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Bryn Compost Liaison Group

# Public health (bioaerosol) assessment update

October 2012

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# In-vessel composting

- Biological process where micro-organisms convert biodegradable organic matter into compost
- Process uses oxygen from air and produces carbon dioxide and water vapour by-products
- Biodegradable waste comprises garden and food waste
- 'In-vessel' composting features enclosed composting of waste process with higher degree of process control than windrow composting



# Bioaerosols

- Bioaerosol emissions associated with in-vessel composting activities are primary health concerns
- Defined as microscopic airborne particles including bacteria, fungal spores, protozoa and organic constituents of microbial or fungal origin
- Evidence of adverse health effects relates mostly to occupational exposures amongst compost site workers



# Potential health effects

- Infection, allergy, adverse response to **micro-organism** toxins
- Rarely, **fungi** (*Aspergillus fumigatus*) can cause infections – invasive aspergillosis – and can produce mycotoxins
- **Bacteria** e.g. coliforms may survive high temperatures achieved in composting and can cause infection and allergies
- Aerosolised **Actinomycetes** spores can penetrate deep into lungs causing allergic and respiratory problems
- **Endotoxins**, inhaled in large quantities, can cause short-term flu-like illness with symptoms of fever, myalgia and malaise
- **Mycotoxins** can cause acute or chronic disease in animals, (neurotoxicity, carcinogenicity and teratogenicity). **But, NO recognised occupational or public health risk**
- **Volatile organic compounds (VOCs) and odours** (sulphurous compounds) unlikely to be a health concern, but assumption of detectable nuisance odours synonymous with perceived health risks of bioaerosol exposure

# Health-related thresholds

Parameter	Threshold	Source
Mesophilic bacteria	1000 CFU/m <sup>3</sup>	Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T., Tyrrel, S.F. Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Bristol, UK: Environment Agency.
Total bacteria	1000 CFU/m <sup>3</sup>	Wheeler PA, Stewart I, Dumitrean P, Donovan B (2001). Health effects of composting: a study of three compost sites and review of past data. R&D Technical Report P1-315/TR. Bristol, UK: Environment Agency.
Total gram negative bacteria	300 CFU/m <sup>3</sup>	Wheeler PA, Stewart I, Dumitrean P, Donovan B (2001). Health effects of composting: a study of three compost sites and review of past data. R&D Technical Report P1-315/TR. Bristol, UK: Environment Agency.  Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T., Tyrrel, S.F. Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Bristol, UK: Environment Agency.
Total fungi	1000 CFU/m <sup>3</sup>	Wheeler PA, Stewart I, Dumitrean P, Donovan B (2001). Health effects of composting: a study of three compost sites and review of past data. R&D Technical Report P1-315/TR. Bristol, UK: Environment Agency.
Aspergillus fumigatus bacteria	500 CFU/m <sup>3</sup>	Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T., Tyrrel, S.F. Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Bristol, UK: Environment Agency.
Thermophilic actinomycetes bacteria	No standard – acts as indicator of heat-gen. process	N/A

- Sensitive receptors: those living within 250m of composting facility site

# Bioaerosol emissions monitoring (1)

Interpretation of results and comments provided

Bryn  
Composting,  
Gelligaer,  
Sept 2009

Sampling programme methodology is in line with appropriate guidance i.e. Association for Organics Recycling's *A Standardised Protocol for the Monitoring of Bioaerosols at Open Composting Facilities*;

- Mesophilic bacteria levels below suggested health-related threshold (1000 CFU/m<sup>3</sup>), 9-64 CFU/m<sup>3</sup>;
- Total Gram Negative Bacteria levels below suggested threshold level (300 CFU/m<sup>3</sup>), 0-61 CFU/m<sup>3</sup>;
- *Aspergillus fumigatus* levels below suggested threshold level (500 CFU/m<sup>3</sup>), range 0-205 CFU/m<sup>3</sup>;

Not possible to determine compliance with the health-related Total fungi level threshold.

Agree with the report's conclusion that bioaerosol levels recorded during the monitoring exercises on 22nd July 2009 and 14th September were low, and fell well below corresponding threshold levels. Therefore, it would be unlikely for these levels of bioaerosols to give rise to any adverse public health impact amongst residents in the local community.

Since the odour arising from operations at Bryn Composting is considered to be a nuisance by many local community residents, it is feasible that the public perception of there being a link between unpleasant odours and ill-health could result in wider and less tangible public health implications in the form of potential psychological impacts e.g. stress, anxiety etc.

