Clinical Observations and Practice Guidelines for EHS

Riina Bray MD

This presentation focuses on clinical observations made over the last 15 years at the Environmental Health Clinic. In conjunction with the European practice guidelines for Electromagnetic Hypersensitivity (EHS) created by the European Academy of Environmental Medicine[1], we have attempted to manage these patients given the constraints created by our Canadian health care system. The Environmental Health Clinic at Women's College Hospital is an academic unit affiliated with the Faculty of Medicine, University of Toronto. Ideally, this clinic would run as a multidisciplinary clinic It is the only one of its kind in Ontario and one of three in in Canada. It was established in 1996 by the Ministry of Health and Long Term Care, and is a Provincial resource. Patients travel in from all parts of Ontario with environmentally-linked chronic complex conditions.

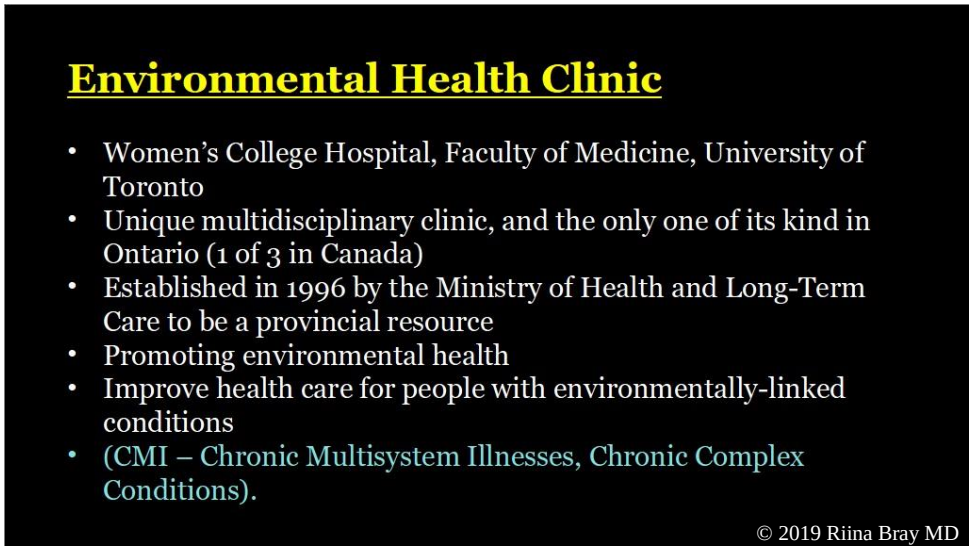


Figure 1

What is environmental health? It is the study of effects upon human beings of external physical, chemical and biological factors impacting on the general population. It is a public health-based discipline which is a determinant of health. It is a very important part of our public health domain.[2]

Over the past 15 years, we have had an increasing number of referrals of people who have electromagnetic hypersensitivity. It has presented as a huge burden of illness on the patient, for which our medical system and society are not prepared. Most patients come in self-diagnosed and finally realize that what is making them unwell can't be seen but is pervasive in their environment.

[1] EUROPAEM Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2015; 30(4):337-371.
[2] Electromagnetic hypersensitivity: fact or fiction? Genuis SJ. Lipp CT. Sci Total Environ. 2012; 414:103-12.

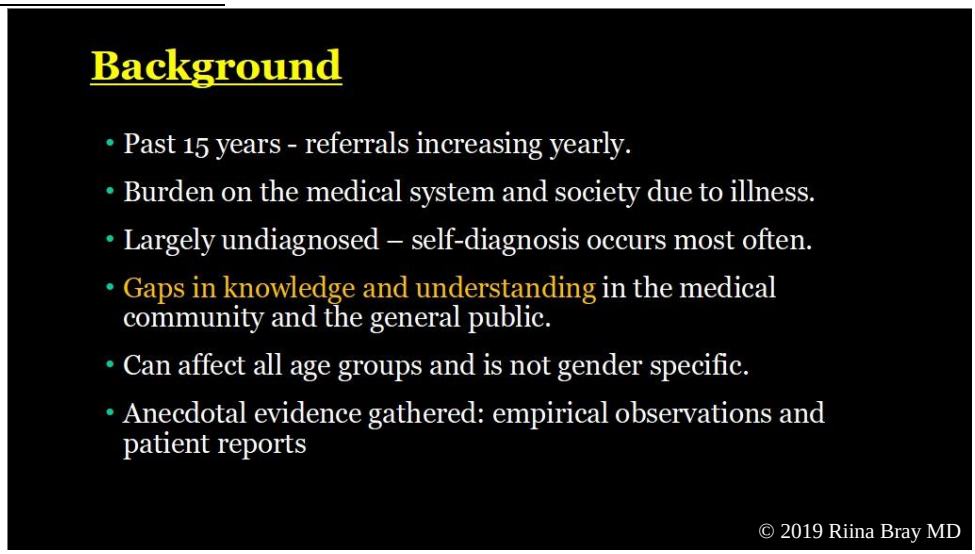


Figure 2

We have such a gap of knowledge in this subset and poor understanding of this problem. It can affect all age groups and genders. Over the years, we have been gathering anecdotal evidence, making empirical observations, documenting and counseling my peers.

The definition of electromagnetic hypersensitivity is an awareness and or adverse symptomatology in response to electromagnetic fields.[3][4] There are multiple variations of the same theme. The incidence of EHS has been rising exponentially over the years. EHS is a functional impairment. It is a spectrum disorder. In other words, there is a wide variety of degrees of impairment that one can exhibit.[5]

[3] Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): A systematic review of identifying criteria. Baliatsas C. Van Kamp I. Lebret E. et al. BMC Public Health. 2012; 12(1).

[4] Electrosensibility and electromagnetic hypersensitivity. Leitgeb N. Schrottner J. Bioelectromagnetics. 2003; 24(6):387-94.

[5] Reported functional impairments of electrohypersensitive Japanese: A questionnaire survey. Kato Y. Johansson O. Pathophysiology. 2012; 19(2):95-100.

