BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of SENECA )
WIND, LLC for a Certificate of )
Environmental Compatibility and Public Need ) Case No. 18-488-EL-BGN
for a Wind-Powered Electric Generating )
Facility in Seneca County, Ohio. )

# DIRECT TESTIMONY OF 

Robert J. McCunney, M.D.<br>Brigham and Women's Hospital<br>Harvard Medical School

on behalf of

Seneca Wind, LLC

August 6, 2019

## Q-1. Please state your name, current title, and business address.

A-1. Robert J. McCunney, MD, MPH, MS. I currently hold a number of positions with respect to occupational and environmental medicine. I have an active clinical practice at Brigham and Women's Hospital; Pulmonary Division, 75 Francis Street, Boston, MA 02115. I also give periodic lectures as part of my faculty position at Harvard Medical School and coteach a course related to epidemiology at Massachusetts Institute of Technology, Department of Biological Engineering, Massachusetts Avenue 16-771, Cambridge, MA 02139.

## Q-2. What position do you currently hold?

A-2. I am a practicing internist, also board certified in occupational and environmental medicine, a research scientist at the Massachusetts Institute of Technology Department of Biological Engineering, a staff physician in occupational/environmental medicine at Brigham and Women's Hospital in Boston, a member of the clinical faculty of Harvard Medical School and a visiting scientist at the Harvard School of Public Health. I am also a co-author of a comprehensive review of the peer-reviewed scientific literature with respect to wind turbines and human health, entitled "Wind Turbine Sound and Health Effects: An Expert Panel Review." (Colby et al., 2009). I am also lead author of an article published in the Journal of Occupational and Environmental Medicine, entitled "Wind Turbines and Health: A Critical Review of the Scientific Literature." (McCunney et al., 2014) and the lead author of a critical examination of a proposed case definition related to potential health effects of living near wind turbines. (McCunney et al., 2015). A CV with my educational background and publications is attached at Attachment RJM-1.

## Q-3. How long have you been practicing occupational and environmental medicine?

A-3. For the past 38 years, I have practiced Occupational and Environmental Medicine from a variety of perspectives, including research, clinical and educational dimensions. (See Attachment RJM-1). I have been board certified since 1982 by the American Board of Preventive Medicine in Occupational and Environmental Medicine. Board certification requires completion of a three-year residency following graduation from medical school,
a year of practical experience and successful passing of a comprehensive examination. As evidenced by my CV, I have published over 110 peer-reviewed articles, book chapters, and related publications, including three editions of a major textbook and two other textbooks as well as a number of scientific monographs. I have also served as editor of three special issues of major academic journals. I have an active medical practice in Boston, Massachusetts where I evaluate and treat people exposed to potential occupational and environmental hazards. At the Massachusetts Institute of Technology (MIT), where I am a research scientist, I conduct environmental and occupational medical research and also co-teach a course in epidemiology. I regularly lecture to graduate students and residents in occupational/environmental medicine at the Harvard School of Public Health on the subject of noise and hearing. I also lecture the pulmonary fellows of the Brigham and Women's Hospital of Harvard Medical School on occupational and environmental lung disease.

## Q-4. What is your experience with health and noise exposure?

A-4. My professional interest in the health implications of noise exposure arose as a result of my responsibilities as an occupational physician in overseeing hearing conservation programs of workers in occupational settings. Occupational exposure to noise can adversely affect hearing, a finding noted and confirmed in the medical literature and summarized in three book chapters in which I was a co-author, including Meyer and McCunney; Environmental and Occupational Medicine; Rom, WN, (editor) Lippincott Williams and Wilkins; 2007. My involvement with potential noise implications on health has focused on (1) publishing: I have written three book chapters for two different textbooks; (2) clinical issues: in serving as Director of Environmental Medicine at MIT from 1994 to 2001, I was responsible for reviewing, interpreting and following up the results of audiometric tests conducted on MIT employees; and (3) lecturing: for the past 14 years, I have regularly lectured at the Harvard School of Public Health to graduate students on noise and hearing.

In my testimony below, I discuss certain matters relating to epidemiology, and specifically the epidemiology of health effects of noise emissions from wind turbines. My experience and training in epidemiology includes course work towards my MS in
environmental health at the University of Minnesota (1972) and course work at the Harvard School of Public Health during my residency training (1979-1981) in occupational and environmental medicine. I have also taught and continue to teach occupational epidemiology at MIT. In addition, as noted in my CV, I have been a coauthor of a number of epidemiology studies and am a participant in ongoing epidemiological research efforts. Finally, as part of my teaching responsibilities at MIT, I lecture on the critical interpretation of research studies, most notably epidemiology studies.

## Q-5. Have you previously provided testimony in support of siting energy projects in Ohio or other jurisdictions?

A-5. I have appeared before environmental tribunal hearings in Canada and the US. The focus of my testimony has exclusively pertained to potential health implications of living near wind turbines.

## Q-6. On whose behalf are you offering testimony?

A-6. I am testifying on behalf of the Applicant in this case, Seneca Wind, LLC ("Applicant" or "Seneca Wind") in support of the Seneca Wind Project.

## Q-7. What is the purpose and scope of your testimony?

A-7. My testimony is being submitted to address information presented which alleges that wind turbine noise can cause certain "adverse health effects."

Q-8. What documents did you review in preparing your testimony?
A-8. Application of Seneca Wind, LLC for a Certificate of Environmental Compatibility and Public Need, and its corresponding appendices, OPSB docket July 16, 2018;

- Shadow Flicker Impact Analysis, OPSB docket June 6, 2019;
- Updated Acoustic Assessment, OPSB docket June 6, 2019;
- Petition to Intervene of Seneca County Residents and Memorandum in Support, OPSB docket November 13, 2018; and
- Scientific Literature noted in the reference section of this testimony.

Q-9. In your testimony, will you refer to, or otherwise rely upon, any studies, publications, data or documents produced by persons other than yourself. If so, please cite these sources.

A-9. Included with my testimony is a list of references to which I refer to or otherwise rely upon to reach my conclusions. Attachment RJM-2.

## Q-10. Can you provide a summary of your testimony?

A-10. Wind turbines, just like other mechanical equipment, produce sound, both audible and inaudible (i.e., infrasound). Sound can be minimized through proper siting design criteria and potential impacts to public health and safety can be effectively minimized, if not eliminated, with compliance with noise guidelines. In short, the assertions made by the interveners that wind turbine sound causes "adverse health effects" are inconsistent with epidemiology studies, most notably the results of a major investigation conducted by Health Canada.

In its most recent review on noise and health, the World Health Organization drew the following conclusion about potential health implications of living near wind turbines. ". . . the evidence on health effects from wind turbine noise (apart from annoyance) is either absent or rated low/very low quality (McCunney et al, 2014). Moreover, effects related to attitudes towards wind turbines are hard to discern from those related to noise and may be partly responsible for the associations. (Knopper and Ollson, 2011)" (WHO, 2018). Note that the McCunney et al., 2014 reference cited by the WHO in their conclusion is based on a research grant that I received at MIT and for which I was the lead author. Further discussion of this research and its implications for the Seneca Wind Project will be discussed later in this testimony.

## Q-11. What are the noise design goals for the Facility?

A-11. It is my understanding that the Facility has an audible noise design goal of 51 dBA or below at all non-participating residences for scenarios 1, 3, and 5 set forth in the Acoustic Assessment, and 49 dBA or below for scenarios 2, 4, and 6 set forth in the Acoustic Assessment.

## Q-12. How is your testimony structured?

A-12. I provide a literature review of the reports I have co-authored regarding wind turbine noise and potential health effects, and other reports as well, most notably the Health Canada study. I also provide background on sound and its components, including infrasound and low-frequency sound from wind turbines. Finally, I address certain potential "health impacts" that have been raised in the context of wind turbines, most notably, shadow flicker and electromagnetic fields.

## II. Literature Review

## Q-13. How are potential health effects associated with an environmental project, such as a wind farm, addressed?

A-13. One of the most reliable scientific methods that is used to evaluate risks to human health from exposure to potential hazards is to conduct epidemiological studies. These studies evaluate large groups of people and have demonstrated health risks associated with smoking, alcohol abuse, asbestos exposure and many others. Epidemiological studies have also been used to evaluate potential health implications of living near noise generating sources, such as highways, airports, and construction sites as well as wind turbines.

As part of a research grant that I received at the Massachusetts Institute of Technology (MIT), my colleagues and I conducted and published a comprehensive and critical analysis of the scientific literature, including epidemiological studies, on wind turbines and health. (McCunney et al., 2014). Highlights of this research that were referenced by the World Health Organization in its recent (2018) report on noise, follow.

Q-14. Can you describe your involvement with the December 2009 report entitled "Wind Turbine Sound and Health Effects: An Expert Panel Review." (Colby et al., 2009)?

A-14. In 2009, I was invited to be part of an expert panel assembled to provide a report on potential health implications of living near wind turbines. ("Wind Turbine Sound and Health Effects: An Expert Panel Review." (Colby et al., 2009)). This report contains a comprehensive discussion of health issues that have been raised with respect to wind
turbines, including infrasound, low-frequency sound and annoyance, among other matters, associated with living in proximity to wind turbines.

## Q-15. What was the conclusion of the expert panel review?

A-15. The expert panel concluded that:

- The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.
- The body of accumulated knowledge about sound and health is substantial.
- The body of accumulated knowledge provides no evidence that the audible or inaudible sounds emitted by wind turbines have any direct adverse physiological effects.
- Over 125 references were cited as part of the report.


## Q-16. Can you explain what you mean by "audible" or "inaudible"?

A-16. Audible means the ability to hear a sound whereas; inaudible means a sound is not heard.

## Q-17. Have you confirmed these conclusions?

A-17. Yes. My co-authors and I confirmed the conclusions of the 2009 expert panel review (Colby et al, 2009) in a published research article entitled "Wind Turbines and Health: A Critical Review of the Scientific Literature." (McCunney et al., 2014). This article was peer-reviewed by reviewers assembled by the editor of the Journal of Occupational and Environmental Medicine.

## Q-18. What were the conclusions of this review?

A-18. In McCunney et al., 2014, we concluded that:

- Measurements of low-frequency sound, infrasound, tonal sound emission and amplitude-modulated sound show wind turbines emit infrasound. The levels of infrasound, however, are typically well below audibility thresholds.
- Among the cross-sectional studies reviewed, no clear or consistent association is seen between wind turbine noise and any reported disease or other indicator of harm to human health.
- Components of wind turbine sound, including infrasound and lowfrequency sound, have not been shown to present unique health risks to people living near wind turbines.
- Annoyance associated with living near wind turbines is a complex phenomenon related to personal factors. Noise from turbines plays a minor role in comparison with other factors (such as visual impacts) in leading people to report annoyance in the context of wind turbines.


## Q-19. In preparing your testimony today did you review whether there has been any additional scientific literature since 2014 questioning the conclusions from your previous work?

