EXHIBIT 1

Purple Mattress Air Sampling Studies Report

John J. Godleski, MD

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Executive Summary

A study to measure emissions of particulate from the Purple Mattress® using techniques similar to, but more comprehensive than, those used in studies supported by the manufacturer (Tarracon Study) was conducted by Dr. John Godleski. With him were Dr. Marco Martens, an environmental health scientist at Harvard TH Chan School of Public Health, Dr. Yuwei Fan, an electron microscopist with experience in particle analysis by Scanning Electron Microscopy (SEM), and research assistants, Erika Sato and Luca Sheedy. The study was conducted in a conference room at the Landmark Center, Boston, MA.

The purpose of the study was to produce accurate data on the number and mass concentrations of particles that are released from Purple Mattress® products and to compare the results to US EPA ambient air quality standards for particulate matter and to Clean Room Standards used in the Tarracon study. This assessment was important because of the potential inhalation hazards posed by such mattresses and because the Material Data Sheets of the particulate product used in the Purple Mattress state that it is a known combustion and dust explosion hazard.

Findings and Conclusions

Two mattresses were tested in this study, and both had particle mass emissions much higher than both the Terracon study and the US EPA Air Quality standard for particulate matter. Compared to the US EPA Air Quality daily standard of 35.0 $\mu g/m^3$ for particulate matter less than 2.5 microns, the mattresses emitted an average 369.25 $\mu g/m^3$ and 168.05 $\mu g/m^3$, respectively, combining all conditions tested. Considering that exposure to one's mattress occurs daily over years, it is also appropriate to compare these data to the US EPA's annual standard for 2.5 micron particulate matter which is currently set at 12.0 $\mu g/m^3$. Indeed, of 20 test filters, only two fell below the EPA daily standard, and only one was below the annual standard. Thus, the emissions of the Purple Mattress® based on mass measurements far exceed particulate matter levels set by the US EPA to protect human health.

Compared to the Terracon study, the mattresses assessed here emitted roughly 100 times more particles using a continuous particle counting instrument. The continuous measurement also showed that increases in particle counts peaked with human activity on the mattress. Using the morphological approach applied in the Tarracon study, a 10-fold higher result was found for every measurement assessed in this study compared to the highest value obtained in the Tarracon study. The dirtiest level acceptable for a level 9 clean room designation is exceeded in this study by 100-fold based on continuous monitoring and by about 8-fold using the morphological approach.

Drawing air directly from the mattresses as a person might do if lying face down on a Purple Mattress® product results in enormous amounts of particulate aerosolized from the interior. Mass measurements drawn from each mattress in a 1 minute sample were 71,000 and 80,000 $\mu g/m^3$, and 643 and 914 million particles/m^3, respectively.

In evaluating average, minimum, and maximum particle sizes, it is clear that the majority of particles are at the accepted demarcation between the fine particle and nanoparticle size ranges with measured diameters ranging from 0.02 to 0.43 microns. This indicates that the majority of particles emitted from Purple Mattress® products are sure to reach deep into the lung with the potential for systemic distribution.

Introduction

The safety of the Purple Mattress® has been raised by studies of Mattress Particulate Air Sampling conducted by Tarracon Consultants, Inc and analysis by RJ Lee Group. These analyses, carried out on studies of two randomly provided mattresses, reported that the Purple Mattress® could give off a range of particulate from 11.35 to 20,854.70 spheres or particles per liter of air which they interpreted as within standards for clean rooms. However, the presented data in their report listed both the total air volume sampled for each determination and the total spheres per sample, and those data suggested that the range of particulate emanating from the mattress was 109 to 200,622 spheres per liter of air. Clean room standards are published as particles/cubic meter, and the least clean (Class 9) may have 35,200,000 particles per cubic meter. Converting the Tarracon data to particles/cubic meter gives a result at the highest level of 200,622,222 particles/cubic meter or almost 6 times higher than the least clean standard. At that level, there is concern for health when compared to ambient air.

