Introduction

The optimal management of various clinical manifestations of allergic conditions in the allergic patient requires an accurate diagnosis, as well as a reliable identification of the allergens to which the patient is sensitised and are causing the allergic symptoms.

Type 1 (IgE-mediated) allergic conditions are consequence of the patient’s immune system recognising these allergens as foreign proteins and developing Immunoglobulin E (IgE) against them. The IgE antibodies, in a second exposure to foreign proteins, initiate an inflammatory cascade in patient’s mucosa, blood or/and organs, giving rise to the classical symptoms of allergy.

The term “Allergy” is often misused or used inappropriately. We are concerned with the classical Type I Allergy mediated by IgE. Other sensitisations to chemicals, cold, smoke or different fumes are not IgE-mediated immune responses. Therefore, they are not diagnosed by Skin Prick Test.

IgE-mediated allergy includes various clinical conditions, such as allergic rhinitis, asthma, atopic dermatitis, anaphylaxis, acute urticaria and angioedema, food allergy, insect venom allergy, latex allergy and some drug allergies. IgE-mediated allergy can coexist with other sensitisations which are a result of other non-IgE-mediated pathways.

Skin prick testing (SPT) is recommended as the primary method for the identification of IgE-mediated allergens in most allergic diseases. Other tests exist to identify IgE-mediated allergens, but the SPT is most usually the first-line test.

SPT is sensitive, reasonably specific, with rapid results, flexibility, low cost, good tolerability, and clear demonstration to the patient of their allergen sensitisations.

Skin prick testing is a procedure which carries low risk, but systemic allergic reactions have been reported.

Patients must be fully and appropriately informed of the risks and benefits of the SPT for their circumstances.

Skin prick testing must be performed by trained and experienced medical and paramedical staff with appropriate knowledge, in medical rooms with facilities and treatments to manage any possible systemic allergic reactions including anaphylaxis.

The Medical Practitioner should order a SPT test panel for the individual patient. The allergen panel is chosen based on patient characteristics, the history and examination findings, familiar history, and relevant allergen exposures including local factors.
The SPT operator may be the Medical Practitioner, or a delegated Nurse or Technician. Technical staff (nurses, technicians) may conduct the tests under direct supervision of the Medical Practitioner, who ordered the procedure and who should be on site and immediately available.

The SPT operator must be adequately trained and experienced in order to provide the most reliable SPT results. The subsequent treatment of that patient depends at least partly on the SPT results, especially for Allergen Avoidance and for Immunotherapy.

**Why use the SPT?**
Of the three main types of treatment for an allergic condition, two require a reliable identification of the problem allergens: **Allergen Avoidance** and **Specific Immunotherapy**. Symptomatic therapy with antihistamines, steroid, bronchodilators and all the other non-specific treatments do not require an identification of the problem allergens, but the patient will probably benefit from allergen avoidance measures to reduce the allergen load.

The SPT is the first-line test used to identify those problem allergens, and the SPT results interpreted considering clinical information on the patient will form the basis of the future management of that patient.

**What is the SPT?**
SPT is performed by placing a small drop of each test extract and control solution on the volar surface of the forearm (or occasionally on the back).

When those introduced proteins are recognised by the allergen-specific IgE attached to local mast cells, then their interaction and cross-linking causes the mast cells to degranulate, so that histamine and other bio-active immune-stimulating substances are released, leading to localised inflammation.

Thus, a patient sensitive to that allergen will react with a wheal and flare at the site of the puncture, which can be measured to give an indication of the degree of sensitivity of that patient to that allergen.

**SPT or s-IgE?**
Allergen-specific IgE (s-IgE) encompasses a range of different blood tests that identify and quantify the allergen-specific IgE that is produced by the patient’s immune system against their problem allergen(s). These s-IgE tests can be laboratory-based, Doctors Office-based, or even Patient-Use tests of various types. However, the most frequently used test to measure allergen-specific IgE is the commercial brand known as “RAST” or “CAP RAST” or “ImmunoCAP” run in a hospital pathology laboratory or a private commercial chemical pathology laboratory. This test can be against any of over 600 different allergens and mixes, including over 100 component allergens, with the Medical Practitioner choosing the relevant tests for each patient and their clinical circumstances. There are certain advantages to the use of the s-IgE test either instead of the SPT or in addition to the SPT.

