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Research Review: Health Consequences of Living Near Wind Turbines and Solar Panels

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Many people are searching for healthier and safer alternatives to fossil fuel; however, concerns have surfaced about the adverse effects associated with both wind turbines and solar panel use in and around homes. Below, we will investigate and sift through recent scientific literature to determine where current research about the potential risks and adverse effects of wind and solar energy sits and whether or not any conclusions can be drawn.

Wind Turbines

Wind turbine placement and development has increased recently to utilize renewable energy. Many people living near and around wind turbines or around proposed sites are concerned about their health and safety. Noise, annoyance, shadow flicker, EMFs and infrasound are the most common concerns.

The Ontario community-based, self-reporting health survey found the most common symptoms to be an altered quality of life, sleep disturbance, excessive tiredness, headache and stress/distress, however many other symptoms have been reported (Table 1).¹ Unfortunately, there is an overall lack of scientific peer-reviewed consensus about whether these health concerns are indeed caused by living in proximity to wind turbines.^{1,4} Two small studies coined the terms: “Wind Turbine Syndrome” and “Vibro-Acoustic Disease” as purportedly caused by exposure to wind turbines, however it has been argued that rigorous scientific peer review has not occurred. Concerns included the fact that, both studies were missing noise measurements, had no statistical representation of potential health effects, used small study numbers and may have created bias by asking about people’s concerns in an un-blinded way.⁴ Evidence is insufficient to suggest that typical exposure, even when in close proximity can lead to VAD, but there may be more-vulnerable people who could be susceptible.⁵

Health effects are too often discounted because “direct pathological effects” or a “direct causal link” has not been established. However, studies conducted have only looked for direct links to human health, finding little.²⁹ Indirect impacts on health also need consideration.¹

TABLE 1: ADDITIONAL SYMPTOMS IDENTIFIED BY SUBJECTS LIVING NEAR WIND TURBINES THROUGH SELF-REPORTED QUESTIONNAIRES¹

Fatigue	Annoyance/stress	Vertigo/dizziness
Insomnia	Vomiting	Panic episodes
Headache	Palpitations	Grief/anger/injustice
Tachycardia	Ear pressure	Depression/anxiety
Visual blurring	Internal pulsations	Cognitive dysfunction

In 2011, McMurty proposed a case definition to diagnose “Adverse Health Effects in the Environs of Industrial Wind Turbines” (AHE/IWT), however it was found to lack scientific support from peer reviewed literature and have very poor specificity.⁸ The problem with the specificity is that there were nearly 40,000 ways to meet diagnostic criteria once the non-specific first-order criteria were met, meaning that false positive assessments and many missed diagnoses could occur very easily.⁸

Issues related to Annoyance, Noise, EMFs, Infrasound and Shadow Flicker from Wind Turbines

When it comes to EMFs, it appears that precautionary measures are not needed at extremely low frequencies (ELFs), which occurs with wind turbines. According to the official position of Health Canada there is no evidence of harm from wind turbines. Health Canada has noted that EMF readings found around wind turbines were lower than levels found inside homes and that these levels were much lower than daily exposure from common household electrical devices.⁶

Shadow flicker is another problem area for local residents, in terms of creating annoyance. There is a belief that this may even induce seizures. Shadow flickers were found to be more annoying in areas where there was a greater perception of noise.⁴ Beyond the annoyance factor, Knopper et al report that wind turbines have specifically been designed not to pose a risk of photo-induced epilepsy by limiting the hours of shadow flicker per year at any one residence. Other literature on the effect of shadow flicker and turbines is lacking.⁴