Shortcomings of the Tarracon report included their failure to designate the pore size of the filters used, which is important for understanding the ability of the filter to collect all important particle sizes, their failure to control the volume of dilutional air which is dependent on room air flow, and their failure to weigh the filters used and provide standard air sampling mass data. In the Tarracon study, the investigators also did not use continuous air monitoring devices to determine how particles are emitted over time and activity and to correlate with the morphological approach used. There was no reported attempt to determine the extent to which particles could be drawn out of the mattress with negative pressure as might occur if a subject were face down on the mattress surface. Finally, the MDS sheets for Microthene FA70900, the particulate material added to the Purple Mattress® and released into the air with inflation, use, and standing in still air (as per the Tarracon report), indicate that the material is combustible and explodes on combustion ("Dust particles from this product are combustible particulate solids that present a flash fire or explosion hazard when suspended in air. Keep away from heat and sources of ignition.").

The purpose of our studies was to independently test emission of particles from the Purple Mattress® using techniques similar to but more comprehensive than those used by Tarracon investigators. This study was carried out by Dr. John Godleski, an expert in inhalation toxicology, pulmonary pathology, and airborne particle analysis who was present for all phases of testing. Dr. Godleski is a retired Professor in the Department of Environmental Health at Harvard TH Chan School of Public and a recognized expert in environmentally related health effects and electron microscopy. He was assisted in these studies by Dr. Marco Martins, an environmental health scientist at Harvard TH Chan School of Public Health, Dr. Yuwei Fan, an electron microscopist with experience in particle analysis by Scanning Electron Microscopy (SEM), and research assistants, Erika Sato and Luca Sheedy. Sampling studies, including gravimetric and continuous monitoring analyses, were carried out in a clean conference room and environmental laboratories at the Landmark Center West, Fourth Floor, 401 Park Drive Boston, MA 02215. SEM studies were carried out at the Housman Research Center, 780 Harrison Avenue, Boston, MA 02118.

Materials and Methods

Two Purple Mattresses, twin XL size were purchased online from Purple Mattress via their web site. The Mattresses were delivered to the home of an employee of John Godleski, MD PLLC by the shipping company used by Purple mattress in intact shipping containers, inspected on arrival to be sure the containers were intact, transferred to our facilities in a vehicle, inspected again, and maintained in the intact shipping containers until testing. At the testing site, the containers received a final visual inspection to assure they were still intact, and externally photographed to document their condition as shown in figure 1.

Figure 1. Mattresses in their shipping containers as received from the Purple Mattress® company.

Filters: 37mm in diameter, 0.2-micron pore size polycarbonate filters (Whatman™ Nuclepore™ Polycarbonate Membrane) were pre-weighed for air sampling using US EPA approved Federal Reference Method protocols for mass determinations. Pre and post weighing was done in a temperature and humidity controlled room and filters were equilibrated in this room for 48 hours. These same filters were used for particle counting by SEM. TSI Flow meters (4000 series 0-20 LPM (liters per minute)) were used to calibrate the flow to filters. MEDO pumps (7 LPM and 20 LPM), and open face filter holders (figure 2) were used for sampling air at a rate of 2 LPM from 3 to 5 inches above the mattress surface, in three different areas of the mattress. Vacuumed samples directly, from the surface of the mattress, and a 10 LPM pump to obtain a 2 LPM flow were placed at the mattress surface. Blank filters were also studied to be sure the filters were free of particles before use.

Figure 2. Pre-weighed filters in petrie dishes, left, and filter holders in a plastic bag, right.

Continuous Air Monitoring Devices (Pictured in Figure 3 on the next page): A Condensation Particle Counter (CPC) TSI 3007 was used for these studies. The CPC detects airborne particles greater than or equal to 7 nanometers in diameter and detects particles over a wide range of concentrations up to 10^7 particles per cubic centimeter. This monitor was used simultaneously with the filter studies to provide a second method of measurement and to help determine optimal loading volume for particle counts on filters.

Figure 3: Equipment used: Left to Right, Continuous sampler CPC – TSI 3007, DustTrak set for PM2.5, DustTrak set for PM10, Filter Holder, and TSI Flow meter (4000 series 0-20 LPM).

DustTrak™ Aerosol Monitors 8520, light-scattering laser photometers that give real-time aerosol mass readings, were also used. These instruments measure aerosol concentrations corresponding to PM_1, $PM_{2.5}$, or PM_{10} with an aerosol concentration range 0.001 to 400 mg/m^3 Two of these instruments, one measuring $PM_{2.5}$ and another measuring PM_{10}, served as independent measures of concentration and help to optimize filter loading.