A-19. Yes, for the purpose of preparing this testimony, I conducted an additional literature search to identify any new articles that may have been published since the MIT review, which was published in October, 2014. Based on my review of the scientific literature regarding wind turbines and health, (through July 2, 2019), there have not been new studies published that refute conclusions made in the MIT research paper and the subsequent Health Canada Study to be described in more detail below. A sample of some of the recent literature follows.

In December, 2014, Schmidt et al. published a literature review titled "Health Effects Related to Wind Turbine Noise: A Systematic Review." That review does not contribute anything new to the scientific literature, and does not change my opinion with respect to the peer-reviewed literature regarding evaluations of potential health effects among people living in the vicinity of wind turbines. In May, 2015 Onakoya et al. also published a literature review titled "The effect of wind turbine noise on sleep and quality of life: A systemic review and meta-analysis of observational studies." The authors concluded that while there is some evidence that exposure to wind turbine noise is associated with increased odds of annoyance, individual attitudes could influence the type of response to noise from wind turbines.

In May 2015, Mroczek et al. published a study titled "Evaluation of Quality of Life [QoL] of Those Living Near a Wind Farm." The authors concluded: That the highest

QoL levels are noted in places where wind farms at various stages of development are located within one kilometer from the residence. These observations are consistent with the authors' earlier study (Mrozcek et al., 2012).

Additional studies have also been conducted including an assessment of the role of psychological factors associated with sleep disturbance among people living near wind turbines. (Jalali et al., 2016). The authors concluded, "Participants reported poorer sleep quality if they had a negative attitude to wind turbines, if they had concerns related to property devaluation or if they could see the turbines form their property." (Jalali et al., 2016) The authors further concluded that it appears that self-reported sleep effects "may be associated with indirect effects of visual and attitudinal cue and concern about property devaluation rather than distance to the nearest turbine or noise itself." This was the first study "to use a repeated noise and sleep measurement before and after wind turbine (WT) operation to investigate the impacts of WT presence on self- reported sleep quality and psychological factors, such as visibility of and attitude towards WTs and concern related to property devaluation. Contrary to expectations, changes in sleep variables were not associated with distance to WTs but "instead strongly associated with subjective factors, such as attitude to WTs, visual impact and concern about property values." (Jalali et al., 2016).

## Q-20. Do these new reports and studies change any of your previous conclusions?

A-20. No. These studies further support the conclusion that noise associated with wind turbines, including infrasound and low-frequency sound, is not a health risk. The studies further support the conclusion that individual attitudes about wind projects contribute to whether an individual reports impacts (i.e. sleep disruption, annoyance) more than the actual sound generated by the turbines themselves.

## Q-21. Can you provide an overview of the 2016 Health Canada Study?

A-21. The Health Canada Study is the largest epidemiology evaluation to date conducted to evaluate potential health implications of living near wind turbines. This cross-sectional study was carried out in 2013 and included 1238 randomly selected participants aged 1879 , living between 0.25 and 11.22 km from a wind turbine. The results of the Health

Canada Study were published in 5 separate peer-reviewed journal articles-discussed below and cited in the references section. The Health Canada Study determined, on the basis of the self-reported questionnaire results, wind turbine noise was not associated with:
(a) self-reported sleep disturbance or disorders;
(b) self-reported illnesses and chronic health conditions; and
(c) self-reported perceived stress and quality of life.

No association was observed between wind turbine noise and objectively measured results such as blood pressure, resting heart rate, sleep efficiency, the rate or awakenings, duration of awakenings, total sleep time or how long it took to fall asleep.

## Q-22. What does the Health Canada study say about health effects?

A-22. This study of health related effects demonstrated that "Self-reported health effects (e.g., migraines, tinnitus, dizziness, etc.), sleep disturbance, sleep disorders, quality of life, and perceived stress were not related to wind turbine noise ("WTN") levels. Visual and auditory perception of wind turbines increased significantly with increasing WTN levels as did high annoyance toward several wind turbine features, including the following: "noise, blinking lights, shadow flicker, visual impacts, and vibrations[.]" Beyond annoyance, the study did not find causal connections between the various health impacts and the presence of wind turbine noise. Annoyance is not a health effect; the International Classification of Diseases (ICD), in its most recent 10th edition, does not classify annoyance as an illness. The ICD has been adopted worldwide and is routinely used in the USA and other countries for classifying disease, research and for health insurance purposes.

## Q-23. What does the Health Canada study say about sleep disturbance?

A-23. The Health Canada authors concluded that the study results "do not support an association between exposure to outdoor wind turbine noise" and "an increase in the prevalence of disturbed sleep." (Michaud et al, 2016, b.) This study demonstrates the fundamental principle of dose-response, that is, risk of noise induced health effects is
based on the noise level and its duration. Although noise at certain intensities can adversely affect sleep, risk of noise exposure on health and sleep is dependent on the intensity and duration of exposure to noise. The absence of an effect of wind turbine noise on sleep is based on an analysis of self-reported and objectively measured outcomes in relation to long-term outdoor average sound levels." As the curve below, adopted from the World Health Organization indicates, no adverse effects on sleep were expected until noise levels reached well beyond 50 dBA . (WHO, 2009)

EFFECTS ON SLEEP 51


Source: Miedema, Passchier-Vermeer and Vos, 2003
Q-24. What does the Health Canada study say about wind turbines and quality of life?
A-24. A World Health Organization questionnaire was used to assess quality of life among people in the Study, which determined that "[c]ollectively, the results do not support an association between exposure to WTN [and] quality of life." Visual "annoyance" was a major feature that affected people's perception of quality of life, but noise from a turbine had no appreciable effect. In fact, numerous studies have demonstrated that annoyance associated with living near wind turbines is primarily affected by the visual aspects of the turbines and whether a person receives economic benefit from the turbines. Noise from the turbines plays a minor role in people reporting annoyance in the context of living near
wind turbines, a conclusion also drawn in epidemiological studies conducted prior to Health Canada. (Pedersen et al., 2011; 2009; 2007; 2004).

Q-25. What does the Health Canada study say about personal and situational variables associated with wind turbine noise annoyance?

A-25. Annoyance was related to several reported measures of health and well-being in the Study, although these associations were statistically weak ( $\mathrm{R}^{2}<9 \%$ ), independent of wind turbine noise levels, and not retained in multiple regression models. A correlation coefficient $\left(\mathrm{R}^{2}\right)$ of 0.09 is extremely weak and indicates that wind turbine noise had a negligible, if any, impact on people reporting annoyance, in contrast to other factors. In fact, the results of the Health Canada study confirm earlier research in which noise from wind turbines plays a minor role in people reporting annoyance, in contrast to more significant factors, such as attitudes towards wind turbines, the impact of cosmetic factors on the landscape and finally whether a person derives economic benefit from the turbines.

Q-26. What does the Health Canada study say about self-reported and measured stress related responses associated with exposure to wind turbine noise?

A-26. The Health Canada Study is the first study to assess both objective and subjective measures of stress in the context of living near wind turbines. In the Study, WTN exposure had no apparent influence on hair cortisol concentrations, resting blood pressure, and heart rate, which are all used to evaluate stress. Collectively, the findings of the Health Canada Study do not support an association between exposure to WTN and elevated self-reported and objectively defined measures of stress.

Q-27. Please summarize the results of the Health Canada Study as it relates to the Project.
A-27. In summary, the Health Canada study does not show an increase in sleep disorders, anxiety, tinnitus, and other reported health impacts that have been raised by some of the residents near the Project in the context of the present Proceedings. The Health Canada Study did demonstrate self-reported results related to annoyance, and it is important to note that annoyance is not a health effect.

## III. Wind Turbines and Health

## Q-28. What conclusions can be drawn from the literature cited above as it relates to wind turbine noise and human health?

A-28. In conclusion, based on numerous research studies conducted around the world, including the largest and most comprehensive objective assessment performed by Health Canada of various aspects of health, including stress, high blood pressure and sleep disturbances, the sound generated from wind turbine operations is not a risk to human health.

Q-29. What are the main concerns for health regarding wind turbines?
A-29. In general, the main concern raised regarding living near wind turbines has been noise. As a result, further discussion about noise and its components, including infrasound and low frequency sound, follows.

Q-30. Going back to your previous work in McCunney et. al., 2014, what are the concerns associated with wind turbine noise?

A-30. To understand the basis of the conclusions reached in the expert panel report, the 2014 MIT critical review of the scientific literature review and the conclusions I express in this testimony, it would be helpful to review general principles about sound. The fundamental environmental "exposure" of concern regarding potential health effects associated with the operation of wind turbines is sound. Sound, characterized primarily by its "loudness" is customarily measured in decibels $\mathrm{dB}(\mathrm{A})$ and its pitch or frequency measured in Hertz $(\mathrm{Hz})$. Sounds can range from various combinations of low frequency to high frequency components. Nearly all environmental sources of noise include a range of frequencies. Low-frequency sounds can be associated with vibration and since they have longer wavelengths than high frequencies, can travel farther distances from the source of the sound in comparison to high frequency sounds.

## Q-31. How are infrasound and low frequency sound defined?

A-31. Infrasound is defined as frequencies between 0 to 20 Hz . Low-frequency sound typically refer to frequencies between 20 to 250 Hz , although some authorities suggest that it may extend to 500 Hz . One internationally regarded acoustician stated: "Over the past 40 years, infrasound and low-frequency sound have attracted a great deal of adverse
publicity on their effects on health, based mainly on media exaggerations and misunderstandings." (Leventhall, 2007).

## Q-32. At what levels are sounds perceptible?

A-32. The ability for people to recognize sound is dependent on the sound's intensity (i.e., loudness) as well as its frequency (low, high, infra etc.). At infrasound frequencies (0-20 $\mathrm{Hz})$ the loudness of the sound needs to be much higher than at higher frequencies in order to be "heard" (see Table 1 below). The lower the frequency, the higher the noise level necessary for the sound to be heard (Leventhall et al., 2003).

Table 1 - Hearing Thresholds in the Infrasonic and Low-frequency Range

| Hz | 4 | 8 | 10 | 16 | 20 | 25 | 50 | 100 | 200 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SPL | 107 | 100 | 97 | 88 | 79 | 69 | 44 | 27 | 14 |

Infrasound is common in the natural and man-made environment and is not unique to wind turbine operations. Sea waves, the wind itself, bodily functions such as the heartbeat and lung sounds, and refrigerator compressors, among others, all produce infrasound. Health risks of infrasound are related to the intensity of the noise exposure as with other frequencies. For example, if an acute explosion generates a sound level of $140 \mathrm{~dB}(\mathrm{~A})$, people nearby can suffer ruptured tympanic membranes (ear drum). This adverse effect is based on the intensity of the noise exposure - not the frequency. A similar assessment of infrasound is used regarding potential health effects, that is, the sound has to be high enough not only to be heard but also sufficiently high to cause hearing damage. At low frequencies, a much higher level of sound is necessary for it to be heard in comparison to recognizing sounds at higher frequencies. For example, at 10 Hz , the sound must be at 97 dB to be audible (see Table 1 above). If this level occurred at the mid to high frequencies, which the ear detects effectively, it would be roughly equivalent to standing without hearing protection directly next to a power saw.

