American Academy of Allergy Asthma & Immunology

Insect Allergy: Barriers in Training and Practice—A Work Group Report of the AAAAI Anaphylaxis Committee

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BACKGROUND: The evaluation and management of insect sting allergy is a complex core competency taught in Allergy and Immunology fellowship programs. It is unclear whether current training on insect allergy is sufficient to meet the needs of the field and what training barriers exist.

OBJECTIVE: To investigate the extent of training on stinging insect allergy and factors currently impacting stinging insect allergy clinical practice through a pilot needs-assessment survey.

METHODS: A Web-based questionnaire was designed and sent to a 20% random sample of American Academy of Allergy, Asthma & Immunology member categories. Data were analyzed for descriptive frequencies.

RESULTS: A total of 78 responses were received (11% response rate). Respondents' mean age was 53.7 years, 52% were female, and 92.3% were physicians. The mean time since training completion was 18.4 years. During fellowship training, 95.7%

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No funding has been received for this study.

Conflicts of interest: M. Greenhawt serves on the advisory boards of ALK-Abello, Allergy Therapeutics, Aquestive, AstraZeneca, Nutritcia, DBV, and Novartis; and senior associate editor of *Annals of Allergy, Asthma and Immunology* (American Academy of Allergy, Asthma and Immunology). T. Bingemann is a consultant to ALK and Aimmune; primary investigator for Novartis; and a speaker for Sanofi. J Tracy is a consultant for Genentech, Hollister Stier, and BioCrys; and serves on the advisory boards for KalVista and Bryn Advisory. A. Anagnostou serves as a consultant for ALK; and received research grant from Mike Hogg Foundation, Aimmune Therapeutics, and Novartis. J. Demain is a speaker for Blueprint Medicine; serves on the advisory boards for Cogent Biosciences, Octapharma, and Regeneron/Sanofi; is coeditor for AAAAI "Ask the Expert"; and a contributor to UptoDate. Anil Nanda is a speaker for Sanofi. Monica Hajirawala is a sub-investigator for Pharming, ADMA Pharmaceuticals, and DBV Technologies/ Syneos Health. S. Waserman is a speaker for MiravoHealth; and serves on the advisory board for Pfizer.

D. B. K. Golden received research grants from AstraZeneca, TEVA, Aimmune, Allergy Therapeutics, GSK, Novartis, Optinose, Pfizer, Regeneron, Stallergenes, and Syneos; serves as a consultant for ALK, Thermofisher, and Aquestive; is a speaker for Genentech; and is a section editor for UpToDate. The rest of the authors declare that they have no relevant conflicts of interest.

Received for publication October 14, 2024; revised December 11, 2024; accepted for publication December 22, 2024.

Available online January 2, 2025.

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2213-2198

Published by Elsevier Inc. on behalf of the American Academy of Allergy, Asthma & Immunology

https://doi.org/10.1016/j.jaip.2024.12.037

Abbreviations used
AAAAI- American Academy of Allergy, Asthma & Immunology
ACGME- Accreditation Council for Graduate Medical Education
DO- Doctor of Osteopathic Medicine
FDA- U.S. Food and Drug Administration
FH- Flying Hymenoptera
ID- Intradermal test
IFA- Imported fire ant
MD- Doctor of Medicine
NP- Nurse Practitioner
PA- Physician Assistant
REMA- Spanish Mastocytosis Network
NICAS- National Institutes of Health (NIH) Idiopathic Clonal Anaphylaxis Score
SPT- Skin prick test
VIT- Venom immunotherapy

were educated on stinging insect allergy, 87.1% reported conducting testing, and 82.6% ordered venom immunotherapy (VIT). During training, 50% of respondents managed 1 to 5 patients with venom allergy (38% managed > 5, and 12% none). After fellowship, 97.3% reported evaluating patients with stinging insect allergy, 90.3% report evaluating 1 to 5 patients per month, and 93.2% and 87.5% offer testing and VIT, respectively. A patient's decision to not start VIT was the most common barrier reported by 81.8%. CONCLUSIONS: In this pilot needs-assessment survey, the majority reported training and education on insect allergy during fellowship, although patient exposure was low for most. After fellowship, insect allergy evaluations increased up to 24-fold compared with fellowship training and patient-driven decisions are the most common deterrent for VIT. Published by Elsevier Inc. on behalf of the American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2025;13:501-10)

Key words: *Stinging insect; Allergy; Hymenoptera; Education; Management; Evaluation*

INTRODUCTION

Allergy to stinging insects is associated with significant morbidity among those affected. For example, those with comorbid clonal mast cell disorders can experience life-threatening reactions to insect stings for which evaluation and management by a trained allergist can be lifesaving. Previous survey data have sought to address specific questions within the field of venom allergy (eg, risks of venom immunotherapy [VIT] in pregnancy, use of VIT in patients with chronic medical conditions, management of fire ant allergy) to determine and describe practice patterns.[1-3] To date, however, there has not been a comprehensive survey of practicing allergists to determine whether their education and training in insect allergy was sufficient to meet the demands of practice after fellowship training. In addition, despite decades of advances in the field of venom allergy, little is known about the incorporation of these advances into clinical practice. Finally, whereas some barriers to venom allergy evaluations and treatment have been described (eg, inconsistent access to venom extracts due to shortages, cost of extracts, or poor reimbursement), the extent to which these barriers prevent the evaluation and management of stinging insect allergic patients after fellowship training is unknown.

