophages.

Materials and Methods

The environmental factors were monitored inside and outside the nursery pig house for consecutive seven days and the PM_{2.5} samples were collected for studying the mechanism of PM_{2.5}-induced immune response in alveolar macrophages.



Results

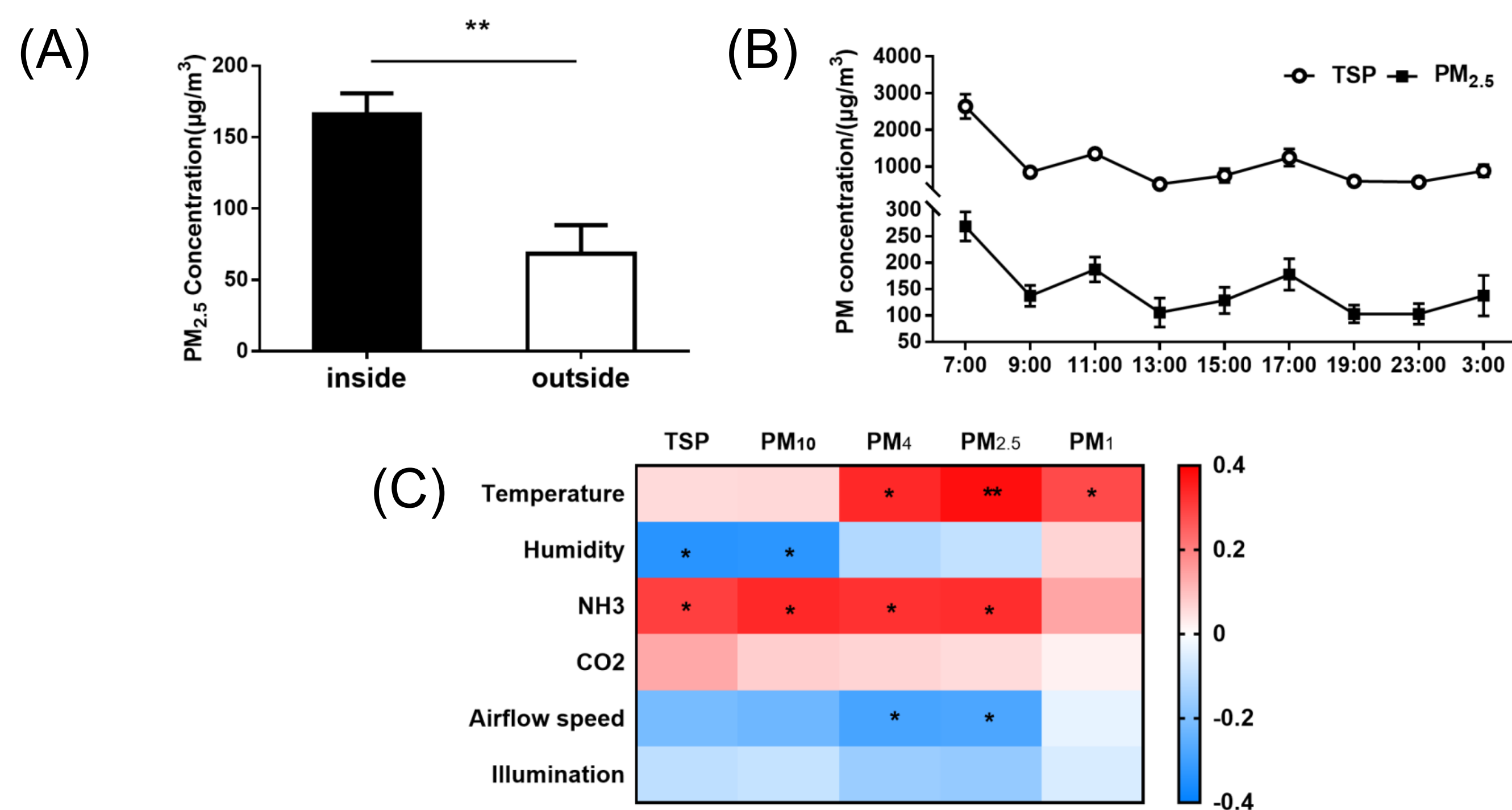


Figure 1. PM_{2.5} concentration inside the nursery pig house (A, B) and the correlations with other environmental factors(C). **p* < 0.05 and ***p* < 0.01.