## Q-33. Are there guidelines for infra and low-frequency sound?

A-33. Sound levels associated with infra or low-frequency sound is addressed in the criteria of the American National Standards Institute (ANSI)/Acoustical Society of America (ASA).

The threshold for moderate acoustically induced vibration and rattles for the 31.5 and 63 Hz octave bands (low frequencies) is 65 dB , and for the 63 Hz octave band, it is 70 dB indoors (ANSI/ASA S12.2-2008). These thresholds are considerably higher than the sound levels associated with wind turbines.

## Q-34. Can you provide more information on the low frequency and infrasound field studies conducted in Texas?

A-34. To address whether the operation of wind turbines may create unacceptable levels of low frequency noise and infrasound, a field study of noise measurements in the vicinity of wind turbines in Texas was conducted (O'Neal et al., 2011). Two types of wind turbines were studied (General Electric (GE) 1.5sle (1.5 MW) and Siemens SWT-2.3-93 (2.3 MW)). Measurements were collected from 15 operating wind turbines. The land around the wind turbines is rural and used for agriculture and cattle grazing. The siting of the sound level measurement locations was chosen to minimize local low frequency and infrasound sources aside from the wind turbines and the wind itself. Two distances from the nearest wind turbine were selected 305 meters ( 1000 feet) and 457 meters ( 1500 feet).

## Q-35. What was the result of the Texas field study?

A-35. The results indicated that infrasound is not audible to even the most sensitive people 305 meters ( 1,000 feet) from the wind turbines. The authors concluded:

- The results show that all equivalent outdoor ANSI/ASA S12.2 [American National Standards Institute /American Standards Association] criteria for evaluating room noise and perceptible vibration criteria were met. The 31.5 and 63 Hz sound levels are below the level of 65 dB identified for minimal annoyance in ANSI S12.9 Part 4 [governing the quantities and procedures for description and measurement of environmental sound], and the 16 Hz sound level is within 1.5 dB of this level, which is an insignificant increase since the levels were not rapidly fluctuating. The low-frequency sound levels are below the ANSI S12.9 Part 4 thresholds for the beginning of rattles (the combined sound level in the 16, 31.5, 63 Hz bands are less than 70 dB ). (O’Neal, 2011)
- Results from the O'Neal study on infrasound and low-frequency sound also indicated that at distances of more than 305 meters from the nearest residence, the wind turbines:
a) Did not pose a low-frequency noise or infrasound problem, in that they were less than the standards and criteria published by cited agencies, such as ANSI. At this distance the wind farms were below ANSI/ASA S12.2 indoor thresholds for low-frequency sound for bedrooms, classrooms and hospitals;
b) Were below ANSI/ASA S12.2 indoor thresholds for moderately perceptible vibrations in lightweight walls and ceilings;
c) Were below ANSI S12.9 Part 4 thresholds for annoyance and beginning of rattles; and
d) Have no audible infrasound to the most sensitive listeners. The results of the O'Neal study are similar to other field studies in the UK (Hayes, 2006), Denmark (Delta, 2008) and the Netherlands (van den Berg, 2008) in which low-frequency sound and infrasound were not considered a health risk to residents living in the vicinity of wind farms.


## Q-36. Have there been human experimental studies on effects from infrasound and lowfrequency noise?

A-36. As noted above, infrasound is ubiquitous in the natural environment (e.g., sea waves, wind) and is present in normal human physiology, such as heart tones. In experimentally designed studies to assess potential health effects of infrasound, astronauts, who were part of the Apollo space program, were tested to determine potential adverse health effects of infrasound. Results suggested that 24 -hour exposures to 120 to 130 dB are tolerable below 20 Hz , the upper limit of infrasound. Studies have also assessed physiological impacts of low-level sounds. Low-level sounds from outside of the body, however, do not cause a high enough excitation within the body to exceed the internal body sounds. In other words, body sounds themselves mask low-level sounds from outside the body. For example, when measuring chest resonant vibration caused by external sounds, the internal vibration of bodily functions masks resonance for external sounds below an 80 dB excitation level (Leventhall, 2006).

Q-37. Can you summarize health issues related to low-frequency and infrasound from wind turbines?

A-37. There are no studies demonstrating harmful effects to humans as a result of exposure to infrasound or low-frequency sound at the noise levels measured in the vicinity of wind turbines or in experimental studies involving noise levels several orders of magnitude higher than those noted in the vicinity of wind turbines (such as in the astronaut studies described below).

Although wind turbines can generate infrasound and low-frequency sound (Moeller, 2011), detectable levels of infrasound and low-frequency sound are not at harmful levels based on studies near wind farms in the United States, the United Kingdom, the Netherlands, Denmark and Australia. Moreover, there are no studies demonstrating harmful effects to humans as a result of exposure to infrasound or low-frequency sound at the noise levels measured in the vicinity of wind turbines or in experimental studies involving noise levels several orders of magnitude higher than those noted in the vicinity of wind turbines (such as in the astronaut studies described above).

## Q-38. What is shadow flicker in relation to wind turbines?

A-38. Shadow flicker is the flickering effect caused when rotating wind turbine blades periodically cast shadows through constrained openings such as the windows of neighboring properties. The frequency of the flickering caused by the wind turbine rotation is variable.

## Q-39. Is shadow flicker associated with wind turbines a health risk?

A-39. The primary health concern that has been raised by some regarding shadow flicker is the risk of seizures in people with photosensitive epilepsy, a relatively rare type of seizure disorder, among the nearly 40 or so types of epilepsy. Research studies have addressed potential risk of this type of epilepsy from shadow flicker and have concluded that there is no risk of shadow flicker inducing this type of seizure. (Smedley et al, 2010 and Harding et al, 2005). Based on my review of pertinent scientific literature, shadow flicker may be considered a nuisance by some people but it is not a health risk.

As part of this testimony, I reviewed the shadow flicker analysis, which modelled potential hours of shadow flicker associated with the operation of the proposed turbines. The analysis addressed 80 receptors within approximately 1,500 meters ( 0.93 miles) of the project. It is my understanding that the Project would be operated such that none of these receptors will experience shadow flicker in exceedance of the Ohio standard, which states that the Project "shall be operated so that shadow flicker levels do not exceed thirty hours per year at any [residential] receptor." See Ohio Adm.Code 4904-4-09(H)(1).

## Q-40. Are electromagnetic Fields (EMF) associated with wind turbine operations a health risk?

A-40. Electromagnetic Fields (EMF) result from the motion of an electric charge and contains electromagnetic energy. According to an investigation in Canada, "there is nothing unique to wind farms with respect to EMF exposure; in fact, magnetic field levels in the vicinity of wind turbines were lower than those produced by many common household electrical devices and were well below any existing regulatory guidelines with respect to human health." (McCallum et al, 2014) In fact, magnetic fields in the vicinity of wind turbines were actually lower than common household appliances, such as dishwashers, refrigerators, microwaves and hair dryers, among others. Earlier studies of areas near wind turbines have drawn similar conclusions about the low levels of EMFs that are lower than household appliances. (Israel et al, 2011.)

Some authors have asserted that so called "EMF sensitivity" is a nocebo reaction, the opposite of a placebo reaction. In nocebo reactions, the mere expectation of an adverse effect leads to some people experiencing the "effect". (Berthelot et al, 2016; Collaca et al, 2017; Webster et al, 2016 and Hauser et al, 2012) Studies have also shown that adverse publicity, unfavorable expectations and news reports can lead to nocebo reactions in the context of wind turbines. (Braescher et al, 2017; Deignan et al, 2013 and Crichton et al, 2013) In fact, placebo effects have been demonstrated in the context of high voltage lines and potential EMF exposure. (Porsius et al, 2016)

Many non-governmental and governmental organizations, such as the World Health Organization, the International Agency for Research on Cancer and the National Institute
of Environmental Health Sciences have critically reviewed the scientific information on EMF and concluded that the weight of scientific information does not support a causal link between EMF and health risks, including cancer. Based on my professional experience and an understanding of the scientific literature, EMF is not a health risk to people living in the vicinity of wind turbines. EMF, at the levels encountered near wind farms, is not a risk to people who use medical devices, such as pacemakers, insulin pumps, hearing aids, among other medical devices. (Hours et al, 2014; Hocking et al, 2004; Belyaev et al, 2016 and Gajsek et al, 2016).

## Q-41. Are additional health risks related to wind turbines an issue of concern for children or adults living with Autism or Autism Spectrum Disorder ("ASD")?

No. Based on a search of PubMed, the National Library of Medicine's database for over 5,500 peer-reviewed medical and health-related journals, and upwards of 25,000,000 published reports, there are no studies that demonstrate an adverse effect as a result of living near wind turbines on people with Autism or Autism Spectrum Disorder (ASD). PubMed, accessed August 6, 2019. As a result, based on this updated search of the scientific literature, and the noise levels that have been modelled for this Project, there is no risk to individuals diagnosed with Autism or ASD being adversely affected by the Project.

## IV. Conclusion

Q-42. Please summarize your conclusions regarding alleged health risks associated with wind turbines.

A-41. It is my professional opinion that the Seneca Wind Project will not lead to adverse health effects of residents due to potential exposure to noise, shadow flicker, infra sound, low frequency sound and electromagnetic fields. While noise from wind turbines is not causally related to adverse health effects, wind turbines may be a source of annoyance for a small minority of nearby residents. At the noise levels modelled for the project, there should be no increased risk of sleep disturbances based on research studies of people living near wind turbines. The weight of the scientific evidence suggests that, when sited properly, wind turbines are not related to adverse health effects.

Q-43. Does this conclude your testimony?
A-42. `Yes, it does, except that I reserve the right to update this testimony to respond to any further testimony in this case.