Figure 4 Opened mattress within the plastic bag showing the sampling locations at either end of the mattress. On the left is one filter set up and one DustTrak sampler probe. On the right end, are two filter set ups and the CP probe and another

Respirator particulate V-flex N95 masks were purchased from VWR Scientific for all personnel and were worn during all testing. A Large particle-free sampling bag to hold the mattress, sampling probes, and standardize room air dilution of aerosols given off was used. Figure 4 illustrates the testing system and mattress within the bag. The bag controlled for room air flow, air changes/hr in the room, and contamination of the room with combustible, explosive dust. One bag for each mattress was used throughout all studies. The bags were tested to be sure no particles came from the bag itself.

Protocol:

All tables and floors were cleaned to be free of dust. Real-time instruments were set up and background particulate levels in the room determined. These determinations were used to correct for background levels of particulate with the real-time instruments.

Mattress Opening: One Purple Mattress was opened according to company directions inside the large sampling bag while sampling using a filter setup of 3 filters at different locations, each 15 cm above the mattress surface. The sampling probes of one of the real-time instruments were in the same areas as one of the filters. Sampling continued throughout the period of Mattress opening and at 14 minutes real time, instruments suggested filter loading had reached optimum levels with the first mattress tested. A second filter setup was in a standby position if filter loading reaches a maximum before mattress opening was complete. The backup filter was not used.

Data on particle concentrations was monitored throughout the opening process with the real-time instruments and recorded. The filter(s) used during the opening process were returned to our environmentally controlled weighing room and post weights were obtained as per EPA air sampling protocol.

The second purple mattress was opened under the same conditions. The only difference was that real time instruments indicated lower particle levels and monitoring continued for 20 minutes.

Activity: After opening the mattresses and monitoring the opening, another set of filters and the real-time instruments were used to monitor during normal use of each mattress. Normal use included laying, siting, and turning over on the mattress as well as more vigorous use as might be done by children or teenagers. Two employees of John Godleski MD PLLC simulated how a mattress may be used in day to day life. One male, weighing 210 lbs, jumped on the bed and rolled about, as if a child or teenager were jumping and playing on his bed. One female, weighing 114 lbs, sat down, turned over, and rolled around, as if someone were trying to find a comfortable position or just lounging on their bed. We were able to do this monitoring with instruments in the bag. Figure 5 shows the female on the bed. Sampling continued until optimal filter loading was achieved which was 24 and 25 minutes, respectively on Mattress #1 and 20 minutes each with Mattress #2.

Figure 5: Right: Female employee sitting on the mattress while sampling continues within the bag. Three sampling sites were used.

Still Air: After using the mattresses for monitoring during activity, The mattresses were not monitored or otherwise disturbed for more than 1 hr. Then, each mattress was set up with two filters and either the CPC or the DustTrak continuous devices and monitored in still air inside their respective bags. Optimum filter loading was reached after 3 hrs of still air monitoring.

Figure 6: Still air monitoring set up with two mattresses assessed simultaneously.

Analysis after air sampling: All filter samples were post weighed after equilibration using EPA Federal Reference Method air sampling weighing protocols in a temperature and relative humidity controlled room to determine mass concentration. Samples were kept in dust-free conditions, and transferred to the electron microscopy lab for morphological particle analysis. Filter samples were sputter coated with Gold-Paladium for optimal visualization of all particles in microscopic fields. A Hitachi SU-6600 field emission SEM was used at 5 kv. Image location was randomly started in the middle of the filter radius. Image step for 10kx is 10 micrometers in Y direction and 20 micrometers in X direction. In analysis mode, image files name started from 00 to 99 at maximum, or till 100 spherical particles were counted on that specimen. PCI Quartz version 9 was used to preform measurements on the spherical particles. Irregular particles were not counted nor measured. Sampling area of each 37mm filter was measured and found to be 31mm in diameter and total area was calculated. The area of the rectangular microscopy field was calculated for several magnifications depending upon optimal visualization of particle sizes. Magnifications used were 10,000x to assess small particles and 200 and 500x for larger particles. Particles partially in the field at the edge of the field were counted along 2 of the 4 boundaries of the field. At least one hundred particles on each filter was the aim for the number to be counted. Images were collected and particle size of each particle determined. The number of fields studied was recorded, and the total number of particles on the filter calculated. Particle number per liter was determined from the total count and total liters sampled.

