

# Health Consultation

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BURLINGTON COUNTY RESOURCE RECOVERY COMPLEX  
MANSFIELD TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

CERCLIS NO. NJD986589059

JUNE 27, 2000

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES**  
**Public Health Service**  
**Agency for Toxic Substances and Disease Registry**  
**Division of Health Assessment and Consultation**  
**Atlanta, Georgia 30333**

## **Health Consultation: A Note of Explanation**

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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**HEALTH CONSULTATION**

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**Prepared by:**

**Exposure Investigation and Consultation Branch  
Division of Health Assessment and Consultation  
Agency for Toxic Substances and Disease Registry**

## **BACKGROUND AND STATEMENT OF ISSUES**

The Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by a local citizen to evaluate potential health concerns related to the Burlington County Resource Recovery Complex (BCRRC) located in Florence and Mansfield Townships, New Jersey. Residents have expressed a number of concerns related to the proximity of this facility to their community (i.e., the Homestead at Mansfield). Many of these concerns have been addressed in prior correspondence with a petitioner from the community [1]. A major concern has been that a composting operation at the facility may result in increased exposure to *Aspergillus fumigatus* (AF) in the community. The petitioner has suggested that since this is an older community, residents may be at higher risk of AF-related illness due to decreased immunity. The purpose of this consult is to address potential risks of exposure to AF through review of the medical literature and site-specific information.

### **Description of area**

ATSDR conducted a site visit to the BCRRC and adjacent areas and met with community members on March 28, 2000. The BCRRC is a large operating landfill facility. The composting operation, located at the western boundary of the facility, produces compost using wood chips and treated sewage sludge. The bulk of the active composting operation is enclosed. Finished product is spread on the ground prior to packaging and shipping. Air from the enclosed portion is vented through the finished product area.

The Homestead, located in a relatively rural area near Columbus, NJ, is a newer subdivision composed mainly of older retired individuals with a population of approximately 1000. It is bordered by a small wooded wetland area with a small creek nearby (Assiscunk Branch) to the south and a plowed cornfield at the time of the visit directly to the east. Pasture land, small wooded areas, and the New Jersey Turnpike are located between the community and the BCRRC. The community is located approximately 6000 feet northeast of the composting facility with a large landfill berm situated in-between.

### **Health effects of *Aspergillus fumigatus* (AF)**

AF is a common fungal organism found in soil and decaying organic matter. Higher levels can be found in wooded areas, agricultural areas, or associated with lawn mower clippings [2,3]. AF also is one of the most common fungi found in indoor environments. In an indoor survey of homes for common fungi, Katz et al. [4] found *Aspergillus* species to be the most abundant. Due to its prevalence in the environment, it has been estimated that all humans will inhale at least several hundred AF conidia per day [5].

AF has been associated with three main clinical syndromes: 1) allergic bronchopulmonary aspergillosis (ABPA); 2) aspergilloma; and 3) invasive aspergillosis. ABPA is a condition which occurs in patients with pre-existing asthma or cystic fibrosis and usually begins in childhood. Symptoms are similar to asthma although it can progress to cause significant lung damage. Aspergilloma, also known as a “fungus ball” is an infection caused by AF which usually occurs in pre-existing lung cavities that may have been caused by tuberculosis, sarcoidosis, or other lung diseases [6]. However, of the three, invasive aspergillosis is considered the most serious and is described in more detail below.

Invasive aspergillosis is a fungal infection with mortality rates ranging from 50-100% that occurs mainly in severely immunocompromised patients [7]. Incidence of the disease has risen dramatically in the last two decades. Manuel and Kibbler [8] have noted that this increase “almost certainly reflects the more widespread use of aggressive cancer chemotherapy regimens, the expansion of organ transplant programs and the advent of the acquired immunodeficiency syndrome (AIDS).” As might be expected, there has also been dramatic increases in other types of opportunistic infections over the same time period for similar reasons [9]. Those at greatest risk of acquiring aspergillosis are bone marrow or organ transplant recipients, patients with acute leukemia and lymphomas undergoing intense chemotherapy, patients with aplastic anemia, or patients with advanced human immunodeficiency disease [5]. The most common characteristic among these patients is severe neutropenia (i.e., decrease in the number of a type of white blood cell). Patients with this degree of neutropenia are usually seriously ill, hospitalized, and susceptible to a number of opportunistic infections.

