

Diagnosis of Inhalant Allergies: Patient History and Testing

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KEYWORDS

- Allergy • Atopy • Allergic rhinitis • In-vitro testing
- Intradermal testing • Prick testing • Skin testing
- Modified quantitative testing

Key Points: DIAGNOSIS OF INHALANT ALLERGIES

- Allergic disease affects multiple systems through one common immunologic mechanism of IgE-mediated response, and its symptoms can range from annoying to life threatening.
- A thorough exploration of symptoms, including timing, patient location when symptomatic, and duration/onset of symptoms, will help the physician determine if allergic disease is present and which possible antigens are potentially responsible.
- Testing for the presence of IgE-mediated disease is performed by either skin testing or in vitro testing.
- Both types of testing methods are valid and the choice of testing methods is influenced by a number of different factors.
- Patient history should guide the selection of antigens for testing and support clinical decision making.

In the United States, roughly 20% to 25% of the general adult population is afflicted by some form of chronic allergic respiratory disease, making allergy one of the most commonly diagnosed disorders.¹ Among children, allergic disease is more common, with some sources estimating that it affects up to 40% of children.² The social and economic burden of allergic disease is substantial, with allergic rhinitis alone responsible for 3.5 million missed days of work³ and more than \$6 billion spent on prescription medications alone for its treatment in 2000.⁴ This does not take into account loss of productivity, physician office visits, over-the-counter medications, or other costs associated with additional manifestations of allergic disease.

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Allergic disease affects all ages, ethnicities, and socioeconomic classes, and occurs throughout the United States, accounting for a large number of physician visits annually. Basically, allergy is the undesirable clinical manifestation of an exaggerated immunologic response to an otherwise harmless antigen. These responses also are known as hypersensitivity reactions and are classified further into several different types, depending on the immunologic mechanism of the reaction. The focus of this article involves making the diagnosis of the most familiar and best understood of the hypersensitivity reactions, type 1 hypersensitivity, also termed immediate hypersensitivity. This diagnosis is made through a combination of eliciting symptoms from the patient's history, noting physical examination findings, and testing for evidence of immunoglobulin E (IgE)-mediated disease by either some form of skin testing or in vitro testing.

Type 1 hypersensitivity reactions are IgE mediated, and the process of IgE production in response to exposure to an allergen is termed atopy. Although type 1 hypersensitivity can be caused by ingestion of food antigens or pharmaceuticals, this article focuses on IgE-mediated allergic disease caused primarily by inhalant allergens. In addition to allergic disease and allergic rhinitis, there are other types of rhinitis and disorders that may be similar or confused with true allergic disease, and should be included in the physician's differential diagnosis. These are discussed in other articles within this publication.

Inhalant allergic diseases can manifest in a variety of organ symptoms, but, generally, complaints are focused on the head and neck and upper airways. All types of allergic complaints tend to be grouped together under the term "allergic rhinitis," as the myriad of symptoms all result from a single common pathogenesis. Much of the allergy literature centers around the diagnosis and management of allergic rhinitis, although the disease manifestations typically are not isolated or restricted to the nose.

At the beginning of taking a patient's allergy history, the patient may state on questioning that he or she "has allergies." This self-diagnosis may or may not be accurate and a patient's self-diagnosis should not be passively accepted without further query to establish the likelihood of allergic disease. Nonallergic triggers may cause symptoms that are identical to allergic disease; however, it is just as common for patients to be completely unaware that the main cause of their complaints is allergy. A good example is the patient with frequent sinus complaints who often feels ill from repeated infections. Many times, the cause is an underlying allergic pathology, not sinusitis. History taking and testing for evidence of IgE-mediated disease are important steps in determining whether or not the diagnosis of allergic disease is appropriate for each patient.

HISTORY: INHALANT ALLERGIES

For any patient with chronic or recurrent upper respiratory complaints, the diagnosis of allergic disease should be considered. Food allergy or hypersensitivity has some crossover manifestations similar to inhalant allergic disease but this article focuses on inhalant allergic disease. For all types of allergy, though, the patient's history is the single most important source of information in making the diagnosis of atopy.⁵ Additionally, there are various inflammatory conditions of the head and neck for which allergy may be a contributing factor to the underlying disease process. For some patients with head and neck symptoms, complete improvement may not occur unless the associated allergic issues also are addressed.