The Anaphylaxis Committee, Insect Allergy Subcommittee, of the American Academy of Allergy, Asthma & Immunology (AAAAI) sought to perform a pilot needs-assessment survey among the current membership to investigate the education and practice approaches of allergists in treating patients with stinging insect allergy using a questionnaire. Our primary aim was to assess current stinging insect practice patterns to include gathering data on training that allergists receive during Allergy and Immunology fellowship, their approach to diagnostic testing and management of insect allergy, and what barriers exist that impact the evaluation and treatment of insect allergy.

METHODS

In conjunction with project approval from the Practices, Diagnostics, and Therapeutics Committee, members of the Insect Allergy Subcommittee of the AAAAI Anaphylaxis Committee drafted the questionnaire, which was reviewed, revised, and the final version approved by the entire subcommittee. The final questionnaire was Web-based and included a total of 40 questions that covered demographics, educational background, insect allergy training specifics, questions regarding the respondents' current practice and management of venom allergic patients, as well as barriers to practice. Skip logic was built into the survey that tailored the survey for each individual respondent. The questionnaire was distributed per AAAAI protocol to 20% of a randomly selected sample membership. The results were tabulated in an excel spreadsheet and descriptive statistics were utilized to analyze the results.

RESULTS

The survey was sent out to 737 AAAAI members. A total of 78 responses were received (11% response rate). Figure 1 shows the different unique geographic locations based on self-reported ZIP Codes with representation from 23 states in the United States and 2 respondents from Canada. Demographics of respondents are presented in Table I. Overall, respondents' mean age was 53.7 years with an SD of 11.6 years. Fifty-two percent were female. Professional designation was Medical Doctor (MD) or Doctor of Osteopathic Medicine (DO) in 92.3% of respondents, and 4 were Nurse Practitioners (NPs) and 2 were Physician Assistants (PAs). For MD and DO respondents, 52.9% completed primary residency training in Pediatrics, 40% completed training in Internal Medicine, and 7.1% completed combined Medicine and Pediatrics residency training. Of the 61 respondents who answered the question regarding years since training was completed (answers exclude NP/PA respondents because the question was not applicable), the mean years since training was completed was 18.4 years (SD 11.7 y). Of these, 29.5% of respondents were only out of training 10 years or less, 24.6% were out of training for 11 to 20 years, 26.2% were out of training for 21 to 30 years, 16.4% were out of training for 31 to 40 years, and 3.3% had been out of training for over 40 years. Among respondents, 66.2% currently practice in a suburban setting, and 55.1% were in a private group practice setting.

Fellowship experience

A total of 67 respondents (95.7%) reported receipt of education and training on stinging insect allergy during fellowship training (Table II). Application of this training was notable in 87.1% who reported conducting testing for stinging insect

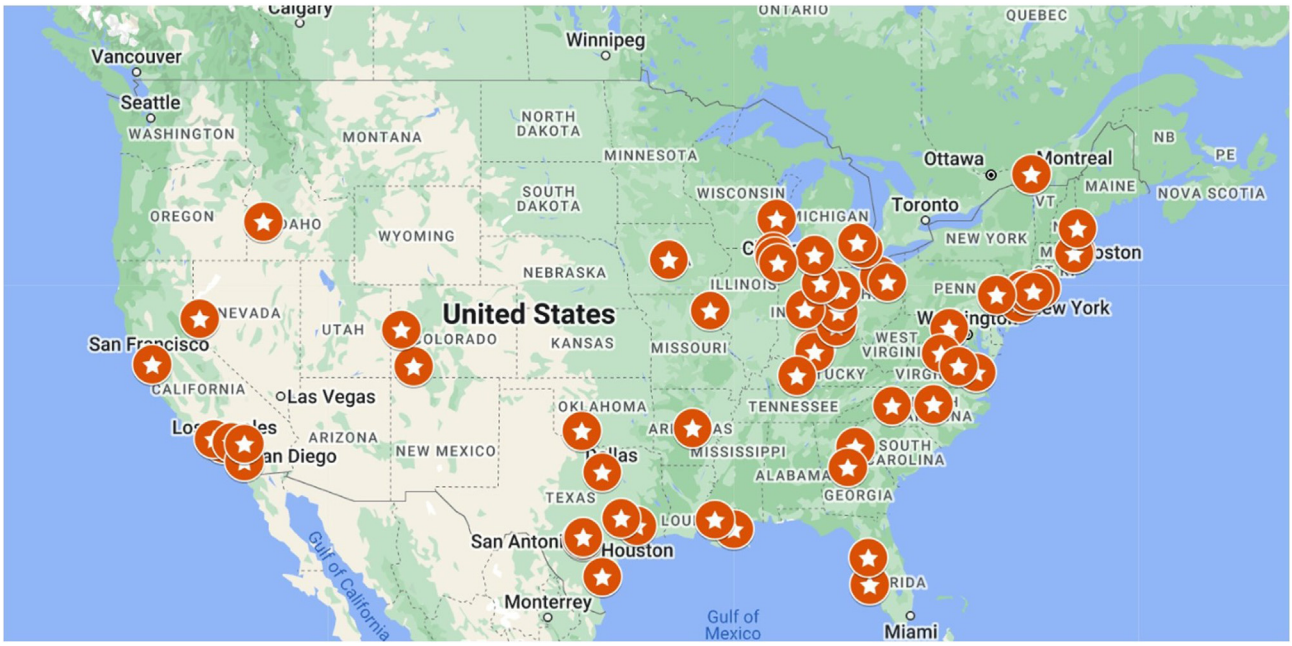

FIGURE 1. Location information for respondents based on ZIP Code. Each star represents a unique ZIP Code location for respondents. Map does not represent the density of respondents in that particular ZIP Code or location. (Created using Google My Maps.)

