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Electromagnetic Hypersensitivity: Biological Effects of Dirty Electricity with Emphasis on Diabetes and Multiple Sclerosis

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Dirty electricity is a ubiquitous pollutant. It flows along wires and radiates from them and involves both extremely low frequency electromagnetic fields and radio frequency radiation. Until recently, dirty electricity has been largely ignored by the scientific community. Recent inventions of metering and filter equipment provide scientists with the tools to measure and reduce dirty electricity on electrical wires. Several case studies and anecdotal reports are presented. Graham/Stetzer (GS) filters have been installed in schools with sick building syndrome and both staff and students reported improved health and more energy. The number of students needing inhalers for asthma was reduced in one school and student behavior associated with ADD/ADHD improved in another school. Blood sugar levels for some diabetics respond to the amount of dirty electricity in their environment. Type 1 diabetics require less insulin and Type 2 diabetics have lower blood sugar levels in an electromagnetically clean environment. Individuals diagnosed with multiple sclerosis have better balance and fewer tremors. Those requiring a cane walked unassisted within a few days to weeks after GS filters were installed in their home. Several disorders, including asthma, ADD/ADHD, diabetes, multiple sclerosis, chronic fatigue, fibromyalgia, are increasing at an alarming rate, as is electromagnetic pollution in the form of dirty electricity, ground current, and radio frequency radiation from wireless devices. The connection between electromagnetic pollution and these disorders needs to be investigated and the percentage of people sensitive to this form of energy needs to be determined.

Keywords Diabetes; Dirty electricity; Electromagnetic hypersensitivity; Multiple sclerosis; Power quality; Radio frequency.

Introduction

Most of the research on the biological effects of nonionizing radiation is done at one of two frequency ranges: extremely low frequency (ELF) associated with electricity (50/60 Hz) and radio frequency (RF) associated with wireless telecommunication

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devices (800 MHz to 2.5 GHz range). An intermediate frequency range, at the low end of the RF spectrum (kHz), flows along and radiates from wires (dirty electricity) and thus has characteristics of the two major types of electromagnetic pollution mentioned above. Scientists doing research on the biological effects of power line frequencies seldom measure this frequency range and thus ignore the effects it might have on health.

Recent advances in filtering technology (Graham/Stetzer or GS filters) and measuring equipment (microsurge meter) enable scientists to test for dirty electricity and to reduce it on indoor wires. In this article, case studies are presented of individuals who have benefited after the dirty electricity in their environment was reduced. This technology provides scientists with the tools to monitor, reduce, and experiment with a frequency range that, until now, has been largely ignored and it may help those who suffer from symptoms of electromagnetic hypersensitivity (EHS).

Dirty Electricity

Poor power quality, also known as dirty electricity, has been a concern for the electric utility for decades. Dirty electricity refers to electromagnetic energy that flows along a conductor and deviates from a pure 60-Hz sine wave (Figure 1). It has both harmonic and non harmonic (transient) components and emerged as a problem in the late 1970s with the increasing use of electronic devices that produce nonlinear loads. Karl Stahlkopf, a vice president of the Electric Power Research Institute (EPRI), estimates that dirty power costs U.S. industry between $4 and $6 billion a year, and that it is likely to get worse before it can be mitigated. EPRI expects that 70% of all electricity produced within the U.S. will flow through electronic devices by 2002, compared with 30% in 1999 (Fortune, 1999).