The noise created by the turning blades of a wind turbine has been described as sounding like a constant airplane overhead. This sound is characterized as piercing, preoccupying and continually surprising, as

well as often irregular in intensity, depending on wind conditions.^{1,5} The audible portion of the sound is around 300Hz, which easily penetrates the walls of homes and other buildings.⁵ Audible and low-frequency acoustic energy from turbines is sufficiently intense to cause extreme annoyance and inability to sleep, or disturbed sleep in people living nearby.⁵ It was noted that noise emissions were found to disturb sleep, cause daytime sleepiness and impair mental health for residents within 1.4 km of two turbines.¹ Although newer turbines are touted as being quieter than older turbines, the increased size of the newer multi-MWatt turbines, and especially their blades, have been associated with more complaints of adverse health effects that cannot be explained by auditory responses alone.⁵

Another issue is the increased perception of noise from wind turbines at night. It was found that wind turbines are 10-20dB louder at night than during the day.⁷ Unfortunately, it's financially unlikely that the industry would consider stopping nighttime-operation as an option.

A number of studies have found that turbine noise was significantly more annoying than other environmental nuisances, including road traffic noise.^{3,10-13} Not surprisingly, they also found that the closer wind turbines were and the higher sound pressure levels caused increased annoyance. Interestingly, subjects who see wind turbines as a negative aspect of their environment perceive noise from them as more annoying compared to other respondents.^{3,10-13} A perceived negative attitude toward turbines, and those with increased annoyance outdoors, reported higher frequency of feeling nervous, tense or stressed out on a weekly, and even daily basis.^{3,10-13} Respondents whose self-assessment of their own health as "poor" were also more annoyed by them in general. Further studies suggest that reported ill effects on health from wind turbines are more likely attributed to a number of environmental stressors that result in an overall greater relative annoyed/stressed state in that exposed population.⁴

Insomnia is higher for those in which the turbine induced noise levels were 40-45dB compared to 35-40dB.³ Some jurisdictions, like Ontario, have set a maximum sound-level of 40dB to protect the public and vulnerable populations.⁴ Subjects living closer to wind turbines, at distances of 400-800m, believed that wind turbines had a negative impact on humans, the landscape and the environment as compared to those living 800-1200m away. Interestingly, direct economic benefits derived from wind turbines significantly decreased annoyance by respondents. However, paid lease agreements often include a gag-clause, ensuring that people aren't able to speak out or write anything unfavorable about wind turbines on their property.⁵

Interestingly, annoyance has been correlated with noise, but annoyance was more strongly related to visual impact, attitude about wind turbines and sensitivity to any noise in general.^{4,10-13}

Infrasound, which includes sound waves at frequencies that occurs at a level below the limit of audible sound (which is approximately

16Hz), is another area of concern. Crichton et al conducted a study to see if positive or negative expectations of harm from infrasound influenced symptoms experienced. Any perception of environmental hazard created symptom expectations, and a priming effect, whereby subjects were more likely to notice sensations and symptoms and attribute them to the infrasound.² Crichton's study involved exposure to 10-minutes of infrasound compared to 10-minutes of sham 'sound' in groups who had both high expectancy of symptoms, and low expectancy of symptoms. Subjects presented with a body of lay-information commonly found on the Internet and in the media linking sound exposure and health effects, did in fact increase their report of symptoms in both sham and infrasound groups. It is likely that information alone about potential harm may be enough to create health concerns and trigger symptom reporting, even in the absence of inherent objective risk.² Implications are that people near turbines may seek out the Internet and media opinions on the safety and health effects that may in the end bias them. However the study lacked a control group and exposure periods that are typical of people living near wind turbines in the real world. In fact, biological and harmful effects have indeed been noted with infrasound, but at much greater sound pressure levels than those created by wind turbines.⁴

Recently, 23andme, Inc., found a correlation in European populations between the snp Rs2937573 and misophonia, which is a condition known to trigger severe irritation to noise.⁹ Further investigations with these populations and their negative health effects when living in close range to wind turbines would be interesting to consider.