allergy. If testing was conducted, it included testing for flying Hymenoptera (FH) only in 31 (52.5%), testing for both FH and imported fire ant (IFA) in 27 (45.8%), and 1 respondent noted testing to FH, IFA, and the Asian needle ant. Testing methodology varied while in fellowship with 51 (86.4%) conducting skin prick tests (SPTs), 50 (84.7%) intradermal tests (IDs), 38 (64.4%) whole venom serology (ImmunoCAP; Phadia, Uppsala, Sweden), and only 2 (3.4%) conducted component testing or sting challenges (SCs). Because respondents could select multiple options for testing methodology, the most common combination of tests used by 45.8% was serology, SPT, and ID.

Venom immunotherapy was ordered by 82.6% of respondents during training, which included 51.8% FH-only prescriptions, and 46.4% reported ordering both FH and IFA prescriptions. Only 1 respondent noted IFA as the sole immunotherapy ordered during training. The number of patients with stinging insect allergy managed during training ranged from 0 in 11.8%, 1 to 5 patients in 50%, 6 to 10 in 16.2%, and greater than 10 patients in 22% of respondents.

Current stinging insect allergy practice

A total of 72 respondents (97.3%) currently offer evaluations for stinging insect allergy (Table III). Only 2 respondents reported not performing stinging insect allergy evaluations. For those who evaluate patients with insect allergy, the majority (90.3%) noted that the number of monthly patients was 5 or fewer. Only 2.8% responded that they evaluate more than 11 patients per month for stinging insect allergy. Of those that evaluate patients, most (93.2%) conduct testing for insect allergy with 52.2% only conducting FH testing, and 46.3% conducting both FH and IFA testing. Regarding testing methods, IDs are done by 86.6%, serology by 85%, and SPTs by 82.1%. Only 4.5% reported ordering component allergen tests and none conduct SCs. The most common combination of testing methods was serology, SPT, and ID seen in 67.2% of the respondents. When asked to select factors used to decide which insect to test for, the majority (97%) noted using the patient history as the main factor considered. Other factors utilized included geographic location by 53% and the time of year by 13.7%. Despite allowance for selection of multiple factors, most (45.5%) only use the patient history to guide their testing. It is unclear what patient history factors are utilized by respondents in determining what insects to test for. The second most common pairing was patient history and geographic location selected by 39.4%. For patients presenting with flying insect reactions, 91% reported routinely testing for all 5 flying Hymenoptera (honeybee, yellow jacket, white-faced hornet, yellow hornet, and wasp). For choice of testing modality order, 34.8% do serology first then skin test, 30.3% reverse this order and start with skin test prior to serology. Only 18.2% reported performing both serology and skin tests concomitantly. For some (10.6%), testing order depends on the patient history or the culprit insect. For those who conduct IDs, the majority (70%) do not report conducting 1-step IDs. Of the 30% who conduct 1-step IDs, all completed fellowship training prior to 2017 (mean time since training completion 21.2 y). Most (72.3%) define a positive ImmunoCAP as a value greater than 0.35 kU/L. Positive SPTs and positive IDs are defined as a wheal of 3 mm or greater than the negative control by 85% and 81.8%, respectively. For patients with stinging insect allergy, 68.6% respondents noted ordering tryptase levels for all patients, whereas 58.2% considered mastocytosis for all patients. Severity of the sting reaction was used as a factor in obtaining a tryptase level in 23.9% and to consider mastocytosis in 29.9% of respondents.

Regarding the management of stinging insect allergy, the majority of respondents use a multistep strategy of prescribing epinephrine autoinjectors, avoidance counseling, and VIT (91.7%) (Table IV). Venom immunotherapy is started in 87.5%

TABLE I. Demographics of all survey respondents

Characteristic	Total question responses	Value
Age, y		
Mean (SD)	62	53.7 (11.6)
Range		32–80
Gender, n (%)		
Female	71	37 (52)
Male		34 (48)
Professional designation, n (%)		
MD/DO	78	72 (92.3)
NP		4 (5.1)
PA		2 (2.6)
MD/DO primary training, n (%)		
Pediatrics		37 (52.9)
Internal medicine	70	28 (40)
Combined medicine/pediatrics		5 (7.1)
Years since training completed, n (%)		
Mean (SD)		18.4 (11.7)
<1–10		18 (29.5)
11–20	61	15 (24.6)
21–30		16 (26.2)
31–40		10 (16.4)
>40		2 (3.3)
Current practice location, n (%)		
Suburban		51 (66.2)
Urban	77	17 (22.1)
Rural		6 (7.8)
Multiple locations		3 (3.9)
Current practice setting, n (%)		
Private—group		43 (55.1)
Private—solo		17 (21.8)
Academic	78	10 (12.8)
Hospital		6 (7.7)
Multiple settings		2 (2.6)
Veteran's hospital/military		0

of patients and covers FH only in 54%, FH and IFA in 38.1%, and IFA only in 6.3%. Regarding testing results and VIT prescriptions, 79.4% include all positive results of IDs in the VIT prescription, 74.6% include all positive serology results, and 68.3% include all positive SPT results. The majority (58.7%) utilize results from serology, SPTs, and IDs to arrive at VIT prescriptions. A significant number of patients are treated with VIT; for example, 42.6% of respondents note that 50% to 89% of their patients are on or start VIT. Most (81.7%) use conventional build-up schedules for VIT, and of these, 59% only use conventional schedules (48.3% of all respondents). Of those that utilize multiple build-up schedules, conventional and modified rush or cluster schedules were the most used combination reported.