The SPT is generally the first choice for identification of the problem allergens, because:
• The cost of the consumed materials for an SPT is approx. 10% of using a lab-based s-IgE blood test
• The sensitisation by the patient to the problem allergens is convincingly illustrated to the patient with SPT, rather than being a number on a report
• Time-to-result is just 20 minutes for SPT, instead of the few hours to several days for a lab report on s-IgE (thus requiring another patient visit).

The s-IgE test would be used as well as SPT in the following circumstances:
• When the SPT Positive Control is negative and all the SPT allergens also give negative results.
• When the SPT results are not in accordance with the clinical history and presentation
• When the required SPT Allergen solution is not available
• When the patient will not cooperate for an SPT testing session
• Prior to starting any course of Allergen Immunotherapy that requires a precise and reliable identification before investing in a 3 year and comparatively expensive course of treatment.
• To reliably identify the molecular components which are sensitizing the patient.

The s-IgE test would be used instead of SPT in the following circumstances:
• When the patient cannot come off their anti-allergy symptomatic medication due to the severity of the symptoms.
• When the patient cannot come off other medications for other conditions, when that medication has an anti-inflammatory effect.
• When the patient is known in advance to have not stopped their consumption of antihistamine and any other medications that inhibit inflammation and therefore inhibit the SPT response.
• The patient has Dermatographism, so every SPT would be positive.
• When SPT is not possible due to lack of staff or facilities, or inadequate time for the Medical Practitioner

Concordance between SPT and s-IgE tests is approximately 85% to 95% depending on the allergen being tested and the s-IgE method used.

Indications for SPT
• Suspected Inhalant Allergy
• Suspected Asthma
• Suspected Food Allergy
• Suspected Drug Allergy

Contra-Indications for SPT
The SPT should not be used in several clinical situations:
• Patient cannot cease their anti-allergy medications and other interfering substances
• Non-cooperation
• Dermatographism
• History of Anaphylaxis
• Severe Eczema on the test sites
• Subject unable to cease antihistamines/other interfering drugs
• Persistent or severe asthma
• Patients on beta-blockers.
• Pregnancy (small risk of anaphylaxis with hypotension and uterine contractions)

Warnings
• Before the SPT, asthma signs and symptoms must be controlled
• In very rare cases, the SPT may cause an anaphylactic reaction with alarming symptoms occurring seconds or minutes after the allergen is administered. Symptoms can include swelling of the throat, or other parts of the body, wheezing, breathing difficulty, generalised erythema, generalised pruritis, difficulty swallowing, diarrhoea, pallor, stomach cramps or vomiting.

Interfering Substances
A patient who cannot or will not or forgets to temporarily stop their consumption of certain interfering substances is not able to be effectively skin prick tested, due to the suppressant effect of those substances on the skin reaction.

Check carefully with the patient what other medications they are taking or have taken within the previous week. If unsure of the significance of any medication, check with the Medical Practitioner or Pharmacy.

This list of interfering substances is not exhaustive, as there are many other drugs and medications that can affect the SPT results. For a more comprehensive list of Interfering Substances see the Inmunotek SPT Operators Manual available free of charge from Inmunotek or its Distributors.

Preparations for the Patient
• Non ongoing or recent anti-allergy medications or other interfering substances
• Non skin lesions such as eczema in the area of the test
• Skin to be dry and clean and disinfected (preferably with 70% alcohol)
• Cooperation, including non-mobility for 20 minutes

Preparations for SPT Operator
• All the required materials are available
• The SPT solutions should be at ambient room temperature. The Medical Practitioner, or a colleague, is readily available.

Materials Required
• SPT solutions for the relevant allergens to be tested
  o Check the SPT vial still has usable solution
  o Check the SPT vial is still within expiry date of manufacture, as printed on the vial label
o Check the SPT vial is still within expiry date of opening
  (Some manufacturers recommend that their SPT vials are to be discarded 6
  or 12 months after opening)
o SPT Positive and Negative Controls
  • SPT lancets; enough for this test panel
  • Skin Marker Pen
  • Alcohol swab or tissue
  • Sharps Container
  • Tissues
  • Timer with alarm
  • Ruler in mm and/or SPT gauge
  • Pen (Biro type)
  • Informed Consent Form (if applicable)
  • SPT Report Form
  • 30 minutes of preferably uninterrupted attention for the patient.