For the allergic history, the history of present illness can be broken down into 3 essential components: symptoms (ie, what they are), timing (ie, onset, duration, seasonality), and location/environment (ie, types of exposures, geography). In reality,

a discussion of the patient's symptoms will not occur in isolation; that is to say, the patient will not generally relate a history of itchy eyes (ie, symptom) without mentioning when this occurs (ie, timing) or where (ie, location). If the patient does not, the physician will promptly question the patient at that point about timing and location for that particular symptom, rather than elicit all possible symptoms before moving on to discover the timing and location of each. Although the performance of the patient interview will be more fluid in actuality than what is described here, the mechanics of the patient history have been isolated into the essential components as an aid in understanding. Family history and past medical history are also very important to elicit but come later in the patient interview.

Common and Important Aspects of History for Inhalant Allergies

The potential number and kinds of questions that could be asked of the patient during the allergy history are almost infinite. The purpose of this portion is not to present an exhaustive list of all questions that should be considered. Rather, for practicality's sake, the most common and important aspects of the history are covered. However, the reader should keep in mind that an allergic history is like a detective story or a murder mystery. Not all the facts or clues are presented in the initial setting, but are discovered over a period of time and not all are relevant or completely accurate. Information vital to identifying the culprit allergen may be missing and the physician will need to further investigate areas outside what is most commonly encountered. The history of the allergic patient is an ongoing process, not just an occurrence at the initial visit, and continues over the course of the physician-patient relationship.⁵ This becomes very important if the patient develops recurrence of allergic symptoms or onset of new allergic symptoms. The detective must remember his magnifying glass and begin to search for more clues.

Patient Symptoms in Allergy

The first type of "clue" to consider is the patient's specific symptoms. Sneezing; itchy, red, or watery eyes; and clear rhinorrhea are common, well-known allergic symptoms. Wheezing, particularly expiratory wheezing, coughing, urticaria, complaints of increased mucus, and shortness of breath are more potential allergic symptoms. However, other less specific symptoms may indicate allergy, such as complaints of nasal congestion; frequent sinus infections; change in hearing, ear pressure, or pain; the feeling of ears being stopped up; itchy throat; hoarseness; heartburn; and gastrointestinal upset.^{6,7} In addition, other disease processes, such as obstructive sleep apnea, eustachian tube dysfunction, asthma, and chronic rhinosinusitis can be exacerbated by inhalant allergies, so it is critical that the practitioner investigate the presence of allergic symptoms.^{6,7}

Timing of Symptoms in Allergy

The timing of symptoms is helpful to establish in diagnosing allergy. Timing includes onset of symptoms (ie, both age at onset and duration of symptoms), fluctuation or seasonality (ie, only in the spring vs year round), and symptom pattern. The age of onset is important because onset of true inhalant allergies is rare in the infant and geriatric populations, but more common in the teen and young adult ages, peaking at around age 30.⁵ Duration of symptoms includes not only the time frame of onset (ie, How many years have you had this complaint?) but also time course of symptoms (ie, I only sneeze for a week or my eyes itch most of the year). Questions about the time course of symptoms overlap somewhat with questions about fluctuation or seasonality, but the key thing to identify is if the symptom occurs periodically, associated with

a season or location, or perennially. Whether the symptoms are present year-round or only during certain seasons is very helpful in diagnosing perennial versus seasonal allergic disease. **Fig. 1** demonstrates examples of the seasonal pattern and distribution by geographic location of a few common inhalant allergens. This type of information can be very helpful in the investigation of allergic symptoms. Establishing any symptom patterns is crucial as well. If multiple symptoms are elicited, do they all occur together or only certain ones? This helps the physician track down potential suspect allergens and aids in identification of which allergen is causing which symptom or symptom pattern.