## CERTIFICATE OF SERVICE

I hereby certify that the foregoing Direct Testimony of Dr. Robert J. McCunney was served upon the following parties of record via regular or electronic mail this $\underline{6}^{\text {th }}$ day of August 2019.
Dewar

Devin D. Parram
jstock@beneschlaw.com
cendsley@ofbf.org
lcurtis@ofbf.org
amilam@ ofbf.org
iclark@senecapros.org
jvankley@vankleywalker.com
cwalker@vankleywalker.com
SShuff@foreignjourneys.com
abauer@ohioedlaw.com
werner.margard@ohioattorneygeneral.gov

## Attachment RJM-1

## Curriculum Vitae

## Robert J. McCunney, M.D., M.P.H., M.S. Curriculum Vitae

| Office Address: | Brigham and Women's Hospital; Pulmonary Division, 75 Francis Street, Boston, MA |
| :--- | :--- |
| 02115 |  |

## Education

| 1971 | BS | Chemical Engineering Drexel University, Philadelphia, PA |
| :--- | :--- | :--- |
| 1972 | MS | Environmental Health University of Minnesota, Minneapolis, MN |
| 1976 | MD | Medicine |
| 1981 | MPH | Thomas Jefferson University Medical |
|  | Occupational Medicine Harvard Shiladelphia, PA |  |

## Postdoctoral Training

| 7/76-6/77 Intern | Internal Medicine | Northwestern University Medical Center, <br> Chicago, IL |
| :--- | :--- | :--- |
| $7 / 77-6 / 78$ Resident | Internal Medicine | Northwestern University Medical Center |
| $1 / 79-6 / 79$ Resident | Internal Medicine | Faulkner Hospital, Boston |
| $1 / 80-6 / 81$ Fellow | Occupational Medicine Peter Bent Brigham Hospital, Boston, MA |  |

## Faculty Academic Appointments



Appointments at Hospitals/Affiliated Institutions

Medicine
Occupational Health

| $1996-2010$ | Physician | Medicine <br> Pulmonary Unit | Massachusetts General Hospital |
| :--- | :--- | :--- | :--- |
| 2012- | Physician | Medicine <br> present | Pulmonary Division <br> $2001-$ <br> present |
| Research Scientist | Biological <br> Engineering | Massachusetts Institute of Technology |  |
| $2014-2016$ | Consulting Staff | Dana Farber Cancer <br> Institute | Dana Farber Cancer Institute |

## Major Administrative Leadership Positions

## Local

1981-1983 Medical Director, Occupational Health
1983-1989 Medical Director, Occupational Health
1989-1994 Medical Director, Occupational Health
Residency Program
1994-2000 Director, Environmental Medicine

## Regional

| $1982-1986$ | Board Member | New College of Occupational and <br> Environmental Medicine, Boston, MA |
| :--- | :--- | :--- |
| $1983-1985$ | President | New College of Occupational and <br> Environmental Medicine |

Sturdy Memorial Hospital, Attleboro, MA Goddard Memorial Hospital, Stoughton, MA
Boston University Medical Center, Boston, MA
Massachusetts Institute of Technology

New College of Occupational and Environmental Medicine, Boston, MA New College of Occupational and Environmental Medicine

## Committee Service

Local

2005present

Member of Residency Advisory Committee for the occupational and environmental medicine training program

1994-2000 Radiation Protection Committee
1994-2000 Pharmacy and Therapeutics Committee

Massachusetts Institute of Technology
Massachusetts Institute of Technology

Professional Societies: Past President of the American College of Occupational and Environmental Medicine. (1999-2000)

1981 -

American College of Occupational and Environmental Medicine 1983-1989 1984-1986 1986-1994 1985-1988 1988-1993
1989

Member
Member, House of Delegates
President, New England Chapter
Member, Publications Committee
Chair, Publications Committee
Member, Residency Director Section
Chair, Scientific Sessions of Annual
Meeting

|  | 1989-1993 | Member, Government Affairs |
| :---: | :---: | :---: |
|  | 1994 | Member, Ethical Practice Committee |
|  | 1993-1995 | Co-Chair, Occupational Medicine SelfAssessment Program |
|  | 1996-1999 | President Elect, $1^{\text {st }} \mathrm{VP}, 2^{\text {nd }}$ VP |
|  | 1999-2000 | President |
| 1981 - | New England College of Occupational and Environmental Medicine | Member |
| 1986 - | Medichem | Member |
|  | 1989-1993 | Secretary |
|  | 1995 | Chair, Annual Congress |
|  | 1999 | Honorary Life Membership |
| 1981-1991 | American Public Health Association | Member |
| 1983 - | American College of Preventive Medicine | Member |
|  | 1983- | Fellow |
| 1983-2000 | American Medical Association | Member |
| 2008 - | American Thoracic Society | Member |
| 2010- | American College of Chest Physicians | Member |
| Grant Review | Activities |  |
| 1996-1997 | Medical Research Committee | US Department of Energy Member |
| Editorial Act | ivities (Ad hoc peer reviewer for the journ | s noted below) |
| Journal of Occ | upational and Environmental Medicine |  |
| Environmenta | Research |  |
| Journal of the | Acoustical Society of America |  |
| Epidemiology |  |  |
| Chest |  |  |
| American Jou | nal of Industrial Medicine |  |
| International A | Archives of Occupational and Environmental | Medicine |
| Inhalation Tox | icology |  |

## Other Editorial Roles

| 1995 | Co-Editor |
| :--- | :--- |
| 1996 | Co-Editor |
| 2000 | Guest Editor |
| 2006 | Guest Editor |

International Archives of Occupational and Environmental Medicine (special issue: 1996; 6: 349-530)
Inhalation Toxicology (special issue: 1996; 8 (suppl): 29-39)
Journal of Occupational and Environmental Medicine (special issue: 2001; 43: 1-55)
Journal of Occupational and Environmental Medicine (special issue: 2006; 48: 12171338)

## Honors and Prizes

Tau Beta Pi
Presidential Award
Drexel 100
National Leadership
Harriet Hardy Leadership Award
Health Achievement Award
Presidential Award

National Engineering Honor Society
American College of Occupational and Environmental Medicine (ACOEM)
Drexel University
Central States Occupational Medical
Association
New England College of Occupational and Environmental Medicine
ACOEM
ACOEM

## Report of Funded and Unfunded Projects

## Funding Information

## Past

2000-2009 Cabot Corporation foundation for unrestricted work in occupational and environmental medicine
PI
The goal of this gift was to publish and teach in occupational medicine.

## Current

International Carbon Black Association
Mortality study of USA carbon black workers
Particle exposure and risk of heart disease: an international meta analysis of
German, British and American cohorts
American Wind Energy Association
Health effects of wind turbine operations: a critical review of literature
US Power Gen
Cluster evaluation of apparent cancer elevation among employees: a preliminary assessment
Parkinson's Disease and Environmental Risk Factors

## Current Unfunded Projects

2007- Occupational causes of kidney cancer
PI
The purpose of this project is to evaluate occupational causes of kidney cancer secondary to recognition of a "cluster" of kidney cancer at a manufacturing plant
2007 Health implications of occupational and environmental mold exposure. The purpose of this project is to develop a Continuing Medical Education (CME) course for physicians with other MGH colleagues.

## Report of Local Teaching and Training

## Teaching of Students in Courses

2000 -
Occupational Noise Exposure
Graduate students

2007- Public Health and Epidemiology Graduate students

Clinical Supervisory and Training Responsibilities

| $1994-1999$ | Preceptor, Occupational Medicine, Boston | $6-8 \mathrm{hr} / \mathrm{wk} \mathrm{x} 6 \mathrm{wks}$ |
| :--- | :--- | :--- |
| $1994-1999$ | University Medical Center | Preceptor, Occupational Medicine, Harvard <br>  <br> $200 \mathrm{hr} / \mathrm{wk} \mathrm{x} 6 \mathrm{wks}$ <br> School of Public Health |
|  | Preceptor, Allergy and Immunology, <br> Massachusetts General Hospital |  |

## Formally Supervised Trainees

| $1991-1993$ | Cheryl Barbanel, M.D., M.P.H., M.B.A., Prof Occupational Medicine, University of <br> Connecticut; Chair, Residency section, ACOEM <br> I served as residency director. Trainee published a paper on chest film opacities in workers <br> and noise exposure. |
| :--- | :--- |
| $1992-1994$ | Joseph Chern, M.D., M.P.H., Director of Occupational Neurology at University of Taipei, <br> Taiwan <br> I served as residency director. Trainee published a book chapter on health effects of <br> solvents. |
| $1990-1992$ | Alain Couturier, M.D., M.P.H., Editor: "Occupational Infectious Disease" deceased <br> I served as residency director. Trainee published a paper on medical surveillance. |
| $1988-1990$ | Ross Myerson, M.D., M.P.H., Chair ACOEM Annual Meeting Consultant, 2004 <br> I served as residency director. Trainee published a book chapter on Health effects of <br> cleaning agents and sterilants |
| $1988-1990$ | John Doyle, M.D., M.P.H., Director, Occupational Health, Taunton Hospital <br> I served as residency director. Trainee published a paper on occupational illness in the arts. |
| $1989-1991$ | Robert Godefroi, M.D., M.P.H., Director, Occupational Health Center, Manchester, NH <br> I served as residency director. Trainee published a paper on drug screening practices in <br> industry |
| $1991-1993$ | Khalid Kabrum, M.D., M.P.H., Medical Director, Aluminum Company of Bahrain <br> I served as residency director. Trainee published a book chapter on Health effects of <br> cleaning agents and sterilants |

Formal Teaching of Peers (e.g., CME and other continuing education courses)
1987 Managing Occupational Risks in the High Technology $1 / 2$ day postgraduate seminar Industries
Annual Meeting of American Occupational Medical Philadelphia, PA Association
1987 Introduction to Occupational Medicine
Annual Meeting of American Occupational Medical Association
1987 Indoor Air Quality and Health
Annual Meeting of American Occupational Medical
Association
1988
Establishing Health Services for Small Businesses Annual Meeting of American Occupational Medical Association

Occupational Medicine: An Introduction
American College of Occupational Medicine
Introduction to Occupational Medicine
American College of Occupational Medicine
Introduction to Occupational Medicine
American College of Occupational Medicine Ethical Issues in Occupational Medicine
American College of Occupational Medicine
Publishing in Occupational Medicine
American College of Occupational Medicine
Introduction to Occupational Medicine
American College of Occupational Medicine

1 presentation
San Antonio, TX
4 hr seminar
Pittsburgh, PA
1 presentation
San Francisco, CA
seminar
San Francisco, CA
1 presentation
San Francisco, CA
Seminar
Dallas, TX

## Local Invited Presentations

## Sponsored Lectures are marked *

1984 Setting Policy for Reproductive Hazards/Invited Talk Harvard School of Public Health, Boston, MA
1985 Medical Surveillance: Screening for Occupational Illness/ Invited Talk
Harvard School of Public Health and the New England Occupational Medical Association, Boston, MA

2017 Update on Occupational Medicine: Invited presentation for BWH Pulmonary Medicine Update; Boston, MA

2018 Epidemiology studies of titanium dioxide workers; presented at annual meeting of TDMA; Boston, MA
2019 Pulmonary Grand Rounds at BWH: Pitfalls in interpreting PFTs in the Occupational Setting

