



The Acquisition of Food Allergies: Exploring Airway Sensitization to Peanut in a Mouse Model



Ashley Habig, Andrew Turner, Mike Kulis, Johanna Smeekens

The University of North Carolina at Chapel Hill, UNC School of Medicine, Division of Pediatric Allergy and Immunology, Chapel Hill, NC

Overview & Background

- Over 33 million Americans suffer from food allergies, with approximately 6.1 million people having a peanut allergy¹
- The development of food allergies has been heavily studied by researchers in recent years
- Current research using mouse models has shown that intratracheal treatment of Peanut (PN) + House Dust Extract (HDE) leads to allergy^{2,3,4}
- This research examines various concentrations of PN (alone, and with HDE) via intranasal treatment to determine which dose is most effective in creating an allergic response
- Negative controls, using PBS, have been previously established using an identical experimental setup and intranasal sensitization schedule

Methods

- 6-week old C57BL/6J female mice were sensitized with intranasal (i.n.) treatment of PN or PN + HDE with varying concentrations twice per week for 2 weeks.
- Mice were challenged by intraperitoneal (i.p.) injections of peanut
- Blood samples were collected to quantify peanut-specific IgE, IgG1, and IgG2c present after sensitization
- An allergic response was defined as a body temperature drop of 3°C, and/or a significant amount of peanut-specific IgE or IgG1 present in blood samples

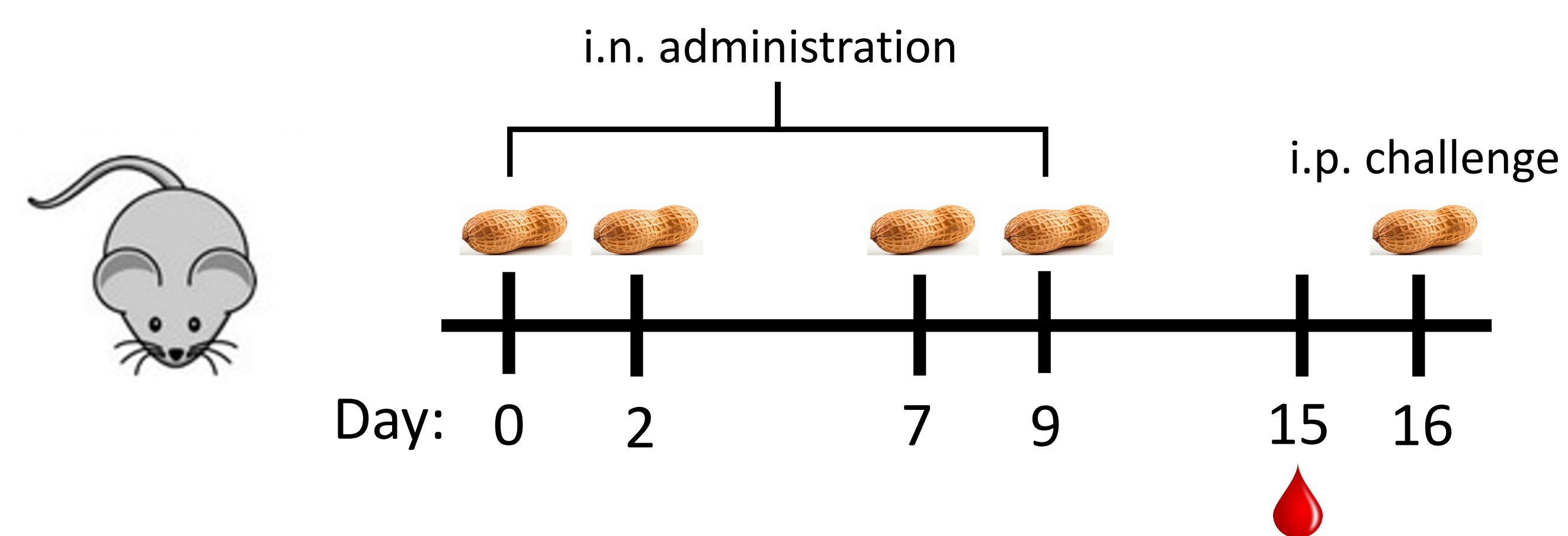


Figure 1. Timeline of experimental procedure involving airway sensitization to various levels of peanut (PN) alone or with house dust extract (HDE) in mice.