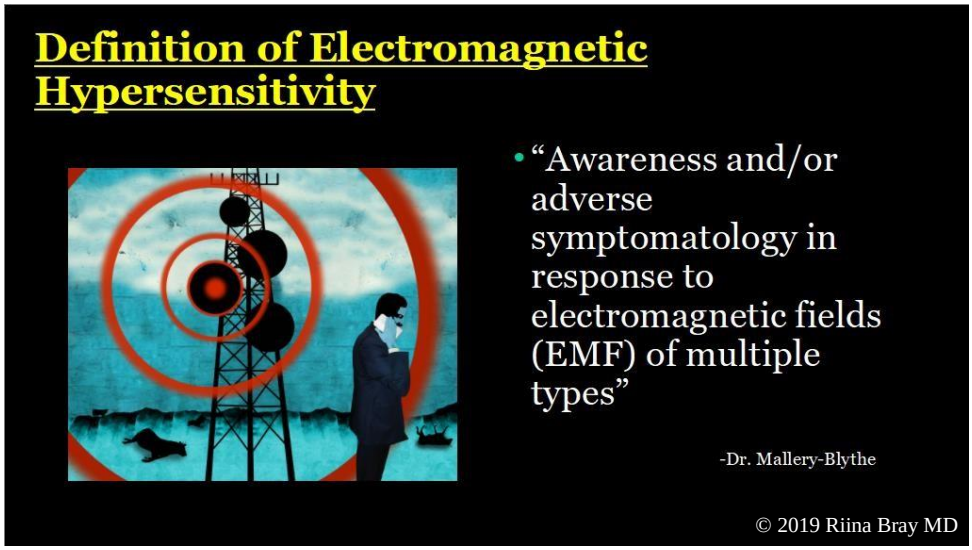


Figure 3

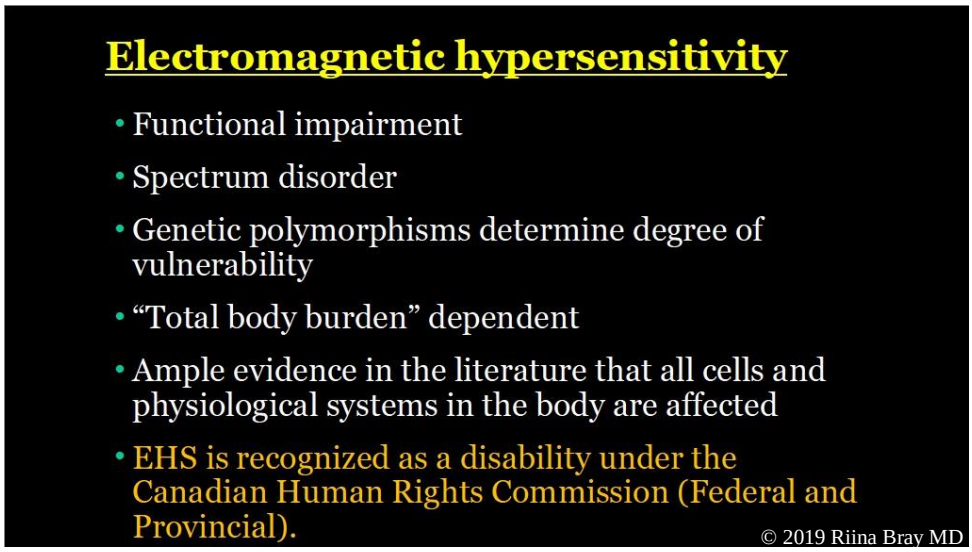


Figure 4

There are genetic polymorphisms that determine the degree of susceptibility and vulnerability that a patient may have rendering them at higher risk of becoming electromagnetically sensitive due to an increased total body burden.[6][7] Total toxic load, or total body burden, is related to a person's lifetime

[6] Wi-Fi is an important threat to human health. Martin PL. Environmental Research 2018; 164:405-16.

[7] Metabolic and Genetic Screening of Electromagnetic Hypersensitive Subjects as a Feasible Tool for Diagnostics and Intervention. De Luca C. Thai JCS. Raskovic D. Cesareo E. Caccamo D. Trukhanov A. Korkina L. Mediators of Inflammation. 2014. https://doi.org/10.1155/2014/924184. (2014)

exposures and stressors (their exposome from preconception until the present)[8] that renders their body a reservoir of inflammation, toxins/ toxicants and physiological malfunction.

There is ample evidence in the literature about the mechanisms of action surrounding EHS[9], which is a recognized disability under the Canadian Human Rights Commission, Federal and Provincial sectors.[10]

Patients are reacting to electric fields (measured in volts per meter), magnetic fields (measured in milligauss or nano Tesla), dirty electricity, radiofrequency radiation and/or ground currents. Everyone needs to get on board to try to understand basic physics, in order to make decisions regarding acceptable levels of exposure for themselves and their loved ones. The parameters of radiation exposure include its frequency, intensity, proximity and duration.[11]

I want to mention the gene-environment interactions we've been finding through genetic studies, and what is basically rendering these people more vulnerable. The findings overlap with Multiple Chemical Sensitivities and degree of oxidative stress and nutritional status also makes a difference on how this illness manifests.[12]

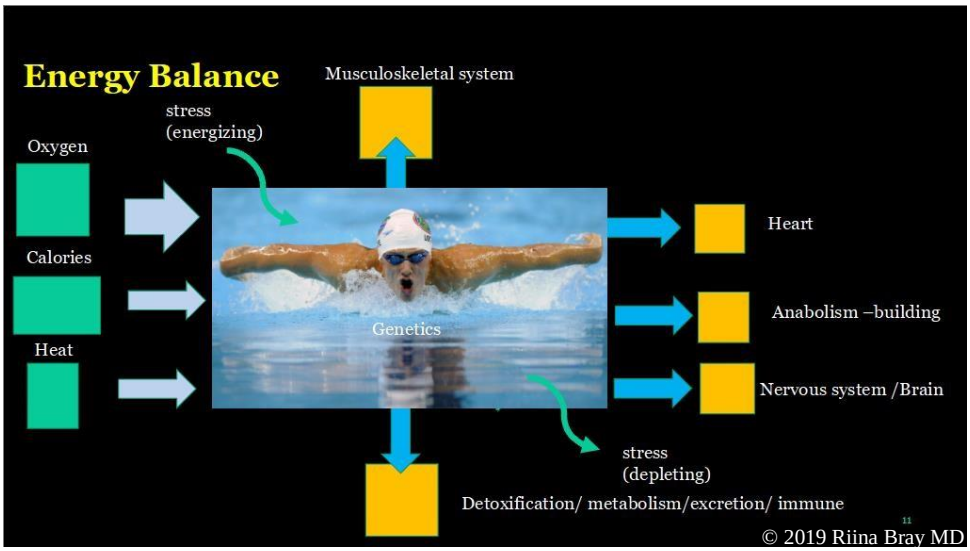


Figure 5

[8] What is new in the exposome? Vineis P. Robinson O. Chadeau-Hyam M. Dehghan A. Mudway I. Dagnino S. Environment International. 2020. 143.

[9] The Medical Perspective on Environmental Sensitivities. Sears ME. Canadian Human Rights Commission. 2007. https://www.chrc-ccdp.gc.ca/sites/default/files/envsensitivity_en.pdf

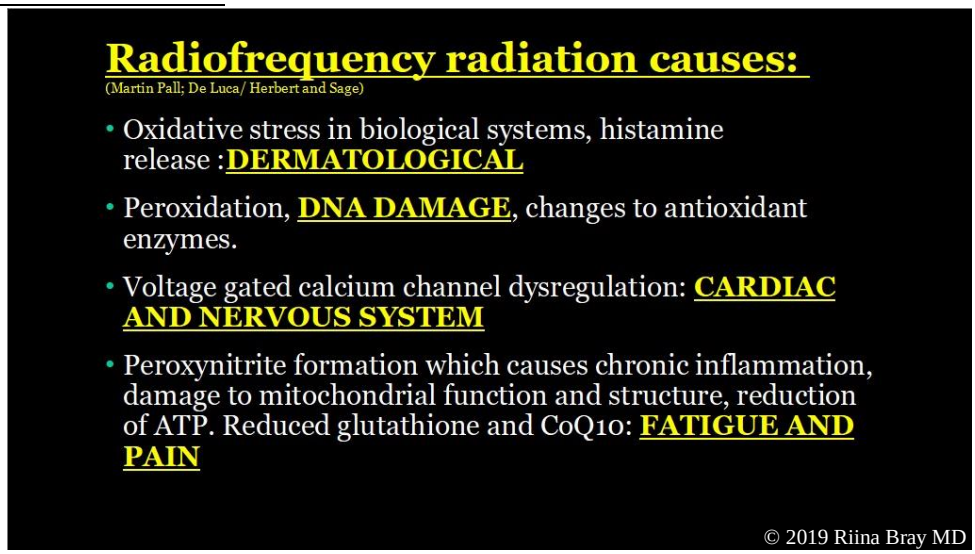
[10] Standing Committee on Health, Evidence. House of Commons Canada. Number 058, 2nd Session, 41st parliament. April 2015. http://www.ourcommons.ca/DocumentViewer/en/41-2/HESA/meeting-58/evidence

[11] Cognitive and physiological responses in humans exposed to a TETRA base station signal in relation to perceived electromagnetic hypersensitivity. Wallace D. Eltiti S. Ridgewell A. et al. Bioelectromagnetics. 2012; 33(1):23-39.

[12] Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. Belpomme D. Philippe I. Int. J. Mol. Sci. 2020; 21(6),1915

Allostatic load is "the wear and tear on the body" which accumulates as an individual is exposed to repeated or chronic stress, and is a term coined by McEwen and Stellar in 1993. It includes chemicals, but also emotional and psychological stress that can tip the balance and cause genuine somatic pathology.[13]

While we have biomarkers established to help us in our diagnosis of susceptibility to EHS, we are restricted because our laboratories do not have the capabilities. Sometimes we have to send samples to the United States for analysis. Under the influence of electromagnetic fields, cerebral blood flow is altered because of hypoperfusion leading to hypoxia scenario and inflammation. Symptoms and signs of the in the realm of dermatology, DNA damage, cardiac, nervous system, fatigue and pain. This is all explained in the literature in detail. The pathophysiology is very clear.[14]



[13] Stress and the Individual: Mechanisms Leading to Disease. McEwen BS. Bruce S. Stellar E. Archives of internal medicine 153.18 (1993): 2093-2101

[14] Microwave frequency electromagnetic fields (EMF's) produce widespread neuropsychiatric effects including depression. Pall. J Chem Neuroanatomy. 2015; 75

Figure 6

In her previous talk, Dr. Sears explained the adverse biological effects which are thermal or non-thermal. We are quite interested in the non-thermal effects. Under the non-thermal category, we see DNA damage, an immune system that gets suppressed, increased blood brain barrier, permeability, and thickening of blood viscosity with rouleaux formation. We also see dysregulation of the cardiovascular, neurological and endocrine system, cognitive problems, fatigue, tinnitus, headaches, ECG abnormalities, and disruption of sleep with alpha wave intrusions and reduced REM.[15]

The clinical findings are not specific. There is a multimorbid picture of various overlapping problems. When patients come to our clinic, we have to pull and tease apart all those various parameters and factors and this takes quite a bit of time.