## Report of Regional, National and International Invited Teaching and Presentations

Invited Presentations and Courses

## Sponsored Lectures are marked *

## Regional

|  | Billerica, MA |
| :---: | :---: |
| 1986 | Indoor Air Pollution: An Update/Invited Talk |
|  | University of Massachusetts Medical Center, Worcester, MA. |
| 1986 | Clinical Applications of Epidemiology/2 3 hr Invited Talks |
|  | Occupational Nursing Program, Simmons College, Boston, MA |
| 1986 | Drug Screening in Industry: An Overview/Invited Talk |
|  | New England Occupational Medical Association, Boston, MA |
| 1986 | AIDS: What are the Occupational Risks?/Invited Talk |
|  | Goddard Memorial Hospital, Stoughton, MA |
| 1986 | Silicosis: A Disease of the Past or Current Concern/Invited Talk |
|  | Goddard Memorial Hospital, Stoughton, MA |
| 1987 | Controlling the Health Risks of Asbestos/Invited Talk |
|  | Asbestos Information Center of Tufts University Medical Center, Boston, MA |
| 1987 | Health Care Hazardous Waste Sites/Invited Talk |
|  | Environmental Protection Agency, Boston, MA |
| 1987 | Recognition and Treatment of Occupational Skin disease/Invited Talk |
|  | Associated Industries of Massachusetts, Boston, MA |
| 1987 | Drug Screening. Scientific and Ethical Issues/Invited Talk |
|  | New England Chapter of the American Industrial Hygiene Association, Boston, MA |
| 1988 | Occupational Medicine: An Introduction/Invited Talk |
|  | American College of Occupational Medicine, |
| 1989 | When to Suspect the Building as a Cause of Your Patient's Symptoms/Grand Rounds |
| 1989 | Preventing Back Injuries at Work/Invited Talk |
|  | Massachusetts Safety Council, Boston, MA |
| 1990 | Occupational Health in Cost Containment/Invited Talk |
|  | Health Care Financial Management Association, Boston, MA |
| 1990 | Emergency Triage Systems for Work Related Injuries/Invited Talk |
|  | American College of Rehabilitation Medicine, Boston, MA |
| 1990 | Occupational Health and Cost Containment/Invited Talk |
|  | Health Care Financial Management Association, Boston, MA |
| 1990 | Recognizing Hand Disorders Due to Vibrating Tools/Invited Talk |
|  | New England College of Occupational Medicine, Boston, MA |
| 1991 | Occupational Health Challenges in Primary Care/Grand Rounds |
|  | Carney Hospital, Boston, MA |
| 1991 | Occupational Cancer in the 1990s/Invited Talk |
|  | National Workers Compensation and Occupational Medicine Seminar, Hyannis, MA |
| 1993 | Indoor Air pollution: A Recurring Problem in Occupational Medicine Practice; the Case |
|  | Report: Recognition of Occupational Disease/Invited Talk |
|  | Workers Compensation and Occupational Medicine, Hyannis, MA |
| 1998 | Genetics in the Courtroom/Invited Talk |
|  | Einstein Institute for Science, Health and the Courts, Orleans, MA |
| 2000 | Work Implications of Sedating Antihistamines/Invited to Testify |
|  | Boston City Council, Boston, MA |
| 2001 | Risk Assessment: Current Issues/Invited Talk |
|  | MIT, Cambridge, MA |
| 2006 | Future of Occupational and Environmental Medicine/Invited Talk |
|  | Cape Cod Conference SEAK, Hyannis, MA |
| 2010 | Health Implications of Wind Turbines/Invited Talk |
|  | Rutland Medical Center, Rutland, VT |

## National

1981
1982
1983
1983
1983
1985
1985

The Need for a National Commission in Boxing/Scientific Panel
American Medical Association, Chicago, IL
Health Hazards in the Garment Industry/Invited Talk
International Ladies Garment Workers Union. New York, New York.
A Hospital Develops an Occupational Health Service/Invited Talk
American Occupational Medical Association, Washington, DC
The Role of Fitness in Preventing Heart Disease/Invited Talk
Amateur Athletic Union Annual Meeting, Washington, DC
Diverse Manifestations of Trichloroethylene/Invited Invited Talk
American Academy of Occupational Medicine Annual Meeting, New Orleans, LA
The Effect of Fitness on High Density Lipoproteins and Heart Disease/Panel Moderator American Occupational Medical Association, Kansas City, MO.
Indoor Air Quality: A Review With Recommended Protocol to Evaluate
Complaints/Invited Invited Talk
New York State Medical Society, New York, New York
Staying Healthy in Retirement/Invited Talk
Cabot Corp, Champagne, IL, Indianapolis, MO, Atlanta, GA, Ville Platte, LA, Amarillo and Midland, TX
Environmental Medicine: Setting Policy at Hazardous Waste Sites/Invited Talk New York State Medical Society, New York, New York
Managing Workers Compensation Costs Through Fitness Programs/Invited Talk Food Marketing Institute, New Orleans, LA
Pulmonary Alveolar Proteinosis and Cement Dust: A Case Report/Invited Talk
The $7^{\text {th }}$ International conference on Pneumoconiosis, Pittsburgh, PA
Occupational Medicine: An Introduction/Invited Talk
American College of Occupational Medicine, San Antonio, TX
Establishing Health Services for Small Businesses/Seminar Leader
New York Academy of Sciences, Boston, MA
Hand-Arm Vibration Syndrome: Means of Control/Invited Talk
National Safety Council annual meeting, Chicago, IL
Providing High Quality Occupational Medical Services/Invited Invited Talk
Annual Symposium on Delivery of Occupational Health Services, Washington, DC
Current Developments in Occupational Medicine/Invited Invited Talk
Centers for Disease Control, Atlanta, GA
Ethical Issues in Occupational Medicine/Invited Talk
American College of Occupational Medicine, Houston, TX
A Hospital Based Occupational Medicine Residency Program/Moderator and Presenter American College of Occupational and Environmental Medicine, Washington, DC
The Academic Industry Interface in Occupational Medicine/Invited Talk
American College of Occupational and Environmental Medicine State of the Art
Conference, New York City, New York
Advanced Occupational Medicine/Invited Talk
American College of Preventive Medicine, Chicago, IL
The Use of Biomarkers in Clinical Practice/Invited Talk
US Department of Energy, Santa Fe, NM
Health effects of ionizing radiation exposure/Invited Talk
US Department of Energy, Tampa, FL
Preserving Confidentiality in Occupational Medical Practice; The Physician's Role in Emergency Response; The Occupational Medical Self Assessment Program/3 Invited

Talks
American College of Occupational and Environmental Medicine Annual Meeting, Las
Vegas, NV

New Directions in Occupational Medical Practice/Invited Talk
American College of Occupational and Environmental Medicine, San Antonio, TX
The International Agency for Research on Cancer (IARC) decision on Evaluating the Carcinogenicity of Carbon Black/Invited Talk
Annual Joint Labor/Management Health and Safety Conference on United Rubber and Steel Workers, Cleveland, Ohio.
The New EPA Standard on Ambient Particulates and Ozone: Implications for the Occupational Physician
American College of Occupational and Environmental Medicine (ACOEM), Nashville, TN
Health and Productivity: A Role for Occupational Health? /Invited Talk
$4^{\text {th }}$ Annual Employers Summit, Chicago, IL
The Legacy of the Cold War; Challenges to the Occupational Health Professional/Invited Talk
Annual Department of Energy meeting in Occupational Medicine, Washington, DC
The Flu, A new Medication and Occupational Health; A Look At The Links/Seminar Leader
Naples, Florida (Glaxo Wellcome)
The Future of Occupational and Environmental Medicine/Invited Talk
Annual meeting of the Maryland, Virginia, and Pennsylvania components of the American
College of Occupational and Environmental Medicine (ACOEM), Williamsburg, VA.
Health and Productivity/Invited Talk
Annual meeting of American Journal of Health Promotion on Health and Productivity, Colorado Springs, CO
Occupational Health and Productivity/Invited Talk
Central States Occupational Medical Association annual meeting, Chicago, IL
On behalf of ACOEM, gave oral testimony to OSHA on the proposed ergonomics standard/Invited to Testify (April and May)
Washington, DC
Latex Allergy/Invited Talk
Annual meeting of the Michigan College of Occupational Medicine, Ann Arbor, MI
Clinical application of recent research in occupational medicine/Invited Talk
State of the art meeting, American College of Occupational and Environmental Medicine, Nashville, TN
Health and Productivity: A Role for Occupational Health/Invited Talk
Annual meeting of the Health Enhancement Research Organization, (HERO), Washington, DC
The Human Genome Project: Implications on Occupational Medical Practice/Invited Talk Annual meeting at the American College of Occupational and Environmental Medicine, San Francisco, CA
Health and Productivity Research/Invited Talk
Annual meeting of the Institute of Productivity Management, Orlando, FL
Future of Occupational Medicine/Invited Talk
MIT and the American College of Occupational and Environmental Medicine, San Juan, Puerto Rico
Should we screen for occupational lung cancer with low dose CT?/Invited Talk
Annual meeting of the American College of Occupational and Environmental Medicine,

## Atlanta Georgia

Are there health effects of wind turbine operations?/Invited Talk
Annual meeting of American Wind Energy Association
Orlando, FL
2010 thru Harvard School of Public Health; Graduate students in Public Health; "Health effects of 2015 occupational and environmental noise exposure

2012 thru Evaluating Occupational Lung Disease Part 1; Harvard Medical School Pulmonary
Fellows Conference
2013 Evaluating Occupational Lung Disease Part 2; Harvard Medical School Pulmonary Fellows Conference
"Evaluating health effects from exposure to hazardous materials." and "How to critically interpret the scientific literature." State Supreme Court Justices' Conference, sponsored by a grant from the US Department of Justice. Chapel Hill, NC

2014 Grand Rounds: Pulmonary Division. "Radiation risks in lung cancer screening programs." Brigham and Women's Hospital, Boston
2015 Grand Rounds: Harvard School of Public Health. Hypersensitivity Pneumonitis, Boston
Grand Rounds: Pulmonary Division; Brigham and Women's (BWH) Hospital, Boston.
Hypersensitivity Pneumonitis
Occupational Lung Disease: Lecture to Pulmonary Fellows of BWH
2017 Amorphous Silica; A review of a cross sectional study at German plants; Grand Rounds: Pulmonary Division; Brigham and Women's (BWH) Hospital, Boston.
Lung Tumors in Lab Rats: Implications for humans. Grand Rounds: Pulmonary Division; Brigham and Women's (BWH) Hospital, Boston. ;

2018 Epidemiology studies of Titanium Dioxide workers. Annual meeting of titanium dioxide manufacturers. Boston, MA
International Presentations

1982 Sino-American study tour in occupational medicine to hospitals and factories/Invited Participant
People's Republic of China (Peking, Shanghai, Hangzhou and Canton)
Diverse Manifestations of Trichloroethylene/Invited Talk
Kyoto University Hospital, Kyoto, Japan
Fitness and Heart Disease/Seminar Leader
Mahidol University Hospital, Bangkok, Thailand
Indoor Air Pollution: A Summary of an Investigation in an Office Setting/Invited Talk Society of Occupational Setting, Society of Occupational Medicine, Hong Kong, United Kingdom
Diverse Manifestations of Trichloroethylene/Invited Speaker
Annual meeting of Medichem, Ludwigshafen, West Germany