Results

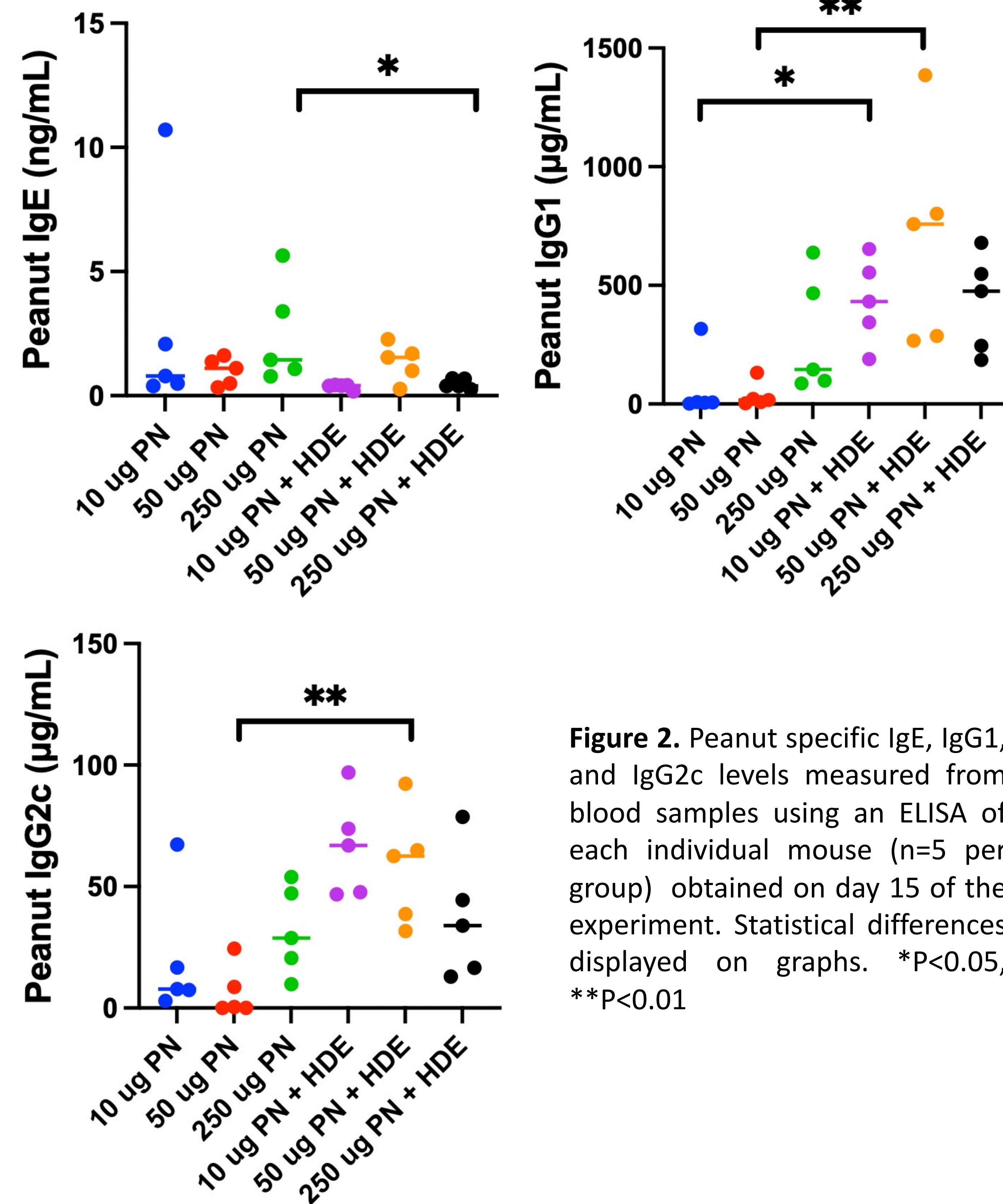


Figure 2. Peanut specific IgE, IgG1, and IgG2c levels measured from blood samples using an ELISA of each individual mouse (n=5 per group) obtained on day 15 of the experiment. Statistical differences displayed on graphs. *P<0.05, **P<0.01