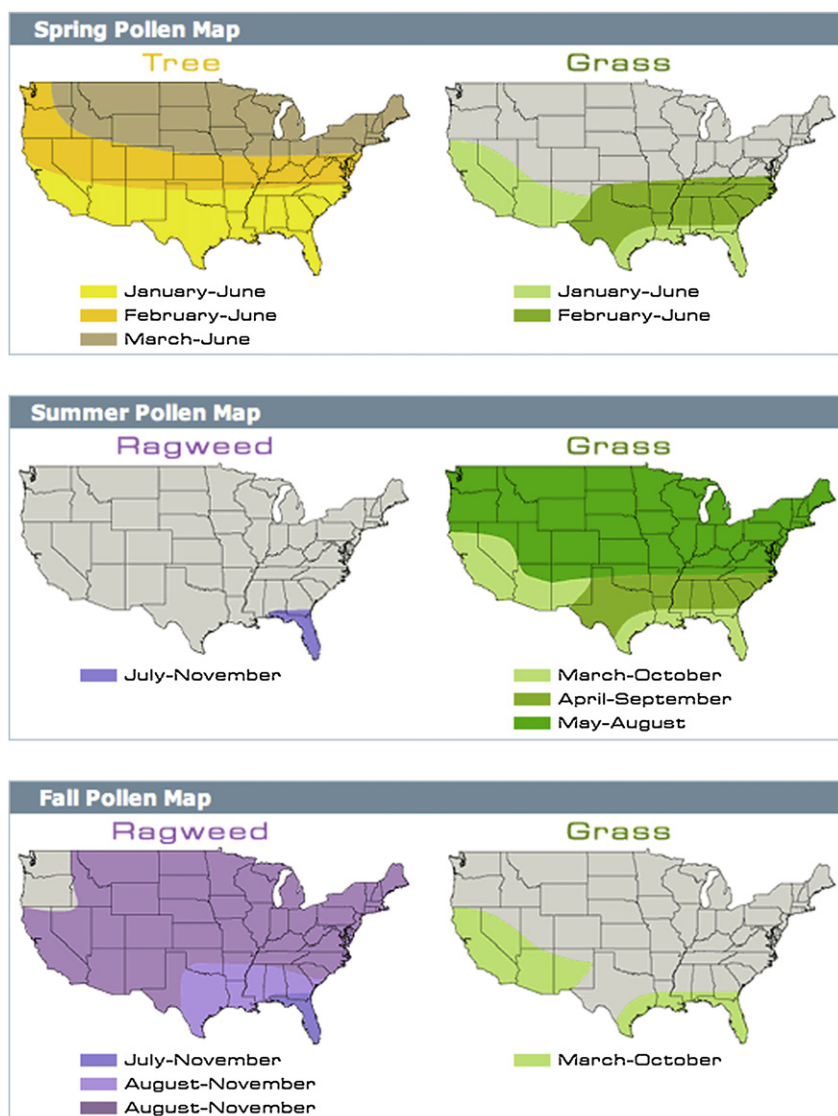


Fig. 1. Seasonal pollen map of the contiguous United States. (From the American Academy of Otolaryngic Allergy Web site, www.aaof.org; with permission.)

Location and Environment in Allergies

Location and environment complete the critical elements of information to obtain in the history of present illness. The current geographic location helps establish what potential aeroallergens the patient is exposed to, but previous locations where the patient has lived are also important. A significant change in environment, such as a cross-country move, with exposure to new allergens, can be factor in the development of allergies in the adult population, so it is important to elicit this history when seeing a new patient with allergic-type symptoms.⁵ Questions of timing overlap with location and environment as the patient's fluctuations in symptoms may not necessarily be seasonal but related to local exposures at work or home. The list of environmental exposures can be exhaustive when considering home, outdoor, and occupational environments, but key things to inquire about are the presence of pets (indoor or outdoor) or livestock, tobacco use, hobbies, stuffed animals, carpeting or draperies in the domicile, type of heating or air conditioning, indications of mold or humidity, and nearby landscaping. Certainly it is impossible during one session to investigate all possible exposures, but if the allergic patient is not improving with appropriate treatment, it can be highly beneficial to review additional environmental exposures.