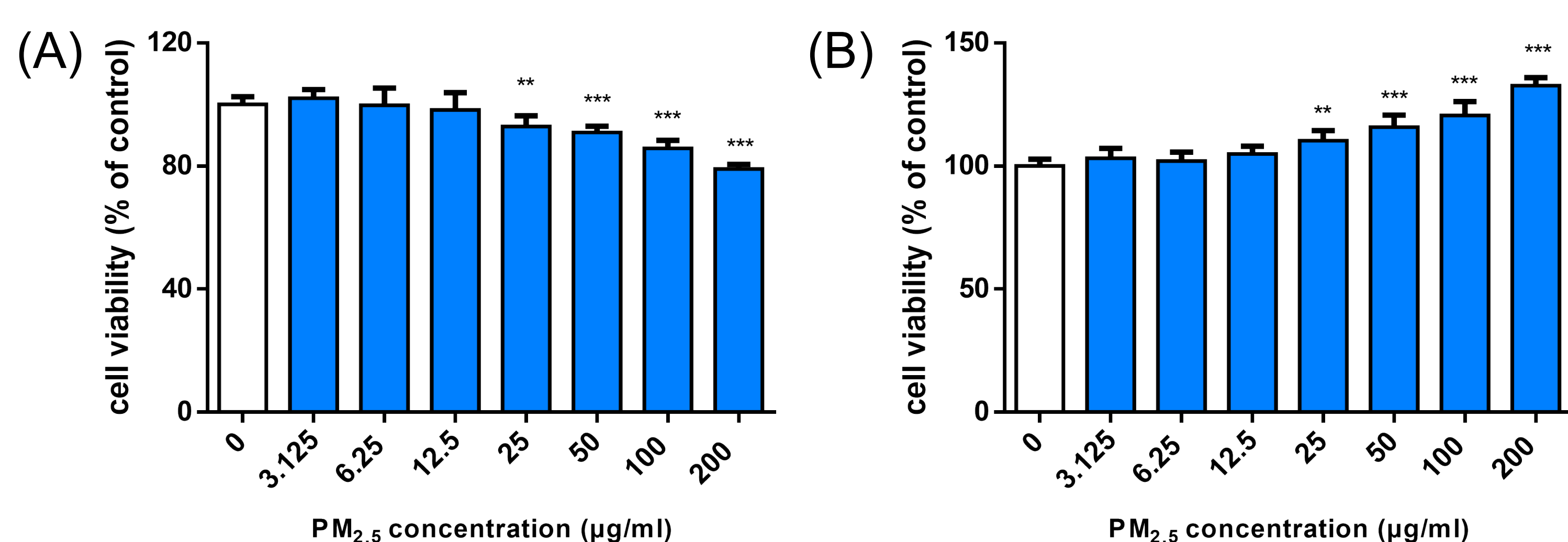


Figure 2. Effects of PM_{2.5} on cell viability (A) and LDH release (B). Compared with control group, **P* < 0.05, ***P* < 0.01, ****P* < 0.001.

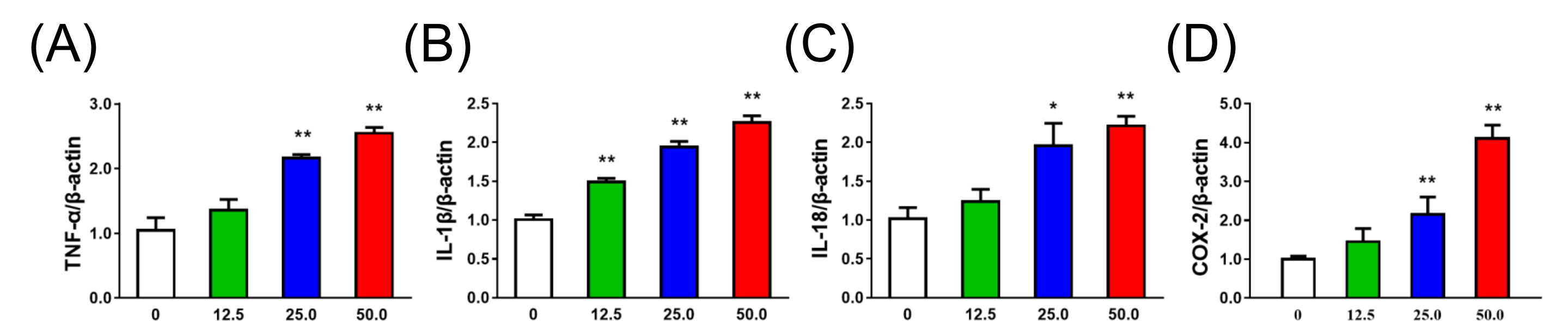


Figure 3. PM_{2.5} promoted production of proinflammatory cytokines in 3D4/21. mRNA expression levels of TNF-α(A), IL-1β(B), IL-6(C) and IL-8(D) were detected by RT-qPCR. **p* < 0.05 and ***p* < 0.01.