Dirty electricity is ubiquitous. It is generated by electronic equipment such as computers, plasma televisions, energy efficient appliances, dimmer switches, as

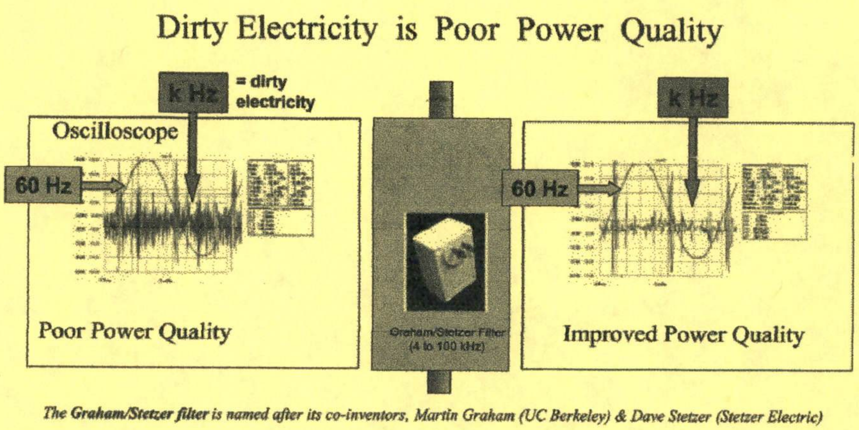

Figure 1. Visual display of dirty electricity (kHz range) and 60 Hz power frequency without (left) and with (right) Graham/Stetzer filters. A 2-channel Fluke 199 Scopemeter was attached to a ubiquitous filter to separate the 60 Hz frequency from the dirty electricity (Graham, 2000). The improved power quality has fewer spikes and smaller amplitude for the high frequency transients. The GS filters have no effect on the 60 Hz sine wave.

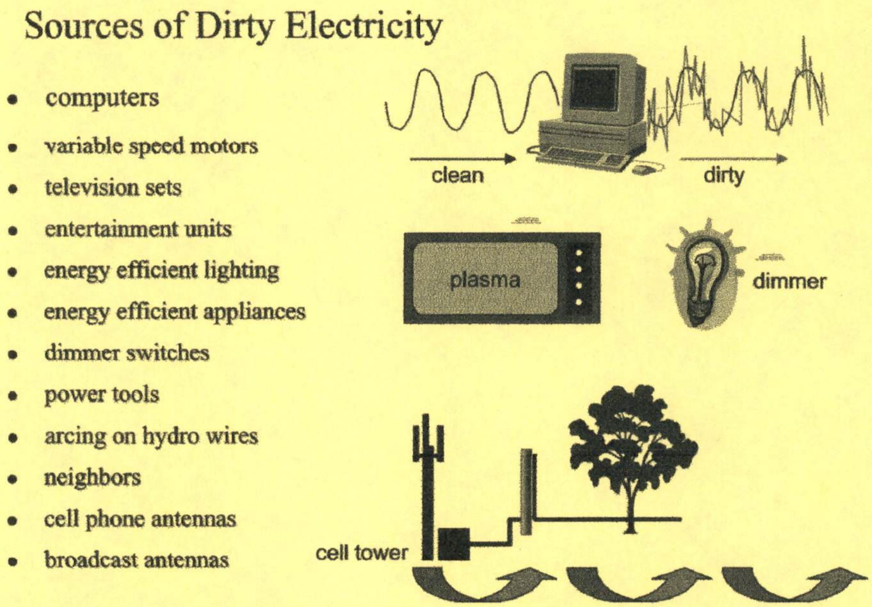

Figure 2. Sources of dirty electricity include electronic equipment and appliances, arcing on wires, and unfiltered cell phone and broadcast frequencies from nearby antennas.

well as arcing on electrical conductors caused by loose wires or contact with trees (Figure 2). Dirty electricity is thus produced within buildings but can also enter buildings from neighbors who share the same transformer. Mobile or broadcast antennas, if not properly filtered, can also contribute to high frequencies on electrical wires in nearby buildings.

The IEEE 519-1992 recommends installing filters to control harmonic distortions on power lines. With 5 kV and higher voltage distribution lines the IEEE identifies voltage notching, which produces both harmonic and nonharmonic frequencies in the radio frequency (RF) range and, as such, can introduce harmful effects associated with spurious RF. Industry uses large capacitors to protect sensitive equipment from power surges, especially in production line work, where malfunctions and down time are costly. Until now filters have not been available for in home use.