Particle size was determined from measurements of the diameters of the spheres in images with the secondary mode of the SEM. The morphological identification of particles from the mattress was based on the previous study done in our laboratory in which particles were taken directly from a Purple mattress sample, assessed by scanning electron microscopy morphology, and also chemically analyzed for uniformity of particulate material by Fourier Transformed Infrared spectroscopy (FTIR) analysis.

Background counts of spherical particles which were morphologically indistinguishable from mattress derived particles were to be subtracted from all determinations, but blank and background counts were 0.

The morphology based particle count data were compared to the averages of data collected and analyzed with the real-time instruments. Real-time instrument data was plotted in relationship to the sampling time to show the pattern of particle emissions from the mattress. Numbers obtained from the individual mattresses were compared to data reported by Tarracon in their sampling studies.

Results

The data from the CPC continuous monitor are shown in Table 1. Although these data are corrected and likely to represent particles only from the mattress, an ambient particle contribution cannot be ruled out. Mattress #1 had higher counts consistently compared to Mattress # 2. Activity such as initial opening of the package and activity on the mattress resulted in higher particle counts than still air. The average data in this table is 100 times higher than any Tarracon finding.

Table 1: Condensation Particle Counter Data for all conditions tested showing the Minimum, Maximum, and Average per minute

Condition	Measurement	Mattress #1 particle #/Liter	Mattress #2 particle #/Liter
Opening	Min	1,777,000	1,274,000
Opening	Max	4,914,000	2,237,000
Opening	Ave	2,112,200	1,705,400
Male on Mattress	Min	1,747,000	575,000
Male on Mattress	Max	2,374,000	1,732,000
Male on Mattress	Ave	2,088,500	1,183,400
Female on Mattress	Min	1,590,000	848,000
Female on Mattress	Max	2,405,000	1,670,000
Female on Mattress	Ave	2,181,700	1,249,100
Still Air	Min	787,000	
Still Air	Max	1,330,000	
Still Air	Ave	979,200	

Figure 7 on the next page illustrates CPC data showing the changes in particle concentration emanating from the mattress with movement on the surface. The subject on the mattress was a thin female weighing 114 lbs. It can be seen that initially sitting down on the mattress produced a substantial peak in released particles. This is followed by more quiet activity with a decrease in emissions. Movements such as rolling in the bed and movement produced larger peaks of emissions.