# Bioaerosol emissions monitoring (2)

Monitoring report	Interpretation of results and comments provided
Bryn Composting, Gelligaer, May 2010	<p>Sampling programme covers a reasonable mix of sampling sites in terms of upwind/downwind locations and occupational and residential settings.</p> <p>Sampling programme methodology is in line with appropriate guidance i.e. Association for Organics Recycling's <i>A Standardised Protocol for the Monitoring of Bioaerosols at Open Composting Facilities</i>;</p> <ul style="list-style-type: none"><li>- Mesophilic bacteria levels below health-related threshold (1000 CFU/m<sup>3</sup>), range 5-40 CFU/m<sup>3</sup>;</li><li>- Total Gram Negative Bacteria levels below health-related threshold (300 CFU/m<sup>3</sup>), range 0-14 CFU/m<sup>3</sup>;</li><li>- <i>Aspergillus fumigatus</i> levels below health-related threshold (500 CFU/m<sup>3</sup>), range 0-12 CFU/m<sup>3</sup>;</li><li>- Thermophilic Actinomycetes bacteria levels act as an indicator of heat-generating processes e.g. composting, in the vicinity of the sampling location. There is currently no standard for these gram positive bacteria but levels appear to be low, ranging from 0 to 54 CFU/m<sup>3</sup>;</li></ul> <p>Agree with the report's conclusion that bioaerosol levels recorded were low, and fell well below corresponding threshold levels. Therefore, it would be unlikely for these levels of bioaerosols to give rise to any adverse public health impact amongst residents in the local community;</p> <p>Since the odour arising from operations at Bryn Composting is considered a nuisance by many local community residents, it is feasible that the public perception of there being a link between unpleasant odours and ill-health could result in wider and less tangible public health implications in the form of potential psychological impacts e.g. stress, anxiety etc.</p>



# Bioaerosol emissions monitoring (3)

Monitoring report	Interpretation of results and comments provided
Bryn Composting, Gelligaer, Jan 2011	<ul style="list-style-type: none"><li>- Mesophilic bacteria levels are below the suggested threshold of 1000 CFU/m<sup>3</sup>; range 16 to 60 CFU/m<sup>3</sup>. Measured levels are broadly similar to those obtained from the last monitoring exercise undertaken in May 2010; range 5 to 40 CFU/m<sup>3</sup>;</li><li>- Total Gram Negative bacteria levels below suggested threshold of 300 CFU/m<sup>3</sup>; range 0 to 4 CFU/m<sup>3</sup>. Measured levels are broadly similar to those obtained from the last monitoring exercise undertaken in May 2010; range 0 to 14 CFU/m<sup>3</sup>;</li><li>- <i>Aspergillus fumigatus</i> fungi levels below suggested threshold of 500 CFU/m<sup>3</sup>; range 0 to 2 CFU/m<sup>3</sup>. Measured levels are broadly similar to those obtained from the last monitoring exercise undertaken in May 2010; range 0 to 12 CFU/m<sup>3</sup>;</li><li>- Thermophilic actinomycetes bacteria levels act as an indicator of heat-generating processes e.g. composting, in the vicinity of the sampling location. There is currently no standard for these gram positive bacteria but levels appear to be low; range 2 to 30 CFU/m<sup>3</sup>. Measured levels are broadly similar to those obtained from the last monitoring exercise undertaken in May 2010; range 0 to 54 CFU/m<sup>3</sup>;</li></ul> <p>In the report's Recommendations section, 'copy and paste' error identified, since a recommendation is made that "this sampling methodology is continued during 2009/2010 at quarterly intervals to establish trends in bioaerosol release and dispersion and to assess the impact of operational controls".</p> <p>Overall, agree with the report's conclusion that bioaerosol levels measured were low, and fell well below the suggested corresponding threshold levels at all locations monitored. Therefore, it is possible to conclude that bioaerosols, at the counts measured, would not pose an elevated public health risk to residents living in the vicinity of the Bryn Compost IVC facility.</p> <p>For future reports, it would be useful to see graphs showing trends of bioaerosol monitoring results over time. This would save having to refer back to previous reports to compare results.</p>