1989

Occupational Health in the Chemical Industry/Invited Co-Chair International Commission on Occupational Health triennial meeting, Montreal, Canada Medical Response to Environmental Emergencies/Invited Talk Annual meeting of Medichem, Melbourne, Australia Health Effects of Carbon Black/Invited Talk Presented in German to the German Automobile Association, Frankfurt, Germany Biomarkers and the Human Genome: A look at the Clinical Issues/Invited Talk US Department of Energy International Meeting, Charleston, SC.
Particles and Lung Disease: A Look at the Clinical Issues/Invited Talk
Health and Safety Executive of the United Kingdom, University of Leicester, Leicester, England Occupational Health and Productivity/Invited Talk
Annual Latin American Conference on Occupational Medicine, Dorado, Puerto Rico
Occupational Health and Productivity/Invited Talk
Annual meeting of Medichem, Vienna, Austria
Chemical Sensitivity and Idiopathic Environmental Intolerance/Invited Talk Ottawa, Canada
The Role of the Human Genome in Occupational Medical Practice/Invited Talk Pulmonary Division, University of Bochum, Bochum, Germany
Review of Epidemiology Studies and the Exposure Limit for Carbon Black./Invited Talk Health and Safety Executive Meeting (UK), London, England
Occupational Health Research in the Carbon Black Industry/Invited Talk
Carbon Black World Conference, Guilin, China
Health Effects of Carbon Black; Institute of Occupational Medicine; Edinburgh, Scotland
Health Effects of living near wind turbines: An update; annual meeting of the Canadian Wind Energy Association (Toronto, Canada)
Lung tumors in Lab Rats: Implications for Human Risk Assessment; Titanium Dioxide International Meeting; Paris France
Setting Occupational Exposure Limits; German MAK Commission; Berlin, Germany Role of epidemiology in evaluating Health Risks; presentation to Risk Assessment Committee of European Chemical Agency; Helsinki, Finland

## Report of Clinical Activities and Innovations

## Current Licensure and Certification

1983 American Board of Preventive Medicine - Occupational and Environmental Medicine

## Practice Activities

1996-2010 Ambulatory Practice
2010-current Ambulatory Practice

MGH
Brigham and Women's Hospital, Boston

1-2 days per week
1-2 days per week

## Clinical Innovations

Implemented three hospital-based occupational health programs at:

- Sturdy Memorial Hospital, Attleboro, MA
- Goddard Memorial Hospital, Stoughton, MA
- University Hospital of Boston University Medical Center, Boston, MA


## Report of Scholarship

## Publications

## Peer reviewed publications in print or other media

## Research Investigations

1. McCunney RJ. "Acute and Chronic Brain Injuries in Boxers; Causes and Prevention". Physician and Sports Medicine, 1984;12:52-64.
2. McCunney RJ. "A Hospital-Based Occupational Health Service". Journal of Occupational Medicine, 1984;26:375-80.
3. McCunney RJ. "Are Stress Management Programs Cost Effective?" Journal of Occupational Medicine, 1984;26:410.
4. McCunney RJ. "Confidentiality of Medical Records." Journal of Occupational Medicine. 1984;26:790-91.
5. McCunney RJ. "Are Exercise EKG's Needed Prior to a Fitness Program?" Occupational Health and Safety. 1984, 23-24.
6. McCunney RJ. "Corporate Medical Programs". (letter) Harvard Business Review, Nov/Dec, 1984; 16-18
7. McCunney RJ. "Video display Terminals: What are the Health Risks?" Boston Business Journal, December 24, 1984; 7-9
8. McCunney RJ. Acid Rain. (book review) Journal of the American Medical Association, 1985;253: 2291-92.
9. McCunney RJ. "The Role of Fitness in Preventing Health Disease". Cardiovascular Reviews and Reports 1985;6:776-78.
10. McCunney RJ. "Health Effects of Work at Wastewater Treatment Plants: A review of the literature with guidelines for medical surveillance". American Journal of Industrial Medicine 1986;9:271-79.
11. McCunney RJ. Indoor Air Quality. (book review) Journal of the American Medical Association 1986;255:1261-62.
12. McCunney RJ. "The Patient with Asbestos Exposure". Journal of Family Practice 1986;22:73-78.
13. McCunney RJ. "Distilling Questions on Drug Testing". Boston Business Journal, November 17, 1986.; 2-3
14. McCunney RJ. "Physical Activity and HDL Levels". Physician and Sports Medicine 1987;15:6774.
15. McCunney RJ. "The Role of Building Construction and Ventilation in Indoor Air Pollution: A Review of a Recurring Problem". New York State Journal of Medicine 1987;87:203-09.
16. McCunney RJ. "Effective Drug Screening Programs Should Be Applied Judiciously". Occupational Health and Safety: News Digest, Feature Story, May 1987, 9-10.
17. McCunney RJ. "The Role of Fitness in Controlling Workers Compensation Costs". Proceedings of the Annual Food Marketing Institute, 1987, Washington DC.
18. McCunney RJ. Cluster Mystery: Epidemic and The Children of Woburn, Mass. (book review). JAMA 1987; 258: 969-71.
19. McCunney RJ, Doyle JR, Russo PK. "Occupational Illness in the Arts" American Family Physician. 1987;36:145-53.
20. Godefroi R, McCunney RJ. "Drug Screening Practices in Small Businesses: A Survey". Journal of Occupational Medicine 1988;30:300-02.
21. McCunney RJ. "Diverse Manifestations of Trichloroethylene", British Journal of Industrial Medicine, 1988; 45:122-26.
22. McCunney RJ, Cashins R. "Environmental Tobacco Smoke: A Problem Revisited". Journal of Occupational Medicine 1988;30:540-42.
23. McCunney RJ. "Occupational Health: What the Future Holds". Industry, December 1988.
24. McCunney RJ, Walter E. "Occupational Medicine Services" in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988;3-20.
25. Godefroi R, McCunney, RJ, "The Role of Regulatory Agencies" in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988; 36-46.
26. Jacknow D, McCunney RJ, Jofe M. "Musculoskeletal Disorders" in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988;106-29.
27. McCunney RJ. "Cardiovascular Disorders" in Handbook of Occupational Medicine (McCunney 00RJ, ed.), Little Brown, Boston 1988; 143-58.
28. McCunney RJ. "Medical Surveillance" in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988; 297-308.
29. McCauley M, McCunney RJ, Scofield M. "Health Promotion" in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988; 335-49.
30. Melius J, Wallingford RM, McCunney RJ. "The Health Hazard Evaluation: Investigating Occupational Health Problems in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988;362-73.
31. Frumkin H, McCunney RJ. "Health Effects of Common Substances" in Handbook of Occupational Medicine (McCunney RJ, ed.), Little Brown, Boston 1988; 423-39.
32. McCunney RJ, Godefroi R. "Pulmonary Alveolar Proteinosis: A Case Report." Journal of Occupational Medicine 1989;31:233-237.
33. McCunney RJ. "Drug Screening: Technical Complications of a Complex Social Issue." American Journal of Industrial Medicine; 1989;15:589-600.
34. McCunney RJ "Providing High Quality Occupational Medical Services." J Amb Health Care Marketing 1990; 4: 9-18.
35. McCunney RJ. Greaves, W, "Addressing the Shortage of Occupational Physicians," Journal of Occupational Medicine 1990:1247-48.
36. Ducatman A, McCunney RJ. "What is Environmental Medicine?" Journal of Occupational Medicine 1990;32:1130-32.
37. McCunney RJ, Cikins W. "The Effect of Federal Health Policy on Occupational Medicine. Polish Journal of Occupational Medicine, 1990;3:241-56.
38. McCunney RJ, Brandt-Rauf P. "Ethical Issues in the Private Practice of Occupational Medicine.

Journal of Occupational Medicine 1991;33:80-82.
39. McCunney RJ. "Occupational Noise Exposure," in Rom WM. (Ed) Environmental and Occupational Medicine, Little Brown, Boston, 1992, 2nd edition.
40. McCunney, RJ, "Recognizing Hand Disorders caused by Vibrating Tools." Journal of Musculoskeletal Medicine, 1992;9(3): 91-110.
41. McCunney RJ, Jetzer T. "Hand Vibration Isolation: A Study of Various Materials" Journal Applied Occupational Hygiene 1992;7:8-12.
42. McCunney RJ, Harzbecker J. "The Role of Occupational Medicine in General Medical Practice: A Look at the Journals." Journal of Occupational Medicine, 1992; 34: 279-286.
43. McCunney RJ, Boswell R, Harzbecker J. "Environmental Health in the Journals." Environmental Research 1992;59:114-24.
44. McCunney RJ, Couturier A. "Where do Occupational Medicine Residency Programs Belong in the Institution?" Journal of Occupational Medicine 1993; 35: 889-890.
45. McCunney RJ, Barbanel C. "Auditing Workers Compensation Claims." Occupational Health and Safety 1993;63:75-84.
46. McCunney RJ. "The Academic Occupational Physician as Consultant: A Ten Year Perspective." Journal of Occupational and Environmental Medicine 1994;36:438-42.
47. Barbanel C, McCunney RJ. "Environmental Surveillance of Respiratory Disorders: The Hazardous Waste Site as an Example" Environmental Respiratory Disease," Cordasco E., Demeter SL, Zene C. (eds.) Yearbook Medical publishers, Chicago 1995; pp 479-504.
48. McCunney RJ. "Challenges and Opportunities in Occupational Medicine". Journal of the American Osteopathic Medical Assoc. 1994;95(2):107-14.
49. McCunney RJ, Schmitz, S. Cardiovascular disorders, in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;3-19.
50. McCunney RJ. Boswell R. Musculoskeletal Disorders, in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;166-86.
51. McCunney RJ. Schmitz S. Cardiovascular Disorders, in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;199-213.
52. Harber P, McCunney RJ, Monosson I. Medical Surveillance, in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;35875.
53. McLellan R, McCunney RJ. Indoor Air Pollution, in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;633-50.
54. McCauley M, McCunney RJ. Health Promotion in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;465-78.
55. McCunney RJ, Barbanel C, Frumkin H. Health Effects of Common Substances in A Practical Approach to Occupational and Environmental Medicine, (McCunney RJ, ed.) Little Brown, Boston, 1994;709-33.
56. Boswell R, McCunney RJ. Bronchiolitis Obliterans from Exposure to Incinerator Fly Ash. Journal of Occupational and Environmental Medicine 1995;37(7):850-55.
57. Shields P, Chase K, McCunney RJ. "Confined Space Hazards: Combined Exposures to Styrene,