Past Medical History and Family History in Allergies

Additional components of the allergic history are past medical history and family history. Past medical history should include a review of any previous treatments or testing, surgeries, particularly past sinus surgery, and medications. Previous treatment includes not only treatment the patient may have received from a physician, such as previous skin or in vitro testing or immunotherapy, but also self-administered medications, such as over-the-counter antihistamines and cold preparations. The effectiveness of any previous treatment should be documented. A thorough review of medications is important, as certain medications, like tricyclic antidepressants and antihistamines, can effect skin reactivity or increase the risk of certain testing and treatment options, such as beta-blockers or angiotensin-converting enzyme (ACE) inhibitors. Family history is also key historical information. Allergic disease is hereditary, and other family members usually will be affected by the same or similar complaints as the patient.

DIAGNOSTIC TESTING

Not all patients with allergic rhinitis or atopic disease require confirmatory diagnostic testing. The patient's history and physical examination are sufficient to make the diagnosis of allergic disease in most cases. If appropriate medical therapy is instituted and it controls the patient's symptoms, then no further workup or testing is needed. However, if medical therapy fails or incompletely resolves the patient's symptoms, the patient wishes to implement environmental control measures and wants guidance on what to avoid, or wishes to receive allergy immunotherapy, then proceeding with diagnostic testing is appropriate. It is important to note that although diagnostic testing does not necessarily mean that the patient must proceed with immunotherapy, immunotherapy cannot commence without the evidence of IgE-mediated disease that diagnostic testing provides. A patient who undergoes diagnostic allergy testing with negative results is not a candidate for immunotherapy.

Diagnostic allergy testing for inhalant allergens includes selecting a type of in vivo testing (ie, skin testing) or in vitro testing. The decision as to which testing method the physician chooses to use can be a complex one and is influenced by a number

of factors. Some of these factors are discussed in the following paragraphs with each different type of testing method and are also discussed toward the end of the article. The following described testing methods are all considered acceptable standard medical practice and the author does not espouse one technique over the other.

Skin Testing in Allergies

Skin testing generally involves prick testing, intradermal testing, or a combination of the two testing methods, such as modified quantitative testing (MQT).^{8,9} For all types of skin testing, appropriate types of positive histamine controls and negative controls must be placed at the start of testing to confirm the validity of any positive or negative skin tests. The type of negative control used will depend on any diluents used in the antigen testing vials.⁸ If an antigen is presented in a mixture containing 50% glycerin, then 50% glycerin should be used as the negative control and so forth. Skin testing has the advantage of providing the patient with an immediate answer as to which allergens do or do not potentially cause his or her symptoms but it can be time consuming, carries the risk of a systemic reaction or anaphylaxis, and involves some discomfort. Its accuracy is also subject to medication effects and skin disorders, so not all patients may be eligible candidates for skin testing. Patients with dermatographism or active eczema, who are actively taking antihistamines or antihistamine-containing over-the-counter cold preparations, or who are on beta-blockers are just a few examples of patients who are more appropriate for an alternative method of allergy testing, such as in vitro allergy testing.

Prick Testing in Allergies

Prick testing can be used to confirm clinical sensitivity to inhalant and other types of allergens and can be done in a number of ways with different devices.¹⁰ Prick testing is a type of epicutaneous test and involves placing an antigen concentrate on the patient's skin after small, superficial punctures have been made to the epidermis, placing the antigen concentrate on the skin, and making a small puncture through the concentrate, or using a device that applies the antigen concentrate to the skin at the same time the puncture is made (**Fig. 2**). These devices can be either a single-prong device or a multiprong device (**Fig. 3**) or the testing can be done with needles or lancets. There are no objective data comparing devices that support a clear-cut advantage of using one type of device over another and good results



Fig. 2. Skin-prick testing with a single-prick device.