It is also important that patients presenting to physicians about health concerns related to wind turbines not be further victimized by a doctor with a lack of knowledge or understanding of the situation.¹

In 2011, an Ontario environmental review tribunal decision acknowledged: "...the debate should not be simplified to one about whether wind turbines can cause harm to humans. The evidence presented to the tribunal demonstrates that they can, if facilities are placed too close to residents. The debate now has evolved to one of degree."¹

Solar Panels

Photovoltaic solar panels are another area where consumers and industry alike are trying to move further away from traditional fossil fuel use and find ways to harness renewable resources, like sunlight.

There have been very few studies conducted concerning the safety and potential impact of solar voltaic panels on human health. The majority of the studies that have been conducted though suggest that there are currently minimal health and safety hazards associated with their presence or operation.¹⁵⁻¹⁷ The majority of environmental, health and safety hazards are associated with the use of hazardous chemicals in the manufacturing process.¹⁵⁻¹⁷ The benefits to solar energy use may outweigh the risks compared to conventional fossil fuel technology and its associated harms.¹⁵

KEY FACTS

Wind Turbines

- perceived annoyance to wind turbines increases reported health concerns
- patients sensitive to noise or those with poor health may see more adverse risk
- no conclusive evidence on wind turbines direct impact on health effects

Solar Panels

- manufacture and disposal of solar panels have increased toxicity risk
- patients very sensitive to EMFs may be affected by solar panels and batteries

Highly toxic chemicals and materials are used in the manufacturing process of photovoltaic cells. Silica sand, kerf dust, heavy metals like arsenic, lead, cadmium, gallium and copper, and solvents such as nitric acid, sodium hydroxide and hydrofluoric acid are used and are known to impact health. Silica dust exposure has been linked to silicosis, COPD, rheumatoid arthritis, scleroderma, Sjogern's, lupus, renal disease and lung cancer.¹⁵ Carcinogenic chemicals such as arsenic and cadmium are also concerns when proper safety precautions are not taken in the manufacturing process.¹⁷ Critical to maintaining good health for individuals is a requirement on safe manufacturing processes, but once the product is finished and produced in a complete form, these risks become much less of an issue to the public at large.

Environmentally, there is risk of industrial accidents and the release of vapors and dust into the surroundings.^{15,17} Through effective regulation, enforcement and vigilance by manufacturers and operators, dangers to workers, the public and the environment can be minimized.¹⁵

Of all steps, consumers appear to have the least amount of risk. Solar voltaic panels are enclosed and encased in heavy-duty glass or plastic, with little risk that small amounts of semiconductor materials will be released, except in explosion or fire.¹⁵⁻¹⁷ Firefighters and first responders have struggled with accessing rooftops and risked electrocution when coming into contact with high voltage conductors that are still charging on solar panels.¹⁵ There is currently no general recommendations or guidelines to address their concerns.

Disposal is another area of danger due to the hazardous elements and trace metals discussed above. Proper recycling programs will be an important follow up to ensure that leakage of trace metals into the environment doesn't occur.¹⁷

EMF exposure is another area of concern, however the current scientific consensus suggests that there is no causal relationship between exposure to the low-level power frequency EMFs emitted by

solar voltaic cells and adverse health effects.¹⁵ The strength of EMFs do not begin to approach levels set by the International Commission on Non-ionizing Radiation Protection and small EMFs produced by solar panels diminish rapidly and are indistinguishable from normal background levels within several yards.¹⁵

Many of us have, however, had patients present who are very sensitive to EMFs, and as with wind turbine noise, there is likely a small proportion of the population who may find EMF exposure from solar panels to be troubling and contribute to health concerns.

Overall, consensus about the safety, annoyance and health risks of both wind turbines and solar panels has not been reached and further studies should be done in order to assess whether many people may be negatively affected or if there's a small identifiable minority that needs protection from them. 🌞

About the Author

Shannon Morgenstern, ND is a licensed naturopathic doctor practicing in Calgary, Alberta. As a naturopathic doctor, trendsetter and guide, she helps patients to challenge the status quo, inspire change and live a cleaner, greener existence. Her mission is helping moms and moms-to-be remove toxins from their homes to give their families the healthiest, happiest lives possible.

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