Professor Martin Graham from UC Berkeley and power quality expert, Dave Stetzer, President of Stetzer Electric in Wisconsin, have designed a filter that can be used inside buildings to clean the power that enters the building as well as the dirty electricity generated within the building. The Graham/Stetzer (GS) filter is a compact unit that plugs into an electrical outlet (Figure 3). It contains an electrical capacitor that shorts-out the high frequency transients on the circuit and is most effective when placed close to the appliance generating the dirty electricity. The GS filter has optimum filtering capacity between 4 and 100 kHz (Graham, 2000, 2002).

In Russia, the safety guidelines for electric and magnetic field exposure are frequency specific. For frequencies between 5 Hz and 2 kHz, the guideline is 25 V/m for electric fields and 0.25 μT (2.5 mG) for magnetic fields. For frequencies between 2 and 400 kHz, the guidelines are lower by a factor of 10. Since energy is proportional to frequency, the energy is 1,000 times higher at 60 kHz than it is at 60 Hz.

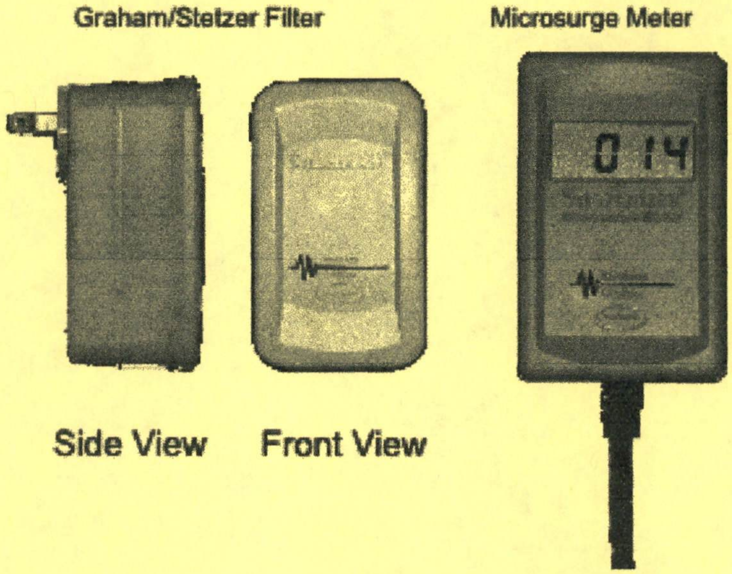

Figure 3. Equipment used to reduce and monitor dirty electricity inside buildings: the Graham/Stetzer filter and the microsurge meter.

The microsurge meter (Figure 3), also designed by Graham and Stetzer, measures the energy associated with dirty electricity in GS units with a range from 1 to 1999 and an accuracy of ±5% (Graham, 2003). The Health Department of the Republic of Kazakhstan (2003) has stated that any reading on the microsurge meter exceeding 50 is unacceptable and steps must be taken to lower such readings. Experience with this meter suggests that values below 30 GS units are undesirable and that extremely sensitive individuals may not see any benefits until the values are at or below 20 GS units. In some extremely dirty environments it is not possible to achieve such low values.

In the following, a number of case studies are presented.

Case Studies

GS filters have been placed in homes, offices, and schools. People report having better sleep, more energy, and less pain. They document cognitive improvements in memory and concentration. Symptoms of radio wave sickness or electrical hypersensitivity (Table 1) are often reduced or eliminated in the filtered environment.

GS filters placed in one Wisconsin school that had sick building syndrome, significantly improved power quality. Shortly after the filters were installed, the health and energy level of staff and students began to improve. According to the District Nurse, of the 37 students in the school who used inhalers on a daily basis, only 3 required inhalers and only for exercise-induced asthma after the filters were in place (Sbraggia, 2002).