Barriers to practice

Respondents were also asked to assess barriers to VIT (Table V). Current barriers to VIT initiation include the patient choosing to not proceed with VIT (81.8%), cost of VIT to the practice (43.6%), difficulty in obtaining extracts (27.3%), severity of the index sting reaction (12.7%), and a host of other reasons such as lack of insurance or age of the patient (11%), insufficient staffing (7.3%), concern for risk of a systemic reaction to VIT (7.3%), and finally, uncertainty with how to prescribe VIT or insufficient training (5.5%). Seven respondents noted that VIT was previously offered in their practice but no longer is. The main barrier preventing VIT from being offered in this group was cost of VIT to the practice or lack of reimbursement (71.4%).

DISCUSSION

To our knowledge, this is the first formal pilot needs-assessment of the educational training that is provided by U.S. Allergy and Immunology fellowship programs regarding stinging insect allergy as well as the current barriers to practice facing allergists. Although our pilot survey results represent only a snapshot of the AAAAI constituency, it provides an indicator of where the practice of venom allergy may stand today. This can be used as a guide and steppingstone for planning future educational initiatives, annual meeting programming, and practice updates. This sample did have a good mix of experience reflected in a mean of 18 years since training completed, with a third of respondents completing training in the last 10 years, a quarter in their second decade, and a quarter in their third decade since training completion. Whereas there was representation across multiple practice environments, respondents tended to practice in a suburban setting and as part of private group practices.

Impact of findings on fellowship education and training

In a 2003 survey of 253 U.S. Allergy and Immunology fellowship graduates, 100% of respondents perceived that allergen immunotherapy for stinging insect allergy was important but only 84% felt that their training was adequate.[4] Our results indicate that 95.7% of graduates received training in sting allergy, which is disconcerting given this is an Accreditation Council for Graduate Medical Education (ACGME) core competency in all accredited programs. In addition, 87.1% tested for insect allergy during training that included multiple testing methodologies (serology, SPT, and ID as the most common combination when multiple testing methodologies utilized). Regarding insects tested, more than half tested only for FH (52.5%) although testing for both FH and IFA was done by 45.8% of respondents. Venom immunotherapy followed a similar pattern with it being ordered by 82.6%, and VIT to FH-only being slightly more common than VIT to FH and IFA. Interestingly, the exposure to patients was very low during training; 50% and 63.8% of respondents managed only 1 to 5 stinging allergy patients or had 1 to 5 patients on VIT, respectively. It is likely the exposure to such patients may vary by program and be explained by time of year and geographical location of the training program. Our study was not able to gather additional information regarding these variables and how they impact training, although these concepts require further investigation. The concern remains, however, that without training graduates may not be equipped to practice or offer the full spectrum of allergy services to populations that are mobile or travel to areas that are endemic to insects they may not be regularly exposed to.

The ACGME program requirements for Allergy and Immunology fellowship training in the United States have changed over time. One of the most significant changes occurred in 2019

TABLE II. Stinging insect allergy education and practice during fellowship training

Question	Total question responses	Value
Received training on diagnosis and management of stinging insect allergy, n (%)		
Yes	70	67 (95.7)
No		3 (4.3)
Testing for stinging insect allergy, n (%)		
Yes	70	61 (87.1)
No		9 (12.9)
Type of insect evaluated, n (%)		
FH only		31 (52.5)
FH and IFA	59	27 (45.8)
Other (FH, IFA, and Asian needle ant)		1 (1.7)
Type of testing, n (%)*		
SPT		51 (86.4)
ID	59	50 (84.7)
Whole venom serology		38 (64.4)
Component test		2 (3.4)
SC		2 (3.4)
Multiple testing methods used, n (%)		
Serology + SPT + ID		27 (45.8)
SPT + ID		16 (27)
Serology only		5 (8.5)
Serology + SPT	59	3 (5.1)
Serology + SPT + ID + SC		2 (3.4)
SPT + ID + Component		2 (3.4)
ID only		2 (3.4)
SPT only		1 (1.7)
Serology + ID		1 (1.7)
VIT, n (%)		
Yes	69	57 (82.6)
No		12 (17.4)
Type of VIT ordered, n (%)		
FH only	56	29 (51.8)
FH and IFA		26 (46.4)
IFA only		1 (1.8)
Patients with stinging insect allergy managed during course of training, n (%)		
None		8 (11.8)
1–5	68	34 (50)
6–10		11 (16.2)
>10		15 (22)
Number of patients on VIT, n (%)		
None		2 (3.4)
1–5	58	37 (63.8)
6–10		6 (10.3)
>10		13 (22.4)

SC, Sting challenge.
*Denotes questions or which respondents could select all applicable answers. Percentage equals the number of survey responses selecting that variable compared with the total number of respondents to that question.