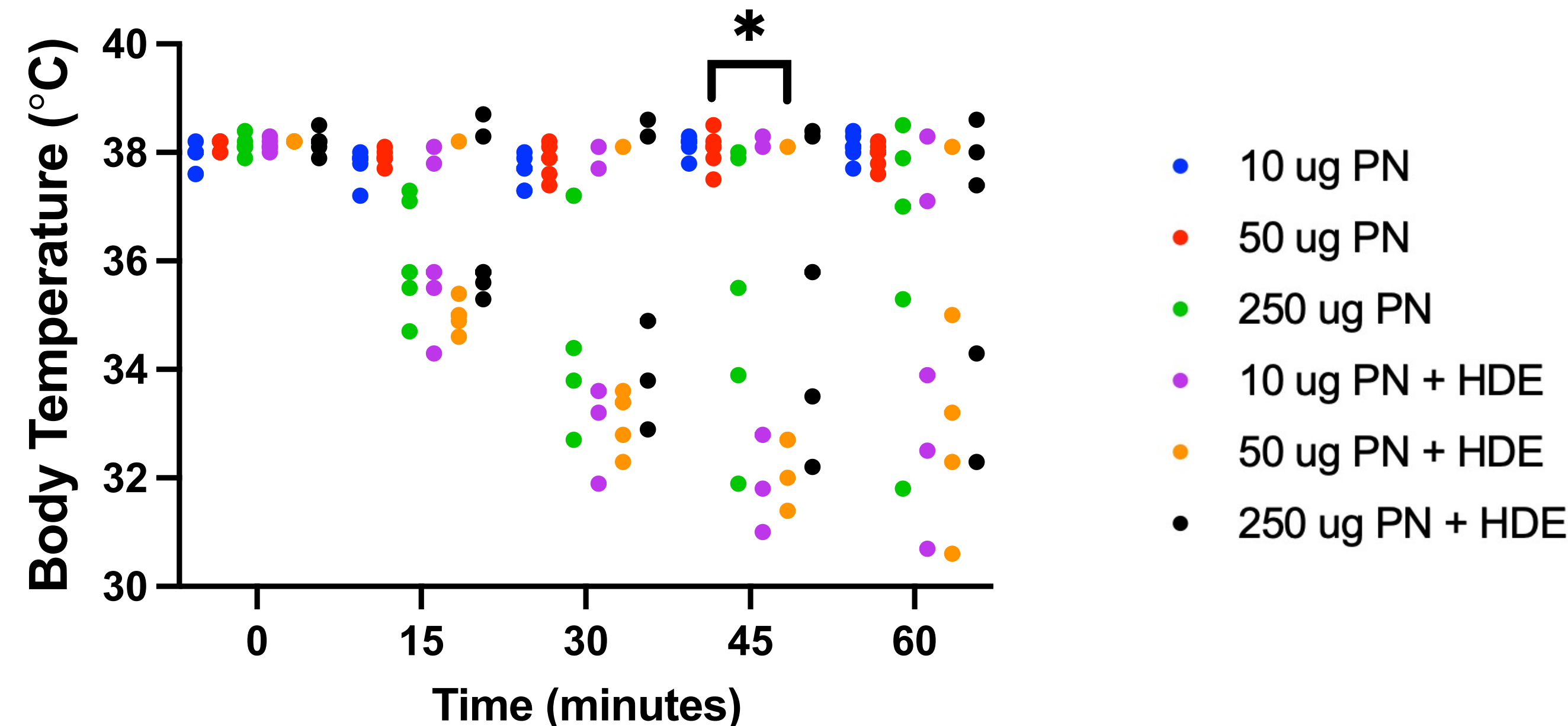


Figure 3. Individual core body (rectal) temperatures of each mouse (n=5 per group) obtained over a 60-minute duration beginning immediately after PN i.p. challenge. *P<0.05

Results (continued)