GS filters were placed in a Toronto school and approximately 50% of the teachers documented improvements in energy, performance, mood, and/or health in a single blind study (Havas et al., 2004). Student behavior, especially at the elementary level, also improved. The symptoms that changed were ones we associate

Table 1
Symptoms of radio wave sickness first documented among radar workers during the Second World War resemble those now associated with electromagnetic hypersensitivity

Symptoms of radio wave sickness* (Firstenberg, 2001)
Neurological: Headaches, dizziness, nausea, difficulty concentrating, memory loss, irritability, depression, anxiety, insomnia, fatigue, weakness, tremors, muscle spasms, numbness, tingling, altered reflexes, muscle and joint paint, leg/foot pain, "flu-like" symptoms, fever. More severe reactions can include seizures, paralysis, psychosis, and stroke.
Cardiac: Palpitations, arrhythmias, pain or pressure in the chest, low or high blood pressure, slow or fast heart rate, shortness of breath.
Respiratory: Sinusitis, bronchitis, pneumonia, asthma.
Dermatological: Skin rash, itching, burning, facial flushing.
Ophthalmologic: Pain or burning in the eyes, pressure in/behind the eyes, deteriorating vision, floaters, cataracts.
Others: Digestive problems, abdominal pain, enlarged thyroid, testicular/ovarian pain, dryness of lips, tongue, mouth, eyes, great thirst, dehydration, nosebleeds, internal bleeding, altered sugar metabolism, immune abnormalities, redistribution of metals within the body, hair loss, pain in the teeth, deteriorating fillings, impaired sense of smell, ringing in the ears.

**Note:* These symptoms resemble symptoms associated with electrical hypersensitivity.

with attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD). This begs the question, "How much of the increase in ADD/ADHD among young people is due to electromagnetic pollution and poor electromagnetic hygiene?"

People with situational tinnitus (ringing in the ears that is present only in certain environments, often where RF is present) have documented improvements as well after the filters were installed in their home, as have those individuals who are otherwise healthy (Havas and Stetzer, 2004). Two diseases we seldom associate with electromagnetic hypersensitivity are diabetes and multiple sclerosis (MS). What follows are case studies that document the response to dirty electricity of diabetics and those with MS.

Diabetes

Two case studies are presented. (1) A 51-year old male with Type 2 diabetes who does not take medication and (2) an 80-year old female with Type 1 diabetes who takes insulin twice a day. A 51-year old male with Type 2 diabetes monitored dirty electricity in his environment and his blood sugar levels randomly throughout the day for approximately one month in 2003. The microsurge meter was not yet available to measure dirty electricity so he used a Protek 506 Digital Multimeter and measured the peak-to-peak voltage. His blood sugar levels were positively correlated with the amount of dirty electricity in his environment (Figure 4). One day he was