when the ACGME Allergy and Immunology Review Committee removed the requirement to track diagnoses in the ACGME case log system.[5] Prior to July 1, 2019, fellowship trainees had to evaluate and log a required minimum number of select diagnoses (5 for venom hypersensitivity) derived from the 10th percentile of the 2009–2010 National Resident Log Report.[5] The intent of minimum diagnoses requirements was for monitoring purposes and these requirements did not supersede the need for training program directors to confirm a trainee's competence prior to graduation. The current Allergy and Immunology program requirements state that trainees' "experiences in direct patient care must include…IV.C.5.b) direct patient contact with pediatric and adult patients with…IV.C.5.b).(11) stinging insect allergy".[6] The current procedure requirements for Allergy and Immunology programs do include a minimum of 30 immediate hypersensitivity skin tests and 10 allergen immunotherapy prescriptions, although there is no specific requirement regarding the diagnoses that these procedures must be accomplished for.[5] Our survey had 4 respondents that completed training after the 2019 ACGME change. Three of the respondents noted evaluating 1 to 5 patients with stinging insect allergy during training and 1 respondent stated 0 stinging allergy patients were evaluated during training. Whereas education regarding insect allergy can be attained in a variety of ways (eg, direct patient care, simulated cases), the removal of a specific diagnosis requirement may impact the education of our trainees going forward and needs further evaluation. For comparison, in the current state of practice, 65 respondents (90.3%) evaluate 1 to 5 stinging allergy patients per month, up to a potential 24-fold increase from what most evaluate in the course of a 2-year fellowship.

Impact on current practice trends

Nearly all respondents (97.3%) currently evaluate patients with stinging insect allergy, with the majority (93.2%) offering testing and VIT (87.5%). Only a small number do not report presently evaluating stinging allergy patients, although may refer them to other providers. As with fellowship training trends, current practices for most respondents included a variety of testing methodologies used with the combination of serology, SPT, and ID common among the majority. Interestingly, there was a 32% increase in the use of whole venom serology after fellowship training compared with during fellowship training, which may reflect the challenges to current practice, such as availability of an uninterrupted supply of extract for testing (Figure 2). The cost of materials and labor for skin testing have led many practices to favor serological testing as the preferred (or only) test modality. There was wide variability when it comes to order of testing with a third ordering serology first then skin testing and a third reversing this order. The current 2016 Update to the Stinging Insect Hypersensitivity practice parameter highlights skin testing as the preferred testing modality; however, it also mentions serological testing as a complementary or alternative test.[7] A recent study has proposed reversal of the traditional testing order for improved efficiency, although larger and multisite studies are needed to confirm.[8] A surprising number of respondents (13.4%) report that they only perform serology, which is likely to result in missing some patients at risk of stinging insect allergy. For those who test

TABLE III. Current evaluation of stinging insect allergy

Question	Total question responses	Value
Currently evaluates stinging insect allergy, n (%)		
Yes	74	72 (97.3)
No		2 (2.7)
Patients with stinging insect allergy evaluated per month, n (%)		
1		34 (47.2)
2–5		31 (43.1)
6–10	72	5 (6.9)
>11		2 (2.8)
Testing for stinging insect allergy, n (%)		
Yes	73	68 (93.2)
No		5 (6.8)
Type of insect evaluated, n (%)		
FH only	67	35 (52.2)
FH and IFA		31 (46.3)
Other (FH, IFA, and Asian needle ant)		1 (1.5)
Type of testing, n (%)*		
ID	67	58 (86.6)
Whole venom serology		57 (85)
SPT		55 (82.1)
Component test		3 (4.5)
Multiple testing methods used, n (%)		
Serology + SPT + ID	67	45 (67.2)
Serology only		9 (13.4)
SPT + ID		7 (10.4)
Serology + ID		2 (3)
SPT + ID + Component		2 (3)
ID only		1 (1.5)
Serology + SPT + ID + Component		1 (1.5)
Factors used to decide what to test for, n (%)*		
Patient history	66	64 (97)
Geographic location		35 (53)
Time of year		9 (13.7)
Other (insect identification, sting location, sterile pustule)		2 (3)
Combination of factors used to decide what to test for, n (%)		
Patient history only	66	30 (45.5)
Patient history + geographic location		26 (39.4)
Patient history + geographic location + time of year		6 (9.1)
Geographic location + time of year		1 (1.5)
Geographic location only		1 (1.5)
Patient history + time of year + other		1 (1.5)
Patient history + geographic location + time of year + other		1 (1.5)
For flying insect reactions, all 5 FH species tested, n (%)		
Yes	67	61 (91)
No		5 (7.5)
Other		1 (1.5)
Testing order, n (%)	66	
Serology then skin test		23 (34.8)
Skin test then serology		20 (30.3)
Both tests done		12 (18.2)
Serology only		4 (6.1)
Depends of patient history		2 (3)
Other (eg, order depends on the trigger insect)		5 (7.6)
If ID ordered, 1-step ID done, n (%)		
Yes	60	18 (30)
No		42 (70)
Definition of positive serology (ImmunoCAP), n (%)		
>0.10 kU/L	65	18 (27.7)
>0.35 kU/L		47 (72.3)
Definition of a positive SPT, n (%)		
Wheal size ≥ 3 mm greater than the negative control	67	57 (85)
Wheal size ≥ 5 mm greater than the negative control		10 (15)
Definition of a positive ID test, n (%)		
Wheal size ≥ 3 mm greater than the negative control	66	54 (81.8)
Wheal size ≥ 5 mm greater than the negative control		12 (18.2)
Tryptase level obtained as part of insect allergy evaluation, n (%)		
For all patients with stinging insect allergy	67	46 (68.6)
Only for patients with severe insect sting reactions		16 (23.9)
No		4 (6)
Other		1 (1.5)
Mastocytosis considered when evaluating patients for stinging insect allergy, n (%)		
For all patients with stinging insect allergy	67	39 (58.2)
Only for patients with severe insect sting reactions		20 (29.9)
No		6 (8.9)
Other		2 (3)

*Denotes questions for which respondents could select all applicable answers. Percentage equals the number of survey responses selecting that variable compared with the total number of respondents to that question.

for venom allergy, all test for FH with over half testing for FH only and 46.3% test for both FH and IFA.