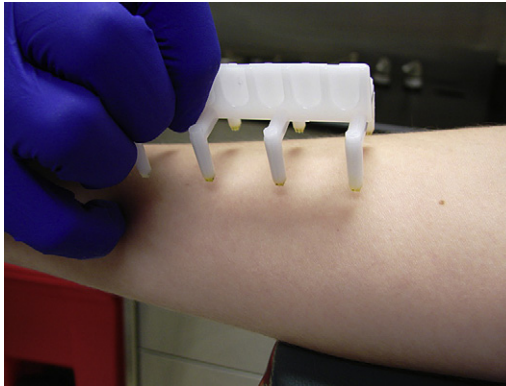


Fig. 3. Skin testing with a multiprnick device.

can be achieved with any device, as long as there is consistency in its use and proper training.¹⁰

After a period of time, generally 15 to 20 minutes, any resulting wheals are noted and measured.^{8,10} Assuming appropriate responses to control tests, the size of any resulting wheals can be graded, termed “qualitative scoring,” and used to confirm presence of allergic disease or can be used to guide placement of an intradermal test, if a blended technique like MQT is used. There are a variety of wheal-grading systems and scales that categorize size of the resulting wheal and erythema (ie, flare reaction); an example of one such grading system for classifying wheals is in [Table 1](#). Many practitioners no longer grade wheals because of the demonstrated variability between physicians, and solely judge wheals as positive or negative.¹¹ If a grading scale is used, which scale or system is used is not so important as the consistency of its application.⁸ Depending on the system or scale used, +3-sized or +4-sized wheals are considered positive and a wheal smaller than 3 mm is considered negative.

Intradermal Testing in Allergies

Intradermal testing involves injecting dilute solutions of antigenic material into the patient’s dermis. This can be a single intradermal injection placed after a negative prick test, as part of a blended testing method, or as a part of a progressively stronger series of dilutions, such as intradermal dilutional testing (IDT).^{8,9} Intracutaneous tests, such as intradermal tests and the various intradermal testing techniques, are more sensitive and will identify a large number of patients with lower skin sensitivity than epicutaneous tests, like skin-prick testing.¹⁰

Table 1
Sample grading scale for skin-prick testing

Grade	Wheal Size
0 or Negative	Less than 3 mm
+1	3 mm to 5 mm
+2	6 mm to 10 mm
+3	11 mm to 15 mm
+4	Greater than 15 mm or pseudopods

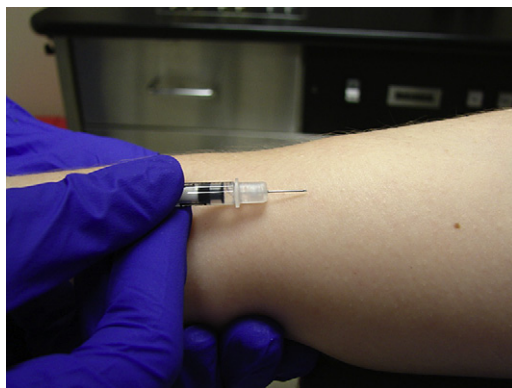


Fig. 4. An intradermal injection is performed with a very small amount of antigenic material.

In general, a small needle is used to inject a dilute quantity of antigen into the superficial dermis, raising a wheal of roughly 3 to 4 mm in size (**Figs. 4** and **5**). Appropriate positive and negative controls are placed for intradermal tests as well. If a positive control has been placed for prick testing, then a subsequent positive control for intradermal testing is not necessarily needed if the prick test positive control was positive and the prick test negative control was negative. It is important to note, however, that if no positive control was previously placed, an intradermal positive histamine control is placed, which is different from that placed for prick testing. This type is generally an aqueous form of histamine in a more dilute strength.⁸ A negative control is almost always placed, as the diluents used for intradermal testing are different from those used in prick testing and, depending on the concentration of the intradermal dilution used, an intradermal glycerin control or controls may need to be placed if there are suspicions of glycerin sensitivity.

After a period of time, usually 10 to 15 minutes, any resulting wheals are measured, assuming appropriate responses to the positive and negative controls.¹⁰ Overall, for an inert liquid substance or nonantigen material injected intradermally, physical spreading in and of itself will cause the initially placed 4-mm wheal to enlarge to

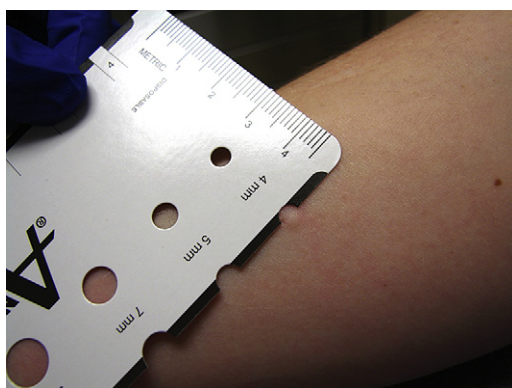


Fig. 5. An intradermal injection should raise a 4-mm wheal.