Basic rules to help with diagnosis and management are established by taking an exposure history. If you are not familiar with an exposure history, you can download it off the website.[16] Obviously, we're ruling out other illnesses and diseases. Often, on physical examination there are usually neurological, dermatological and cardiac signs.

[15] EUROPAEM Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2015; 30(4):337-371.

[16] Identifying and managing adverse environmental health effects: 1. Taking an exposure history. Marshall, Lynn, et al. Cmaj 166.8 (2002): 1049-1055.

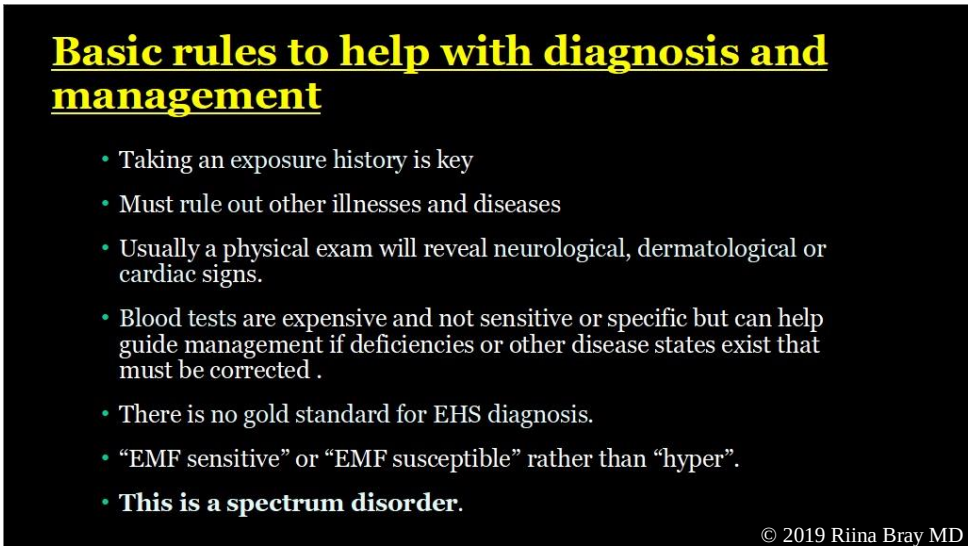


Figure 7

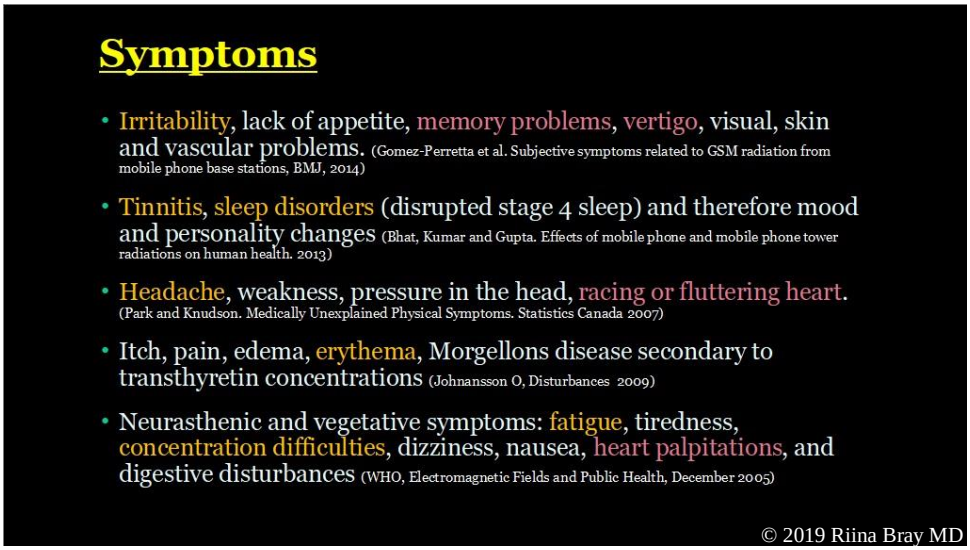


Figure 8

Really, there is no gold standard for the diagnosis of EHS; however, I think we are getting closer to qualitative measure including heart rate variability.[17]

The use of EMF "sensitive" or EMF "susceptible", rather than "hyper" are better descriptors. It is important to differentiate between those categories because when you label someone as hypersensitive, suddenly there is a stigmatization of their condition. I really appreciate household members giving me feedback about the condition of their loved ones who come in to see us, as they are witnesses of a

[17] Provocation study using heart rate variability shows microwave radiation from 2.4 GHz cordless phone affects autonomic nervous system. Havas, Magda, et al. Non-thermal effects and mechanisms of interaction between electromagnetic fields and living matter. Bologna (IT): Ramazzini institute (2010): 187-218.

phenomenon that is novel and perplexing. We also see serious family conflict, and child custody battles around wireless technology issues.

More often than not, spouses or children witness a double blinded experiment. They finally figure out that a loved one is not making up a story. They confirm my suspicions unequivocally. The nocebo effect, (opposite to placebo) is excluded. Patients also feel very anxious about this realization because they do not want to be perceived as having paranoia.

The magnetic field of the human is in the shape of a torus, depicting the energetic field around us. Our bodies electromagnetic fields generated by our nervous system interacts with the electromagnetic outside world and any disruption of this field can affect our nervous system.

Over the last 15 years, I have been able to categorize the patient morbidities/ vulnerabilities that I have seen. More research to confirm these findings would be invaluable.

Category I are those patients with a toxic metal body burden, most commonly mercury, but it can be nickel or lead. I have not seen enough patients with cadmium or arsenic toxicities to formulate a hypothesis. The high load of mercury is due to overconsumption of aquatic, contaminated food. Most fish is now contaminated with mercury. Methyl mercury builds up and causes neurotoxic effects, such as axonal demyelination. Zinc/ nickel/ mercury dental amalgams also release elemental mercury vapour which goes straight into the brain, and then is converted to methyl mercury, which is neurotoxic. Those people present with cardiac and neurological manifestation. Those with metallic hardware implants such Harrington rods, braces, wire meshes, pins and screws can potentially be affected. Those with excessive Gadolinium from multiple contrast studies are also at risk.

Category II are the group of people with infectious diseases such as Lyme disease, co-infections and other infections which affect the nervous system. We've talked about the way EMFs affect the nervous system through voltage-gated calcium channel disruption.

Category III are those with lesions of the brain, including tumours, demyelination, microangiopathic changes, diffuse ischemia, inflammation, neurodegenerative diseases (multiple sclerosis, ALS and the like).

This brings to mind an area that needs to be studied: the ageing population. With the ageing population comes the rise in prevalence of dementia and Alzheimer's disease. Through our increasing technology, could we actually be accelerating neurodegeneration? Long term care units have significant sources of wireless technology.

