Nina Pierpont, MD PhD

Fellow of the American Academy of Pediatrics

February 8, 2006

Education

1991	M.D.	The Johns Hopkins University School of Medicine
1985	Ph.D.	Princeton University (Behavioral Ecology)
1981	M.A.	Princeton University (Behavioral Ecology)
1977	B.A.	Yale University, National Merit Scholar (cum laude)

Post-Doctoral Training

1992 to 94	Pediatrics	Dartmouth-Hitchcock Medical Center, Lebanon, NH
1991 to 92	Pediatrics	Children's National Medical Center, Washington, DC
1985 to 86	Ornithology	American Museum of Natural History, New York, NY

Licensure and Certification

1997	Licensed Physician, New York
1997	Licensed Physician, New Hampshire (expired)
1995	Pediatric Advanced Life Support Instructor and Affiliate Faculty
1994	Diplomate, American Board of Pediatrics (recertified 2000, expires 2008)
1994	Licensed Physician, Alaska (expired)

Hospital or Affiliated Institution Appointments

10/00 to 12/03	Senior Attending in Pediatrics	Bassett Healthcare, Cooperstown, NY
1997 to 00	Attending Pediatrician	Alice Hyde Hospital, Malone, NY
1995 to 96	Chief of Pediatrics	Yukon-Kuskokwim (Yup'ik Eskimo) Delta Regional Hospital, Bethel, AK
1994 to 95	Staff Pediatrician	Yukon-Kuskokwim (Yup'ik Eskimo) Delta Regional Hospital, Bethel, AK

Other Professional Positions

2004 to …	Private Practice (Solo) Pediatrics (emphasizing Behavioral Peds)	Malone, NY
1998 to 00	Private Practice (Solo) Pediatrics	Malone, NY (poorest county in state)
1997 to 00	Staff Pediatrician	St. Regis Mohawk (Iroquois) Health Services, Hogansburg, NY
1997 to 98	Staff Pediatrician	North Country Children's Clinic (clinic for needy children), Malone, NY

Academic Appointments

2000 to 03	Assistant Clinical Professor of Pediatrics Columbia University, College of Physicians and Surgeons

Health Effects of Wind Turbine Noise

Nina Pierpont, MD, PhD
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Industrial wind turbines produce significant amounts of audible and low-frequency noise. Dr. Oguz A. Soysal, Professor and Chairman of the Dept. of Physics and Engineering at Frostburg State University in Maryland, measured sound levels over half a mile away from the Meyersdale, PA, 20-turbine wind farm. Typical audible (A-weighted) dB (decibel) levels were in the 50-60 range, and audible plus low-frequency (C-weighted) dB were in the 65-70 range.[1] 65-70 dB is the loudness of a washing machine, vacuum cleaner, or hair dryer.[2] A difference of 10 dB between A and C weighting represents a significant amount of low-frequency sound by World Health Organization standards.[3]

The noise produced by wind turbines has a thumping, pulsing character, especially at night, when it is more audible. The noise is louder at night because of the contrast between the still, cool air at ground level and the steady stream of wind at the level of the turbine hubs.[4] This nighttime noise travels a long distance. It has been documented to be disturbing to residents 1.2 miles away from wind turbines in regular rolling terrain,[5] and 1.5 miles away in Appalachian valleys.[6]

At night, the WHO recommends, the level of continuous noise at the outside a dwelling should be 45 dB or less, and inside, 30 dB or less. These thresholds should be even lower if there is a significant low-frequency component to the sound, they add – as there is for wind turbines. Higher levels of noise disturb sleep and produce a host of effects on health, well-being, and productivity.[7]

The decibel is logarithmic. Increasing the dB level by 10 multiplies the noise level by 10. Increasing the dB level by 20 multiplies the noise level by 100 (and 30 dB multiplies by 1000, etc.). Thus the 65 dB measured day and night half a mile from the Meyersdale wind farm is 100 times louder than the loudest continuous outdoor nighttime noise (45 dB) recommended by the WHO.