Emergency Equipment and Materials Required
Whilst the SPT is generally a very safe procedure, the SPT operator must be aware of the
signs and symptoms of severe local reactions, systemic reactions and anaphylactic shock.
For a detailed statement of the treatment of these cases the SPT Operator should consult with:
  • The Medical Practitioner who ordered the SPT and who should be readily available
  • A medical colleague
  • The hospital SOP (Standard Operation Procedure) the treatment of Anaphylactic
    Shock
  • The Hospital Pharmacy
  • The Directions for Use of an Immunotherapy Vaccine
  • The Directions for Use of the Skin Prick Test Solutions (see below).

Severe local reactions – unusual - localised swelling of the entire forearm.
Systemic Reactions - rare – oesophageal oedema, generalised urticaria, syncope, nausea
Anaphylaxis – extremely rare – if not just a faint, then requires immediate treatment.

The appropriate equipment and treatments, and the knowledge how to use them, must be readily available.

The following information is taken directly from the Directions for Use of Inmunotek SPT solutions:

Adverse reactions
The local reaction is an integrated part of the diagnosis and is the type of reaction related
directly to the patient’s allergy that might appear and can be treated with local
antihistamines or corticosteroids if needed.

In rare cases a general reaction may develop, such as rhinitis, asthma an even anaphylaxis,
which must be managed with appropriate treatment.
Reporting suspected adverse reactions after administration of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Patients and healthcare professionals are asked to report any suspected adverse reactions via the national reporting system.

TREATMENT SCHEDULE FOR ADVERSE REACTIONS
The following treatment indications are general recommendations, but depending on each individual case, a different treatment may be optimal.
The doses for children must be adapted to their age and weight.

Mild-moderate Systemic Reaction
Eye itching, sneezes, cold, face swelling, general skin reddening, generalized itching, bronchial asthma, Quincke’s oedema, larynx oedema.
Treatment:
1. Insert a butterfly probe.
2. SC, IM or IV. Antihistamines.
3. Aerosol with beta-adrenergic agents.
4. Water soluble SC, IM or IV. corticosteroids (30-250 mg of prednisolone or equivalent, if required, to a total maximum dose of 2 g/24 h).
5. Adrenaline (1:1000) IM (0.01 mL/Kg b.w., max. 0.5 mL). Adults: 0.3-0.5 mL, Children 6-12 years: 0.3 mL, children <6 years: 0.15 mL.
   If necessary, inject adrenalin every 10-15 minutes.

Severe Systemic Reaction, Anaphylactic Shock
Pruritus of the palms and scalp, intense erythema of the skin, conjunctival injection, cough, angioedema, laryngeal oedema, severe asthma, hypotension, cyanosis and shock.
Treatment:
1. Place the patient in supine position with the legs raised, with the head to one side. Monitoring the pulse rate and blood pressure.
   IM is the route of choice.
   If the patient is monitored; in adults immediately start slowly IV injection: 1 ml–5 ml of 1 mg of 1:1000 adrenaline solution in 10 ml 0.9% NaCl solution, (1/10000).
   In infants 1mg of adrenaline (1/1000) in 100 ml of 0.9% NaCl solution, (1/100000); 0.1–1 μg/kg/min.
   Do not administer undiluted adrenaline 1/1000, IV.
   If necessary, inject adrenaline every 10-15 minutes.
3. IV antihistamines.
4. High dose IV corticosteroids (250-1000 mg of prednisolone or equivalent).
5. If the reaction continues, substitute volume (500 ml of infusion solution) by previously injecting human plasma or saline solution with dopamine (10 μg/Kg/min) or adrenaline (5 μg/min).
6. For patients under beta-blockers, invert the steps 2-4.
7. Other cardiopulmonary resuscitation measures, oxygen, artificial breathing, vascular massaging, broncholytic agents, aminophylline, etc. Constantly check pulse rate and blood pressure.