Regarding testing interpretation, most define a positive SPT (85%) and a positive ID (81.8%) as a wheal of 3 mm or greater than the negative control. This definition of what constitutes positive results is in line with previously published practice parameters and survey data.[7,9] Of note, a wheal at least 5 mm greater than the negative control is used to define positive SPTs

and IDs in 15% and 18.2% of respondents, respectively. The method of application and interpretation of venom skin tests was the subject of a AAAAI survey that was reported and discussed in the Practice Parameter 2016 Update.[7] Historically, IDs are performed by injection of a 3- to 4-mm bleb with a positive test showing a wheal at least 5 mm greater than the control with 10 mm of erythema, whereas positive SPTs show a wheal at least 3 mm greater than the negative control. There are no studies to compare the diagnostic accuracy of these methods, so the practice parameters recommended that practitioners use the technique they are most familiar with to determine a positive response.[7]

Additional testing with tryptase levels is done for all patients presenting with stinging insect allergy by most (68.6%) respondents, although 23.9% only reserve this additional test for patients with severe sting reactions. Mastocytosis is considered for all patients with stinging insect allergy by 58.2%, whereas a third only consider mastocytosis in patients presenting with severe stinging insect reactions. The current practice parameter recommends consideration for obtaining tryptase levels in all patients with stinging insect allergy, although the clinical usefulness of this approach is improved with increased stinging insect reaction severity or with phenotypic features as described by scoring systems such as those of the Spanish Mastocytosis Network (REMA) or National Institutes of Health (NIH) Idiopathic Clonal Anaphylaxis Score (NICAS).[7,10]

Several questions were included to assess for changing insect allergy practices. For example, respondents were asked whether 1-step ID is done with 70% indicating this is not performed. One-step testing was noted in the latest Stinging Insect practice parameter as an option and several studies have pointed to the safety of accelerated testing.[11,12] Interestingly, all of the respondents who conduct 1-step ID completed fellowship training prior to 2017 (ie, before publication of the latest Stinging Insect practice parameter).[7] Also, whereas the traditional cut-off defining a positive serological test is 0.35 kU/L, the former lower limit of reporting, laboratory advancements now allow for reporting values as low as 0.1 kU/L, which is the lower limit of detection. Although the clinical utility of values between the traditional lower limit of reporting and the actual lower limit of quantitation is unclear, data supporting the clinical utility of values of 0.1 kU/L or greater exist.[13,14] For our survey, 18 of 65 respondents (27.7%) use this lower cut-off to define a positive serological test for venom allergy confirming adaptation of advances in the field. Only 3 (4.5%) reported ordering component tests despite this testing modality being available in the United States (although not U.S. Food and Drug Administration [FDA]—approved until 2020). Owing to the low number of respondents and missing data for this question, we were unable to stratify results based on fellowship training completion year.

Management of venom allergy is multifaceted for most (91.7%) and includes prescription for epinephrine autoinjectors, avoidance counseling, and VIT. Whereas most

TABLE IV. Current management of stinging insect allergy

Question	Total question responses	Value
Management of stinging insect allergy, n (%)	72	
Epinephrine autoinjector + avoidance counseling + VIT		66 (91.7)
Epinephrine autoinjector + avoidance counseling		4 (5.5)
Other (eg, shared decision making with patient)		2 (2.8)
VIT started, n (%)	72	
Yes		63 (87.5)
No		9 (12.5)
Type of VIT ordered, n (%)	63	
FH only		34 (54)
FH and IFA		24 (38.1)
IFA only		4 (6.3)
Other		1 (1.6)
Factors used to decide what to include in VIT prescription, n (%)*	63	
All positive results on ID		50 (79.4)
All positive results on serology testing		47 (74.6)
All positive results on SPT		43 (68.3)
Other (eg. clinical history)		11 (17.5)
Combination of factors used to decide what to include in VIT prescription, n (%)	63	
Serology + SPT + ID		37 (58.7)
Other		7 (11.1)
Serology only		6 (9.5)
ID only		4 (6.3)
SPT + ID		3 (4.8)
Serology + ID		2 (3.2)
Serology + SPT + ID + Other		2 (3.2)
SPT + ID + Other		1 (1.6)
ID + Other		1 (1.6)
Percentage of patients that start or are on VIT, n (%)	61	
<10%		6 (9.8)
10%–49%		10 (16.4)
50%–89%		26 (42.6)
>90%		19 (31.2)
Build-up schedule utilized for VIT, n (%)*	60	
Conventional		49 (81.7)
Modified rush or cluster		24 (40)
Rush		11 (18.3)
Ultra rush		4 (6.7)
Other (eg, depends on the insect)		1 (1.7)

(continued)

TABLE IV. *(Continued)*

Question	Total question responses	Value
Only 1 type of build-up schedule offered for VIT, n (%)	60	
Conventional only		29 (48.3)
Modified rush or cluster only		6 (10)
Ultra rush only		2 (3.3)
Rush only		1 (1.7)
Combination of build-up schedules offered for VIT, n (%)		
Conventional + modified rush or cluster		11 (18.3)
Conventional + modified rush or cluster + rush		6 (10)
Conventional + rush		2 (3.3)
Rush + ultra rush		1 (1.7)
Conventional + modified rush or cluster + rush + ultra rush		1 (1.7)
Other		1 (1.7)

*Denotes questions for which respondents could select all applicable answers. Percentage equals the number of survey responses selecting that variable compared with the total number of respondents to that question.