Category IV are the group of people with heart rhythm disturbances: either exacerbation of existing conditions or new onset caused by radio and microwaves. There are periods of poor blood circulation due to rouleaux formation and there is disturbance of heart conduction. Tachycardic spells, especially at night, can occur. People also experience premature ventricular contractions, premature atrial contractions, atrial flutter and fibrillation. Those with Wolff Parkinson white syndrome are especially at risk for sudden cardiac death.[18]

Category V includes students and teachers. Shelley Wright is going to be speaking more about this, but it is prudent to consider that university students, college students, and high school students are all being

[18] Reversed reciprocating paroxysmal tachycardia controlled by guanethidine in a case of Wolff-Parkinson-White syndrome. Harris WE. Semler HJ. Griswold HE. American heart journal 67.6 (1964): 812-816.

exposed to high levels of radiation. They might be working close to lamps with compact fluorescent lights. They get eyestrain, and sometimes develop rashes related to exposure of this radiation. They can feel quite unwell at times. You wonder about the epidemic of anxiety, depression, suicide at universities and colleges being fueled by the increased level of agitation and anxiety caused by radio and microwave radiation on mood.

For treatment strategies, I reference the European Academy for Environmental Medicine[19] Basically it suggests the following: reduce exposure. Home inspections are really important. Rob Stellar is going to be giving us a wonderful demonstration today. Everyone has to be treated individually.

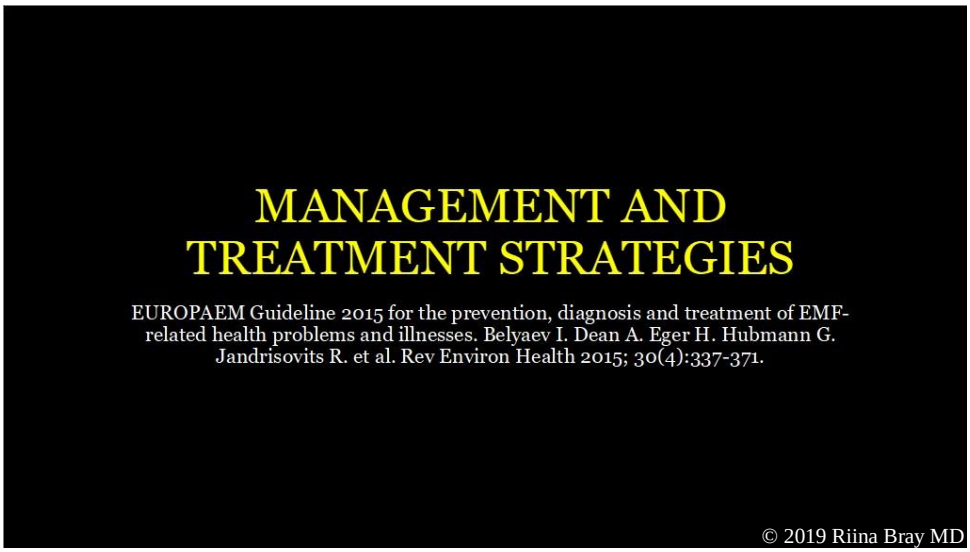


Figure 9

It is very important to reduce total load in these patients, to empty out the physiological barrel, as it were. All these stressors compound the effects of radiation on the body. We have to help patients detoxify by getting rid of stressors which can be emotional, psychological, genetically induced, environmental and anything else related to their exposome. Taking a proper exposure history allows us to determine what lifestyle changes a patient could make.[20][21]

[19] EUROPAEM Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2015; 30(4):337-371.

[20] Chemical Sensitivity, Vol 1. Rea, William J. Boca Raton. Lewis Publishers. 1992.

[21] Identifying and managing adverse environmental health effects: 1. Taking an exposure history. Marshall, Lynn, et al. Cmaj 166.8 (2002): 1049-1055.

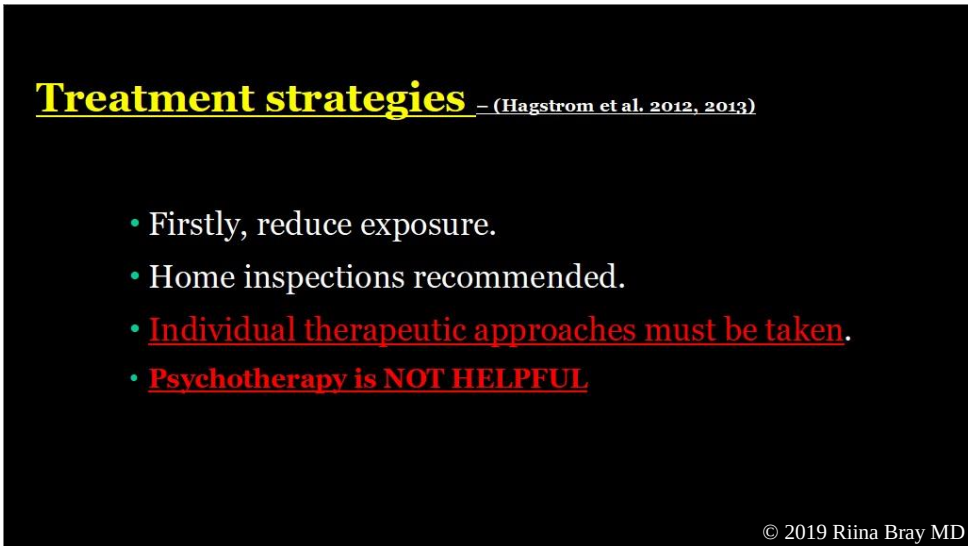


Figure 10

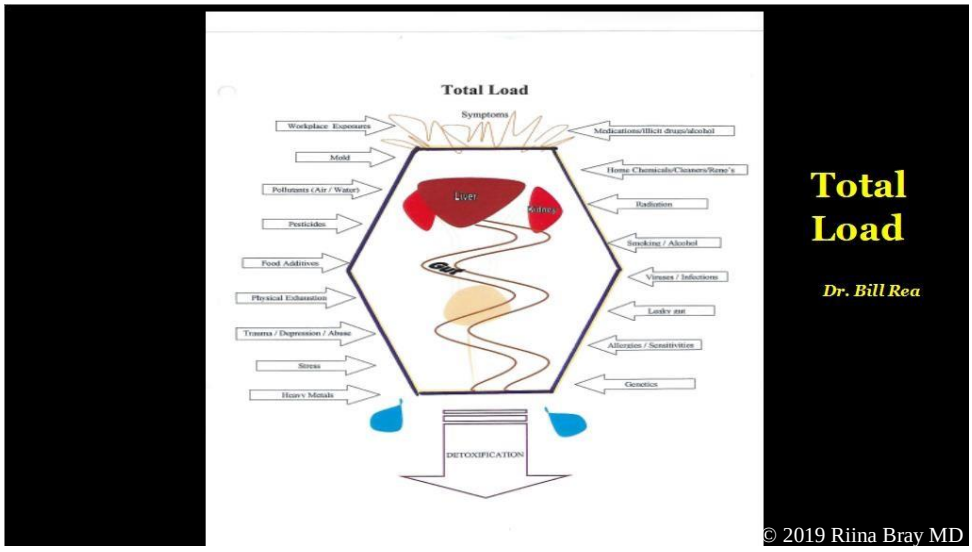


Figure 11

Markers of inflammation, histamine release, autoimmunity markers, including anti-O-myelin sheath antibodies. The products of nitric oxide production are still not able to be determined using our regular laboratory services. Melatonin variations would be useful in determining impacts on the brain as some studies have shown.[22] Impacts on bone marrow could be reflected in changes of serum protein

[22] Tordjman S, Chokron S, Delorme R, et al. Melatonin: Pharmacology, Functions and Therapeutic Benefits. *Curr Neuropharmacol*. 2017;15(3):434-443. doi:10.2174/1570159X14666161228122115

electrophoresis parameters. Hypoperfusion of the limbic system and thalamus can be determined using a weighted MRI.[23]