# Bioaerosol emissions monitoring (4)

Monitoring report	Interpretation of results and comments provided
Bryn Composting, Gelligaer, July 2011	<ul style="list-style-type: none"><li>- Mesophilic bacteria levels are below the suggested threshold of 1000 CFU/m<sup>3</sup>; range 122 to 249 CFU/m<sup>3</sup>. Measured levels are elevated compared to previous results for the same monitoring locations but are below specified limit;</li><li>- Total gram negative bacteria levels are below the suggested threshold of 300 CFU/m<sup>3</sup>; range 0 to 2 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li><li>- <i>Aspergillus fumigatus</i> fungi levels are below the suggested threshold of 500 CFU/m<sup>3</sup>; range 2 to 9 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li></ul> <p>Overall, agree with the monitoring report's conclusion that measured bioaerosol levels were below suggested threshold levels at all locations monitored. Therefore it is possible to conclude that bioaerosols, at the counts measured, would not pose an elevated public health risk to residents living in the vicinity of the facility.</p> <p>In a previous response (2 March 2011) comment made that it would be useful for each monitoring report to present trends in each of the bacteria levels over time.</p>

# Bioaerosol emissions monitoring (5)

Monitoring report	Interpretation of results and comments provided
Bryn Composting, Gelligaer, Oct 2011	<ul style="list-style-type: none"><li>- Mesophilic bacteria levels are below the suggested threshold of 1000 CFU/m<sup>3</sup>; range 9 to 57 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li><li>- Total gram negative bacteria levels are below the suggested threshold of 300 CFU/m<sup>3</sup>; range 0 to 2 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li><li>- <i>Aspergillus fumigatus</i> fungi levels are below the suggested threshold of 500 CFU/m<sup>3</sup>; range 0 to 9 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li></ul> <p>Overall, agree with the monitoring report's conclusion that measured bioaerosol levels were low and fell well below suggested threshold levels at all locations monitored. Therefore it is possible to conclude that bioaerosols, at the counts measured, would not pose an elevated public health risk to residents living in the vicinity of the facility.</p> <p>In a previous response (2 March 2011) commented that it would be useful for each monitoring report to present trends in each of the bacteria levels over time.</p>

# Bioaerosol emissions monitoring (6)

Monitoring report	Interpretation of results and comments provided
Bryn Composting, Gelligaer, Jan 2012	<ul style="list-style-type: none"><li>- Mesophilic bacteria levels are below the suggested threshold of 1000 CFU/m<sup>3</sup>; range 4 to 87 CFU/m<sup>3</sup>. Measured levels for the same monitoring locations are slightly elevated compared to with October 2011 but below those of July 2011. However, in all cases they are below the specified limits.</li><li>- Total gram negative bacteria levels are below the suggested threshold of 300 CFU/m<sup>3</sup>; range 0 to 7 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li><li>- <i>Aspergillus fumigatus</i> fungi levels are below the suggested threshold of 500 CFU/m<sup>3</sup>; range 0 to 11 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li></ul> <p>Overall, agree with the monitoring report's conclusion that measured bioaerosol levels were below suggested threshold levels at all locations monitored. Therefore it is possible to conclude that bioaerosols, at the counts measured, would not pose an elevated public health risk to residents living in the vicinity of the facility.</p> <p>In previous responses (6 December 2011, 2 March 2011) commented that it would be useful for each monitoring report to present trends in each of the bacteria levels over time.</p>