Vogeser et al. [10] recently reviewed all cases of aspergillosis occurring over a four year period in a European hospital. They found that of 48 fatal cases, 44 occurred in patients with “severe” immunosuppression. The four patients who did not show signs of severe immunosuppression appeared to develop aspergillosis during their hospitalization (i.e., often termed “nosocomial”) which were associated with prolonged intensive care therapy and procedures including mechanical ventilation. Kauffman [9] has noted that “Probably the most important reason for the increase in opportunistic fungal infections in older adults, however, is the aggressive approach to treatment in the intensive care unit setting.” This includes treatments such as aggressive chemotherapy, iatrogenic immune suppression to facilitate transplant acceptance, or mechanical ventilation.

Sources of AF infections in hospitalized patients are difficult to trace. Measurement of AF concentrations in hospital wards have not correlated well with hospital acquired cases. Other possible suggested sources of AF infections in hospitalized patients have included nearby building renovations, contaminated ventilation systems, fire proofing material, carpets, potting soil from plants brought to patients rooms, showers, ice makers, and various foods such as coffee beans, cereals, or peanuts which may naturally contain AF [7, 8].

Case reports of invasive aspergillosis occurring in individuals with normal immune system function or outside of a hospital setting are rare. Karim et al. [11] reported a series of 17 aspergillosis patients treated in a Pakistan hospital who did not have obvious immunodeficiencies. However, the authors noted that other factors such as underlying tuberculosis, liver disease, or other factors which may be more prevalent in that region could have contributed to many of these cases.

In a review of the subject, Epstein [2] has noted that of the hundreds of cases of aspergillus-associated disease which have been reported in the medical literature, only two implicated gardening and composting as described below. Zuk et al. [12] reported a case of aspergillosis which occurred in a previously healthy individual who had been employed for 14 years as a gardener. No underlying immunodeficiency was identified. It was theorized that he may have had heavy environmental exposure to AF as a result of his occupational activities. Actual levels of exposure were not determined.

The only identified case of aspergillus-related disease associated with residents near a compost facility was a case of ABPA in a 23-year-old who lived approximately 250 feet from a municipal compost facility [13]. Although the composting site was implicated, Epstein noted that the AF air concentrations near the patient's home were similar to background levels in other areas and that the area between this particular residence and the facility contained woods and wetlands which would also be a significant source of AF.

It should be noted that there have been no case reports of invasive aspergillosis in compost workers who would have exceeding high levels of exposure to AF. Invasive aspergillosis also has not been reported in individuals living near compost facilities.

### **Comparison of AF air concentrations**

Millner et al. [3] reviewed a number of studies which measured AF air concentrations in different types of environments. AF concentrations are typically reported as colony forming units per cubic meter of air (CFU/m<sup>3</sup>). A CFU refers to a microbial colony that grows on a petri dish and may have started from one or more particles in which the microbe is found. Background AF concentrations can vary depending on location, season, or other factors. However, most average outdoor background concentrations are in the range of 0-50 CFU/m<sup>3</sup>. For example, average AF levels in Cardiff, Wales were reported as 33 CFU/m<sup>3</sup> with a maximum of 535 CFU/m<sup>3</sup>. Levels measured in St. Louis were reported to vary between 0-50 CFU/m<sup>3</sup>. AF levels measured in the Washington DC area were generally <10 CFU/m<sup>3</sup>, although much higher levels were periodically observed (i.e., 686 CFU/m<sup>3</sup> were measured near a mulched area of lawn; 56 CFU/m<sup>3</sup> measured on a wooded nature trail; 5550 CFU/m<sup>3</sup> measured in a barn; 1160 CFU/m<sup>3</sup> measured in a dusty attic.)