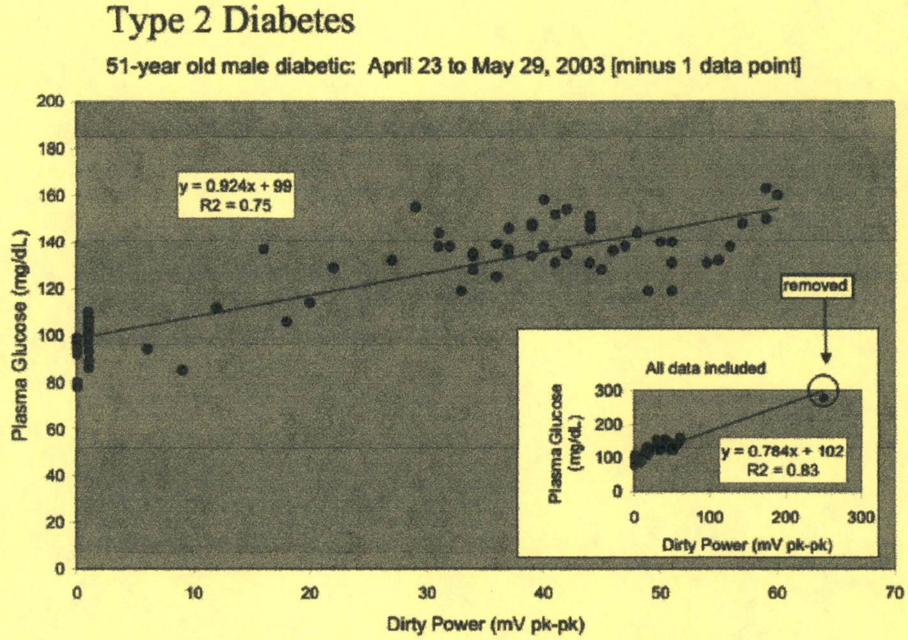

Figure 4. Fifty-one year old male with Type 2 diabetes. His plasma glucose levels correlate with the dirty electricity in his environment. Insert shows exposure on one day to a very high level of dirty electricity and this is reflected in elevated blood sugar.

exposed to very high levels of dirty electricity and this was reflected in exceptionally high levels of blood sugar. He noticed that his blood sugar levels remained low when he was in his truck away from power lines and antennas and when he was in a wilderness setting. In an electromagnetically dirty environment his blood sugar levels would increase within minutes.

An 80-year old female with Type 1 diabetes, who monitors her blood sugar twice daily—once in the morning upon awakening (fasting plasma glucose) and once in the evening before supper—had her home in Arizona filtered by an electrician. He was able to reduce the dirty electricity in her home from an average of 800 GS units to 13 GS units. As soon as the dirty electricity in her home was reduced, her blood sugar began to drop. Her average fasting plasma glucose levels without the filters was 171 mg/dL and this dropped to an average of 119 with the filters (Figure 5). During this period her insulin injections were reduced from a daily average of 36 units to 9 units.

Her evening plasma glucose did not change after the filters were installed in her home but they did change on days she spent away from home. Levels were particularly high after spending time in a casino. Casinos are likely to have high levels of dirty electricity but stress may also have contributed to higher levels of blood sugar (Hinkle and Wolf, 1950).

Multiple Sclerosis

One teacher in the Wisconsin school that was filtered had been diagnosed with multiple sclerosis (MS). She was extremely tired, had double vision, had cognitive

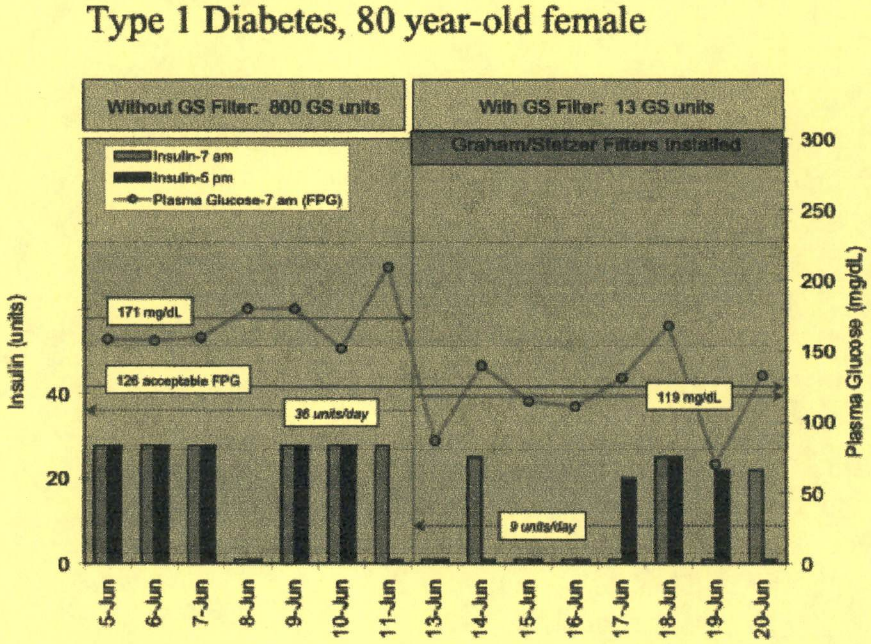

Figure 5. Eighty-year old female with Type 1 diabetes, who takes insulin twice daily. Fasting plasma glucose levels and insulin injections with and without Graham/Stetzer filters are shown.

difficulties and could not remember the names of the students in her 4th grade class. Her health would improve during the summer but her symptoms returned in September. She assumed her problems were mold-related but her symptoms did not improve after the mold was removed from the school. Once the school was filtered her symptoms disappeared. Similar stories prompted studies with people who had MS.

