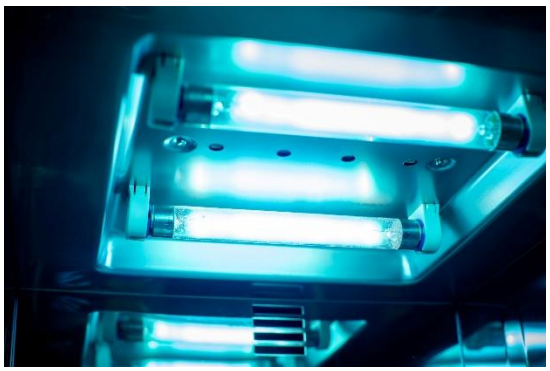
Common Allergens and Asthma Triggers Disrupts by Far-UV at 222 nm

Airborne allergens, or aeroallergens, can cause respiratory allergies and asthma. A recent study examined the impact of far-ultraviolet (UV) radiation on the immunogenicity of several common aeroallergens, hoping to find a preventative intervention.



Study

The researchers developed a controlled chamber model containing 10 m3 of air. They generated airborne allergens within the chamber using those commonly linked to patient sensitization, allergy, and asthma. The chamber was set to a relative humidity of 60% since allergens derived from mold and dust mites thrive in such an environment.

The allergens used included:

- Der p 1 (European house dust mite)
- Der f 1 (American house dust mite)
- Can f 1 (domestic dog)
- Fel d 1 (domestic cat)
- Phl p 5 (Timothy grass)
- Bet v 1 (European white birch)
- Asp f 1 (Aspergillus fumigatus, a common mold)

Aeroallergens were introduced from either dustborne or purified sources. The aeroallergen-bearing particles in the air were then collected and measured. The particle size distribution was also checked for allergen enrichment at any fraction.

UV222 exposure of the whole chamber was provided. Still, it was set below the threshold for skin and eye exposure, as per the American Conference of Governmental Industrial Hygienists (ACGIH) standards. Ozone levels generated by the radiation were also monitored.

Results

As expected, over 99% of aeroallergens in the experimental chamber were 10 µm or smaller. No single allergen was concentrated within any particle size range. Interestingly, some aeroallergens were more stable in the air than others, likely due to intramolecular interactions and interactions with the surrounding environment. Future research should examine how this stability influences the risk of inhalation.

Allergen levels at baseline were about 50-200 ng/m3 in the controls and the UV chamber, reflecting clinically observed respirable air allergen levels. UV222 irradiation significantly reduced the average aeroallergen load by 20% to 25%. Most of the reduction occurred within 30 minutes of treating the air.

Comparing all aeroallergens, dustborne allergens decreased faster, on average, than airborne ones, after UV222 treatment. The most significant reduction was seen with the birch allergen Bet v 1. The least affected was Fel d 1, from dustborne and purified sources. However, it became much more vulnerable to UV222 after stabilizing components like Tween-20 were removed from the purified airborne form.

The finding of borderline significant ozone exposure levels indicates the need for ozone monitoring during ultraviolet irradiation in confined conditions. However, the ozone generated during the experiment did not significantly reduce allergen levels.

Not only did clinically relevant reductions in aeroallergen loads occur, but they occurred within feasible time periods. Regarding allergen decrease, the reductions are comparable to those reported in long-term allergy studies, though the paper stresses that clinical outcomes were not directly tested here.

The authors interpret these results cautiously, suggesting that UV222 likely disrupts protein structure and reduces immunoassay detection of allergens, which may also reduce IgE-epitope recognition in the body, but this requires further study.

This is the first study to use common aeroallergens in a controlled setting at concentrations similar to real-world allergy-causing levels in the air. These new methods should help understand airborne allergens' movement and availability in respired air. They could thus help in framing effective interventions and preventive measures.

Conclusion

“These findings suggest that UV222 exposure can reduce allergen immunorecognition within respirable particles, supporting its use as an integrated strategy for indoor aeroallergen control.” Further research is required to understand how this is associated with a clinically relevant reduction in symptoms in sensitized or allergic individuals.

Source:

https://www.news-medical.net/news/20250924/Far-UV-at-222-nm-disrupts-common-allergens-and-could-ease-asthma-triggers.aspx