roughly 5 mm in size, so wheals of this size can be considered negative. Inflammation would cause the wheal to enlarge further beyond the 5-mm size, so wheals are usually considered positive when they are 2 mm larger than what is expected from a negative wheal.^{8,9} The size of the resultant wheal can be graded alone with a variety of scales similar to that of **Table 1**, or if part of technique, such as IDT or MQT, the size of the wheal is used to guide the next step in testing or is in itself graded as the end result.^{8,9} When an intradermal injection is used as part of a series (IDT) or as a blended method, its purpose is to try to “quantify” how sensitive that patient is to that a particular antigen. The purpose of this quantification is to provide the physician with a way to potentially adjust the starting dose of immunotherapy. Not all skin-testing methods will provide the practitioner with such a quantification. IDT and MQT are examples of skin-testing methods that have the ability to do so. However, even when such information is available, it is the practitioner’s choice as to whether the test results are used to adjust the immunotherapy dosage or not.

In IDT, several different concentrations of an antigen have been previously mixed that are part of a treatment or testing board of dilute antigen solution vials. Depending on the method used, the different concentrations are mixed as 1:5 dilutions of 6 different strengths, with dilution #1 being the most concentrated and dilution #6 being most dilute.⁸ These dilutions are introduced into the dermis in a series, starting from weakest to strongest. The purpose of IDT is to not only demonstrate if the patient is sensitive, but also attempt to quantify how sensitive the patient is to the test antigen by introducing progressively stronger concentrations of the test antigen until either sensitivity is demonstrated or the highest concentration of antigen that is safe for intradermal use is reached. IDT has been demonstrated to be equivalent to prick/puncture testing for both positive and negative predictability of clinical allergy when both are compared with nasal challenge.¹²

A full discussion on the exact procedure for IDT, its nuances, and testing variations is beyond the scope of this article. In general, dilutions of increasing strength are placed one at a time until there is no reaction to a #2 dilution, a confirmatory wheal is reached, or one of several possible uncommon to rare variant reactions happen that preclude making a positive diagnosis of IgE-mediated disease to that specific antigen. If there is no positive wheal response to a dilution #2 intradermal injection, then the patient is graded as having a negative response, or no allergy to that particular antigen. In general practice, a #1 dilution is not placed after a negative response to a #2 dilution, as the false positive rate for that concentration of antigen is much higher and no confirmatory wheal would be available to validate it, as this would require intradermal injection of antigenic concentrate that is considered unsafe.^{8,10} A #1 dilution is rarely placed, except in the case where a confirmatory wheal is required to validate a #2 dilution end point.

A confirmatory wheal occurs at a point when there is demonstrated definite sensitivity to an antigen, and can be defined by certain wheal size and positioning criteria. A patient who has a confirmatory wheal can be said to demonstrate IgE-mediated sensitivity to that antigen, and the adjacent wheal(s) can be used to determine a safe starting dose for immunotherapy, if the patient desires to proceed with allergy shots.⁹ A confirmatory wheal is defined as a wheal (1) that is the first wheal 2 mm larger than the negative control wheal and (2) is followed by a second wheal that is at least 2 mm larger than the preceding one.¹² If an uncommon or rare variant reaction happens, testing for that antigen may cease and the patient may be brought back on another day for testing or, depending on the variant reaction, the patient may be able to be declared allergic or not allergic to that particular antigen.