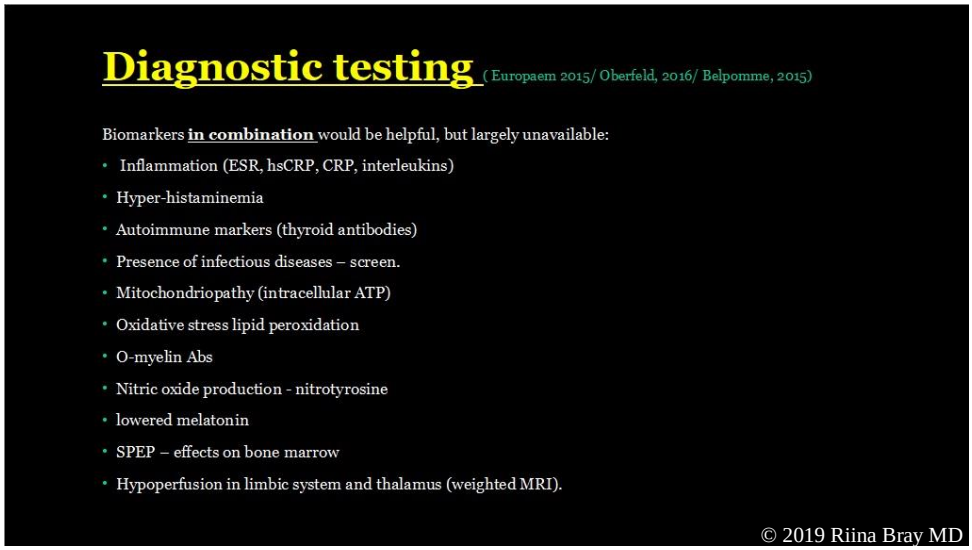


Figure 12

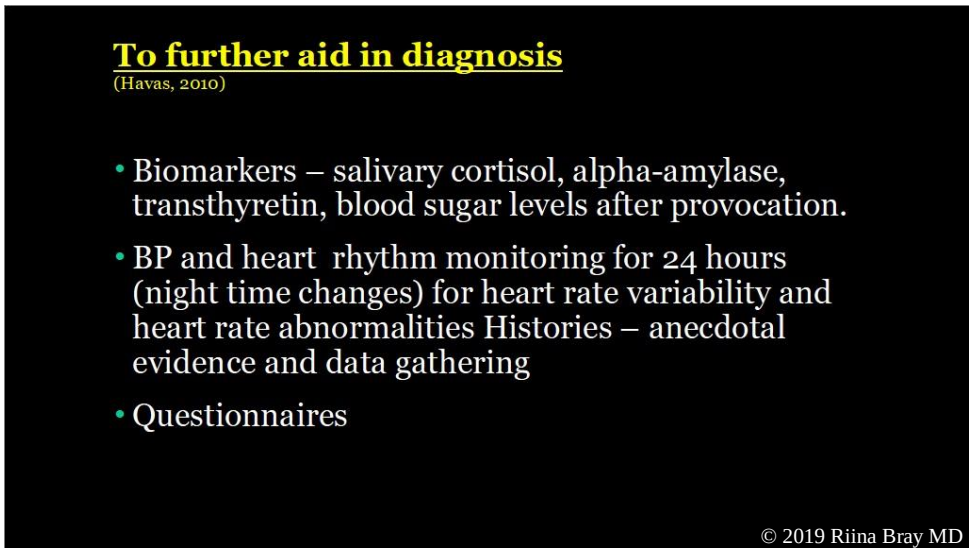


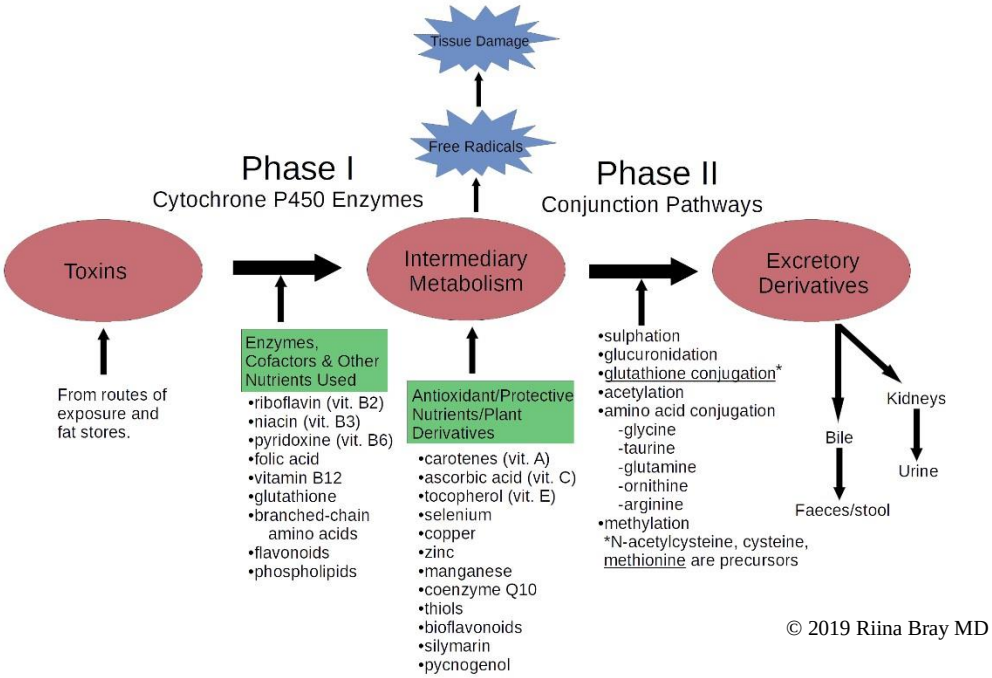
Figure 13

Questionnaires are also useful. Physiologic tests quantify heart rate variability, blood pressure changes, blood sugar fluctuations and heart rhythm changes over time, and in real-time monitoring.

[23] Microwave frequency electromagnetic fields (EMF's) produce widespread neuropsychiatric effects including depression. Pall. J Chem Neuroanatomy. 2015; 75

To detoxify, one basically must decrease toxicant input, and increased contaminant output. Other treatments include hydration, sauna therapy, enhanced antioxidant reserves through nutritional supplementation, and improved excretion through the bowel and renal function. One should be very well nourished in order to do the job. If you cannot get what you need, either due to genetic compromise, or just due to lack and imbalance of diet, then supplements are helpful. If you cannot afford supplements, then we have to rely on an excellent diet. The natural methods of detoxification, soluble and insoluble fibres, breathing, relaxation nutritional supplements, sweating, sauna and exercise, all help enhance the battle of elimination. I caution against fasting because it does not work for some people if they don't have adequate supplies of vitamins, minerals and other antioxidant substrates in their body.[24]

[24] Textbook of Functional Medicine. Institute for Functional Medicine. 2010.



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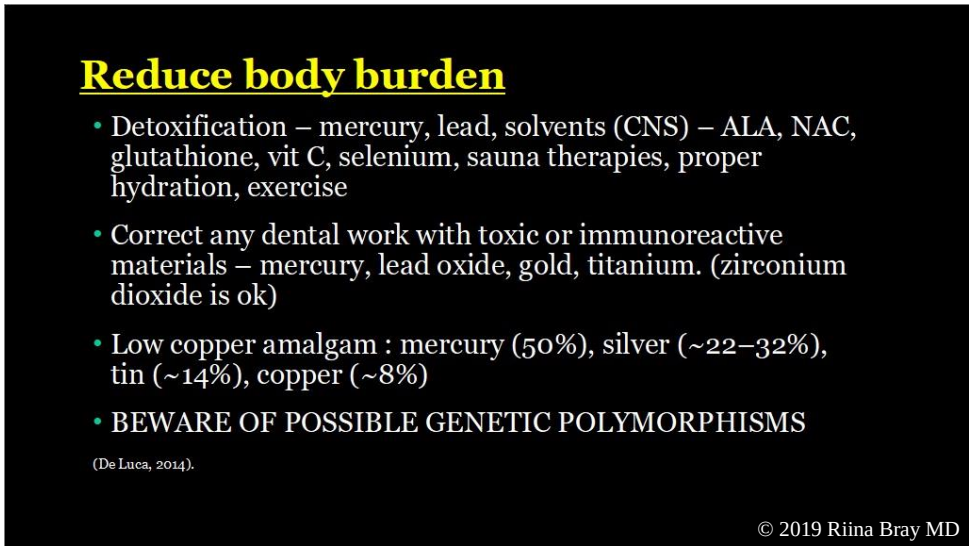

Figure 15

Finally, patients need a lot of psychosocial support in dealing with and removing stress triggers. Mindfulness Based Stress Reduction, and a little CBT can be useful to decrease sympathetic nervous system overdrive. For heart arrhythmias, beta-blockers are helpful. Grounding can be important to balance out the electrons by walking barefoot outside or swimming in a lake.
Basically, one is trying to replenish the electrons that have been depleted from the body. By grounding, you can get things back into better balance.

