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Target Audience:

All FOD Inspectors with Waste Management responsibilities

### BIOAEROSOLS IN COMPOSTING SITES

This SIM is to alert inspectors to the issue of bioaerosols generated at composting sites. It informs inspectors of the issues, the conclusions drawn by recent research, and advises action to be taken by inspectors in response to enquiries.

#### BACKGROUND

There is an obligation on the UK Government to reduce the amount of waste going to landfill. Consequently, the composting of organic waste is becoming a more important part of the waste management industry. As an expanding industry, there has been growing interest in the potential of this activity to create a health risk to both workers and members of the public.

In response to an increase in enquiries relating to the potential risks arising from composting sites, HSL were commissioned to research pre-existing literature and some pre-existing sampling data to assess the health risks. This report was published as a pdf file (Research Report [RR130 - Occupational and environmental exposure to bioaerosols from composts and potential health effects - A critical review of published data](#)) on the HSE website in July 2003.

The report concentrates on the health risks to workers from composting, though it is anticipated that inspectors will be contacted enquiring about health risks to the public residing outside composting sites.

#### REPORT CONCLUSIONS AND RECOMMENDATIONS

The report drew the following main conclusions:

Reported data indicates that workers may be regularly exposed to bioaerosols between 10 and 1,000 times greater than in ambient air. The allergenic fungus, *aspergillus fumigatus* is a significant component.

Studies report raised levels of antibodies and inflammatory mediators in compost workers (as found in other workers exposed to organic dusts, such as farmers etc).

Worldwide, only two published cases reported evidence of respiratory infection in workers.

Composting on a major scale is a new and expanding industry. Although evidence does not currently exist to cause major concern, there remains the potential for chronic ill health, which may not yet have had time to manifest itself.

The Environment Agency (EA) currently operates a '250 metre limit' rule around composting sites to minimise the potential of bioaerosol exposure to nearby residents.

The Agency's position is that there will be a presumption against permitting [and to object to any planning application] of any new composting process [or any modification to an existing process] where the boundary of the facility is within 250 metres of a workplace or the boundary of a dwelling, unless the application is accompanied by a site-specific risk assessment, based on clear, independent scientific evidence which shows that the bioaerosol levels are and can be maintained at appropriate levels at the dwelling or workplace. The Agency will continue to work with others to identify appropriate controls measures that may allow operations to take place within 250 metres of the boundary or a dwelling/workplace.

Most published studies indicate that bioaerosols are reduced to background within the 250 m distance prescribed by the Environment Agency for risk assessment purposes. (Some experimental studies and dispersion modelling exercises suggest that bioaerosols sometimes may exceed concentrations chosen as background levels at distances greater than 250 m).

There is no published evidence that exposure to bioaerosols disseminated from compost facilities cause respiratory ill health in residents or workers at nearby locations, or that the greater than background bioaerosol levels which may occur under anticipated conditions represent a significant excess risk.

There is no evidence upon which to alert the Environment Agency to consider a review or amendment to their current '250 metre rule'.

## BACKGROUND INFORMATION

A briefing document for inspectors headed "Compost Bioaerosols – Frequently Asked Questions." is given as an [Appendix](#) to this SIM, and covers the most likely asked questions from enquirers.

## ACTION BY INSPECTORS

Inspectors should:

- Continue to apply the principles of reducing exposure to bioaerosols, so far as is reasonably practicable.
- Require risk assessments from employers to determine the control measures required. It is likely that such a risk assessment will require the routine use of

respiratory protective equipment (RPE) to avoid exposure to bioaerosols when shredding, turning, screening or moving composting material or whenever leachate is either sprayed or transferred from one place to another. This precaution is likely to be required by anyone within 30 metres of such a procedure, and for five minutes afterwards. For those working within a cab, with an adequate, well maintained, filtration system then RPE may not be needed. (See HSG53 and Appendix 2, which deal with biological agents regarding choice of RPE. Suitably fitted RPE of FFP2 or P3 are suitable for use against biological agents in terms of non-penetration of spores/cells through the filter material.) Further advice is available from RSG Occupational Hygienists.