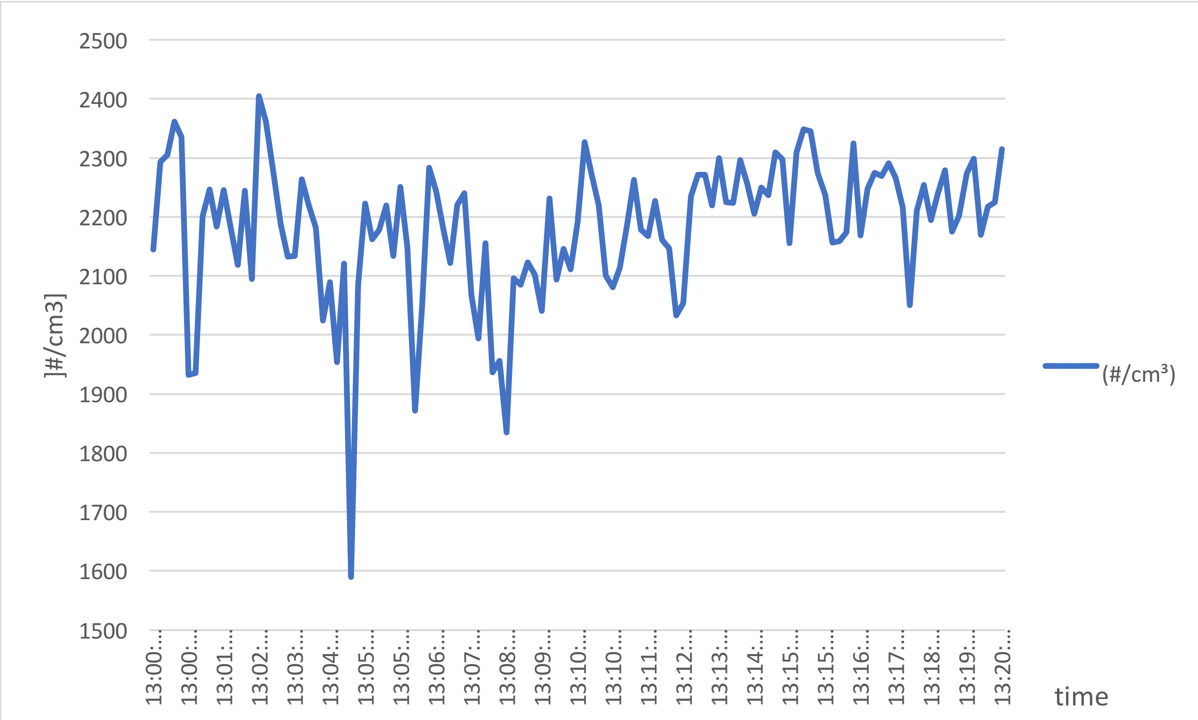

Figure 7: Continuous CPC data with the female subject on the mattress. Note the increase in emission of particles as the subject sits down onto the mattress, the decrease while sitting, and then the increases with various movements over the surface of the mattress. It appears that the human form may compress an area of the mattress which moves air within the mattress structure, and this moving air contains particles which can escape from the mattress surface and spread combustible dust into the air.

The dust Trak continuous monitors sampling dust less than 2.5 microns in aerodynamic diameter and dust less than 10 microns in aerodynamic diameter also showed variation in measured amounts with activity. These instruments also consistently showed lower measured amounts for mattress #2 compared to mattress #1 for opening and activity on the mattresses. In the "still air" studies, mattress #1 had monitoring by the CPC while mattress #2 was monitored with the Dust Traks, therefore, it is not possible to compare the continuous data for the mattresses, in this condition. However, mattress #2 in "still air" emitted about half as much PM2.5 and PM10 compared to the "opening" and "activity" data. Overall, the Dust Trak instruments were less sensitive in detecting particles compared to the data from the filters. This lack of sensitivity may be due to particle size which is presented later in this report.

Table 2 lists the data from the filters. Particles counted by SEM were done only on the median filter by weight where there were triplicate filters. The duplicate filters of the still air samples were both counted for each mattress, and both samples collected at the surface of each mattress by vacuum were both counted. Again, our data show that Mattress #1 emitted more particulate by mass than Mattress #2. Average of all airborne filter samples for Mattress # 1 was 369.25 μg/m^3 whereas Mattress #2 was 168.05 μg/m^3.

Table 2: Data from filters showing both Gravimetric and SEM Particle counts

Condition	Corrected Net Weight (μg/filter)	Total Flow in Sample (Liters)	Concentration μg/m^3	Counted Particles Per Liter by SEM
Opening M1	26.0	26	1000.0	
Opening M1	3.5	26	134.6	
Opening M1	15.5	28	553.6	206,556
Male on Mattress 1	4.5	48	93.8	
Male on Mattress 1	12.0	48	250.0	228,136
Male on Mattress 1	75.5	46	1641.3	
Female on Mattress 1	8.0	50	160.0	119,743
Female on Mattress 1	14.5	50	290.0	
Female on Mattress 1	5.0	50	100.0	
Opening M2	10.5	40	262.5	188,819
Opening M2	1.0	40	25.0	146,302
Opening M2	0.0	40	0.0	
Male on Mattress 2	8.0	40	200.0	323,205
Male on Mattress 2	6.5	40	162.5	
Male on Mattress 2	9.0	40	225.0	
Female on Mattress 2	16.5	40	412.5	
Female on Mattress 2	5.0	40	125.0	134,371
Female on Mattress 2	4.0	40	100.0	
Vacuum M1	142.0	2	71,000.0	642,842
Vacuum M2	160.0	2	80,000.0	913,906
Still Air M1		360		192,425
Still Air M1		360		285,849
Still Air M2		360		145,792
Still Air M2		360		91,038