Fiberglass, and Silica". Journal of Occupational and Environmental Medicine 1995;37(2):185-88.
58. McCunney RJ. "Clinical Applications of Biomarkers in Occupational Medicine" in Biomarkers and Occupational Health: Progress and Perspectives. (Mendelsohn, ML, Peeters, JP, Normandy MJ, eds.) Joseph Henry Press, Washington, DC, 1995;148-60.
59. McCunney RJ. "From the Lab Bench to the Work Place: Implications of Toxicology Studies on Occupational Medical Practice." Inhalation Toxicology 1996;8(suppl):29-39.
60. McCunney RJ. "Preserving Confidentially in Occupational Medical Practice". Am Fam Phys 1996;53(5):1751-56.
61. McCunney RJ. "Emergency Response to Environmental Toxic Incidents: The Role of the Occupational Physician." Occupational Medicine 1996;46(6):397-401.
62. Meyer JD, Islam S, Ducatman A, McCunney RJ. "Prevalence of Small Lung Opacities in Populations Unexposed to Dusts: A Literature Analysis." Chest 1997;111:404-410.
63. McCunney RJ, Burton W, Anstadt G, Gregg D. "The Competitive Advantage of a Healthy Work Force: Opportunities for Occupational Medicine (editorial). J Occup Env Med, 1997;39:611-13.
64. Couturier A, McCunney RJ. "Physicians' Role in Emergency Response. Occ Health and Safety Feb 1997:46-52.
65. McCunney RJ, Leopold R. "Protecting Employee Privacy" in Genetic Secrets: Privacy, Confidentiality and New Genetic Technology (M. Rothstein (ed), Yale University Press, 1998; 4754
66. Couturier A, McCunney RJ. "Biological Indicators of Chemical Dosage and Burden" in Handbook of Occupational Safety and Health, 2nd Edition. (DiBerardinis, L, ed.) John Wiley \& Sons, Boston, MA, 1998;373-413.
67. McCunney RJ. "How to Ensure and Maintain Quality in a Medical Surveillance Program" in Handbook of Occupational Safety and Health, 2nd Edition. (DiBerardinis, L, ed.) John Wiley \& Sons, Boston, MA, 1998;415-28.
68. McCunney RJ, Meyer J. "Occupational Exposure to Noise" in Environmental and Occupational Medicine (ed. Rom Wm, Little Brown, Boston), 1998; 1121-1132.
69. McCunney RJ. "Use of Biomarkers in Occupational Medicine." in Biomarkers; medical and Workplace Applications(Mendelsohn, Mohr, Peeters, eds) John Henry Press, Washington, D.C. 1998;377-86.
70. McCunney RJ, "Particles and Lung Disease. A Clinical Perspective." Published in IEH Report on Approaches to Predicting Toxicity from Occupational Exposure to Dusts (Report R11), Leicester UK. Institute for Environment and Health ISBN 1899110208
71. McCunney RJ, Masse F, Galanek M. "The Use of Bioassay Data to Estimate Radiation Dose Resulting From Intake of Radioactive Phosphorous (P-32)." J Occup Env Med October 1999;41(10):878-83.
72. Bunn WB, McCunney RJ. "Corporate Occupational Health Services in the United States: Services Provided Internally." Encyclopedia of Occupational Health and Safety, 4th Edition. Int. Labor Organization, Geneva, 1998;16.35-16.38.
73. McCunney RJ. "EPA Ruling on Environmental Particulates and the Occupational Physician: An Editorial." J Occup Env Med; September 1998;40(9):768-71.
74. McCunney RJ. "Key Gaps in Knowledge About the Role of the PNOC/R in the Etiology of

Chronic Airways Disease: Recommended Future Research." Appl Occup Environ Hyg 1998;13(8): 582-85.
75. McCunney RJ. "Hodgkin's Disease: Work and the Environment: A Review." J Occup Env Med January 1999;41(1):36-46.
76. McCunney RJ, Muranko H, Valberg P. "Carbon Black" in Patty's Industrial Hygiene and Toxicology 3rd edition, 2000
77. McCunney RJ. Health and Productivity: A Role for Occupational Health. J Occup Environ Med 2001; 43:30-35
78. McCunney RJ. Opportunities and challenges in leading a professional organization: a president's perspective J Occup Environ Med 2001;43(7)596-600
79. McCunney RJ. Medical Surveillance: The role of the Family Physician. Am Family Physician 2001;63:2339-40
80. McCunney, RJ. and Okawroski, L. "Occupational cancer" (in Shields, PG (editor). Methods for Cancer Risk Assessment, Taylor \& Francis, Boca Raton, FL, 2005; 331-352
81. McCunney, RJ. Genetic Testing: Ethical implications in the workplace. Occupational Medicine: State of the Art Reviews. 2002;17:(4)665-72
82. McCunney RJ Asthma, Genes and Air Pollution, J Occup Environ Med 2005;47:1285-91
83. Morfeld P, Büchte S, Wellmann J, McCunney R, Piekarski C. Lung cancer mortality and carbon black exposure: Cox regression analysis of a cohort from a German carbon black production plant $\mathbf{J}$ Occup Environ Med 2006;1230-41
84. Büchte S, Morfeld P, Wellman J, Bolm-Audorff U, McCunney R, Piekarski C. Lung cancer mortality and carbon black exposure - A nested case-control study at a German carbon black production plant J Occup Environ Med 2006;48:1242-52
85. Morfeld P, Buechte S, McCunney R, Piekarski C. Lung cancer mortality and carbon black exposure-uncertainties of SMR analyses in a cohort study at a German carbon black production plant. J Occup Environ Med 2006;48:1253-64
86. McCunney RJ. Should we screen for occupational lung cancer with low dose computed tomography? J Occup Environ Med 2006;48:1328-33
87. McCunney RJ. Particles and Cancer (editorial) J Occup Environ Med 2006;1217-18
88. McCunney RJ, Meyer J. "Occupational Exposure to Noise" in Environmental and Occupational Medicine; 4th edition (Rom WN, ed.), Lippincott Williams and Wilkins, Baltimore), 2007. pp 129538
89. Morfeld P, McCunney RJ. Carbon black and lung cancer-testing a new exposure metric in a German cohort Am J Ind Med 2007; 50: 565-567
90. McCunney RJ. Health and safety consulting in Effective management of health and safety programs Moser R (ed) OEM Press, Beverly Farms, MA, third edition, 2008
91. McCunney RJ, Morfeld P, Payne, S What component of coal causes coal workers pneumoconiosis J Occup Environ Med 2009; 51: 467-471
92. Valberg PA, Bruch J, McCunney, RJ Are rat results from intra-tracheal installation a reliable basis for predicting cancer risk? Reg Tox Pharm 2009; 54: 72-83
93. Morfeld P, McCunney RJ Carbon black and lung cancer - testing a novel exposure metric by
multi-model inference Am J Ind Med 2009; 52: 890-899
94. Morfeld P, McCunney RJ Bayesian bias adjustments of the lung cancer SMR in a cohort of German carbon black production workers J Occup Med Toxicol. 2010 Aug 11; 5:23.
95. Fischman M, Storey E, McCunney RJ, Kosnett M. National Institute for Occupational Safety and Health nanomaterials and worker health conference--medical surveillance session summary report. J Occup Environ Med. 2011 Jun; 53(6 Suppl):S35-7.
96. McCunney, RJ, Morfeld P, Levy L, Muranko H. Carbon black research recommendations Environ Health Perspect 2011; 119: A332-A333
97. McCunney, RJ, Valberg P, Muranko H, Morfeld, P "Carbon Black" in Patty's Industrial Hygiene and Toxicology 2012; pp 429-453
98. Levy L, Chaudhuri, I Morfeld P, McCunney R. Comments on Induction of Inflammasome dependent Pyroptosis by Carbon Black Nanoparticles. J Biol Chem 2011: 286, NO. 38, 17
99. Morfeld P, McCunney RJ, Levy L and Chaudhuri I, Inappropriate exposure data and misleading calculations invalidate the estimates of health risk for airborne titanium dioxide and carbon black nanoparticle exposures in the workplace. Environ Sci Pollut Res; 2011; December 15.
100. Levy, L, Chaudhuri, I, Krueger, N, McCunney, RJ Does Carbon Black Disaggregate in Lung Fluid? A Critical Assessment. Levy, L; Chaudhuri, I, Krueger, N; McCunney, R. Chemical Research in Toxicology 2012; 25: 2001-2005
101. McCunney RJ and Li J. Risks of radiation-associated cancer in lung cancer screening programs compared to nuclear industry workers and atomic bomb survivors. Chest 2014; 145 (3): 618-624
102. Morfeld P ... McCunney RJ Cross sectional study on respiratory morbidity in workers after exposure to synthetic amorphous silica at five German production plants. Exposure assessment and exposure estimates. J Occup Environ Med 2014; 56: (1): 72-78
103.Morfeld P Taeger D, Mitura H, Bosch A, Nordone A, Vormberg R6, McCunney R Merget R. Assessment and estimates of exposure to synthetic amorphous silica at five German production plants. Occup Environ Med. 2014 Jun; 71 Suppl 1:A60-1.
104. McCunney RJ, Mundt K, Colby WD, Dobie R, Kaliski K and Blais M. Wind Turbines and Health: A critical Review of the Scientific Literature. J Occup Environ Med 2014; November, e1-e24
105. McCunney, RJ (Invited editorial) "Should Radiation Dose from CT Scans be a Factor in Patient Care? Yes." Chest 2015; 147: (4): 872-874
106. McCunney RJ. Rebuttal From Dr McCunney. Chest. 2015 Apr 1; 147(4): 877-8
107. Morfeld P,... McCunney, $\mathbf{R}$ "Translational toxicology in setting occupational exposure limits for dusts and hazard classification - a critical evaluation of a recent approach to translate dust overload findings from rats to humans. Particle Fibre and Toxicology 2015; Apr 23; 12(1): 3.
108. Moniodis A, Cockrill B, Hamilton T, McCunney RJ. Case Report: Hypersensitivity Pneumonitis with Exposure to Metal Working Fluids in a Vocational School Teacher. Occup Med (London) 2015 July
109. McCunney RJ, Mundt K, Morfeld P and Colby D Wind Turbines and Health: An examination of a proposed case definition. Noise and Health 2015; 77: 175-181
110. McCunney RJ, Mundt K, Colby WD, Dobie R, Kaliski K and Blais M. Wind Turbines and Health: An Informed View. Response to Letter to editor. J Occup Environ Med 2015; 57: e133-135
111. Taeger R, McCunney RJ, Bailer U, Barthel K, Küpper U, Thomas Brüning" Morfeld P, Merget R Cross-sectional study on non-malignant respiratory morbidity due to exposure to synthetic amorphous silica. J Occup Environ Med 2016 (in press)
112. Morfeld P, Bruch J, Levy L, Ngiewih Y, Chaudhuri I, Muranko H, Myerson R and McCunney, RJ. Response to the reply on behalf of the permanent Senate commission for the investigation of Health Hazards of Chemical compounds in the work area (MAK Commission) by A Hartwig Karlruhe Institute of Technology (KIT) Particle Fibre and Toxicology 2016; 13: 1-6
113. Morfeld P, Mundt K, Dell L, Sorahan T and McCunney RJ. Meta-analysis of cardiac mortality in three cohorts of carbon black production workers. Int J Environ Research and Public Health 2016; 13: 129
114. Chaudhuri I, Morfeld P, Crocker S, Ngiewih Y, Levy L, McCunney J. 2016. Cigarette smoke particulates, carbon black, and emphysema; a commentary. Comment listed in eLife 2015;4:e09623. https://elifesciences.org/content/4/e09623
115. Yong M, Anderle L and McCunney, RJ. Carbon Black and Lung Cancer Mortality - A Metaregression Analysis Based on Three Occupational Cohort Studies-submitted to Journal of Occupational and Environmental Medicine: Under peer review; March 2019.
116. McCunney, RJ. "Wind turbines and Health" book chapter under review; March 2019. (editors; Michaud D and Basich M.)