Typical ordinances proposed or passed for NY State communities considering industrial wind turbines allow A-weighted noise levels of 50 dB and construction of turbines only 1000 ft. from dwellings. These ordinances meet neither WHO nor NYS DEC standards, especially compared to the very low ambient noise levels (with dB levels typically in the 20's) in rural NY.[8]

The health effects of excessive community noise are carefully documented in the WHO report with reference to scientific and medical literature. Effects relevant to wind turbines, in terms of dB levels and noise type, are paraphrased and summarized from this report:

- For people to understand each other easily when talking, environmental noise levels should be 35 dB or less. For vulnerable groups (hearing impaired, elderly, children in the process of reading and language acquisition, and foreign language speakers) even lower background levels are needed. When noise interferes with speech comprehension, problems with concentration, fatigue, uncertainty and lack of

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[1] Soysal, OA. 2005. Acoustic Noise Generated by Wind Turbines. Presented to the Lycoming County, PA Zoning Board 12/14/05. osoysal@frostburg.edu
[2] www.lhh.org/noise/decibel.htm
[3] World Health Organization, 1999. *Guidelines for Community Noise*. Ed. by Berglund B et al. Available at http://www.who.int/docstore/peh/noise/guidelines2.html.
[4] van den Berg, FGP, 2005. "The beat is getting stronger: The effect of atmospheric stability on low frequency modulated sound of wind turbines." *Journal of Low Frequency Noise, Vibration, and Active Control*, 24(1):1-24.
[5] van den Berg, FGP, 2003. "Effects of the wind profile at night on wind turbine sound." *Journal of Sound and Vibration* 277:955-970.
[6] Linda Cooper, Citizens for Responsible Windpower, "Activist Shares Wind Power Concerns," *The Pendleton Times*, March 3, 2005, p. 4.
[7] WHO, 1999. *Guidelines for Community Noise.*
[8] NYS DEC, 2001. *Assessing and Mitigating Noise Impacts.*

self-confidence, irritation, misunderstandings, decreased work capacity, problems in human relations, and a number of stress reactions arise.[9]

- Wind turbine noise, as described above and experienced by many turbine neighbors, is easily within the decibel levels to disturb sleep. Effects of noise-induced sleep disturbance include fatigue, depressed mood or well-being, decreased performance, and increased use of sedatives or sleeping pills. Measured physiologic effects of noise during sleep are increased blood pressure and heart rate, changes in breathing pattern, and cardiac arrhythmias.[10] Certain types of nighttime noise are especially bothersome, the authors note, including those which combine noise with vibration, those with low-frequency components, and sources in environments with low background noise.[11] All three of these special considerations apply to industrial wind turbines in rural NY State. Children, the elderly, and people with preexisting illnesses, especially depression, are especially vulnerable to sleep disturbance.

- Noise has an adverse effect on performance over and above its effects on speech comprehension. The most strongly affected cognitive areas are reading, attention, problem solving, and memory. Children in school are adversely affected by noise, and it is the uncontrollability of noise, rather than its intensity, which is most critical. The effort to tune out the noise comes at the price of increased levels of stress hormones and elevation of resting blood pressure. The adverse effects are larger in children with lower school achievement.[12]

- What is commonly referred to as noise "annoyance" is in fact a range of negative emotions, documented in people exposed to community noise, including anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, and exhaustion.[13] Numerous reports from neighbors of new industrial wind turbine installations document these symptoms. The percentage of highly annoyed people in a population starts to increase at 42 dB, and the percentage of moderately annoyed at 37 dB.[14]

Low-frequency sound is also sensed as pressure in the ears. It modulates the loudness of regular audible frequencies, and is sensed as a feeling or vibration in the chest and throat.[15] Neighbors of industrial wind turbines describe the distressing sensation of having to breathe in sync with the rhythmic thumps of the turbine blades, especially at night when trying to sleep.

The participants in noise studies are selected from the general population and are usually adults. Vulnerable groups of people are underrepresented. Vulnerable groups include:

- People with decreased personal abilities (old, ill, or depressed people)
- People with particular diseases or medical problems
- People (such as children) dealing with complex cognitive tasks, such as reading acquisition
- People who are blind or who have hearing impairment
- Fetuses, babies and young children
- The elderly

These people may be less able to cope with the impacts of noise exposure and at greater risk for harmful effects than is documented in studies. Attention needs to be paid to them when developing regulations and setback requirements for industrial wind turbines and other sources of annoying and debilitating noise.

Wind turbines also create moving visual disturbances, especially early and late in the day when the long shadows of moving blades sweep rhythmically over the landscape. That portion of the population which is susceptible to vertigo, unsteadiness, or motion sickness (including many children and a large proportion of the elderly) will be vulnerable to unsteadiness and nausea when subjected to this visual disturbance. People with seizure disorders are susceptible to triggering of seizures by the strobe effect of seeing the sun through the moving blades.

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[9] WHO, 1999. *Guidelines for Community Noise*, pp. 42-44.
[10] Ibid, p. 44.
[11] Ibid. p. 46
[12] Ibid. pp. 49-50
[13] Ibid. p. 50
[14] Ibid. p. 51
[15] Moller, H. and CS Pedersen. 2004. Hearing at low and infrasonic frequencies. *Noise & Health* 6 (23):37-57.