



## Sensitization to Bee Venom in Portuguese Non-Allergic Beekeepers

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### ABSTRACT

Hymenoptera venom is one of the main causes of anaphylaxis. Beekeepers are a group at risk of developing allergic bee sting reactions. The objective of this study was to evaluate the sensitization to bee venom in beekeepers without any history of systemic reactions to bee stings. A total of 64 beekeepers denied systemic reactions to bee stings participated and 59% of them had positive intradermal skin tests with bee venom. So regular exposure to bee venom in these individual, may confer greater tolerance and thus reduce the risk of systemic allergic reactions to stings.

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Beekeepers; Bee venom;  
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### Introduction

The prevalence of hymenoptera stings in the general population ranges from 56.6% to 94.5%, and it may vary according to the location and the climatic conditions whereas the estimated prevalence of hymenoptera venom allergy is approximately 5% [1]. Allergy to Hymenoptera venom including honey bee (*Apis mellifera*) is one of the main causes of anaphylaxis both in adults and children [2]. In professionals such as beekeepers, gardeners, farmers, truck drivers, and masons, venom allergy is considered as an occupational allergy and its occurrence exceeds that of the general population due to higher exposure to the respective insect [3]. Beekeepers and their family members are especially at risk of developing allergic sting reactions. Reported data suggests that 17-43% of beekeepers are allergic to bee venom and definite risk factors are the first years of beekeeping, fewer than 10 annual bee stings, high skin sensitivity and serum-specific IgE to bee venom and low serum venom-specific IgG as well as a history of atopy [2-4].

The objective of this study was to evaluate the sensitization to bee venom in beekeepers without any history of systemic reactions to bee stings.

### Methods

#### Participants

Subjects were eligible for inclusion if they were

beekeepers, at least 18 years old, able to consent and did not have a history of sting-induced systemic reactions. The participants were recruited during a beekeeping meeting in 2018. This article complies the principles of the Declaration of Helsinki.

#### Questionnaire

A structured questionnaire was used to collect demographic data and history of atopic diseases (atopic dermatitis, allergic rhinoconjunctivitis and/or allergic asthma) or any other medical condition, duration of beekeeping, the use of protective suits and information on previous Hymenoptera stings (number and local of stings, time interval to last sting, history of large local or systemic sting reactions). Large local reactions were defined as greater than 10 cm in diameter and persistence for more than 24 hours [5]. Subjects reporting systemic sting reactions were excluded from evaluation.

#### Prick and intradermal skin tests

Skin prick tests were performed with aeroallergens (*Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, cultivated and wild grasses, *Olea europaea* and *Parietaria judaica* and intradermal tests with bee venom at two concentrations, 0.1 and 1 µg/mL.

#### Statistics

Statistical analysis was performed with SPSS version 24 for Windows (SPSS Inc., Chicago, Ill). Interval-

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scaled data are presented as median and interquartile range (IQR). Ordinally and categorically scaled data are reported as absolute and relative frequencies and  $P < 0.05$  were considered statistically significant.

## Results

A total of 64 beekeepers without any history of systemic reactions to bee stings agreed to participate. Fifty-two (81%) were male, with a median age of 46 ( $\pm 15$ ) years. Four (6%) reported asthma and 9 (14%) rhinitis. Duration of beekeeping activity was as follows: 5 (8%) under 1 year, 10 (16%) 1 to 2 years, 18 (28%) 2 to 5 years, 13 (20%) 5 to 10 years and 18 (28%) longer than 10 years (Table 1). With respect to the use of protective suits, 83% reported that they always wore them; 14%

sometimes wore them and 3% admitted not using any protective gear.

**Table 1.** Duration of beekeeping activity

DURATION OF BEEKEEPING ACTIVITY				
<1 year	1-2 years	2-5 years	5-10 years	>10 years
5 (8%)	10 (16%)	18 (28%)	13 (20%)	18 (28%)

Skin prick tests with common aeroallergens were positive to *D. Pteronyssinus* in 9%, cultivated grass pollens 8%, wild grass pollens 9%; olive tree (*Olea europaea*) 5% and *Parietaria judaica* 2% (Table 2).

SKIN PRICK TESTS WITH COMMON AEROALLERGENS					
<i>D.Pteronyssinus</i>	<i>D. Farinae</i>	<i>Cultivated grasses</i>	<i>Wild grasses</i>	<i>Olea europaea</i>	<i>Parietaria judaica</i>
Positive-9%	Positive-9%	Positive-8%	Positive-9%	Positive-5%	Positive-2%
Negative-91%	Negative-91%	Negative-92%	Negative-91%	Negative-95%	Negative-98%

**Table 2.** Skin prick tests with common aeroallergens

Of the total, 38 (59%) had positive IDT with bee venom; 1 (26%) positive with 0.1  $\mu\text{g}/\text{mL}$ , 16 (26%) with 1  $\mu\text{g}/\text{mL}$  and 21 (33%) with both concentrations.

In beekeepers with less than 1 year of activity, 3 (60%) had positive IDT, while 9 (50%) of those with over 10 years had positive IDTs.

The beekeepers who affirmed wearing totally protective suits were less sensitized to bee venom ( $p=0.011$ ). Those with more years of beekeeping had a higher number of positive IDT with 0.1  $\mu\text{g}/\text{mL}$  ( $p < 0.05$ ). In addition, sensitization to cultivated grass pollen and wild grass pollen was associated with a higher number of positive IDT with 0.1  $\mu\text{g}/\text{mL}$  and 1  $\mu\text{g}/\text{mL}$  ( $p=0.001$ ;  $p=0.048$ ;  $p=0.007$ ;  $p=0.028$ , respectively).

In this group, there was no significant association between the estimated mean annual number of stings and sensitization to bee venom.

## DISCUSSION

In this sample, 59% of the beekeepers without any systemic reactions were sensitized to bee venom. This may be explained by the greater exposure to stings when no protective suit is worn and a longer period of beekeeping.

Regular exposure to bee venom in these individuals

may confer greater tolerance and thus reduce the risk of systemic allergic reactions with stings. More extensive studies with larger samples and follow-up may help to clarify these issues.

## References

- [1] Toletone A, Voltolini S, Passalacqua G, Dini G, Bignardi D, et.al. Hymenoptera venom allergy in outdoor workers: occupational exposure, clinical features and effects of allergen immunotherapy. *Hum Vaccin Immunother.* 2017;13(2):477-483.
- [2] Matysiak J, Matysiak J, Bręborowicz A, Kyrcer Z, Dereziński P, et.al. Immune and clinical response to honeybee venom in beekeepers. *Annals of Agricultural and Environmental Medicine* 2016;23(1):120-124.
- [3] Tomsitz D, Brockow K. Component resolved diagnosis in hymenoptera anaphylaxis. *Curr Allergy Asthma Rep.* 2017;17(6):38.
- [4] Muller UR. Bee venom allergy in beekeepers and their family members. *Curr Opin in All and Clin Immunol* 2005, 5(4):343-347.
- [5] Bilo BM, Ruëff F, Mosbech H, Bonifazi F, Oude-Elberink JN. Diagnosis of Hymenoptera venom allergy. *Allergy.* 2005; 60(11): 1339-49.