As noted previously, AF is commonly found indoors and will grow in any area which will support its growth. Levels reported in homes also are generally in the range of 0-50 CFU/m<sup>3</sup> with occasional high concentrations greater than 1000 CFU/m<sup>3</sup> associated with disturbances of dust. Solomon [14] noted that AF was recovered in 31% of 47 homes in the Midwest at concentrations ranging from 1-946 CFU/m<sup>3</sup> with a mean of 24 CFU/m<sup>3</sup>. For comparison, levels in hospitals in which invasive aspergillosis cases have occurred are usually <10 CFU/m<sup>3</sup> suggesting that the characteristically severe immunodeficiencies in these patients rather than unusual or increased AF exposure are the primary risk factor in acquiring this infection [15].

Millner et al. [3] also reviewed AF concentrations at or near several different compost facilities. These studies have indicated that average concentrations of AF on-site are usually in the range of 100-500 CFU/m<sup>3</sup>, with maximum levels often in excess of 1000 CFU/m<sup>3</sup>. However, studies of compost and yard waste facilities in Washington DC, Maine, Canada, New Jersey, and Connecticut have consistently found that downwind AF concentrations decrease to normal background concentrations at distances within approximately 250-500 feet from the compost facility perimeter. For example, at a New Jersey yard waste composting site, maximum AF concentrations were noted to be as high as 70,000 CFU/m<sup>3</sup>. During periods of work activity, the AF concentrations dropped significantly to 354 CFU/m<sup>3</sup> at 100 meters downwind and 86 CFU/m<sup>3</sup> at 500 meters downwind which was considered to be within background. At a Connecticut yard waste composting facility, the maximum AF concentration on-site was 2648 CFU/m<sup>3</sup> with an average of approximately 200 CFU/m<sup>3</sup>. Average levels measured 500 feet downwind from the facility were 4 CFU/m<sup>3</sup>; at 1 mile downwind from the facility the level was 6 CFU/m<sup>3</sup>.

Based on the absence of increased AF concentrations off-site from composting facilities and the lack of epidemiologic evidence of AF-associated disease in either composting workers who are exposed to the highest AF concentrations or residents living near composting facilities, Millner et al. [3] concluded: "Composting facilities do not pose any unique endangerment to the health and welfare of the general public."

### **AF sampling at the BCRRC**

The New Jersey Department of Environmental Protection (NJDEP) air permit for the facility issued in October 1996, required that a monitoring program for AF be conducted for six months before startup of the composting facility (CCF) to establish background levels, and then continue monitoring for a minimum of two years after startup. Under this program, background samples were collected from three on-site and five off-site locations from July 1997 through January 1998 [16]. Triplicate air samples were collected from each location twice a week. Each sample was collected over a seven-minute time span using an Andersen Single Stage Viable Particle Sampler. Dispersion modeling had suggested the highest impact from emissions would be to the northeast of the composting facility. Sampling locations are described below:

- Site 1 - located on-site near the CCF parking area, with 200 feet of entrance
- Site 2 - located on-site approximately 800 feet east-northeast of the CCF
- Site 3 - located on-site approximately 0.75 miles east-northeast of the CCF
- Site 4 - located off-site approximately 1.5 miles northeast of the CCF in a bank parking lot in a strip mall in the Homestead community
- Site 5 - located off-site approximately 1 mile south of the CCF at a horse farm
- Site 6 - located off-site approximately 1 mile northwest of the CCF
- Site 7 - located approximately 1 mile north-northeast of the CCF
- Site 8 - located approximately 2.5 miles west of the CCF

Once the CCF began operations, AF samples were again collected twice a week from May 1998 through April 1999 using the same protocol and sampling sites as above [17]. It was estimated that during the post-startup period, the CCF was operating at approximately 75% of its permitted annual capacity. Sampling results for CCF pre-operation and post-startup are summarized in Table 1.

Average on-site AF concentrations increased from <10 CFU/m<sup>3</sup> (maximum of 140 CFU/m<sup>3</sup>) pre-operation to 18-207 CFU/m<sup>3</sup> (maximum of 1954 CFU/m<sup>3</sup>) post-startup. Average off-site AF concentrations pre-operation ranged from 7-22 CFU/m<sup>3</sup> (maximum of 262 CFU/m<sup>3</sup>); average off-site concentrations post-startup ranged from 5-24 CFU/m<sup>3</sup> (maximum of 992 CFU/m<sup>3</sup>). There were 5 samples in off-site post startup samples which were >150 CFU/m<sup>3</sup>.