By SEM, Large microspheres in 5-20 um were found on Vacuum sample of M1 and M2 at magnification of 200x. Medium microsphere in 0.5-5 um were found on all samples at magnification of 500x. Small spheres in 0.03-0.5 um at magnification of 10,000x. In averaging the particle counts by SEM, Mattress #1 again has more particles emitted than Mattress #2 (279,258 vs 277,633 particles/Liter.) There are several important points to note in Table 2. Only 3 of 18 measurements have mass concentrations below 100 μg/m^3 which indicates a very substantial dose of particulate. In comparison to US EPA air quality standards for Particulate Matter 2.5 microns, the current annual average is 12.0 μg/m^3 and the daily standard is 35 μg/m^3 both well below the findings of particulate mass emitted from these mattresses. At the same time, the study vacuuming the surface of the mattresses for 1 minute (2 liters) shows how much can be emitted. Imagine a person sleeping face down on this mattress. Each breath (~0.5 Liters) would take in more particulate than allowed by the current US daily standard. The differences between the CPC data and the filter data can be explained by the lower size limit measured by the CPC and the 0.2 micron pore size of the filter. Although this is the smallest pore size available, and it does trap many particles less than 0.2 microns by impaction, small particles may pass through this filter. Another explanation is that morphologically, only spheres were counted. One more point to be noted in Table 2 is that almost all measures in our study by SEM reported as particle # per Liter are in the same range of the highest measurement in Table 1 of the Tarracon study if one divides the Spheres per sample by the total air volume sampled (5216,177.78/26 = 200,622 particles/liter). Finally, converting the data in the last column of Table 2 above, to particle number per cubic meter for comparison to clean room standards, our data ranged from 2.9 to 9.2 times greater than a level 9 clean room (35,000,000 particles/cubic meter).

Table 3 shows particle size data of the particles studied by SEM at 10,000x magnification. The average of mean diameters reported in Table 3 is 0.099 which is the upper limit of the nanoparticle range. In looking at average minimum and maximum sizes, it is clear that these particles are right at the demarcation of the fine particle and nanoparticle size range. This means that the majority of particles are sure to reach deep into the lung.

Table 3: Particle size measurements of particles studied by SEM at 10,000x magnification.

Condition studied	# of particles counted	Mean (Diam-eter) µm	Std Dev (Diam-eter) µm	Min (Diam-eter) µm	Max (Diam-eter) µm	Analyzed Area, µm^2	Spherical particles per filter
Opening M1	85	0.108	0.056	0.036	0.298	11088	5,783,074
Male on M1	103	0.102	0.062	0.030	0.357	7096.32	10,949,570
Female M1	88	0.098	0.068	0.022	0.434	11088	5,987,183
Opening M2	101	0.109	0.060	0.040	0.268	10090.08	7,551,267
Male on M2	190	0.104	0.053	0.020	0.281	11088	12,926,871
Female M2	79	0.093	0.046	0.040	0.228	11088	5,374,857
Still air M1	112	0.098	0.058	0.030	0.318	1219.68	69,273,186
Still air M1	121	0.085	0.051	0.022	0.268	887.04	102,904,700
Still air M2	108	0.078	0.058	0.020	0.318	1552.32	52,485,042
Still air M2	106	0.102	0.068	0.040	0.392	2439.36	32,781,061

Table A in appendix 1 shows all data assessed microscopically. Larger particles visible at 200-500x on the SEM make up a very small fraction of the total particles roughly one larger particle for each 10,000 small particles. For all measurements other than the vacuum samples, mean particle size is less than 2.5 microns indicating that all of these will reach the pulmonary alveoli. The nano-sized fractions of the samples are very substantial and these particles have the potential for systemic distribution. Table A, also defines the size fractions in the vacuum sample showing the wide size range, and shows that the average size of large spherical particles is in the PM^{10} size distribution. Finally, Table A presents the numbers of all spherical particles in each sample by size fractions by morphology at the concentrations per cubic meter for comparison to clean rooms. The dirtiest clean room level 9 (35,200,000 particles/m^3), is exceeded by about 8-fold using the morphological approach.

Figure A in Appendix 1 shows the morphology and size measurements from a vacuum sample. Figure B shows small spheres at 10,000x. The pores of the filter are clearly visible at this magnification. The counted particles are all spheres with the morphological characteristics of spheres taken previously from a mattress sample. Non-spherical particles also present most likely came from the mattress either in the form of fragmented spheres or particles from the fabric covering the purple structure.

The data presented in this report shows that emissions from Purple Mattresses far exceed all clean room standards as well as all USEPA standards for airborne particulate matter established to protect human health.