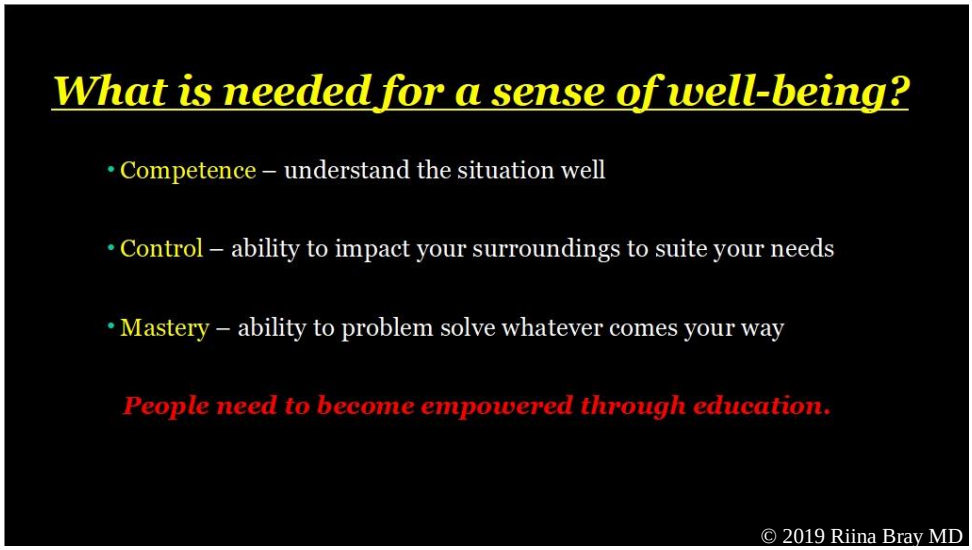
What is needed for a sense of well-being?
• Competence – understand the situation well
• Control – ability to impact your surroundings to suite your needs
• Mastery – ability to problem solve whatever comes your way
People need to become empowered through education.
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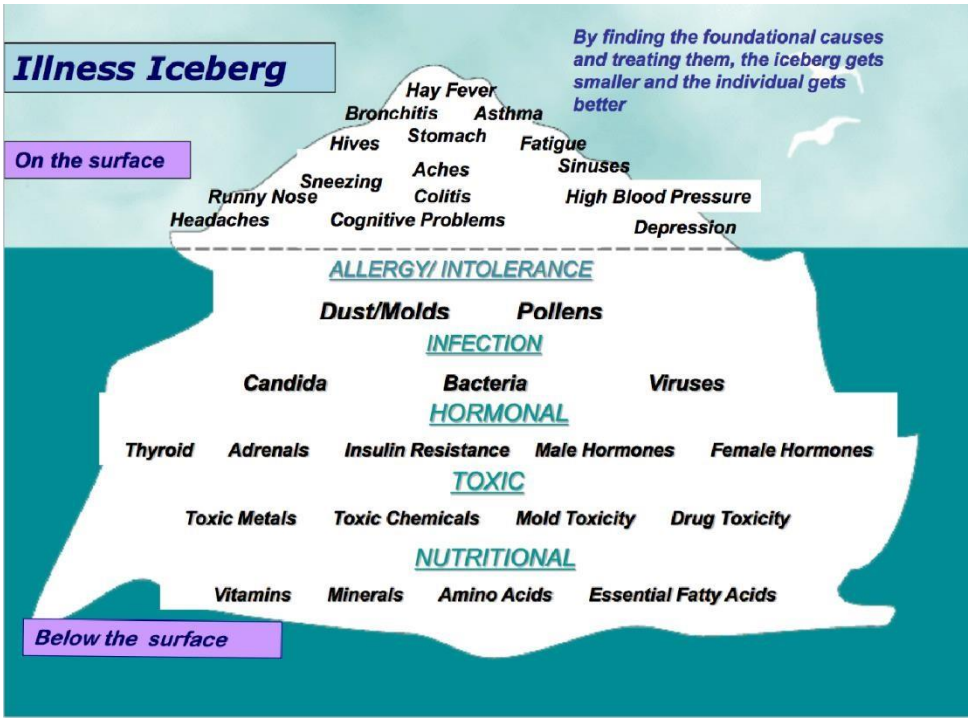
Figure 16

Impacts of Wireless technology on Health, EMR Canaries Clinical Experiences

Dr. Jennifer Armstrong BSc, MD, DIBEM Director, Ottawa Environmental Health Clinic

When I started in this field of environmental health, we didn't have such a thing as an “electromagnetic radiation public health issue”. Mostly, we looked at food allergies, chemical sensitivities, and toxicities. Electromagnetic pollution brings another aspect into our health and is a factor that impacts on our wellbeing. Traditional doctors and I were trained to look at symptoms of a patient and not necessarily think of how all these symptoms fit together. I always had questions like, “why does this patient get this kind of dermatitis? There were never any answers, so I quit asking questions after a while; yet, deep down, I continued to have questions about why people get different types of illnesses.



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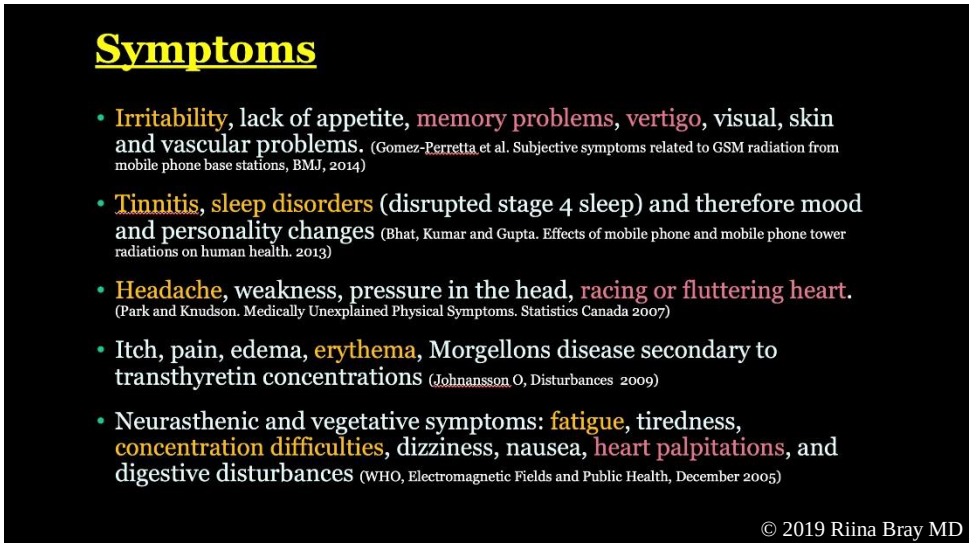


Figure 2

In Environmental Medicine we look at root causes. As in Figure 1, if you think of one's symptoms as the tip of an iceberg, you don't attack the symptoms initially—like giving nasal spray for rhinitis or giving an NSAID for headache—instead, one goes below the tip of the iceberg. You look at all the other variables, for example: what sorts of allergies does this person have that enhance their reactions to chemicals in foods? What sorts of infection does this person have—bacterial, viral, fungal? In the bacterial we are seeing more Lyme disease. A lot of hormonal issues are occurring—many of which are disrupted by environmental causes, such as chemicals, even in exceptionally low doses. We now know radiation can also disrupt hormones. We ask, what sort of toxins can this person be harboring, which they could have accumulated over several years? Then at the end, how is that person's nutritional status holding up? Without appropriate nutritional status, the person will not be able to detoxify.

Chemicals such as volatile organic compounds and persistent organic pollutants (POPs) can stay in our body for many years. Different industrial companies, such as Monsanto, have put out a lot over the years. Whatever the body takes in, we must either utilize—process it—or eventually, if we are not going to use it as a nutrient, excrete it. Yet it can also be absorbed and distributed to fat, liver, bone, nerves, brain, and in protein synthesis. There are different ways the body assimilates materials and different ways the body can excrete through biotransformation or detoxification. Pathways of removal include skin through heat and sweat (sauna therapy or exercise assist in this pathway), urine, excreting through our kidneys, liver/bile, breast milk, tears, rashes, and exhalation. We all have different genetic blueprints and we all have different ways we detoxify. Nutrient status is especially important, as is the duration and timing of exposure. Whether the exposures are additive or synergistic is also a cause for concern.
We are exposed to multiple entities. The total load principle looks at the additive effect of chemical and physical exposures and stressors. Electromagnetic field exposure is now a significant player in our society.

