

# Allergic skin test

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## Introduction

Allergy is a hypersensitivity reactions to foreign substances that are harmless to our bodies. Allergen is a substance that cause allergic reactions, and can be mainly composed of inhalant, food, drug or contact allergens. Allergic reaction occurred when allergens are encountered by immune cells such as IgE bounded mast cells in mucosa or skin. Repeated exposure to those allergens caused allergic disease such as asthma, allergic rhinitis.

Allergic skin test is the both essential and effective methods to identify causative allergens and subsequently diagnose allergic disease. Allergic skin test is also effective to the host's atopic status. Allergic skin test can be performed easily. However, there are somethings to consider interpretation of allergic skin tests. And, allergic skin test is usually safe, but rarely cause serious side effects such as anaphylaxis. Therefore, this lecture will introduce both the principal and clinical application of allergic skin test.

## Immediate-reaction skin test

Immediate-reaction skin test is a method used to detect allergen-specific IgE and subsequently diagnose the causative allergens eliciting type I hypersensitivity reactions. Immediate-reaction skin test examines the occurrence of erythema and wheal after injecting small amounts of diluted allergens into the skin. Because allergic diseases such as asthma, allergic rhino-conjunctivitis, food allergy and even anaphylaxis are provoked by recognition of allergen and allergen-specific IgE, immediate-reaction skin tests such as skin prick test, scratch test, and intradermal test are regarded as an essential method to diagnose causative allergens and type I hypersensitivity reactions.

## 1. Methods

Skin prick tests are usually performed on patient's forearm or on the back. A drop of an allergen extract is placed on the pre-cleaned area of skin. A sharp instrument such as lancet or needle is then passed through the extract drop obliquely to the skin and gently lifted the skin to create a small break in the epidermis for the penetrance of extracts into the skin. Test sites should be 2-2.5cm apart to avoid overlapping reactions. The result of skin prick test is usually measured at 15-20 minute according to occurrence and mean size of the wheal. The histamine is used for positive control and the physiologic saline is also used for negative control.

Intradermal skin test is performed by injecting sufficient allergen to produce 2-3mm bleb on the dermis using a disposable syringe. Due to the direct injection of larger volume, the allergen extracts are typically 100-1000 times less concentrated than those used for skin prick test. The maximal wheal diameter should be measured at 15-20 minutes. Intradermal skin test is usually performed at the volar aspects of the forearm. The prick of histamine is used for positive control and intradermal injection of physiologic saline is used for negative control.

## 2. Interpretation

The skin test can be easily affected by various factors so that the interpretation of skin test always should be always considered the response to negative and positive control. After 15 minutes of skin test, the longest diameter and the diameter perpendicular to longest diameter of the wheal will be measured to the wheal and flare. Then, the grade of reaction is determined by calculating the ratio of the allergen induced wheal size to the histamine induced wheal size (Table 1). If flare or wheal occurred to physiologic saline, it means false-positive dermatographic reactions so that alternative methods to diagnose specific Ig-E should be regarded.

Positive reaction to skin test means the presence of IgE to specific allergens. However, the interpretation

**Table 1.** The reference to skin test grading

Grade	Prick test		Intradermal test	
	Wheal (mm)	Flare (mm)	Wheal (mm)	Flare (mm)
Negative	0	0	0	0
1+	$R < 1$	$< 21$	$R < 1$	$< 21$
2+	$R < 1$	$\geq 21$	$R < 1$	$\geq 21$
3+	$1 \leq R < 2$	$\geq 21$	$1 \leq R < 2$	$\geq 21$
4+	$2 \leq R < 3$	$\geq 21$	$2 \leq R$	$\geq 21$
5+	$3 \leq R < 4$	$\geq 21$		
6+	$4 \leq R < 5$	$\geq 21$		

R=allergen/histamine wheal ratio

**Table 2.** Inhibitory effect of various medications on skin tests.

First generation antihistamines			
Chlorpheniramine	3 days	Hydroxyzine	5 days
Diphenhydramine	2 days	Cyproheptadine	9 days
Second generation antihistamines			
Azelastine nasal spray	2 days	Fexofenadine	2 days
Cetirizine	3 days	Loratadine	7 days
Tricyclic antidepressants			
Desipramine	2 days	Imipramine	>10 days
Doxepin	6 days	Doxepin topical	11 days
Corticosteroids			
Prednisone 30mg for 1 week	0 days	Topical corticosteroids > 3 weeks	>3 weeks
Inhaled corticosteroids	insignificant		
Others			
Theophylline	Insignificant	Montelukast	0 day
H2-antagonist	1 day		

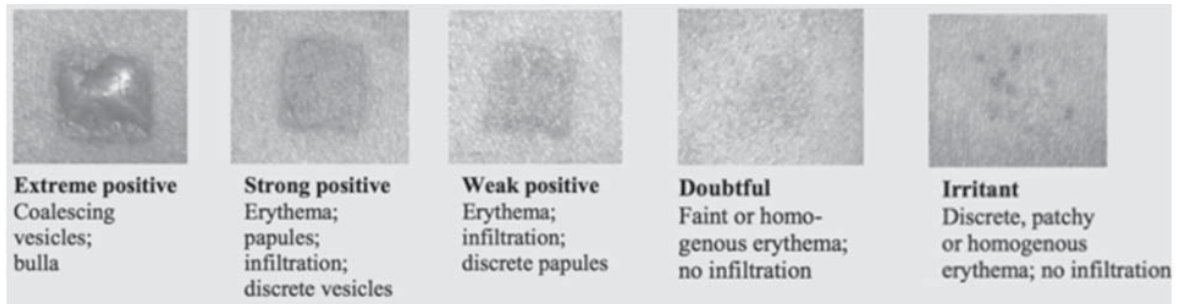
of skin test should be also considered the clinical symptoms to avoid the possibility of asymptomatic sensitization. Various drugs can affect the result of skin tests (Table 2). Therefore, it is very important to check medical history and medication history before skin tests.

### Delayed-reaction skin test

Allergic contact dermatitis is typical disease of type IV hypersensitivity reaction mainly caused by delayed form cell-mediated immune reactions. External substances with low molecular weight can pass through the skin barrier and can activates various immune cells in the dermis. Patch test is widely used to diagnose allergic contact dermatitis.

#### 1. Methods

Allergens are prepared in appropriate concentrations with appropriate diluent, and applied to the skin with inert metal disks like Fin chambers. After 42-48 hours, remove the battery of chambers and note the area of erythema or induration. A similar reading is taken 24 hours after the chamber is removed. Standard patch test panel are composed with about 20 common allergens known to elicit contact dermatitis. Recently, TRUE patch test, which is commercialized patch test composed of 24 kinds of allergens, is also commonly used in clinic.



**Fig. 1.** Interpretation of patch test

## 2. Interpretation

The result of patch test is interpreted according to international contact dermatitis research group (Figure 1). Similar with the interpretation of immediate skin test, the allergen reacted might not be a causative so that it is important to determine the association between allergen reacted and the clinical situation of patients.

## Conclusion

Skin test represent the major tool for the diagnosis of allergic disease. Although it seems relatively easy to perform such tests, accurate interpretation required the properly performed test and consideration of patient's clinical history and physical examination findings.

## References

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