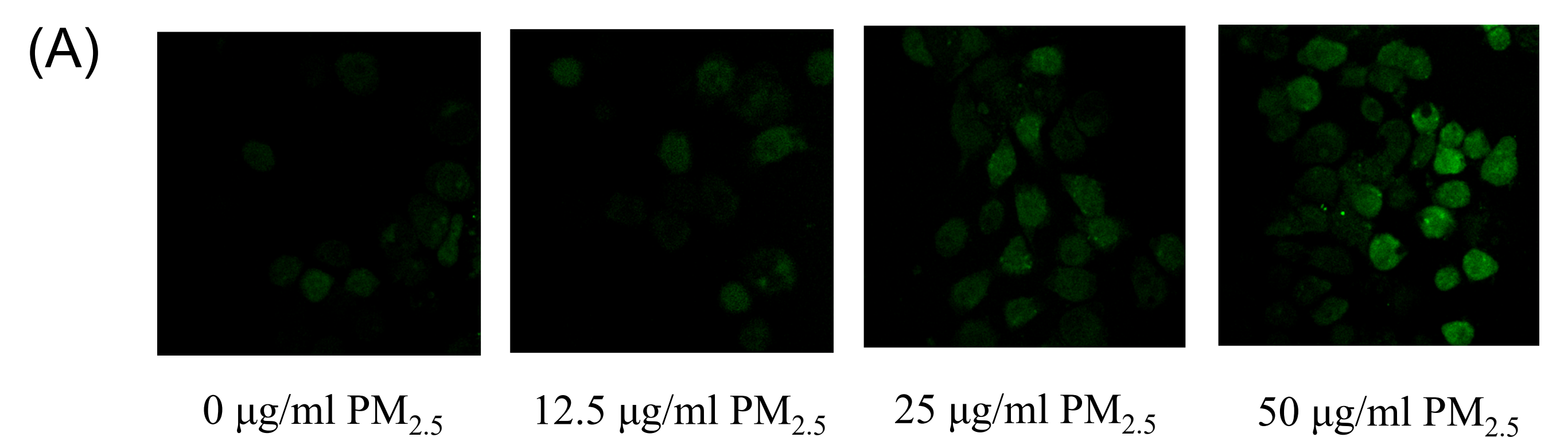


Figure 4. PM_{2.5} promoted production of ROS in 3D4/21. Intracellular ROS was determined by fluorescence microscopy.

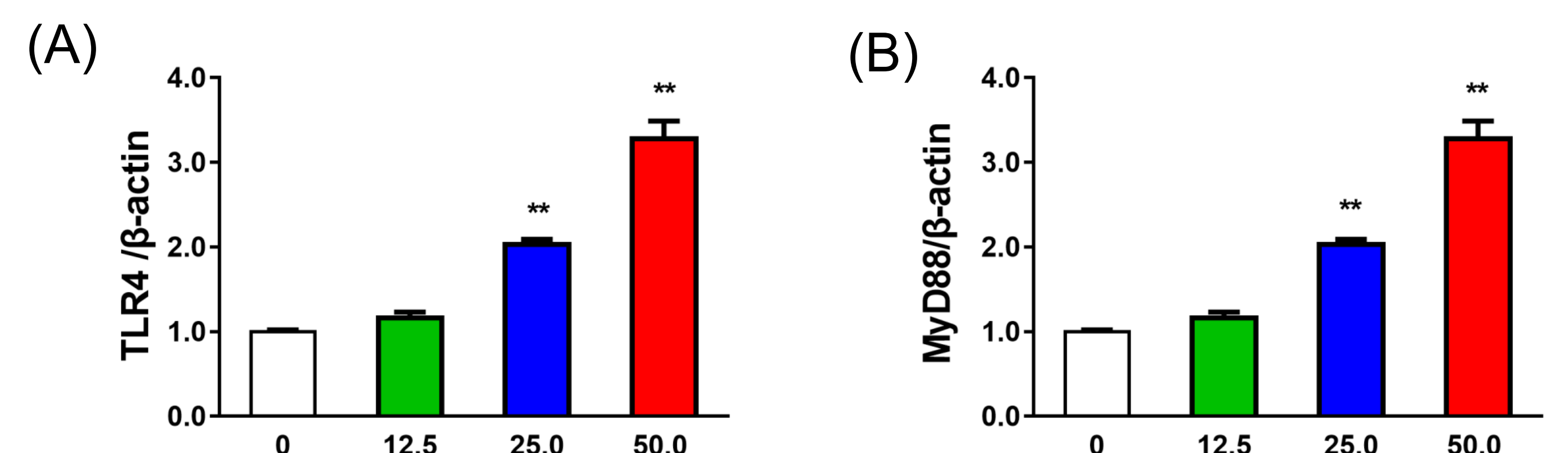


Figure 5. PM_{2.5} increased mRNA expression levels of TLR4 and MyD88 in 3D4/21. **p* < 0.05 and ***p* < 0.01.

