A New Method for Assessing Feather and Down Serum Protein Contamination (#1749)

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Introduction

In the past, allergy to feather was considered very common[11]. It is now known to be quite rare[2]. The reactions initially are recognized as being triggered by contaminants including feather mites, other cross reacting mites and avian serum proteins. All are highly reactive through allergenic and hypersensitivity mechanisms[2-7].

Over recent years commercial processing of feather and down has progressed greatly and remove these contaminants. However, it is crucial to have methodologies that determine whether this processing, highly variable on a worldwide scale, has been effectively performed. Where allergen accumulation is concerned, the integrity of the barrier function of the ticking fabric represents the key consideration.

Existing Testing Methodology

The feather and down industry currently relies upon turbidity and oxygen number as being indicators of adequate cleanliness. Unfortunately relevant quantities of contaminants may remain, in spite of these levels being deemed acceptable. The methodology for determining oxygen number was developed in 1928 by H.F. Knight and is based on a color change following a titration (Fig 1). As such, this is very much an indirect method to determine the cleanliness of feather and down and while it may measure allergen as a component of organic material present, an improved method which is more sensitive is required.

Turbidity is also an indirect testing method for determining cleanliness of feather and down, and measures both organic and inorganic materials. Two methods may be used to measure turbidity, using a glass cylinder (similar to Fig 2) or an automated nephelometric turbidity unit (NTU) meter.

Figure 1 Oxygen Number

According to industry:

<4.8 = ‘Hypoallergenic’

>550 = ‘Hypoallergenic’

Figure 2 Turbidity Test

Existing Vs New Methodology

Feather and down products, pre- and post-wash, were analysed using the industry standard methodology. This was compared to the new immunoassay-based method. The results are detailed below:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Oxygen No.</th>
<th>Turbidity</th>
<th>Avian IgG (µg/g)</th>
<th>Protein (mg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unwashed 1</td>
<td>24</td>
<td>73</td>
<td>42.41</td>
<td>2.5</td>
</tr>
<tr>
<td>Unwashed 2</td>
<td>26</td>
<td>45</td>
<td>75.31</td>
<td>3.08</td>
</tr>
<tr>
<td>Unwashed 3</td>
<td>26.4</td>
<td>60</td>
<td>12.31</td>
<td>1.88</td>
</tr>
<tr>
<td>Washed 1</td>
<td>4</td>
<td>550+1000+</td>
<td>1.06</td>
<td>0.53</td>
</tr>
<tr>
<td>Washed 2</td>
<td>4.8</td>
<td>550+1000+</td>
<td>0.05</td>
<td>0.55</td>
</tr>
<tr>
<td>Washed 3</td>
<td>2.6</td>
<td>1000+</td>
<td>2.42</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Discussion and Conclusions

All the washed samples listed above would be classified as ‘hypoallergenic’ by the feather and down industry. While the term ‘hypoallergenic’ has no medical definition, it is recognised by consumers as being a measure of a product’s ability to elicit an immune response.

As can be seen from the table, although the washed samples would all be viewed as being of a similar quality, the difference in IgG levels between the lowest and highest figures is nearly 50-fold.

• Present methodologies to determine whether allergens are present on feather and down products are not sufficiently sensitive.

• The presented method allows manufacturers, for the first time, to be able to measure accurately the allergenic content of their product.

• Based on data obtained to date, the Avian IgG immunosassay is an important tool for assessing the level of bird allergen contamination of feathers, and hence can be used to assess the effectiveness of the commercial washing process for removal of allergens.

References