Abstract: Enzyme proteins have long been recognized to have a potential to cause occupational allergy. Consequently, enzyme detergent manufacturers have chosen to implement a number of control measures to ensure that the hazard does not translate into health effects in the workforce. A determination has been provided on how risk management guidelines for the industry, as developed by the American Cleaning Institute (ACI) and the International Association for Soaps, Detergents and Maintenance Products (AISE), were actually implemented in practice and the resulting experience of workplace exposures and health impacts. Both medical surveillance and air monitoring practices associated with the implementation of industry guidelines at over 100 manufacturing facilities over a five year period were evaluated with respect to the prevalence of allergic antibody and occupational respiratory allergy. Data was generated from 4 participating companies, from factories that were globally distributed, and from a period of 5 years.

Methods:

Both medical surveillance and air monitoring practices associated with the implementation of the ACI and AISE industry guidelines at approximately 100 manufacturing facilities have been evaluated with respect to the prevalence of allergic antibody and occupational respiratory allergy. Data was generated from 4 participating companies, from factories that were globally distributed, and from a period of 5 years.

Results:

The data in Tables 1 and 2 show that using the approaches described for the limitation of exposure, for good occupational hygiene, and for active health monitoring, the respiratory allergenic hazard/risk associated with enzyme proteins can be successfully managed to ensure the safety of the workforce. Over the 5 year period evaluated, clinical symptoms occurred at a rate of generally 0.1% or less. Also, while up to approximately 10 air monitoring measurements were made per day, only less than 2 per month showed an airborne level above the action standard.

Enzyme Guidelines:


Table 1. Overview of health surveillance experience

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of factories</th>
<th>No. of workers</th>
<th>Uptake1 (%)</th>
<th>Incidence2 (%)</th>
<th>Prevalence3 (%)</th>
<th>Symptoms4 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>107</td>
<td>22100</td>
<td>96.0</td>
<td>0.99</td>
<td>8.6</td>
<td>0.11</td>
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<td>2001</td>
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<td>23668</td>
<td>95.6</td>
<td>0.76</td>
<td>8.1</td>
<td>0.08</td>
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<tr>
<td>2002</td>
<td>114</td>
<td>23976</td>
<td>94.4</td>
<td>1.04</td>
<td>7.8</td>
<td>0.26</td>
</tr>
<tr>
<td>2003</td>
<td>106</td>
<td>22686</td>
<td>97.0</td>
<td>0.82</td>
<td>7.3</td>
<td>0.05</td>
</tr>
<tr>
<td>2004</td>
<td>106</td>
<td>24773</td>
<td>94.9</td>
<td>0.97</td>
<td>8.5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

1 Percentage of the workforce that participated in surveillance programs.
2 Percentage of new cases of sensitization during the calendar year.
3 Percentage of total cases of sensitization in the exposed workforce.
4 Percentage of cases exhibiting any evidence of rhinitis, conjunctivitis, impaired lung function, asthma; not necessarily linked to an occupational causation.

Discussion:

Exposure to enzymes presents a genuine risk to health. In the occupational setting, this risk can readily be expressed if exposure is not tightly controlled. Consequently, monitoring of airborne exposure against stringent limits coupled with regular surveillance of the health of the potentially exposed workforce is required to deliver assurance of a safe working environment. In the 5 years of experience reviewed, results from air monitoring and health surveillance show success in both areas at a level of greater than 99%. At the most telling level, symptoms of allergy are avoided in >99.9% (and it is worth remembering that this figure still exaggerates the true extent of symptoms – see Table 1).

Conclusions:

1) Respiratory allergenic risk associated with exposure to bacterial and fungal enzymes in detergent factories can be successfully managed to ensure the safety of the workforce.

2) The effective implementation by enzyme detergent manufacturers of industry guidelines for occupational hygiene controls and health monitoring strategies, as developed by ACI and AISE, reinforces the view that adoption of these approaches would be beneficial in other industries working with enzymes.