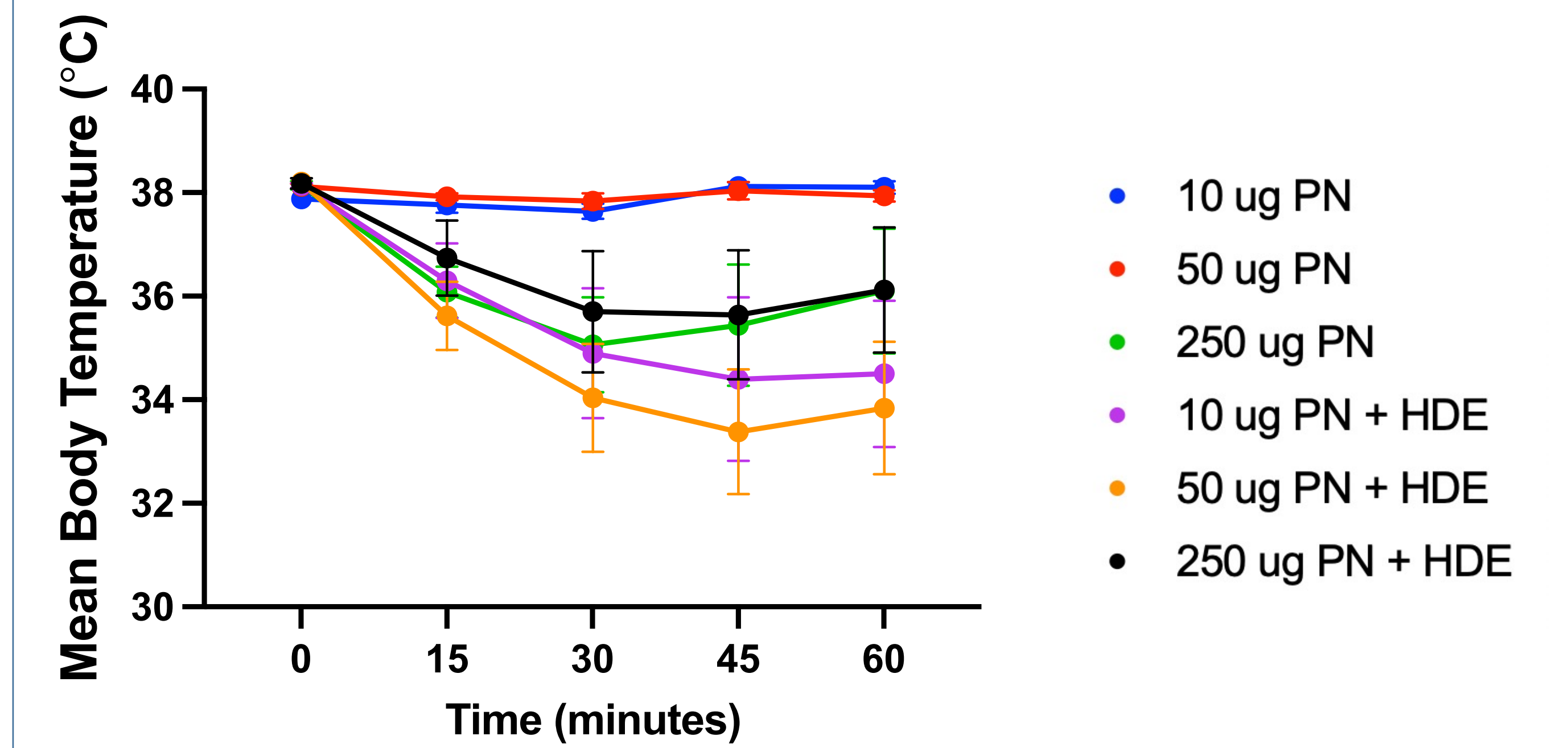


Figure 4. Mean core body (rectal) temperatures obtained over a 60-minute duration beginning immediately after PN i.p. challenge. Data is represented as Mean ± SEM.

Conclusions

- Based on the peanut-specific IgE and IgG1 levels, the 50 ug PN + HDE treatment was the most effective in sensitizing the mice to PN
- Mice sensitized with the 50 ug PN + HDE treatment had the largest drop in body temperature throughout the PN challenge
- Lower doses of PN alone did not lead to sensitization through the airway, while the 250 ug PN treatment did lead to PN sensitization
- Future experiments should investigate increasing the number of treatments given over a longer period of time, sex differences in sensitization, and using different sensitizing foods

References

- FARE – Food Allergy Research and Education
- Kulis, et al. *Journal of Allergy and Clinical Immunology*, 2021
- Smeekens, et al. *Clinical & Experimental Allergy*, 2019
- Smeekens, et al. *Journal of Allergy and Clinical Immunology*, 202