# Bioaerosol emissions monitoring (7)

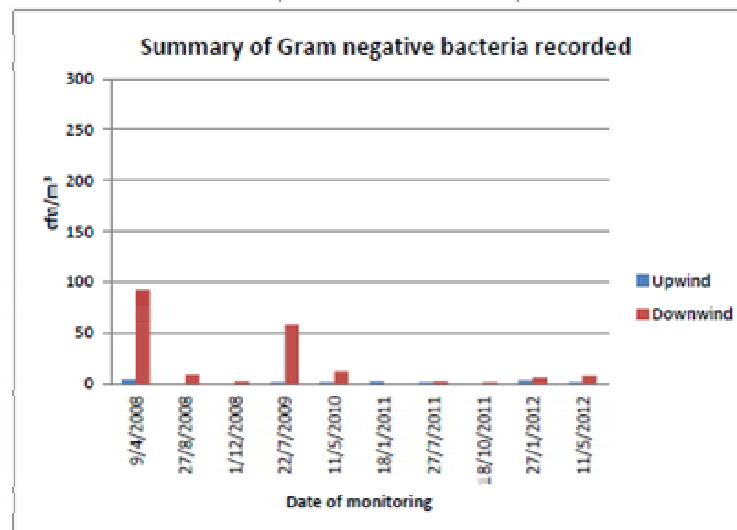
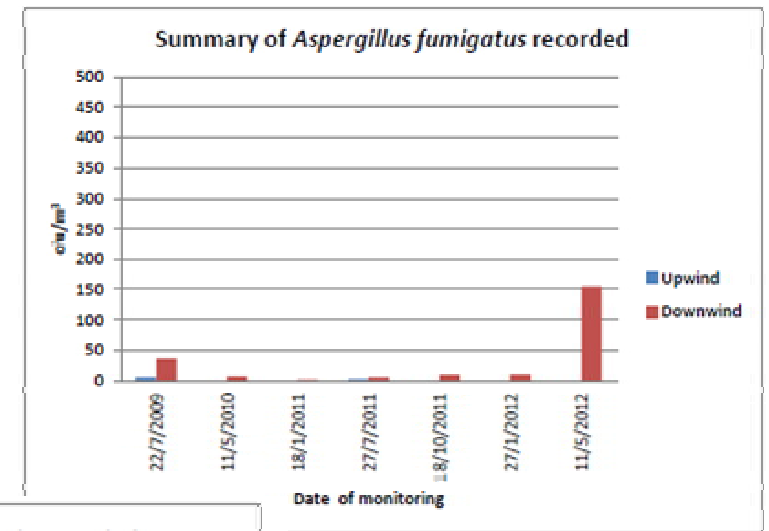
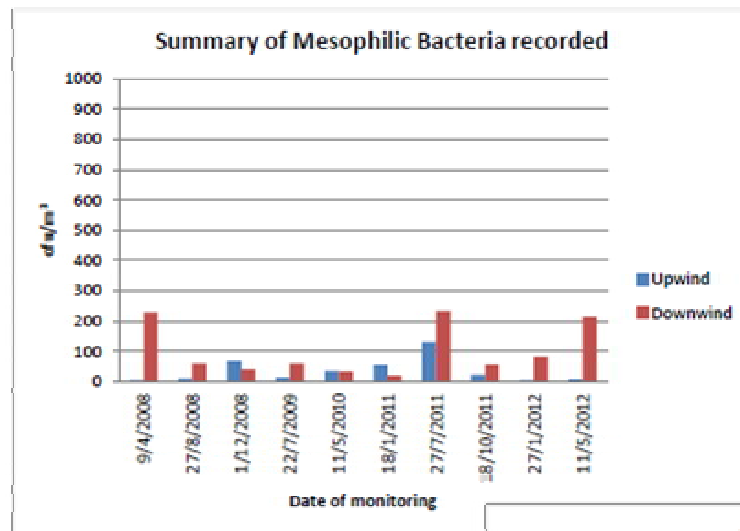
Monitoring report	Interpretation of results and comments provided
Bryn Composting, Gelligaer, May 2012	<ul style="list-style-type: none"><li>- Mesophilic bacteria levels are below the suggested threshold of 1000 CFU/m<sup>3</sup>; range 7 to 260 CFU/m<sup>3</sup>. Measured levels for the same monitoring locations are slightly elevated compared with January 2012 and October 2011 but similar to those of July 2011. However, in all cases they are below the specified limits.</li><li>- Total gram negative bacteria levels are below the suggested threshold of 300 CFU/m<sup>3</sup>; range 0 to 11 CFU/m<sup>3</sup>. Measured levels are broadly similar to those in previous monitoring exercises.</li><li>- <i>Aspergillus fumigatus</i> fungi levels are below the suggested threshold of 500 CFU/m<sup>3</sup>; range 0 to 155 CFU/m<sup>3</sup>. Measured levels are above those seen in recent monitoring but are still below the specified limits.</li></ul> <p>Overall, agree with the monitoring report's conclusion that measured bioaerosol levels were below suggested threshold levels at all locations monitored. Therefore it is possible to conclude that bioaerosols, at the counts measured, would not pose an elevated public health risk to residents living in the vicinity of the facility.</p> <p>Commented previously that it would be useful for each monitoring report to present trends in each of the bacteria levels over time. These data have now been included and the charts are shown on the following slide. The vertical axis reflects the suggested threshold values for the monitored bioaerosols.</p>

# Bioaerosol emissions monitoring (7 contd.)

Monitoring report

Interpretation of results and comments provided

Bryn Composting, Gelligaer, May 2012





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