

## Practice Issues: Wind energy and health effects

Written by Jackie Campbell on February 18, 2010 for [Pharmacy Practice](#)

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Our current energy system relies mainly on burning nonrenewable fuels (oil, natural gas, coal) to produce electricity, which increases greenhouse gas emissions, and contributes to adverse health effects (e.g., asthma) as well as global climate change. The move to green energy, which uses readily available, naturally occurring fuel sources (e.g., wind, water, sun, waste), will lessen many of these problems.

However, new technologies may come with risks. For example, the health effects of living near wind turbines are currently being hotly debated. The press has reported on people who are disturbed by noise and vibrations. These people complain of sleep disturbances, as well as headache, nausea, dizziness, increased blood pressure, weight changes, abnormal heart rhythms, mood problems, exhaustion, depression, difficulty concentrating and tinnitus.(1,2) A controversial new book by a U.S. pediatrician describes a constellation of symptoms, including the above, which she has named the "wind turbine syndrome," and may be experienced by those living near industrial wind turbines.(3)

*Some evidence suggests that audible low frequency noise is associated with adverse health effects*

### **Sound and infrasound**

In simplest terms, sound is characterized by magnitude (i.e., loudness, measured as sound pressure on the ear, in decibels [dB(A)]) and frequency (in cycles per second, or Hertz (Hz)).<sup>4</sup> Most sounds are a mixture of different frequencies.<sup>(5)</sup> Infrasound (sound below 20 Hz) cannot be perceived by human ears, but is always around us, and originates from various sources (e.g., ambient air turbulence, airplanes, machinery, air conditioners, waves at the seashore).<sup>(4)</sup>

### **Wind turbine noise**

Wind turbines are tall towers (usually with three rotating blades) that are used to produce electric power. A collection of turbines located in the same area (although hundreds of metres apart) is called a wind farm.<sup>(6)</sup>

Wind turbines generate a broad spectrum of noise: mechanical (e.g., from gears, mechanical elements and transformers), aerodynamic (e.g., turbulence from the flow of air over the turbine blades), pulsing (e.g.,

rhythmic modulation of aerodynamic noise, particularly at low frequency) and wind farm noise (e.g., multiple turbines may have a drone or beat).(4-8)

Individuals vary in their sensitivity to sound, vibration and other parameters that make up noise.(7) Therefore, while sound levels can be measured, an individual's perception (and tolerance) of the acoustic impact of wind turbines is largely subjective.(4) Some people can ignore low-intensity noise while others will find it extremely unpleasant and annoying.(4)

A few studies have assessed the impact of wind turbine noise on people living near these structures.(9) In a recent field study in the Netherlands (a questionnaire with more than 700 respondents), wind turbine noise was found to be more annoying than comparable levels of transportation or industrial noise.(8) A dose-response relationship was noted, with an increasing number of respondents perceiving (i.e., noticing) turbine noise as noise levels increased from under 30 dB(A) to over 45 dB(A). Two earlier Swedish studies (also questionnaires) noted that the number of individuals perceiving turbine noise increased as noise levels rose from under 32.5 to over 40 dB(A), and that annoyance correlated with higher noise levels; both studies reported some sleep disturbance (with or without annoyance).(5,9)

In the Dutch study, the degree of annoyance rose with increasing sound level.(8) The authors noted an association between annoyance with the noise and individual sensitivity, as well as in general attitudes towards wind turbines and the visual impact of the turbines. Of note, while there was no difference in terms of perceiving turbine noise between those who benefitted economically from the turbines and those who did not, the latter group was more likely to report annoyance at similar sound levels.

Wind turbine noise is attenuated at typical setback distances. For example, in Ontario, all wind turbines over 50 kilowatt capacity must be set back a minimum of 550 metres from noise receptors (e.g., homes, schools, day nurseries, places of worship, hotels), to ensure that noise levels at the receptor do not exceed 40 db(A) (the approximate noise level in a quiet office or library).(10,11)

### **Wind turbine flicker**

In locations where the rotating turbine blades interrupt sunlight, they produce a strobe-like rhythmic light flicker consisting of bright flicker as well as intermittent shadows (called shadow flicker). This can affect people outdoors and indoors and some consider it annoying.(7,12) If rotating quickly, some large wind turbines can produce flicker at frequencies over 3 Hz, which increases the possibility of seizures in those with photosensitive epilepsy (which occurs in 1 in 4,000 people).(12) Of note, the blades of several turbines in a wind farm may produce a higher (cumulative) frequency flicker. Flicker can be minimized by keeping blade rotation speeds low, so that flicker frequency remains under 2.5 Hz under all conditions, and with use of nonreflective turbine blades.(12) As well, the placement of turbines is important (e.g., appropriate setbacks, or out of the path of the sun in areas of concern).(7)

### **Advice to patients**

Pharmacists can inform patients that although personal reports of adverse effects of wind turbines cannot be discounted, more research is needed to assess the effects of wind turbines on human health. Some evidence suggests that audible low frequency noise is associated with adverse health effects, with more complaints occurring in areas where outside noise levels exceed 35 dB(A).(7) These low frequencies are not attenuated by walls and windows of dwellings.7 As well, it is unclear whether infrasound that is below what we can perceive produces adverse health effects.4 Newer turbines minimize infrasound.(7)

This is an exciting, but uncertain, time. Energy generated from green sources means cleaner air and fewer adverse health effects from heart disease, cancer and lung diseases (e.g., asthma).(13) At the same time, it is important to help patients understand that, while the benefits are numerous, health risks associated with these new technologies have not been fully determined.

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