Test Procedure
1. Gather the equipment and materials required
2. Line up the SPT vials ready for use
3. Prepare the metal lancets by cutting or tearing back the retaining sleeve so that the lancet can be easily and safely extracted
4. Check the test site is clean and dry, and free from any lotions that will affect the viscosity of the drops of SPT solutions
5. Mark the skin on the volar forearm with the Skin Marker Pen, with a grid or notched line for the test sites
6. Each test site to be at least 4 to 5 cm apart, to avoid any possible wheal overlap
7. Mark the skin with the allergen code or first letter or according to a fixed order
8. Starting with the Positive and Negative Control solutions
9. With the teated glass pipette, place one full drop of the test solution on the correct location on the test site.
10. Re-cap the SPT vial with its own teat & dropper – to avoid contamination by any airborne bacteria or mould spores. Do not mix them up!
11. Take the fresh lancet, already out of its sleeve, and manipulating it carefully, push the lancet tip vertically through the drop of SPT solution on the skin, to the depth of the shoulders of the lancet. Withdraw the lancet, vertically, and discard safely.
12. Repeat in turn for each SPT allergen to be tested, using a fresh lancet for each test. For 20 tests (18 allergens) this may take 5 minutes or more from 1st to 20th test
13. Start the timer
14. After 2-3 minutes blot dry the test sites, avoiding cross-contamination
15. The test results should be read after 15 minutes on the timer, though this may be 20 minutes after the first test was started
16. Measure the wheal size for each allergen, according to the measurement criteria that the Clinic uses, but at least measure in mm the wheal (if any) at each test site
17. Document each test result on the SPT Report Form
18. Clear up any used product
19. Return the SPT vials to the rack or case
   If the vials are not to be used again for an hour or more then return the SPT rack or case of vials to the refrigerator. Otherwise keep the rack or case at RT but away from any heat source and out of direct sunlight
20. If the patient complains of itching, then apply topical antihistamine cream or similar
21. If the patient complains of a systemic reaction, then treat according to the guidelines stated above
22. The SPT Result Form should be provided to the Medical Practitioner as soon as possible as they may wish to inspect the SPT reactions and visualising any late-phase reactions that may have been missed on the first reading.

Factors that Affect Clinical Validity
The SPT is a biological test and there are many factors that can introduce variability into the test, any one of which can reduce the clinical validity of the test result.

These variable factors are:

1. Patient Paediatric Adult Aged Cooperative
2. SPT Reagent used Brand Shelf Life Stressed Potency
3. SPT Allergen used Pollen Epidermal Mite Food
4. SPT Lancet used Brand Pricker Depth
5. Technique Scratch Prick & Lift Perpendicular
6. Measurement mm size Score vs Pos Control
7. Evaluation by Operator by Doctor
8. Reporting Paper Electronic

Therefore, it is important to avoid or at least minimise those factors that are avoidable. Standardisation of products used, and test technique and result measurement are all critical factors that can be managed well by an experienced SPT Operator, and so increase the clinical validity of the SPT results that they provide.

Information to Patients
Verbal communication to the patient is vital or they may become concerned and even uncooperative. A printed sheet explaining the procedure can be given to the patient ahead of the test procedure.

Test Sites
Most usually the SPT will be performed on the volar forearm or forearms of the patient, though if there are many allergens or for babies, then the back may be used. The disadvantage with the latter is that the resultant itch from a positive SPT may be uncomfortable and may discourage the patient from future cooperation.

What SPT Allergens?
Ideally the Medical Practitioner will pick and choose the SPT allergens for the patient to be tested with from the range of SPT allergen solutions that are available to the Clinic. That may be as few as 2 or 3 SPT allergens or as many as 40 SPT allergens from a range of 100 different SPT allergens available at the Clinic.

The Clinic will have a printed SPT Report Form that states all the SPT allergens they have available. This can be amended manually with any newly stocked SPT allergens. The Medical Practitioner can then tick the boxes to indicate which allergens are to be tested by the SPT Operator for this individual patient.

That SPT Report Form will also record the name of the Medical Practitioner requesting the tests, the date, the name of the SPT Operator, patient details and the test results.

The Clinic may have a General SPT Screen that is applied to every patient, with or without being supplemented by other individual SPT tests chosen by the Medical Practitioner. Alternatively, the Clinic may have one or more fixed panels of SPT allergens, such as:

| Inhalants | Paediatric foods | Adult Food Screen | Nuts & Seeds |
These fixed panels can be time saving, especially when one of the multi-tests SPT lancet devices is used together with the fixed panel of 8 or 10 allergens. See SPT Lancets.

A Positive Control and a Negative Control should always be included for every patient.