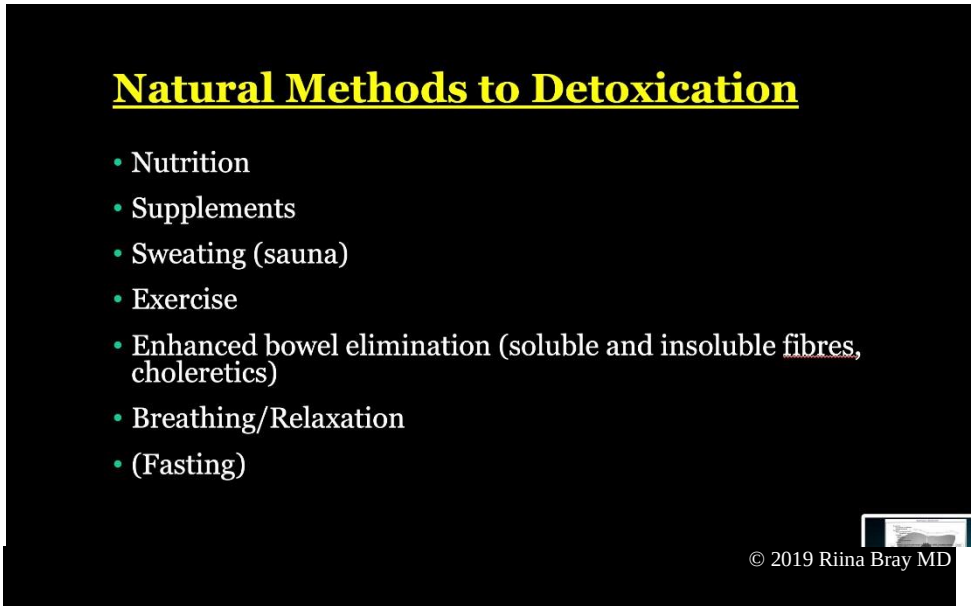
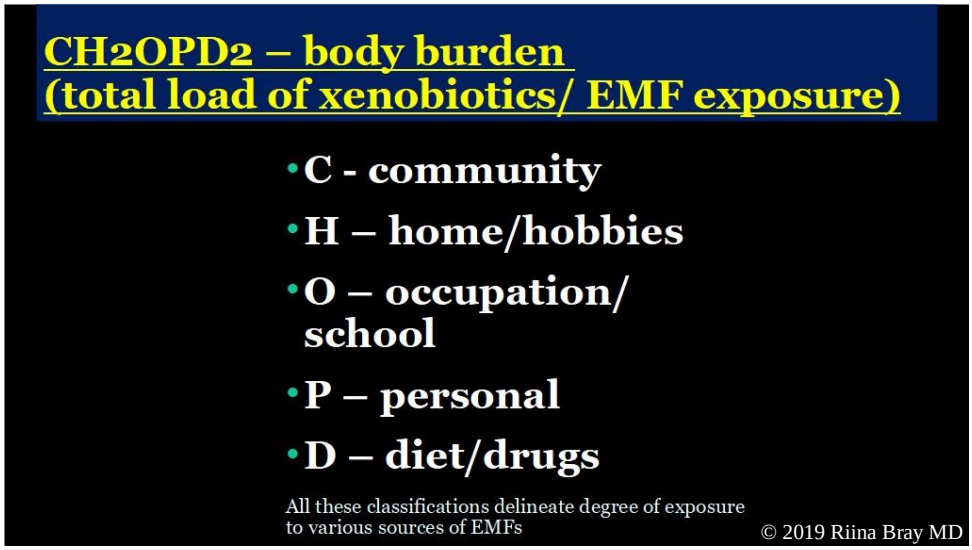


Figure 3

With free radical production in the body, the cell membrane starts having problems. Free radical production can cascade in a destructive fashion until you get the right nutrients on board. This is part of Dr. Martin Pall's work in that he talks about how nitric oxide gets out of control, and needs to be controlled so the patient can start recovering.[25] One of the mnemonics we use is, "weed seed and feed." How do we figure out what is going on? One of the things that we must do is take a good environmental history, using the CH2OPD2 mnemonic.



[25] Taking an exposure history. Marshall L, Weir E, Abelsohn A, Sanborn MD. Identifying and managing adverse environmental health effects: 1. Taking an exposure history. CMAJ. 2002;166(8):1049-1055.

Figure 4

First you look at “C”: what is going on in their Community? You want to find out if there are any cell phone towers nearby, for example. “H”: what kind of electronic devices they are using at Home; and if they are also having chemical exposures. Are they living in a brand-new home? Is there any off-gassing of

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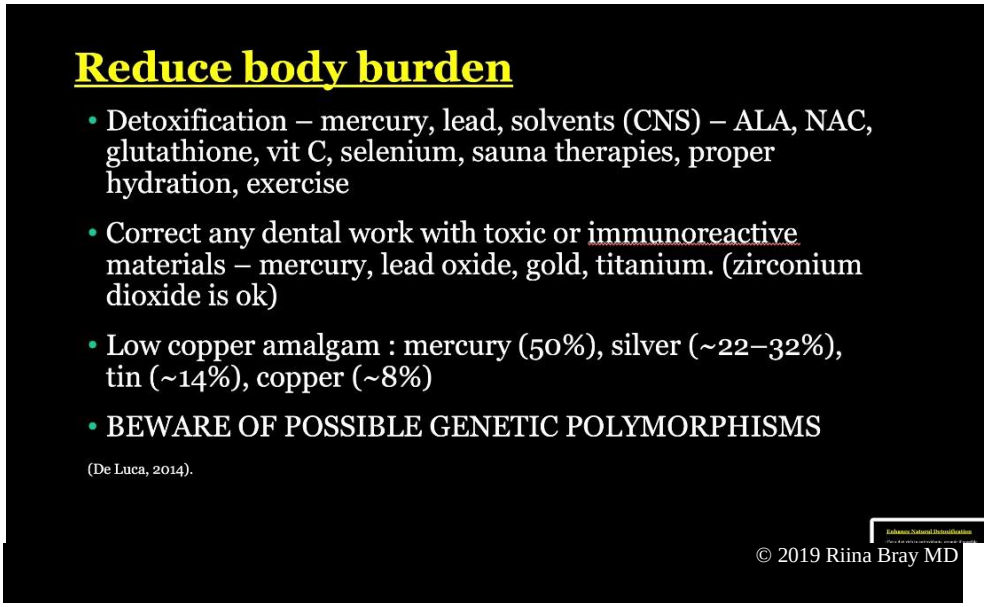
new materials? The other “H”: what sort of Hobbies do they have? Are they playing or using wireless devices for long periods of time? Are they being exposed to paints, solder, furniture strippers, for example? “O”: what is happening in their school or Occupation. Is it near cell phone towers? We do not have any laws yet in Canada that prevent cell phone towers from being near schools. “P”: for Personal life. You want to know their dental history and what they use daily. Do they have amalgam fillings, braces, bridges, or metal implants in their mouth? What kind of mattress are they sleeping on—does it have metal springs? Which cellular devices are they using? What is the SARS rating, how are they using their phone and are they turning off the Bluetooth, cellular data and Wi-Fi functions off appropriately? “D”: is Diet—too much sushi, canned tuna or just a pescatarian predilection can cause metal overload. Lastly “D”: also stands for Drugs that could be causing an increase in body burden.



