PURPOSE
To compare a new 10-leg, single-tip multi-test device (ComforTen) with an 8-leg, cluster-tip multi-test device (MultiTest II), which has a known performance pattern, in a head to head manner. The performance of, and patient preference for, the two FDA allowed skin test devices were evaluated in a single blinded fashion at two allergy clinics. The outcomes may assist clinicians in making an informed decision when selecting a skin test device.

BACKGROUND
The results of allergen skin testing are clinically important because they guide the allergy specialist in devising an avoidance plan and in writing immunotherapy prescriptions. The goal for the allergy specialist is to apply allergen skin testing using a device that minimizes both false negative and false positive findings, and that results in minimal patient discomfort.

Multi-test devices offer the advantage of application of several antigens simultaneously. Many of those devices on the market have been evaluated against each other to compare performance. Studies have revealed significant differences in the size of wheal and flare reactions; for both positive (allergen extract or histamine) and negative (glycerol-saline) sites. Differences appear to result from the degree of skin trauma imparted to the skin, an interpretation that was reinforced by the observation that those producing larger wheals also caused more patient discomfort.

STUDY DESIGN
• Single blinded study executed per IRB-approved protocols at two clinical sites.
  Allergy & Asthma Clinic (AAC, Fort Lauderdale, Florida; Linda Cox, MD)
  National Jewish Health (NJH, Denver, CO; Rohit Katial, MD)
• Inclusion Criteria: 18-70 years of age, male or female, atopic or non-atopic
• Exclusion Criteria: dermatographism, severe atopic dermatitis, inability to withhold medications that may influence the test (antihistamine, H2 blockers, tricyclic antidepressants, prednisone), skin damage/conditions that obscured the readings (NJH only), and pregnancy (NJH only).
• Patient Participation: N=24 (AAC), N=16 (NJH)
• Two multiple test devices were used. 
  ComforTen (CF10, HollisterStier Allergy, Spokane, WA)
  Multi-Test II (MTII, Lincoln Diagnostics, Decatur, IL)
• Test Solutions: 1 mg/mL base (as 2.7 mg/mL Histamine Phosphate, ALK)
  6 mg/mL base (as 10 mg/mL Histamine Dihydrochloride, HollisterStier)
  50% glycerol-saline (HollisterStier) as the negative control.
• Operators trained by each company’s representative, according to the respective package inserts, and tested for proficiency.
• Patients were blind skin tested on the back with each device in duplicate.
  – In order to control for variations in response based on anatomic site, each device was used on two horizontal planes on the back with the order of application randomized. Each quadrant of the back was equally represented by both devices.
  – The skin test devices tested with alternating positive and negative controls.
• Measurements were taken 10 minutes after test application.
  – Wheal responses were outlined, transferred using tape to a case report form, and later measured by two independent operators.
  – The presence of flare was noted, as applicable.
• For each device, patients were asked to assess the degree of pain using the Wong Baker FACES pain rating scale (ICAOH compliant).
• Patients were asked their preference for each of two pairs of devices to confirm consistency of response.
• Study data were analyzed using repeated measure ANOVA (SAS, version 9.2).
• Studies were funded by Jumblott-Hollister LLC.

REFERENCES

RESULTS

OUTCOME: Wheal Size

<table>
<thead>
<tr>
<th>Cut-Off</th>
<th>CF10 AAC</th>
<th>CF10 NJH</th>
<th>MTII AAC</th>
<th>MTII NJH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm</td>
<td>39%</td>
<td>39%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>3 mm</td>
<td>34%</td>
<td>34%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>5 mm</td>
<td>11%</td>
<td>11%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>WHEAL DIAMETER (mm)</td>
<td>0.12</td>
<td>0.48</td>
<td>1.76</td>
<td>6.04</td>
</tr>
</tbody>
</table>

Note: N = 39 patients. 40 patients were enrolled, but one was excluded from analysis due to an incomplete case report form.

OUTCOME: Sensitivity and Specificity

<table>
<thead>
<tr>
<th>Cut-Off</th>
<th>CF10 AAC</th>
<th>CF10 NJH</th>
<th>MTII AAC</th>
<th>MTII NJH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm</td>
<td>98%</td>
<td>98%</td>
<td>93%</td>
<td>93%</td>
</tr>
<tr>
<td>3 mm</td>
<td>98%</td>
<td>98%</td>
<td>99%</td>
<td>99%</td>
</tr>
<tr>
<td>5 mm</td>
<td>99%</td>
<td>99%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Sensitivity = (True Pos)/(True Pos + False Neg)
Specificity = (True Neg)/(True Neg + False Pos)
Optimal Performance = Sensitivity x Specificity

OUTCOME: Patient Preference and Pain Scores

<table>
<thead>
<tr>
<th>Cut-Off</th>
<th>CF10 AAC</th>
<th>CF10 NJH</th>
<th>MTII AAC</th>
<th>MTII NJH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.62</td>
<td>1.63</td>
<td>1.44</td>
<td>1.88</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSIONS
• Under conditions of manufacturer recommended use (CF10 with 6 mg/mL histamine vs. MTII with 1 mg/mL histamine):
  – Two devices produced similar average wheal sizes.
  – Sensitivity and specificity at a 3 mm cut-off are comparable.
• Optimal CF10 outcome used 6 mg/mL histamine control and a 1 mm cut-off.
• Optimal MTII outcomes used 6 mg/mL histamine control and a 3 mm cut-off.
• Differences in operator techniques may account for the observation of some inter-site differences, which highlights the importance of training.
• Patient preference is for the ComforTen device.
• Recommend follow-up studies to confirm these findings with allergen extracts.