- Refer enquirers complaining of smell or other public nuisance to the appropriate Local Authority Environmental Health Department.
- Decline to make comment on the EA '250 metre rule'. This is a matter for the EA to decide upon and comment.
- Refer non-routine queries on matters of FOD's inspection policy and strategy regarding composting to Trevor Hay, Manufacturing Sector at the Cardiff office (02920263077 trevor.hay@hse.gsi.gov.uk).
- Refer matters of an advanced scientific nature to their RSG Occupational Hygienists. (Dr Brian Crook -HSL, Sheffield, or CD6 (HID) microbiologists may need to be contacted in urgent cases).

#### FURTHER INFORMATION

The Composting Association has produced a safety guide designed to help minimise the health and safety risks on site. Aimed at composting site operators, it includes advice on reducing health problems caused by airborne micro-organisms (bioaerosols). 'Health & Safety at Composting Sites - A Guidance Note for Site Managers' is available from the Composting Association - Telephone 01203 308222.

Copies for inspectors' reference are held in the Magdalen House Information Centre.

Date first issued: 10 November 2003

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#### APPENDIX

##### COMPOST BIOAEROSOLS – Frequently Asked Questions

###### **What is a bioaerosol and can I be exposed to one?**

Bioaerosol is the term used to describe micro-organisms (bacteria, fungi/moulds or viruses) or their products that are airborne. Bioaerosols are naturally present in the air, mainly soil borne micro-organisms in airborne dust, so everyone is constantly exposed to them. Concentrations change depending on the weather, season and whether indoors or outdoors. Typical bioaerosol concentrations are greater in rural areas, because of nearby vegetation, than in urban areas. Bioaerosols can result from any

process that makes microbially contaminated material airborne. Examples in the workplace include contaminated industrial process water. In agriculture, bioaerosols may be created from handling dusty contaminated material such as grain or animal feed, or from animal housing.

### **Why do bioaerosols occur from composts?**

Composting is a natural process in which micro-organisms (fungal/mould spores and certain types of bacteria called actinomycetes) are encouraged to grow to break down waste material. As a result, very large numbers of micro-organisms are present in compost and any handling of the material that generates dust will create abioaerosol. To encourage efficient composting, the piles of material (called windrows) have to be well aerated and therefore are turned regularly. At the end of the process, often the compost is screened (sieved) to produce a quality soil supplement. Both of these activities will create bioaerosols.

### **Why was this study done?**

The UK Government has an obligation, through EU legislation, to reduce the amount of waste going to landfill. Challenging targets have been set and ways to achieve these targets include recycling of waste materials. Composting of organic waste is an important part of the recycling initiative and several new composting sites are now in operation or are being planned. Because bioaerosols are generated from composts, concerns have been raised mainly by residents in the vicinity of composting sites, that exposure to the bioaerosols can affect health. As part of the planning and licensing procedure, new composting sites must assess the impact their business may have on the surroundings, including the risks that may be associated with bioaerosols generated from composting activities. The Environment Agency issued a position statement which stipulated that if new composting sites or new activities on existing sites, are less than 250m from a sensitive receptor such as a nearby residential property, they must assess any health risk and if necessary control potential exposure of that sensitive receptor to bioaerosols. The 250m distance was estimated from previous studies which indicated that by this distance any bioaerosols associated with commercial composting would disperse in the atmosphere and concentrations would be reduced to background levels. It was recognised that there was no single source of information to assess worker exposure to bioaerosols and potential health risk. Consequently, HSE commissioned Health and Safety Laboratory and the Composting Association to critically review the available literature on the subject and to summarise it in a single document, also to identify current gaps in relevant information. The Environment Agency was also consulted to ensure that the review would suit their requirements for information on spread of bioaerosols from composting facilities. A similar review had previously been done in USA nearly 10 years ago, which concluded that composting sites do not pose a significant risk to the health of residents in the vicinity of composting sites, but there was a need to determine whether research in the intervening years had changed that view.

### **I work at a composting site. Will I be exposed to bioaerosols and will they affect my health?**

If you work with compost, potentially you will be exposed to bioaerosols, because of the

large number of micro-organisms present in the compost. As with other workers exposed to organic dust and large numbers of airborne micro-organisms (e.g., in certain agricultural activities and in waste handling) if you breathe in those micro-organisms in large numbers over a long period they can trigger an allergic reaction. This can range from a short term flu-like reaction (inhalation fever) to longer term ill health such as asthma or bronchitis. Once a person has become sensitised, subsequent exposure to even a smaller quantity can trigger the allergy. The key is to assess risk and control exposure, which is an obligation placed on employers by the HSAW Act and COSHH. Potential exposure can be controlled by changing the work process to minimise the generation of bioaerosols, by introducing control measures such as exhaust ventilation to prevent exposure, using adequate filters on the air intakes of vehicles such as tractors used to move compost, or using personal protective equipment such as adequate and suitably fitted dust masks when working in areas where bioaerosols are generated.

