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Taranaki Regional Council

APPENDIX '1'

URS Summary of Bio-Aerosol Issues

Composting and Bioaerosol Pollution

Bioaerosol is the term used to describe microorganisms (bacteria, fungi/moulds or viruses) or their products that are airborne. Bioaerosols are naturally present in the air, mainly from soil-borne microorganisms in airborne dust. This means everyone is constantly exposed to them, even at home. Higher levels are present in some work environments (e.g. farms, timber processing, mushroom production). The concentrations change depending on the weather, season and whether indoors or outdoors. However, concentrations of bioaerosols are typically greater in rural areas, because of nearby vegetation, than in urban areas.

Composting is a natural process in which microorganisms (fungal/mould spores and certain types of bacteria called actinomycetes) are encouraged to grow to break down waste organic matter. As a result, very large numbers of microorganisms are present in compost and any handling of the material that generates dust, both during the composting process and post composting (screening), has the potential to create a bioaerosol.

Bioaerosol concentrations and their dispersion depends on a number of site-specific factors including the type of raw material, method of composting, configuration of composting site, method used for and frequency of compost pile turning, weather conditions, moisture of piles, landscaping and background concentrations.

The two bioaerosols that often generate interest in relation to composting facilities are *Aspergillus fumigatus* and *Legionella longbeachae*.

Aspergillus Fumigatus

Aspergillus fumigatus is a very common fungus that is found almost everywhere in rural and residential outdoor areas. It has been associated with soil, crop plants, bird droppings, cattle and horse dung, hay, fodder, corn, grass and compost.

Reported instances of aspergillosis (the condition caused by *Aspergillus fumigatus*) in healthy individuals are rare, even when involved in occupations such as farming which are associated with exposures to high concentrations of airborne *Aspergillus fumigatus*. Most reported cases of aspergillosis have occurred in immuno-compromised individuals (e.g. people with leukaemia or AIDS).

Studies have shown that the airborne concentrations of *Aspergillus fumigatus* spores near to composting operations are similar to, or less than, other sites associated with vegetation. This is demonstrated in the results shown in Tables 1 and 2 below.

Table 1 *Aspergillus fumigatus* Spore Count from the Turning of Compost Piles

Location and Treatment	Spore Count (colony-forming units, CFU/m ³)
Next to compost piles before mechanical turning.	39
Next to compost piles immediately after mechanical turning.	1,390
Next to compost piles 15 minutes after mechanical turning.	39

Table 2 *Aspergillus fumigatus* spore counts at other locations

Site	Spore Count (CFU/m ³)	
	Spring	Summer
Lawn with mulch	6	686
Agriculture (barn)	352	5,550
Home attic	1,160	125
Domestic Greenhouse	1,070	9,810

Most studies also show that bioaerosol concentrations return to background concentrations within a few hundred metres of the source. For example, one study showed that *Aspergillus fumigatus* spore concentrations decreased by 80-90% at a distance of only 20-40 meters from the source.

Legionella longbeachae

There are over 48 different species of *legionella*. The species that is responsible for the majority of health effects is *legionella pneumophila* which is the cause of what is commonly referred to as Legionnaires Disease. This species lives in water or damp conditions (and health concerns are usually associated with indoor air-conditioning systems).

The species that has commonly identified as being present in potting mixes and compost is *Legionella longbeachae*, although other species will also be present. Internationally a relatively small percentage of cases have been reported as occurring from *longbeachae* exposure each year by comparison with the *pneumophila* variety, although available New Zealand data shows a higher percentage, albeit based on the relatively few reported cases each year.

In all cases *legionella* bacteria affect the lungs, resulting in legionellosis a pneumonic-like condition, although at least one variety results in flu-like symptoms. However, like *Aspergillus fumigatus*, *legionella* offers relatively little risk to healthy people.

Like *Aspergillus fumigatus*, *legionella* appears to be very common with it being detected in 75% of soil samples tested in an Australian study.

There is debate about whether infection is via inhalation or from hand to mouth, with *legionella longbeachae* remaining on hands for up to 1 hour after handling potting mix (although it is readily removed by washing). If the bacteria is spread by inhalation the most effective control mechanism is dampening the material down. Therefore there is relatively little risk of exposure from the compost during manufacture as it remains damp.

All reported compost related cases of legionellosis in New Zealand have occurred in people who have been in contact with packaged potting mix / compost. No cases have been reported from exposure in areas surrounding compost manufacturing sites.

There are few published studies where the health of residents near to composting facilities has been investigated, but where this has been done there has been no illness found that was linked to the composting operations.

Conclusions

Aspergillus fumigatus and *Legionella longbeachae* are common in most outdoor rural and residential areas. While the bioaerosols associated with these organisms can cause illness in humans, such illnesses are rare, and none have been reported in New Zealand that have been associated with green waste composting operations. The reported cases of illness in connection with compost have all been caused by people using bags of potting mix in their own homes, where they have been in close contact with the composted material.

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