Sampler 4 was located approximately 1.5 miles northeast of the CCF in a bank parking lot within the petitioner's community. Pre-operation AF levels at this sampler showed a mean concentration of 22 CFU/m<sup>3</sup> with a high of 262 CFU/m<sup>3</sup>. Post sample results were actually lower showing a mean of 11 CFU/m<sup>3</sup> with a maximum of 229 CFU/m<sup>3</sup>.

Overall, sampling results indicated that while on-site AF concentrations increased post startup, the average off-site AF concentrations have not increased and are still within expected background levels. These results are consistent with previous studies at other composting sites which showed AF levels decrease to background within 250-500 feet of the perimeter of the facility.

**Table 1. Comparison of pre-operational<sup>1</sup> and post-startup<sup>2</sup> *Aspergillus fumigatus* (AF) air sampling at the Burlington County Co-Composting Facility**

Site	Location	AF Concentration (CFU/m <sup>3</sup> )			
		Pre-operation		Post-startup	
		Mean	Maximum	Mean	Maximum
1	on-site, CCF parking area	6	64	210	1954
2	on-site, 800 feet ENE of CCF	6	92	100	1950
3	on-site, 0.75 miles ENE of CCF	10	140	18	558
4	off-site, 1.5 miles ENE of CCF in Homestead	22	262	11	229
5	off-site, 1 mile S of CCF	13	198	5	39
6	off-site, 1 mile NW of CCF	7	76	9	293
7	off-site, 1 mile NNE of CCF	11	124	24	992
8	off-site, 2.5 miles W of CCF	11	219	17	767

<sup>1</sup> pre-operation sampling period, 7/97-1/98

<sup>2</sup> post-startup sampling period, 5/98-4/99

## DISCUSSION

Residents have expressed concerns that the Homestead population may be at increased risk because they are older and may have weakened immune systems. However, review of the medical literature indicates that the primary risk factor for invasive aspergillosis is severe immunodepression and neutropenia to a degree which would be unlikely to be found in non-hospitalized individuals. Thus, increased age or various medical conditions which do not result in severe neutropenia would not necessarily place community residents at increased risk of acquiring aspergillosis.

In addition, the Homestead community is located in a relatively rural area with multiple natural potential sources of AF. Due to its proximity to wetlands, wooded areas, and agricultural lands, the background concentration of AF would be expected to be somewhat higher than more urban areas. Residents are likely exposed on a daily level to AF from both indoor and outdoor sources. Although air measurements have shown higher AF concentrations on-site at the composting facility, there has been relatively little if any discernible effect on AF concentrations off-site. Thus, it is unlikely that the composting facility represents a significant health concern due to increased AF levels in the community.

It also should be noted that epidemiologic evidence does not support an association between AF-related diseases and living near a composting facility or that AF disease is increased in compost workers who would be expected to have exposures orders of magnitude higher than a nearby community.

## CONCLUSION

With respect to AF contamination in nearby communities, the BCRRC is considered a no apparent public health hazard based on the following:

1. Aspergillosis is extremely rare in individuals who do not have severe underlying immunodeficiency. Most cases have occurred in hospitalized patients who have marked neutropenia as a result of diseases such as leukemia, aggressive chemotherapy, iatrogenic suppression of the immune system for organ transplant, or end stage AIDS. Invasive aspergillosis has not been reported in compost workers or farmers who may be exposed to AF levels more than 100 times higher than background levels.
2. Available epidemiologic evidence does not support an association between AF-associated disease and living near open air or enclosed composting facilities.
3. AF concentrations around the facility are not significantly different from background levels as determined by pre-operational testing. These results are consistent with other studies which have noted AF levels decrease to background within 250-500 feet of facility boundaries.

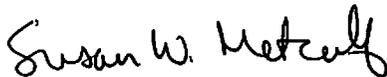
## RECOMMENDATIONS

None.

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