### **I live near a composting site. Will I be exposed to bioaerosols and will they affect my health?**

Most published studies on compost bioaerosol exposure and health have focussed on the exposure of workers on sites handling the material, because their exposure will be greatest. Some studies have looked at the effect of composting activities on surrounding bioaerosol concentrations. A limited number of studies have looked at the health of nearby residents. While it is recognised from these studies that under certain conditions composting activities nearby may raise bioaerosol concentrations above background levels, these concentrations are much lower than would occur on a composting site near to compost material being handled. There is no reported evidence of significant increase in ill health in residents near composting sites in these situations. The lungs of a healthy person are capable of being exposed to relatively large concentrations of micro-organisms without ill effect.

### **How far away from a composting site do I need to be so as not to be exposed to bioaerosols?**

Bioaerosols are always present in the atmosphere. These may be considered as the background level of exposure we constantly experience. Previous published studies have mostly shown that by 200 to 250m distance from composting activity the bioaerosol concentrations will be reduced to background levels. In some studies, bioaerosol concentrations above background have been recorded. Consequently, although there is no evidence of ill health for nearby residents, it would be difficult to justify changes to the 250 m limit set by the Environment Agency on the strength of current evidence. It should be noted that other activities locally, such as farming activities, or even the presence of large areas of vegetation, can also raise the background bioaerosol concentration.

### **I can smell the nearby composting site. Does that mean I am being exposed to bioaerosols?**

Composted material may have a distinctive smell, depending on the feedstock, for example if it contains a large proportion of pine branches there will be the characteristic resin smell. The volatile chemicals responsible for smells are gases, which are smaller

in size and lighter than particles of dust, and bioaerosols (mould spores and bacterial cells in the air) behave like small particles of dust. Consequently, gases can travel further in the air than the heavier particles, which drop from the air under gravity. Some odorous gases can be smelled at extremely low concentration. Sometimes, if composting activities are poorly managed, the compost becomes 'anaerobic' (oxygen starved) which causes the bacteria in the compost to create different chemicals with unpleasant smells. In many cases, this can be avoided: if it occurs you should complain to the compost site or bring it to the attention of the local authority. HSE inspectors will refer complainants commenting on smell and other public nuisance issues to the appropriate local authority Environmental Health Department.

### **Can you predict where a compost bioaerosol will go?**

Bioaerosols, including those from compost, are like any other small dust particles in the air. They can move and be carried along in air currents before falling to the ground under gravity. If the wind direction and strength is known, it is possible to predict in what direction and how far a bioaerosol will travel away from the source of its release. As it is carried by air currents from that source, it will be dispersed and therefore diluted in concentration as it mixes with the surrounding air. Local conditions will affect this; for example, the warmth from a compost pile will make the bioaerosol rise higher in the air, and nearby buildings, trees, fences etc will also push the air current higher into the air, causing more mixing with the surrounding air and dilution of the bioaerosol. It is possible to use computer models (dispersion models) to predict these movements. Such models are already used to predict the movement of airborne pollutants and as part of this study we investigated the potential use of these models for bioaerosols, so that predictions could be made about movement of bioaerosols around and away from composting sites.

### **Are there any other health and safety issues associated with composting sites?**

In addition to the hazards associated with inhalation of bioaerosols on composting sites, there may be other biological hazards depending on the feedstock. If sewage sludge is being used, there may be infectious bacteria and viruses present. If vermin on the site are not controlled, there is the risk of workers contracting leptospirosis (Weil's disease), a bacterial infection caused by exposure to contaminated rat urine. Good hygiene, including provision of adequate hand washing facilities, can reduce these risks. Other hazards on a composting site include potential exposure to any chemicals used on site, and physical hazards such as slips and trips, moving vehicles and machinery. It is the responsibility of the site operator to identify potential hazards, make a suitable risk assessment and to provide adequate protection to their work force to control risks.

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