A standard SPT panel for inhalant allergens has been developed by GA²LEN for use in Europe and comprises the following allergens:

<table>
<thead>
<tr>
<th>Positive Control</th>
<th>Histamine dihydrochloride 0.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Control</td>
<td>NaCl 0.9%</td>
</tr>
<tr>
<td>Grass Mix</td>
<td>Meadow Grass Poa pratensis</td>
</tr>
<tr>
<td></td>
<td>Cock’s Foot Doctylis glomerata</td>
</tr>
<tr>
<td></td>
<td>Perennial Rye Lolium perenne</td>
</tr>
<tr>
<td></td>
<td>Timothy Grass Phleum pratense</td>
</tr>
<tr>
<td></td>
<td>Meadow Fescue Festuca pratensis</td>
</tr>
<tr>
<td></td>
<td>Oat Grass Helicotrichon pretense</td>
</tr>
<tr>
<td>Mugwort</td>
<td>Artemisia vulgaris</td>
</tr>
<tr>
<td>Ragweed</td>
<td>Ambrosia artemissifolia</td>
</tr>
<tr>
<td>Hazel</td>
<td>Corylus avellana</td>
</tr>
<tr>
<td>Alder</td>
<td>Alnus incana</td>
</tr>
<tr>
<td>Birch</td>
<td>Betula alba</td>
</tr>
<tr>
<td>Plane</td>
<td>Platanus vulgaris</td>
</tr>
<tr>
<td>Cypress</td>
<td>Cupressus sempervirens</td>
</tr>
<tr>
<td>Olive</td>
<td>Olea europaea</td>
</tr>
<tr>
<td>Alternaria</td>
<td>Alternaria alternata/tenuis</td>
</tr>
<tr>
<td>Cladosporium</td>
<td>Cladosporium herbarum</td>
</tr>
<tr>
<td>Aspergillus</td>
<td>Aspergillus fumigatus</td>
</tr>
<tr>
<td>Parietaria</td>
<td>Parietaria spp.</td>
</tr>
<tr>
<td>European HDM</td>
<td>Dermatophagoides pteronyssinus</td>
</tr>
<tr>
<td>American HDM</td>
<td>Dermatophagoides farinae</td>
</tr>
<tr>
<td>Cockroach</td>
<td>Blatella germanica</td>
</tr>
<tr>
<td>Cat</td>
<td></td>
</tr>
<tr>
<td>Dog</td>
<td></td>
</tr>
</tbody>
</table>

Allergens can be supplemented as necessary to this standard panel for regional or particular patient needs.

**SPT Techniques**
The Skin Prick Test is sometimes called the **Scratch Test**, but this term is now obsolete as the SPT lancet is no longer used to scratch the epidermis, but to prick it.
There is the **Prick & Lift technique** whereby the lancet is dipped into the drop of SPT solution, pricked into the skin, but then lifted obliquely forward at 45 degrees in order to make a small lift of the skin. This is somewhat more traumatic than the perpendicular prick technique and may cause a minor bleed which is ideally to be avoided. It may also give somewhat different results from the perpendicular prick technique.

The **perpendicular prick technique** is to dip the point of the metal lancet through the drop of SPT solution and to make a 2-3 mm deep puncture, then withdrawing the lancet vertically.

Whichever technique is used it must be standardised by all the SPT Operators in that Clinic for the sake of reproducibility. Having different techniques introduces a variable factor into the SPT which is to be avoided or at least minimised. Ideally the technique that the Clinic standardises on should be the same as is used by all Operators in the hospital group or geographical region, so that results are reproducible by other Operators.

There is another SPT technique which deserves mention; the **prick-to-prick technique**. If a food allergen is not available as a commercial SPT solution, then it is possible to use a metal lancet to first prick into the food (such as a fruit, or vegetable, or nut, or dairy product, etc.) and then to prick into the patient at the appropriate SPT site. The food in question may be fresh or may be frozen. The advantage of this technique is the availability and the low cost and the fact that it may be a more sensitive test than when using commercial SPT extracts for some fresh foods and vegetables – due to the poor stability of food extracts. The main disadvantage of the prick-to-prick technique is the clinical risk due to a possible stronger-than-expected reaction to the non-standardised raw material.

**SPT Solutions**

**Composition** of a SPT solution is a 50/50 mix of saline solution with glycerol, plus minor excipients, plus the allergenic extract. The minor excipients (for Inmunotek SPT solutions) are potassium phosphate dihydrate, sodium dihydrogen phosphate dihydrate, and phenol as preservative. The SPT solutions from all other manufacturers will have similar contents.

There are several Manufacturers of SPT solutions that will be available in your country.

There are over 450 different allergens and allergen mixes available in total from various manufacturers, with each manufacturer producing from 30 to 200 different SPT allergens. Some SPT allergens may be manufactured only by one company.