Havas began to work with people diagnosed with MS, who had difficulty walking and who used canes or walkers. The first person she worked with noticed improvements within 24 h. At that stage Havas assumed this was a powerful placebo effect but the subject's symptoms continued to improve weekly and regressed only during wet weather, which had always been a problem for this subject. Several other people with MS were able to walk unassisted after a few days to weeks with the GS filters and Havas began to videotape those who gave her permission to do so.

One of those individuals is a 27-year old male who had been diagnosed with primary progressive MS two years earlier. He walked with a cane or did "wall walking" at home (holding onto the wall or furniture for balance). He had tremors, was exceptionally tired, and was beginning to have difficulty swallowing. Three days after 16 GS filters were placed in his home his symptoms began to disappear. The dirty electricity in his home was reduced from 135–410 GS units to 32–38 GS units. He assumed his body was recovering spontaneously but he had been diagnosed with progressive MS and not relapsing/remitting MS, so spontaneous recovery was unlikely in his case.

A week after the filters were installed in his home he had enough energy to go shopping with his father. He did not take his cane because he had not needed it, but

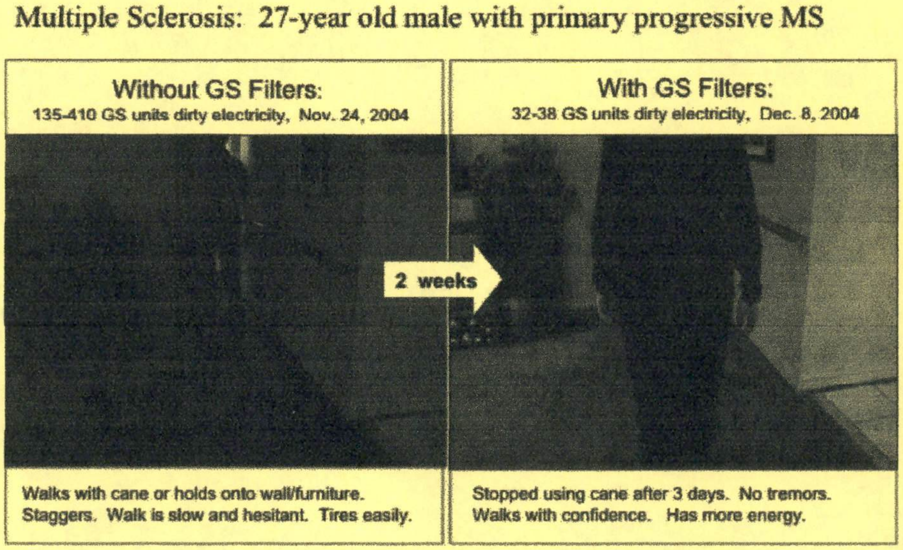

Figure 6. Video-clip of 27-year old male with primary progressive multiple sclerosis, diagnosed two years earlier. In the video on left (without Graham/Stetzer filters), he walks slowly and is hesitant. In the video on the right (two weeks after Graham/Stetzer filters were installed in his home), he walks with confidence and is well coordinated.

