



## Preliminary Study of House Dust Mites

To our knowledge, this is the first controlled experiment which demonstrates allergen consumption by microbes. Therefore, when betterair approach us to test multiple kinds of allergens syntzised by Indoor Micro

Dust Mite allergen - Der p2, is one of the most clinically relevant allergen worldwide<sup>2,3</sup>, and known to be a major source of allergies including Asthma of both young age and adults

Indoor Biotechnologies have incubated Betterair's Enviro- Biotics® with Dust Mite of Der p2 for an 8-days period. Indoor Biotechnologies quantified the concentration of the allergens over time with their professional allergen analysis technology- MARIA®<sup>4</sup>. This report summarizes the preliminary experiment results.

### **Objective**

The trial's objective was to evaluate the efficacy of Enviro-Biotics® in degrading various indoor allergens under controlled experimental conditions, where Dust Mite allergens has been chosen as the first and preliminary experiment.

### **Rationale**

Better Air has a patented bacterial system that degrades the allergens in an indoor environment, by using them as a nutrient.

### **Methods**

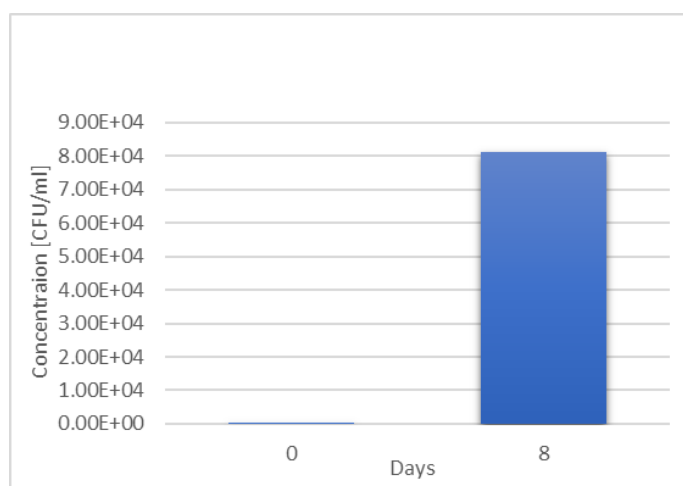
Indoor Biotechnologies used standard laboratory tubes as the controled environment. They added to each tube a small portion of our Enviro-Biotics® (only 100-200 bacteria as a starting point) and a measured portion of allergen in a scale of thousands of nanograms of each allergen (Der p2: Catalog No. NA-DP2-1). The tubes were incubated in room temperature for 8 days, and samples were taken for testing bacterial concentration (using a classic microbiology method) and allergen concentration (using the INDOOR MARIA® assay, method used: MARIA SOP-001 ver.1.3).

### **Results and Discussion**

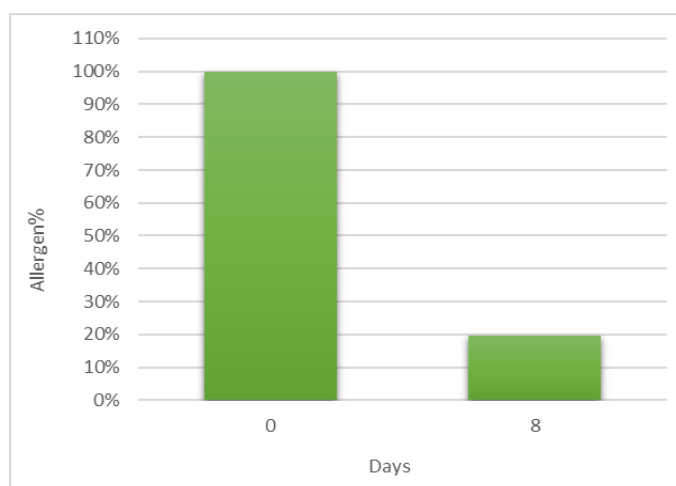
Figure 1 shows that the bacterial growth of the Enviro-Biotics® was 135 fold higher at day 8 with derp2.

As demonstrated in figure 2, the Enviro-Biotics® consumed the allergens and decreased the allergen concentration dramatically. In Fig. 2, the Der p2 concentration was almost below the detectable limit at day 8.

A single probiotic application has decreased the allergen concentration by 80% with Dust Mite Der p2 respectively within 8 days.



**Figure 1:** Enviro-Biotics® concentration over time after incubation with Dust mite (Der p2) Allergen



**Figure 2:** Dust mite (Der p2) Allergen concentration over time after incubation with Enviro-Biotics®

### **The Interpretations of Indoor Biotechnologies**

1. Since allergens were the only available source of nitrogen for enabling bacterial growth, our observations support Better Air's view that these bacteria can grow with allergen as a source of nitrogen.
2. The difference in the growth rate of bacteria with Der p2, correlates well with the rate of allergen decrease.

## **Conclusion**

Enviro-Biotics® can grow and prosper by using allergens as a nutrient source, hence dramatically decrease the concentration of allergens and reduce the pathogenic effects of ubiquitous indoor allergens on human residents.

## **References**

1. Indoor Biotechnologies website, <https://inbio.com/>
2. Calderón, Moisés A., et al. "Respiratory allergy caused by house dust mites: what do we really know?" *Journal of Allergy and Clinical Immunology* 136.1 (2015): 38-48.
3. Cao, Tuo, et al. "High-level expression and purification of the major house dust mite allergen Der p 2 in *Escherichia coli*." *Protein expression and purification* 121 (2016): 97-102.
4. MARIA® by Indoor Biotechnologies, <https://inbio.com/maria-service-partners>