TABLE V. Barriers to VIT

Question	Total question responses	Value
Barriers to initiating VIT, n (%)*	55	
Patient decision not to proceed with VIT		45 (81.8)
Cost of immunotherapy to practice		24 (43.6)
Difficulty in obtaining extract		15 (27.3)
Severity of index sting reaction		7 (12.7)
Other (eg, lack of insurance coverage, pediatric age, patient cardiac status)		6 (11)
Insufficient staffing		4 (7.3)
Concern for risk of systemic reaction to VIT		4 (7.3)
Unsure how to prescribe or insufficient training		3 (5.5)
Legal considerations		0
Concern over efficacy		0
If VIT was previously offered, current barriers that prevent it from being offered, n (%)*	7	
Cost of VIT to practice or lack of sufficient reimbursement		5 (71.4)
Too few patients		3 (42.9)
Safety concerns		2 (28.6)
Difficulty in obtaining extracts		1 (14.3)

*Denotes questions for which respondents could select all applicable answers. Percentage equals the number of survey responses selecting that variable compared with the total number of respondents to that question.

(87.5%) have started VIT, 12% of survey respondents who are seeing patients with stinging insect allergy in practice have not started VIT. There could be several reasons for this, including financial considerations for the practice (see Barriers to practice, later), or newer approaches to shared decision making for venom-sensitized patients with a history of a cutaneous systemic reaction. Immunotherapy to FH-only is ordered by 54%, IFA-only VIT by 6.3%, and 38.1% order VIT for both FH and IFA. Most respondents include positive testing into their VIT prescriptions (79.4% include all positive ID, 74.6% include all positive serology testing, 68.3% include all positive SPT), which indicates that the testing methodology drives the VIT prescription patterns in this group of survey takers. Regarding the percentage of patients on VIT, almost 75% (45 of 61 respondents) start or have at least 50% or more of their stinging allergy patients on VIT. It is notable that 25% of respondents reported that fewer than 50% of their patients had started or were on VIT. This survey did not distinguish the possible reasons for patients not starting VIT, including lack of clear indication by history, negative test results, patient preference, cost, or insurance coverage. When it comes to choosing build-up schedules, most use conventional schedules (81.7%) and 48.3% only use conventional schedules for build-up. Surprisingly, 63% only use 1 type of build-up methodology for VIT, whereas some (18.3%) only use accelerated schedules for build-up for unclear reasons.

Barriers to practice

There was keen subcommittee interest to determine what barriers to the practice of venom allergy exist. Most respondents noted that the patient's decision to not start VIT was the most common barrier reported by 81.8%. Although the reasons for this are likely multifactorial, public education on the availability of testing as well as the efficacy of VIT could significantly impact this metric. Previous studies have noted time constraints as a significant deterrent for VIT.[15] The underutilization of accelerated testing and build-up protocols by our survey cohort could explain the increased percentage of patients not pursuing VIT.

The second most common reason was the cost of immunotherapy to the practice, which has previously been reported as a significant concern.[16-18] Cost and reimbursement are complex issues. In the United States, reimbursement for evaluation and management of venom allergy varies significantly between the private and the public sectors. Private insurers determine coverage based on medical necessity and negotiate rates with providers, leading to variability in reimbursement amounts. Public programs like Medicare and Medicaid offer standardized fee schedules or state-specific rates, often at lower reimbursement levels. These differences in reimbursement mechanisms can affect patient access, provider practices, and the overall cost burden for testing. Unlike health care systems with universal coverage, the U.S. system introduces complexity and variability that may influence the utilization of venom allergy diagnostics.

Similarly, difficulties in obtaining extracts has been described with venom shortages and was cited as a barrier among 27.3% of respondents here.[19] Interestingly, only 5.5% of respondents mentioned insufficient training or being unsure how to prescribe VIT as a barrier to offering this service. Finally, 7 respondents previously offered VIT but no longer do so. The most common reason for this change was the cost or lack of reimbursement to the practice in 71%.

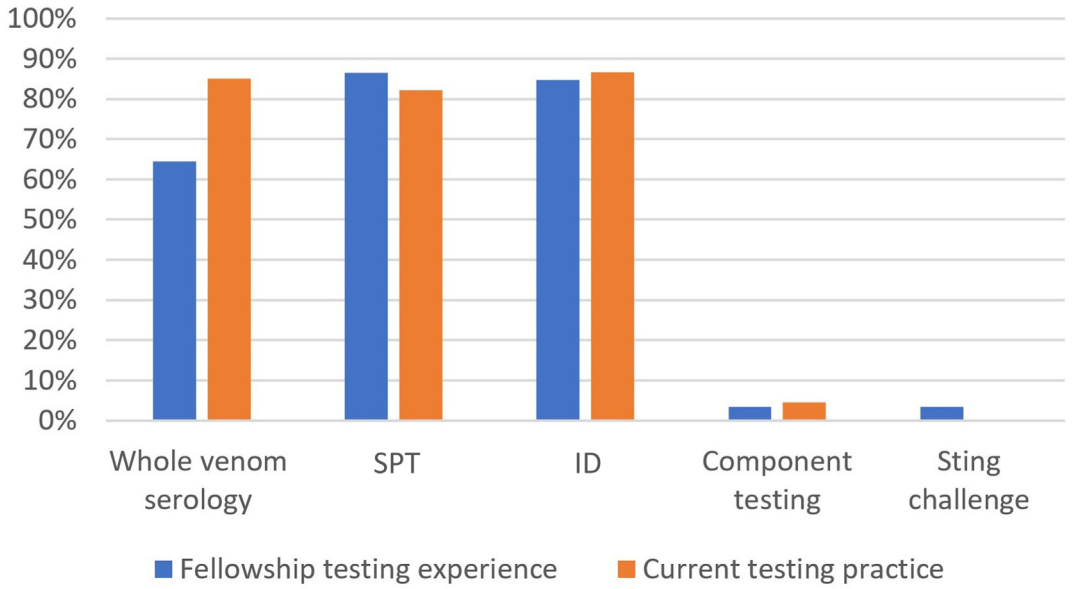

FIGURE 2. Comparison of testing methodologies used in fellowship vs current practice. *SC,* Sting challenge.

