Abstract
The choice of purchasing an environmentally friendly or ‘green’ cleaning product appears to be one that consumers are increasingly happy to make, however the reality is that environmentally friendly cleaners often contain ingredients that may adversely affect those people suffering from asthma and allergies. Confirming that a product will not adversely affect a user is not straightforward, there is little point to a cleaning product that is harmful to the consumer but is ineffective in its cleaning performance. However, adhering to strict guidelines regarding allowable concentrations of chemicals and other constituents may allow consumers to purchase a product that is both human (and environment) friendly as well as being effective. We discuss the basis by which choices may be assessed for suitability for those with asthma and allergies.

1. Introduction
As homes become more and more insulated and sealed (in an effort to conserve energy) natural ventilation decreases thus preventing fresh air from entering, and harmful off-gassing chemicals from exiting. Both the Environmental Protection Agency and the World Health Organization have recognised that indoor air quality is declining and this may have particular effects on those suffering from asthma and allergies.

Allergy and contact dermatitis, particularly in modern society, with the numbers suffering from asthma increasing every year. It is a condition of the airways, whereby the bronchial tubes may become inflamed and mucus-filled, making it very difficult to breathe.

In Western Europe the prevalence of asthma has doubled over the last decade.

• It is estimated that asthma accounts for about 1 in every 250 deaths worldwide, of which are preventable.

• In the UK, it is estimated that 1 in every 7 children aged 2-15 years and 1 in every 25 adults have asthma symptoms that require treatment.

• In Switzerland, 25 years ago the frequency of asthma was 2%, currently it is 8%.

• The total annual cost of asthma care in Europe amounts to approximately €1.77 billion.

In a similar way to asthma, the prevalence of allergies has increased considerably over the past decade or so. An allergen is any molecule capable of eliciting an allergic response and includes dust, pollen, cat and dog dander. Allergens may elicit an allergic reaction by skin contact, injection, ingestion or inhalation.

• More than 1 in 3 children in Europe has at least one allergy.

• More than half of all US citizens test positive in skin-prick test to one or more allergens.

• In a recent survey over 50% of homes had at least six detectable allergens present.

2. Cleaning Products
The development of cleaning products progressed rapidly during the 20th Century and with this increased development came the increased reporting of skin complaints related to these cleaning products. Shortly after the Second World War a myriad of skin complaints were blamed on household detergents as the medical profession deemed detergents as causative agents. It wasn’t until the 1960s that dermatologists reassessed their reaction and decided that detergents were, after all, useful and necessary. However by the 1970s, with the advent of new irritancy assays, the pendulum swung back again in opposition to detergents, with the largest population regarding the toxicity of traditional household cleaners. A survey of 1000 American mothers in 2008 revealed that:

• 95% agreed household cleaning products can be toxic

• 70% agreed they can be harmful to health and family’s health

• 61% agreed that fumes from products bothered them

• 70% agreed that products are safe to use around their family

• 49% agreed that children may be exposed to household toxins

• 81% agreed that household cleaning products may trigger asthma in children and adults.

Increased asthma rates, contact dermatitis and allergic reactions have all been associated with traditional chemical cleaners. Although it could be argued that those cleaning for a living will be more exposed to any allergen that they would normally be allergic to, the role of the constituents of the cleaning products cannot be ignored.

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The toxic nature of some traditional cleaning products is due to constituents such as ammonia, solvents and sodium hypochlorite. All of these chemicals have been associated with lung irritation, skin irritation or airway problems. Fragrance, a constituent of many cleaning products, is a complex product made up of numerous chemicals, and is so allergenic as to have been voted Allergen of the Year, 2007 by the American Contact Dermatitis Society.

Many factors have led to people becoming more environmentally responsible, and a Gallup Poll in 2007 showed that more than 70% of US and Japanese citizens were ‘avoiding certain products that harm the environment’. A more focused survey of King County in Washington revealed that over 50% of inhabitants were ‘choosing less toxic household cleaning products’ and about 40% were ‘considering the environmental impact of [their] purchase decision’.

2.2 Green Cleaning Products
With the move towards environmentally friendly products, the green market has expanded rapidly. Green sales in supermarkets increased 170% in 2007/08 and leaders in the green market (Method, Seventh Generation and Mrs’ Meyer) benefited from this in the form of increased sales. Chlorox released their green product (Greenworks) in 2008 and within 10 months controlled 40% of the green market. At present the green cleaning market is less than 5% of the total market, although this is predicted to rise to 30% by 2013.

It is clear that there has been a large increase in consumers purchasing green products and the reasons for this may vary, however the results of a Haasgroup Survey and Miutel Survey showed that:

• Negative long term effects of chemicals on the body were the most important thing to consider when thinking about adopting a green lifestyle.

• The biggest motivator for adopting green practices was health

• Four in ten cited allergies as a reason for buying eco-friendly cleaning products

• The environment was not a primary concern for respondents.

The paradigm therefore is that although respondents acknowledge that green is synonymous with environmental responsibility, they were more likely to adopt green practices for health reasons rather than environmental ones.

Worryingly, although consumers may be buying green products for their own personal health, there are many constituents in green cleaning products that may cause reactions, mainly for those suffering from asthma and allergies.

Table 1 outlines some of the main constituents of green cleaning products along with their potential health impact. These ingredients were released by green cleaning manufacturers and in these cases, the informed consumer may be able to make a judgment regarding their potential health effects:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Cleaner</th>
<th>Health Effect</th>
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<tbody>
<tr>
<td>Hypochlorite</td>
<td>Glass</td>
<td>Irritant, lung irritation and reduction of air quality</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>Bathroom</td>
<td>Skin irritant, inhalation irritant</td>
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<tr>
<td>Sodium Hypochlorite</td>
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<td></td>
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<tr>
<td>Phosphoric Acid</td>
<td></td>
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<tr>
<td>Butyraldehyde</td>
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<tr>
<td>Formaldehyde</td>
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Either traditional or green cleaning products may be used to clean effectively; however as has been established in this review asthma allergy and contact dermatitis triggers. In order to control asthma and allergies, individuals are encouraged to discourage pests, reduce dust and reduce mold; in order to do this they require an effective cleaner, and this is where a potential problem occurs.

In effect, the ideal cleaning product is one that is environmentally sound, effective and health friendly. At present there are products that are claimed to be environmentally friendly and environmentally responsible, and this is an achievement. However where health friendly is also a consideration, a further challenge is presented.