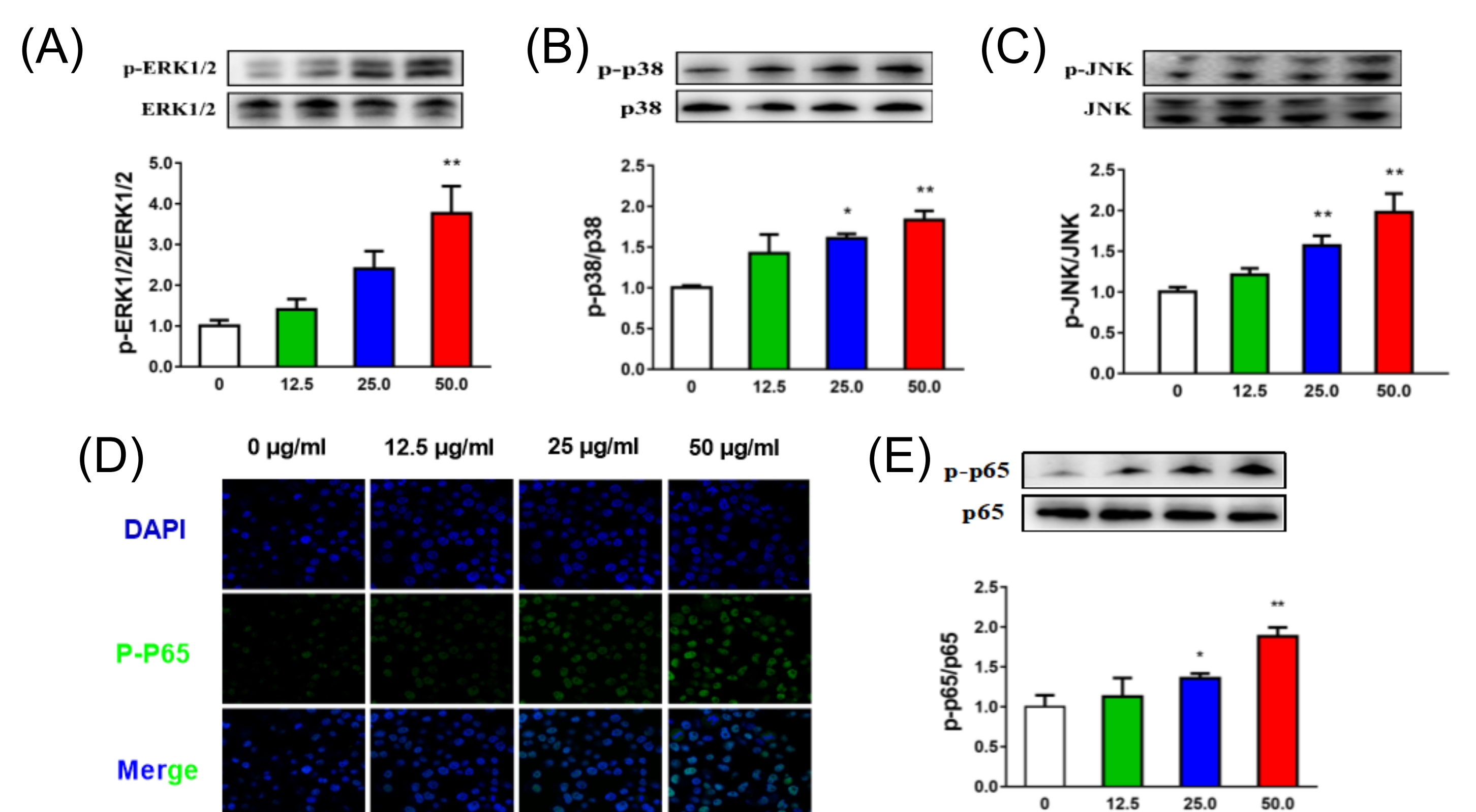


Figure 6. PM_{2.5} activated MAPK and NF-κB pathway in 3D4/21. Protein expression levels of p-ERK1/2(A), p-p38(B), p-JNK(C) and p-p65 (D, E). **p* < 0.05 and ***p* < 0.01.

Conclusions

- The PM_{2.5} concentration inside the nursery house was significantly higher than that outside the house and peaked at the feeding and cleaning time for pigs.
- The concentrations of different-sized particles were correlated with the environmental factors.
- TLR4/MAPK/NF-κB pathway was involved in the immune response induced by PM_{2.5} in alveolar macrophages.

Acknowledgement

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