LIMITATIONS

There were several limitations to our survey. First, the response rate is poor. However, our response rate is consistent with other AAAAI workgroup surveys. The sampling frame covered approximately 2% of the AAAAI constituency (eg, 20% sampled, 11% responded). The biggest risk from the poor response rate and small sample size is sampling bias. However, this is positioned as a pilot study intended to help provide a needs-assessment, and not an inferential exercise. We acknowledge that the sample size in our study is relatively small, which may limit the generalizability of our findings, may introduce reporting biases, and thus, should be interpreted with caution. We recognize that individual variations can exert a disproportionate influence on the overall findings. Recall bias is also a concern, in terms of how accurately respondents may have recalled certain specific information from training or early practice. Third, omission bias is a concern. With any survey, there are item-related issues in terms of potentially not asking questions that may reflect a respondent's experience fully (eg, monthly number of patient evaluations could have been interpreted as new or follow-up patients). We tried to be comprehensive in the scope of questioning, but in doing so, may have missed important aspects of education, training, and current practice. For example, we were unable to collect specific data regarding the fellowship programs that respondents completed (eg, length of training program). Another example that warrants further study is the variable order of testing where it is unclear what prompts an allergist to do a second test or if the testing is done in tandem. There is also likely a selection bias in that the respondents may be more likely than non-respondents to have had experience in training and/or in practice on which they feel prepared to comment. This could lead to overestimation of the use of venom testing or treatment in training or in practice and impact the internal and external validity of the data collected because nonresponders may differ systematically in their experiences or views, further contributing to bias. Lastly, although we surveyed a random sample of AAAAI members, the sample is not representative across geographic locations. Our respondents represented a large portion of the United States based on ZIP Code data, but there was no representation from areas such as the Midwest and Pacific Northwest of the United States.

Our study provides unique and novel insights into the barriers faced in the training and practice of insect allergy management; an area that has been historically underexplored in the literature. Unlike previous studies, our work highlights the specific challenges encountered in this niche yet critical field. The findings shed light on gaps in education, resource availability, and practice infrastructure that can directly inform policy changes and curriculum development. Notably, most survey respondents completed their training prior to the ACGME Allergy and Immunology Review Committee changes implemented in 2019. Our findings establish an important benchmark, providing insight into the state of training and practice before these changes. This baseline will be invaluable for future studies evaluating the effects of updated educational requirements on improving practice and patient outcomes. To our knowledge, this is one of the first comprehensive analyses addressing these issues within the context of the AAAAI Anaphylaxis Committee, providing a foundation for future research and intervention strategies.

RECOMMENDATIONS

Despite our limitations, we find the results of the pilot survey encouraging in terms of providing an indication of potential needs in training and practice. The number of respondents who offer testing and treatment for patients with venom allergy is reassuring. However, there are several areas of potential concern, including what barriers exist to evaluation and treatment and their impact on patient care. In addition, other areas of concern include the frequency of use of only serological venom testing without reflex skin testing, the slow growth of the number of allergists who do not offer venom testing or treatment, the number of patients declining testing or treatment, and the limited use of newer options such as

rush or semi-rush regimens, higher starting dose, and component resolved diagnostic testing. Further validation needs to occur to confirm the scale of these issues, to prioritize their solutions, and to guide practicing allergists.

From an educational standpoint, our survey largely reflects the practice of allergists that trained prior to ACGME and Allergy and Immunology Review Committee changes in 2019. It is unclear how removal of diagnoses minimums will impact fellowship graduates after 2019. To combat a potential decrease in exposure to venom allergy cases, the AAAAI Anaphylaxis Committee is developing a fellow-in-training case-based toolkit that addresses common venom allergy scenarios. Other educational materials such as webinars, sessions at annual meetings, and online continuing education resources are additional ways to ensure that education on venom allergy and advances is available. These tools are also helpful to combat the geographic differences that exist in training because these become very relevant when it comes to the topic of venom allergy (eg, fellowship programs where IFAs are not endemic).

Next steps include targeted surveys of fellows-in-training as well as new graduates of fellowship programs to assess their education (especially after 2019) and provide opportunities for increased awareness and education on the topic of venom allergy. To combat cost and reimbursement barriers, the development of "centers of excellence" in states or regions that could provide economies of scale in the provision of VIT could be considered and may already be occurring in certain areas of the United States (eg, Air Force Allergy Extender system; in New Orleans, patients may receive initial VIT dosing at a large hospital system then return to community allergists for continuation of care). In addition, specific education regarding optimized coding and billing for venom allergy would be useful for all practicing allergists.

Acknowledgments

We appreciate the invaluable assistance of the AAAAI Liaison to the Anaphylaxis Committee and the Insect Allergy Subcommittee, Lauri Sweetman, BA, as well as the support of all the members of these committees.

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