## Other Peer Reviewed Publications; Books

1. McCunney RJ, editor, A Practical Approach to Occupational and Environmental Medicine, Little Brown, Boston, 1994. This 50-chapter book is based on revision of The Handbook of Occupational Medicine, with the addition of 25 new chapters. An official publication of the American College of Occupational and Environmental Medicine; peer reviewed by the Publications Committee. Royalties donated to the Bacon Research Fund.
2. McCunney RJ, editor, A Practical Approach to Occupational and Environmental Medicine, third edition, Lippincott, Williams, Wilcox, Baltimore, 2003 This_60-chapter_text_includes_contributions from 90 authors. It has been peer reviewed by the American College of Occupational and Environmental Medicine (ACOEM). I have donated the royalties to the ACOEM

## Non-peer reviewed scientific or medical publications/materials in print or other media <br> Proceedings of Meetings or Other Non-Peer Reviewed Research Publications

1. McCunney RJ, member, editorial board, Occupational and Environmental Medicine Report.
2. McCunney RJ. Occupational Infectious Diseases, (Couturier AC, editor) OEM Press, 2000
3. McCunney RJ. The DOT Medical Examination (Hartenbaum N, editor) OEM Press, 2000
4. Colby D, ...McCunney RJ. Wind Turbine sound and health effects: An expert panel report,

American Wind Energy Association, Canadian Wind energy association, 2009

Books, Textbooks, for the medical or scientific community

1. McCunney RJ, editor, Handbook of Occupational Medicine, Little Brown, Boston, 1988510 pp, ISBN 0-316-55528-2.
2. Mauderly J, McCunney RJ. co-editors, Particle Overload in the Rat Lung and Lung Cancer: Implications for Human Risk Assessment. Inhalation Toxicology (Special Supplement, Vol 8) Taylor \& Francis 1996. 298 pp, ISBN 1-56032-543-7.
3. McCunney RJ, Brandt-Rauf P. co editors, The Chemical Industry as a Global Citizen: Balancing Risks and Benefits. Proceedings of 1995 Medichem (International Commission on Occupational Health ) Congress held at MIT. Published in Int Arch Occup Environ Health; Vol 68, No. 6, 1996
4. Toxicology Desk Reference, The Complete Medical Monitoring Index, Editors Board, R Ryan and T Shults, Taylor \& Francis, Washington, 1996.
5. McCunney RJ, co-editor, Health and Safety Manual, published by OEM Press, Boston, co-authors DiBenedetto D; Harris J., 1992 (annual updates prepared in 1993, 1994, 1995, 1996, 1997).
6. McCunney RJ, editor, Occupational and Environmental Medicine: Self Assessment Review. Lippincott/Raven, Philadelphia, 1998 (ISBN: 0-7817-1612-8). (to be translated into Portuguese)
7. McCunney RJ, editor, Medical Center Occupational Health and Safety. Lippincott Williams \&Wilkins, Philadelphia, 1999 (ISBN 0-7817-2198-9)
8. McCunney RJ, guest editor, Particles and Cancer, Special Issue of the Journal of Occupational and Environmental Medicine, December, 2006

## Attachment RJM-2 <br> References

## References Associated with McCunney Direct Testimony

Blyaev I et al. EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Rev Environ Health
2016; 31 (3): 363-397.
Berglund B et al. Sources and Effects of low frequency noise. J Accoust Soc Am 1996; 99: 29853002.

Berthelot JM Is electromagnetic hypersensitivity entirely ascribable to nocebo effects? Joint Bone Spine 2016; 83: 121-123.

Braescher AK et al. Are media reports able to cause somatic symptoms attributed to WiFi radiation? An experimental test of the negative expectation hypothesis. Environ Research 2017; 156: 265-271.

Colby, DC, ... McCunney RJ et al. et al. 2009. Wind turbine sound and health effects an expert panel review. American Wind Energy Association; Canadian Wind Energy Association.

Collaca L. Nocebo effects can make you feel pain. Science 2017; 359; 6359.
Crichton, F., Dodd, G., Schmid, G., Gamble, G. \& Petrie, K. J. (2013, March 11). Can expectations produce symptoms from infrasound associated with wind turbines? Health Psychology.

Deignan, B., Harvey, E., and Hoffman-Goetz, L. Fright factors about wind turbines and health in Ontario newspapers before and after the Green Energy Act, Health, Risk \& Society 2013.776015.

Evans, T., Cooper, T., \& Lenchine, V. (2013). Infrasound levels near windfarms and in other environments. Adelaide, South Australia: Environment Protection Authority - Australia.

Feder et al. An assessment of quality of life using the WHOQOL-BREF among participants living in the vicinity of wind turbines. Environ Research 2015; 142: 227-2382016.

Gajsek P et al. Review of studies concerning electromagnetic field (EMF) Exposure assessment in Europe: Low frequency Fields ( $50 \mathrm{~Hz}-100 \mathrm{kHz}$ ) Int J Environ Res Public Health 2016; 13 (9): E 875.

Guski, R., Felscher-Suhr, U., and Schuemer, R. The concept of noise annoyance: How international experts see it, Journal of Sound and Vibration. 1999;
223 (4), 513-527.
Harding G et al. Wind turbines, flicker and photosensitive epilepsy: Characterizing the flashing that may preciatate seizures and optimizing guidleines to pevent them. Epilepsia 2008; 49: 10951098.

Hauser, W et al. Nocebo phenomena in medicine: their relevance in everyday clinical practice, Dtsch Arztebl International. 2012;109:459-465.

IEC. (2012). IEC 61400-11 Wind Turbine Generator Systems - Part 11: Acoustic noise measurement techniques. International Electrotechnical Commission . Geneva.

ISO. (1996). Acoustics - Attenuationof sound during propagation outdoors - Part 2: General Method of Calculation. Geneva, Switzerland: International Organization for Standardization.

ISO 2011. "Acoustics -- Frequency-weighting characteristic for infrasound measurements."
Israel M et al. Electromagnetic fields and other physical factors around wind power generators (pilot study) Environmmentalist 2011; 31: 161-168.

Jakobsen J. Infrasound emission from wind turbines J Low Freq Noise Vib 2004; 145-155.
Jalali $L$ et al. The impact of psychological factors on self reported sleep disturbance among people living in the vicinity of wind turbines. Environ Research 2016; 148: 401-410.

Knopper, L. D, \& Ollson, C. A. Health effects and wind turbines: A review of the literature, Environmental Health. 2011: 10:78. doi:10.1186/1476-06X-10-78.

Leventhall, G. Infrasound from wind turbines - fact, fiction or deception? Canadian Acoustics, 2006; 34:29-36.

McCallum LC, Whitfield Aslund ML, Knopper LD, Ferguson GM, Ollson CA. Measuring electromagnetic fields (EMF) around wind turbines in Canada: is there a human health concern? Environ Health (2014) 13:9)

McCunney, RJ, Mundt, KA, et al. 2014. Wind turbines and health: a critical review of the scientific literature. J Occup Environ Med. 56: e108-e130.

McCunney RJ, Mundt K, Morfeld P and Colby D Wind Turbines and Health: An examination of a proposed case definition. Noise and Health 2015; 77: 175-181.

Metcalfe C et al. 2008. The scope for biased recall of risk-factor exposure in case-control studies: evidence from a cohort study of Scottish men. Scand J Public Health. 2008 Jun;36(4):442-5.

Michaud D et al. A. Exposure to wind turbine noise: perceptual responses and reported health effects. J Accoust Soc Am 2016; 139: (3): 1443-1454.

Michaud D et al. B. Effects of wind turbine noise on self reported and objective measures of sleep. Sleep 2016; 39: (1): 97-109.

Michaud et al. C. Personal and situational variables associated with wind turbine noise annoyance. J. Acoust. Soc. Am. 139 (3), March 2016; p 1455-1466.

Michaud et al. D. Self-reported and measured stress related responses associated with exposure to wind turbine noise.J. Acoust. Soc. Am. 139 (3), March 2016; p. 1467-1479.

Moller H et al. Low frequency noise from large wind turbines. J Acoust Soc Am 2011; 129: 372744.

Mroczek, B et al. Evaluation of Quality of Life of Those Living near a Wind Farm. Int. J. Environ. Res. Public Health 2015, 12, 6066-6083.

Onakoya IJ The effect of wind turbine noise on sleep and quality of life: A systematic review and meta-analysis of observational studies. Environ Int 2015 Sep; 82:1-9.

O'Neal, R., Hellweg, R., \& Lampeter, R. Low Frequency Noise and Infrasound from Wind Turbines. Noise Control Eng 2011; 59 (2): 135-157.

Pedersen E, van den Berg F, et al. Can road traffic mask sound from wind turbines? Response to wind turbine sound at different levels of road traffic sound. Energy Policy 2010: 38: 2520-2527.

Pedersen E, Larsman P. The impact of visual factors on noise annoyance among people living in the vicinity of wind turbines. Journal of Environmental Psychology 2008; 28: 379-389.

Porsius JT et al. Nocebo responses to high-voltage lines: Evidence from a prospective field study. Sci Total Environ 2016; 54: 432-438.

Salt A, Hullar TE. Responses of the ear to low frequency sounds, infrasound and wind turbines. Hear. Res. 2010;268 (1-2): 12-21.

Smedley ARD et al. Potential of wind turbines to elicit seizures under various meterological conditions. Epilepsia 2010; 51 (7); 1146-1151

Turnbull, C., Turner, J., \& Walsh, D. Measurement and level of infrasound from wind farms and other sources. Acoustics Australia. 2012; 40 (1), 45-50
van den Berg, F., Pedersen, E., Bouma, J., \& Bakker, R. (2008). Project WINDFARM perception: Visual and acoustic impact of wind turbine farms on residents.

Webster RK et al. A systematic review of factors that contribute to nocebo effects. Health Psychology. 2016; 35: 1334-1355.

This foregoing document was electronically filed with the Public Utilities

## Commission of Ohio Docketing Information System on

8/6/2019 5:15:43 PM
in

## Case No(s). 18-0488-EL-BGN

Summary: Testimony of Robert J. McCunney, M.D. on behalf of Seneca Wind, LLC electronically filed by Teresa Orahood on behalf of Devin D. Parram