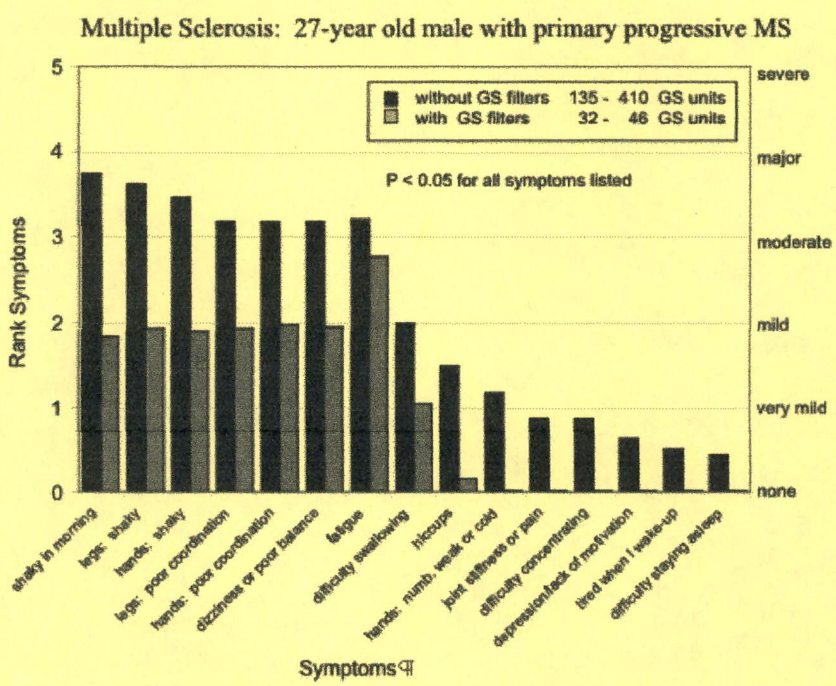

Figure 7. Symptoms of 27-year old male with primary progressive multiple sclerosis with and without Graham/Stetzer filters in his home.

after a couple of hours in the store his symptoms reappeared and he had difficulty walking to the car. His tremors began to subside three hours after arriving home. This experience has been repeated on several occasions and he now knows that if he goes into an environment with dirty electricity his MS symptoms reappear.

Figure 6 is taken from a video before the filters were installed in his home and two weeks later. Prior to the filters his walk was stilted and slow. He staggered and resembled the gait of someone who was intoxicated. Two weeks after the filters were installed his walk was normal with no signs of MS. During this period he began to put on weight, was sleeping better, and had fewer tremors and more energy (Figure 7).

Some other observations that are notable is that his mother had been suffering from hot flashes at night associated with menopause and these came to an end after the filters were installed and his father experienced several episodes of vertigo weekly and these became less frequent.

Conclusions

These case studies and anecdotal reports suggest that dirty electricity is biologically active. Once dirty electricity is reduced, people's health improves. For some it is reflected in more normal blood sugar levels, for others symptoms of MS are reduced, and for still others tinnitus disappears and behavior resembling ADD/ADHD improves. Since dirty electricity is becoming ubiquitous large fractions of the population are being exposed to this pollutant and some are being adversely affected.

Diabetes, multiple sclerosis, ADD/ADHD, asthma chronic fatigue, and fibromyalgia are all increasing in the population and the reasons for this increase are poorly understood. Dirty electricity may be one of the contributors to these illnesses.

According to Philips and Philips (2006) 3% of the population has electromagnetic hypersensitivity (EHS) and 35% have symptoms of EHS. If these percentages apply to diabetics then as many as 5–60 million diabetics worldwide may be responding to the poor power quality in their environment (Wild et al., 2004). Evidence from laboratory studies documents that insulin release and insulin-binding capacity to receptors cells is reduced by electromagnetic fields (Li et al., 2005; Sakurai et al., 2004). It is further known that stress increases blood sugar levels in diabetics and that exposure to electromagnetic energy induces stress proteins at various frequencies (Blank and Goodman, 2004; Hinkle and Wolf, 1950).

Dirty electricity can now be monitored with meters and reduced with filters, providing scientists with the tools needed for research. What is presented here is a handful of studies, many preliminary, with dramatic results. This area warrants further investigation to determine the mechanisms involved and the percentage of the population affected.

Conflict of Interest

Please note that the author has no vested interest, financial or otherwise, in the commercial devices discussed in this article.