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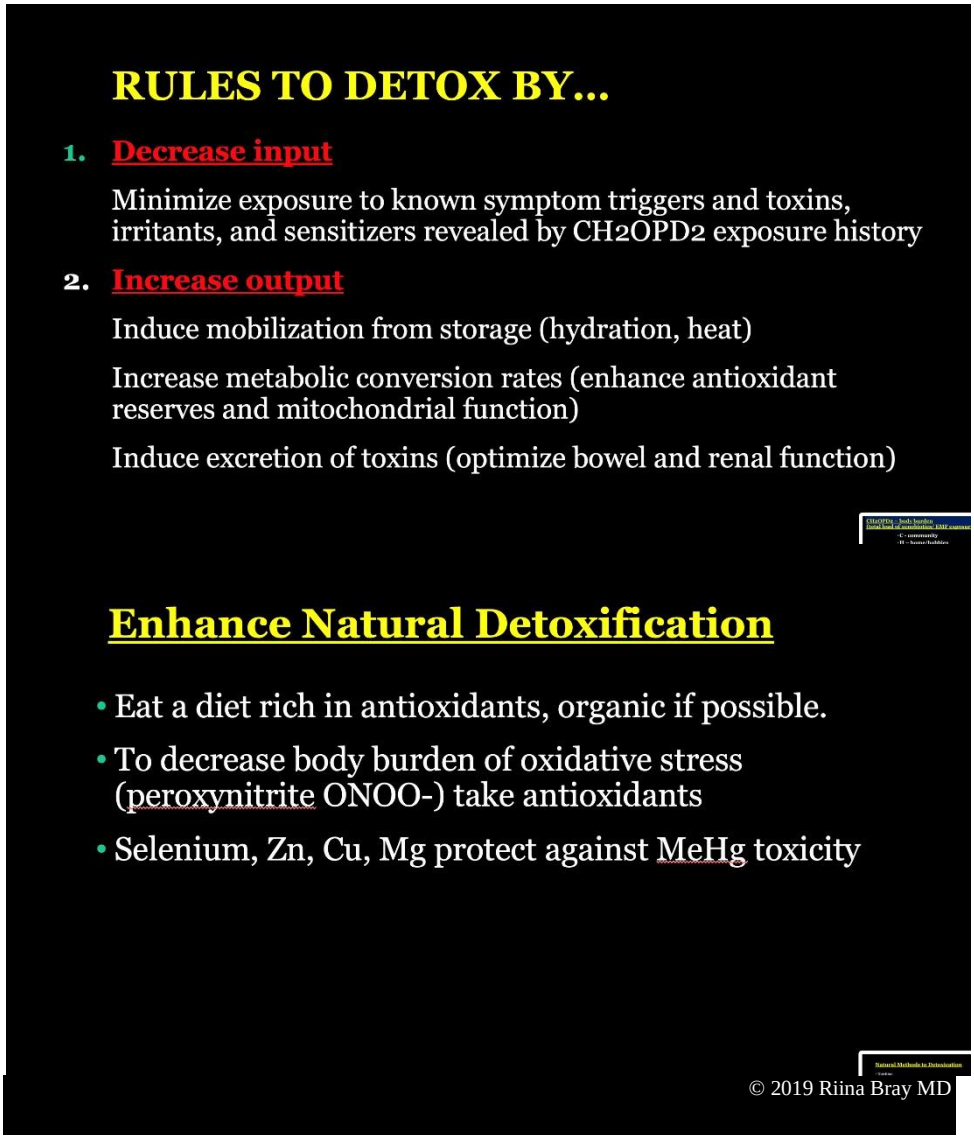

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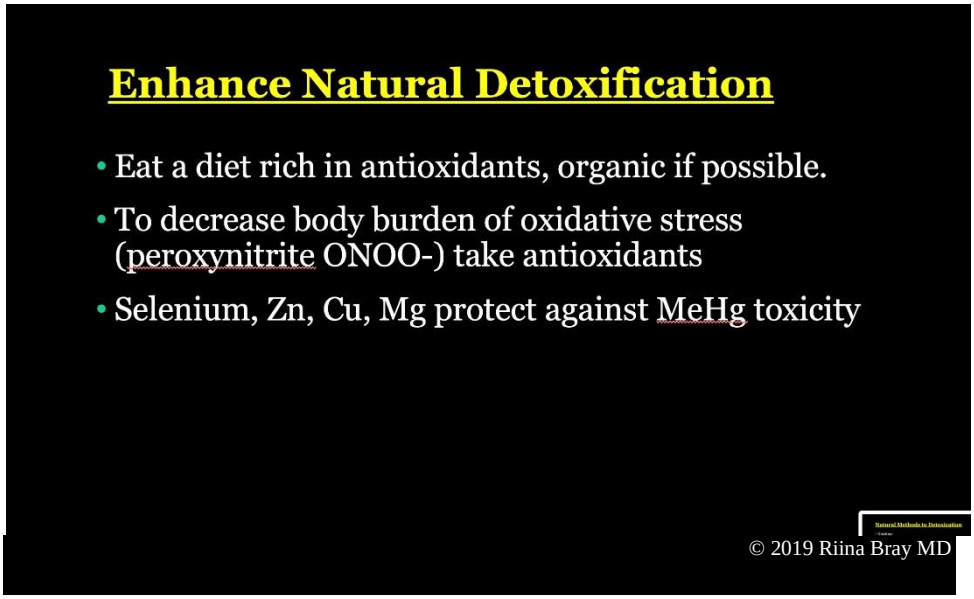

Figure 8

In my practice, electromagnetic issues began about 10 to15 years ago. As a physician I listen to and learn from my patients. The following are examples of cases that illustrate the types of impacts that the MW/RFR are having on my patients.

Case #1

77 year old female living in outskirts of Montreal, 2011with a sudden onset of illness in December. On December 19, 2011—for TSH, the normal range is 0.34 to 5.6—and her TSH dropped to 0.01. Her T3f looked normal. But her T4f went way up above normal. It seemed like she might have hyperthyroidism, or Graves disease. She did have a history of Graves. By January 10th, her TSH went up to 14.5, and her T3 dropped below the normal range of 3.5 to 5.9, to 3.0. Her T4f dropped below normal (8 to 18) to 3.09. Then on January 24th, her TSH dropped again to 0.08, her T3f went up to 5.4, and her T4f went way up to 27.11. It wasn't a cell tower, it wasn't her phone. She said, "Do you think it could have anything to do with the fact that my son bought me an iPad for Christmas?" She was using it already before Christmas in December. She stopped using the iPad, and immediately started feeling better. Her labs corrected to a normal range within a few weeks. There is a report in the literature of cellular technology affecting the thyroid.[26]

Case #2

A 29-year old female was offered a job in a Toronto Bay Street restaurant as a manager and started in that position but couldn't stay because they just kept putting in stronger Wi-Fi in the restaurant. She had temporally associated headaches, poor concentration, and fatigue. She began having issues with Wi-Fi in other parts of the city in certain venues. She now is finding that she now must live in more remote communities that don't have powerful MW/RFR.

[26] Alterations in TSH and Thyroid Hormones following Mobile Phone Use, Mortavazie S et al, Oman Medical Journal, vol 24, Issue 4, Oct 2009

Case #3

A 49-year old female living in a poured concrete house in a rural setting with a history of chemical sensitivities was following rules and eating hypoallergenic food and the air quality was good, but she started developing twitching in her legs and finding it difficult to settle down and sleep; she was generally feeling unwell. Cell phones did not work well in that house as signals coming in from towers were blocked by the concrete. The house was hardwired and had no Wi-Fi signals. The problem in this situation was a cordless phone that had a DECT base constantly emitting a signal. In this case, the radiation was being reflected back into the house. Removal of the phone helped alleviate the problem

Case #4

A school teacher at recess was wearing a walkie-talkie. She also had a emitting modem in her classroom near her desk. She found that she was unable to stay in her classroom for more than 30 minutes. She developed headaches and total inability to concentrate, both of which affected her for days afterwards. She had challenges communicating to me due to severe brain fog. She was not able to teach her class, so she asked for the modem to be moved. but was denied. She had to go on disability, and was never able to return to teaching. As physicians, there is not a lot of time left over to be advocates for patients—you can write letters, but it doesn't matter if employers such as the school board do not want to listen.

Case #5

A 5-year old boy was normal until 18 months old after immunizations. He was next seen by a doctor at age 2 1/2 years at which point he was hyperactive, did not recognize his parents, had no speech other than odd numbers and letters muttering to himself, but didn't really communicate with anybody. He was put on a gluten-free diet, along with soy-free, casein-free, and no sugar, as well as nutritional supplements, digestive enzymes, and probiotics. There were some minor improvements. By age 3, his condition was still active and severe, an

insignificant.