There are approximately a dozen different Manufacturers based in Europe alone. However, in any one country only one or a few manufacturers will be represented and their SPT products available.

**Not all SPT vials are the same!** Some are as small as 1 ml of allergen solution, and some are as large as 5ml, depending on the Manufacturer. This has important considerations regarding the remaining shelf life if the particular allergen is rarely used, so will expire before being consumed.
The volume of SPT solution provided by the usual glass pipette and teat for these glycerol-containing drops is 50 micrograms. Good Clinical Practice dictates that the tip of the dropper is not allowed to touch the patient's skin, thereby avoiding any possible contamination. At 50 micrograms per drop this means 1 ml of SPT solution should be adequate for 20 tests, so 2.5 ml is adequate for 50 tests. There will always be an unreachable dead volume of solution in the vial, but Manufacturers slightly overfill the solution to compensate.

At least monthly, check before use the expiry date printed by the Manufacturer on the vial label. The solution may be used up until the last day of the month stated. The shelf life after date of manufacture for SPT solutions from most Manufacturers is 24 months, though for Inmunotek SPT it is 36 months and for some allergens (moulds) from one manufacturer it is just 12 months. Ideally the Clinic should maintain a log or table of all the expiry dates of all their SPT solutions, and check that on a monthly basis for expiring vials. Upon your receipt, there should be an absolute minimum of 12 months remaining till expiry date for any SPT vial; if not then ask for a discount!

Some Manufacturers have a second expiry date for their SPT solutions, which is 6 months or 12 months after date of opening of the individual SPT vial. Check with your supplier if this principle applies to their SPT solutions; if it does then you will need to keep a record of such opening dates and expiry dates. Inmunotek SPT has no such additional expiry date for their solutions.

A good supplier of SPT solutions will maintain a local stock of all the SPT solutions that they sell. In that case then delivery to you can be overnight. If there is no local stock then the Manufacturer will have to send that SPT solution to the Distributor, which may take a week or a month, depending on various circumstances. For more unusual allergens that may only be manufactured on special request, the Manufacturer may only run a production once they have accumulated orders to a sufficient level to motivate a production.

In the competitive world in which we live, and the choice of 2 or more suppliers of SPT solutions in any country, then prices also tend to be competitive between the brands. Consider not only the price per vial but also the price per ml of SPT solution, as some solutions are in bigger volumes than others.

**SPT Lancets**

Use one lancet per SPT allergen; do not wipe and re-use.

**Metal Lancets** are the classic SPT lancets that are most widely used. They are often manufactured and supplied by the same company that manufactures the SPT solutions. Standardise on one brand of lancet or at least with the same structure and size of pricker.

**Evaluation of Results**
An SPT is measured as the size of the wheal of the individual SPT site, as measured across the largest dimension of that wheal.
One interesting aid of measurement is to draw around each of the wheals using a Biro type pen and that makes it easier to measure the size of the wheal. No wheal gives a dot mark.

A further tip is to then take Scotch tape (the type that is translucent, not transparent) and place the adhesive side hard up against the line of SPT wheals, whereby much of the ink will transfer to the tape. That tape can then be added onto the patient’s SPT Record Form for possible future study. For a far more elegant version of this process see PrickFilm®.

The Clinic may choose to record the SPT result only in terms of the mm size of the wheal.

Or the Clinic may choose to standardise on the size of the wheal of the particular allergen compared to the size of the wheal of the Histamine Positive Control solution, calculated as none, 25%, 50%, 100% or 200%.

Or the Clinic may choose to standardise on using only a score from 0 to ++++. The SPT Results Interpretation table shown below shows the percentage of wheal vs Histamine Positive Control solution.