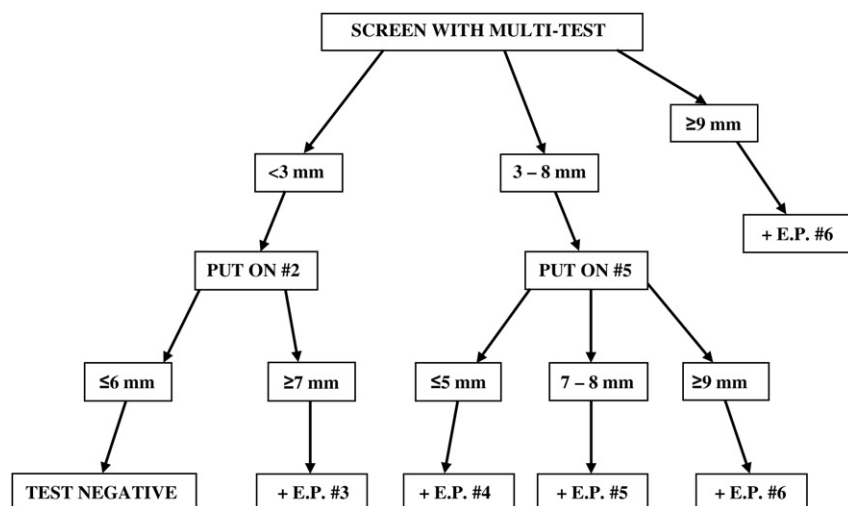


Fig. 6. Modified quantitative testing algorithm. (From Krouse JH, Mabry RL. Skin testing for inhalant allergy 2003: current strategies. *Otolaryngol Head Neck Surg* 2003;29(Suppl 4):S45; with permission.)

Modified Quantitative Testing for Allergies

MQT is a blending of prick and intradermal skin-testing techniques that also can be used to determine a starting dose for immunotherapy.¹³ The technique begins with placing a series of prick tests, usually using a multiprong device. Any resulting wheals and their size are used to guide whether an intradermal injection is placed or not and what strength dilution the intradermal test should be. The MQT algorithm is shown in **Fig. 6**. If both prick and intradermal tests are negative, then the patient is confirmed to lack IgE-mediated disease to that particular antigen. Other results will classify the patient as belonging to a particular IDT equivalent end point. Whether that end point determined by MQT is truly equivalent to the end point determined by IDT has been questioned.¹⁴ Still, MQT is a safe alternative to IDT and has been used to guide starting doses of immunotherapy.¹⁵

In Vitro Testing for Allergies

In vitro testing for inhalant allergens is an equally acceptable method of diagnostic testing. In vitro testing is performed using the patient's own blood and is either sent to a reference laboratory or can be done in the practitioner's office, if the office has the machinery and meets certain federal regulations. It has the advantages of no risk of anaphylaxis and much less discomfort, as only a single needle stick to draw blood is needed; however, many offices lack the capability to perform in vitro testing, so this generally requires the blood to be sent out to a laboratory for analysis, and so does not give the immediate answers that skin testing can give.

There are several variations on the actual testing technique used for in vitro testing and these variations either change how the amount of antigen-specific IgE is measured or how the test antigen is presented, but the general method does not change between each of these different forms of in vitro testing. The general overall method of in vitro testing involves attaching the test antigen in question to a surface, exposing that antigen-coated surface to the patient's blood or serum, then raising that

away after a specified period of time. If the patient has IgE specific to the test antigen, it will remain behind attached to the antigen on the surface. Then IgG antibodies specific to human IgE antibodies are introduced into the testing area and washed away after a set period of time. These anti-IgE IgG antibodies are labeled in some measureable fashion so that the amount of IgE in the patient's serum can be quantified.

Variations in technique in how the antigen-specific IgE is measured include what specifically is used to label the anti-IgE IgG antibodies so they can be measured and how the test antigen is presented in the testing chamber or area. Variations on how the antibodies are labeled include radioallergosorbent testing (RAST), enzyme-linked immunosorbent assay (ELISA), fluoroenzyme immunoassay (FEIA), and chemiluminescence. Variations in presenting the test antigen include presentation on a 2-dimensional surface, such as a disk, or 3-dimensional presentations, such as in a cellulose sponge, on beads, or threads. At this point in time, there is no definitive literature to support the use of one particular type of modality over another. Which type of in vitro test to use is generally influenced by other factors, such as availability of a clinical laboratory and its specific capabilities.

