

<b>Health and Safety Executive</b>		<b>Sector Information Minute</b>	
<b>Agriculture and Food Sector</b>		<b>SIM 01/2003/55</b> (formerly 05/2003/12)	
<b>Cancellation Date</b>	12/06/2007	<b>Open Government Status</b>	Fully Open
<b>Version No &amp; Date</b>	2: 14/05/2003	<b>Author Unit/Section</b>	Food Section

Target Audience

FOD Inspectors responsible for the food industries

Specialist Inspectors (Occupational Hygiene)

## **CHLORAMINE EXPOSURE AND CONTROL IN FOOD PROCESSING**

This SIM gives advice on the risks from exposure to chloramines created during the processing of vegetables and how they can be controlled.

### **BACKGROUND**

1 Chlorinated water is an important biocide in the food industry. It is used mainly for cleaning salad and other vegetables. It was also widely used in poultry processing until recently and there may be some smaller processors still using it.

### **PROCESS**

2 The biocide is usually added to the water in the form of hypochlorite. During the washing and cleaning processes nitrogen-containing materials from the foods, mainly proteins, mix with the chlorinated washing water. A chemical reaction takes place that produces chloramines, mainly trichloramine. Chloramines can evaporate from the water or, where the water is agitated, become airborne in water droplets. The less volatile chloramines are biocides in their own right and are used for that purpose particularly in the water industry. .

### **HEALTH EFFECTS**

3 Chloramines are strong irritants with trichloramine being as irritant as chlorine gas. They cause eyes to water and provoke coughing as the inhaled vapour combines with moisture in the lung airways to produce ammonia and hydrochloric acid.

4 Low concentrations of chloramines produce mild respiratory tract irritation and have a pungent odour similar to chlorine. High concentrations are reported to cause corrosive effects in the lung airways and cellular injury, which may progress to more permanent injuries. People with pre-existing asthmatic conditions may respond to the non-specific respiratory insult from chloramine irritation.

5 There is no OEL for chloramines. However, extensive research in France indicates that workers exposed to levels below  $0.5\text{mg/m}^3$ , the so-called '*comfort limit*', do not suffer symptoms.

6 HSE has recently been investigating several complaints of eye and throat irritation and breathing difficulties at a large salad processing plant. The company had measured airborne levels of chlorine using colorimetric indicator tubes (Draeger) and found nothing. HSE's investigations found exposure up to the '*comfort threshold*' and background levels near the washing tanks above the '*threshold*'. The company was not aware that chlorinated water and nitrogenous compounds could generate chloramines and it was misled by the chlorine measurements it had done. The HSE Specialist Occupational Hygiene report identifies several practical control options that will reduce chloramine exposure to below  $0.05\text{mg/m}^3$ .

## CONTROLS

7 Controls include:

- (1) substitution of hypochlorite (see SUBSTITUTION below);
- (2) incorporating a stripping tank or tower into the system to remove chloramines from the circulating washing water. This reduces the need to use additional ventilation and saves on air-cooling costs;
- (3) separating the preparation and washing areas. The washing tanks are the sources of chloramines and when preparation and washing areas are in the same workroom, people in the preparation area are unnecessarily exposed;
- (4) enclosing the washing tanks and fitting LEV. Enclosure makes LEV potentially very effective. The tops or sides of the tanks can be hinged for access; and
- (5) powered general ventilation.

## SUBSTITUTION

8 The salad processing company referred to in para 6 was able to substitute chlorine dioxide for hypochlorite. Chlorine dioxide is an effective biocide but, unlike the free chlorine generated in water when using hypochlorite, it does not react with nitrogenous compounds to form chloramines. The quality of the product did not appear affected and there was an increase in shelf life. Chlorine dioxide is more expensive than the hypochlorite system but overall the substitution costs were small.

9 Several vegetable and salad processing companies have successfully substituted chlorine dioxide for hypochlorite. Clearly, before changing, companies would have to be convinced that this compound gave the same

biocidal effect but given that, substitution does appear to offer the best control solution.

#### ACTION BY INSPECTORS

10 No special action is required. However inspectors should be aware, when inspecting vegetable processing plants, that significant chloramine generation and exposure can occur and potentially cause respiratory effects. Control measures are available which are reasonably practicable.

Date first issued: 14 May 2003