<table>
<thead>
<tr>
<th>Grade</th>
<th>mm Dia across widest part of Wheal</th>
<th>% of area of Wheal vs Histamine Pos Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>&lt;3 mm</td>
<td>same size as Neg Control</td>
</tr>
<tr>
<td>+</td>
<td>3-5 mm</td>
<td>25%</td>
</tr>
<tr>
<td>++</td>
<td>6-8 mm</td>
<td>50%</td>
</tr>
<tr>
<td>+++</td>
<td>8-10 mm</td>
<td>100%</td>
</tr>
<tr>
<td>++++</td>
<td>&gt;10 mm</td>
<td>200%</td>
</tr>
</tbody>
</table>

There is a lot to be said for this last option as the SPT is by no means a precise test. There are so many variables inherent in the SPT that a measurement of 6 mm to e.g. Mould Aspergillus in one patient using a fresh SPT solution from one Manufacturer means a greater sensitisation than a 5 mm wheal on another patient in a different Clinic, using a different Manufacturers close-to-expiry allergen solution, for a different allergen, and a different lancet, with a different SPT Operator. The SPT is definitely not a totally automated laboratory test for allergen specific IgE, running 500 tests per day, with external and internal QC samples, QA program, and a Coefficient of Variation down to 2-3% intra-batch and 3-5% inter-batch.

**False Positives** occur when an SPT shows a positive result but there is in fact no such sensitisation. This will be evident when the Negative Control gives a positive result. Suspect dermatographism, or contamination in the SPT solution, or a highly sensitised patient who reacts to everything. A lab-based s-IgE test for the allergens will not be influenced by any of these factors and so is the next step.

**False Negatives** occur when the patient shows a negative SPT result though is in fact sensitised against that allergen. If the Positive Control is negative or suppressed, then this indicates that either the Positive Control has deteriorated (check it on yourself) or the patient is still under the influence of medications or other interfering substances.
A false negative result for a particular allergen may only be picked up by the Medical Practitioner if it is discordant with the clinical information. That could be due to failure of that SPT solution, so treat it with suspicion and have a spare handy in case the discordant negative result repeats with the same patient or another patient. A lab-based s-IgE test for the allergens will not be influenced by any of these factors and so is the next step.

**Cross-Reactivity** is a feature of related allergens, such as two related trees or grasses, or foods. There are also pan-allergens that occur in many different native flora and fauna, such as tropomyosin that occurs in HDM and shrimp, or another pan-allergen that occurs in apple and birch. This is experienced by the patient as a sensitivity to both the allergens, so reacts to apple as a food and to birch as a pollen. That patient’s SPT will also be positive to both allergens. All European grasses cross-react to approx. 90% because they are taxonomically related and antigenically very similar, so a SPT for e.g. Timothy grass (*Phleum*) can represent a test for all European grasses. Similarly, with the Immunotherapy vaccine for grass pollen allergy. However, the Bermuda grass (*Cynodon dactylon*) found on golf course putting greens and in warmer Mediterranean climes (and USA, Australia South Africa, etc) is taxonomically distant and antigenically dissimilar to the European grasses and so does not cross-react to a significant degree. It therefore needs to be tested separately if a grass pollen allergy is suspected.

Cross-reactivity patterns can be complex, but there is much information available online.

**Documentation of Results**
Each Clinic offering SPT must have a dedicated SPT Report Form that shows the patient information, the SPT allergens tested, the results, and the interpretation criteria. This will usually be a printed form that can be retained in the patients file, or scanned and stored as a PDF file, or it can be an electronic reporting form for online storage.

For a draft generic SPT Report Form contact Inmunotek or its local Distributor.

**PrickFilm**® is an Inmunotek accessory that allows for the automated evaluation and documentation of SPT results using a physical template and computer software. The system provides a printed report for the patient and the Medical Practitioner. Contact Inmunotek for further information.

**Information to Patient**
The patient should always be given counselling, ideally by the Medical Practitioner as to the results of the SPT and the clinical implications. The various treatment options can then be discussed with the patient and decisions taken as to the future patient management.

**Other Information and Education for SPT Operators**
This SPT brochure is intended as a brief overview of the Skin Prick Test for SPT Operators.

Inmunotek has produced a 40-page A4-size “Inmunotek SPT Manual”, that is available free of charge, as a PDF file, from Inmunotek and its local Distributors,
The “Directions For Use” for SPT solutions is also available free of charge, as a PDF file, from Inmunotek and its local Distributors.

An SPT Training Seminar intended for SPT Operators is also available from Inmunotek and its local Distributors.

Contact Inmunotek or its local Distributor for further information.

References Used
1. Directions for Use of Inmunotek SPT allergen solution products
3. BSACI Nurses SOP for Skin Prick Test of Paediatric Patients
4. BSACI Nurses SOP for Skin Prick Test of Adult Patients
7. McCann WA, Ownby DR. The reproducibility of the allergy skin test scoring and interpretation by board-certified/board eligible allergists. Annals of Allergy, Asthma and Immunology 89:368-371 2002