What these different testing techniques share is the ability to determine the presence of antigen-specific IgE in a patient's blood and quantify it based on comparison with a reference standard. When the amount of IgE in the patient's blood is compared with a reference standard, the amount of IgE is categorized as belonging to one of several different classes. In general, the higher the numerical class, the more antigen-specific IgE is present in the patient's blood and the more sensitive the patient is to that antigen, theoretically. In contrast, the lower the numerical class, the less antigen-specific IgE is present and the less sensitive the patient is to that antigen, theoretically. It is important for the practitioner to keep in mind that each laboratory will have its own quantification scheme as to what result (ie, how much antigen-specific IgE is present) corresponds to which class and that the results from one laboratory cannot be categorized using another's testing classification. In vitro testing has been shown to correlate well with skin testing, but not necessarily with clinical sensitivity, and it has been shown to be a useful determinant in setting the starting dose for immunotherapy.¹⁶

Allergy Testing Modalities: Considerations

Whether the physician decides to pursue one type of testing modality over the other, be it skin testing or in vitro testing, will be influenced by a myriad of factors and should include a discussion of patient preferences. The testing modalities themselves are, for the most part, equivalent and the decision to use one over another can be based on other factors.^{12,16} Certain skin conditions, such as eczema, or medications may make the patient ineligible for accurate skin testing, or patient preferences (a fear of needles) may influence the decision. The physician's familiarity and expertise with skin testing may also affect which type of testing is chosen. The important thing for any practitioner to keep in mind is that no testing modality is 100% sensitive and specific. If a patient has negative testing with one method and continues to have symptoms and history strongly suggesting a positive history of allergy, consideration should be given to retesting the patient with a testing method different from that first used or testing for antigens not on this initial testing battery.

One last consideration is the number and types of antigens tested when ordering or performing diagnostic allergy testing. Testing the patient for all possible antigens, especially ones where there is not sufficient evidence that the patient is even exposed to them, is unnecessary and inappropriate; routine use of large screening panels

without significant clinical indication is not justified.¹⁰ The patient's history can be used to help guide the physician in choosing which antigens to test, and the number and type selected should be determined based on the patient's age, history, environment and living conditions (ie, region of the country), occupation, and activities.¹⁰ In general practice, many physicians start with a diagnostic screening battery of between 10 and 14 antigens, although this varies, with some screening as many as 20 to 40 antigens.

Screens can be created to test for outdoor/seasonal allergens only, for indoor/perennial allergens only, or a combination of both. Screens for outdoor or seasonal antigen can include between 1 and 3 trees, between 1 and 3 weeds, and between 2 and 3 grass families native to the area. Which species of grasses, trees, and weeds are most common in a given location can be discovered through a large number of resources. Inquiries can be made to different antigen-manufacturing companies, which usually have lists of antigens by geographic location, to local colleges or universities that have botany divisions or departments, and even online resources, such as the National Allergy Bureau Web site (www.aaaai.org) or www.pollen.com. Other local allergy practitioners may be helpful in selecting appropriate local antigens to test. Indoor or perennial screening panels usually include 1 or 2 species of house dust mite, 1 or a mix of cockroach species, and at least 1 epidermal antigen, the most common being cat. Molds can also be included on these types of panels or a separate screening panel can be created solely with mold antigens. If molds are included as part of another screening panel, at least 1 or 2 of the more common indoor species (ie, *Alternaria* and *Aspergillus* species) should be considered for inclusion.¹⁰

Which antigens used in a screen or selected for testing will usually not be affected by the choice of testing modality, although there are more antigens available for skin testing at present than there are for in vitro testing. In vitro tests can be ordered as part of a preset panel determined by the laboratory or can be part of a panel tailored to the individual practitioner's requests. Additionally, tests for only one or a few antigens can be ordered. Skin testing, either prick, intradermal, or other techniques, can also be performed using a screening panel or panels the practitioner has created or only a single or few antigens may be tested if the patient's history supports the clinical decision making.

The important point is that the patient's history should guide the selection tests or support the application of a particular screening battery. Annual repeat testing of allergens is not supported by literature, unless there is specific clinical indication in the patient's history.¹⁰ If a patient develops new allergy symptoms, in addition to further investigation in clinical history and changes in the patient's environment, consideration can be given to retesting a patient to see if new allergies have developed or to testing antigens that were not initially tested.

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