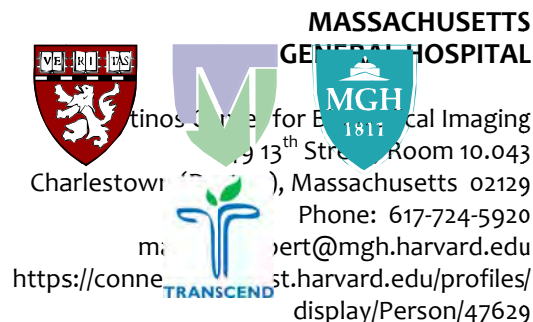


HARVARD MEDICAL SCHOOL

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To Whom It May Concern:

I am writing with regard to the situation of “G”, a 12 year-old Fay student who has been complaining of chronic frequent headaches, essentially daily during school but almost entirely absent over the summer vacation. Concern has arisen that his symptoms may be associated with the Wi-Fi exposure at school over a prolonged period..

I am a pediatric neurologist and neuroscientist at the Massachusetts General Hospital, and a faculty member in the Department of Neurology of Harvard Medical School. I also have a private medical practice where I evaluated G, and I have reviewed his other assessments. I performed a neurological examination which was essentially except for a few mild soft signs (slow finger-tapping and upper extremity overflow with stress gait), not out of the range of normal for a boy his age evaluated mid-afternoon when he was tired after a four hour evaluation at another site with no opportunity for lunch.

I have also reviewed the documentation of the dosimetry measurements of G’s daily exposure. [A copy is attached] This is a remarkable document in its careful explanation and quantification of G’s specific exposures. These exposures are significant and accumulate during the course of the day and over time. The physiological depletion most likely associated with these exposures will also be cumulative, and increase G’s risk for further symptoms and health problems.

Based on the evidence both in the literature and in the documentation of Gs exposures and symptom patterns, I think it is entirely reasonable to diagnose G with Electromagnetic Hypersensitivity Syndrome, and to use the diagnostic code Idiopathic Environmental Intolerance, ICD10-T78.8 in lieu of a specific code for EHS.

The accommodations being requested, of using Ethernet ports for cable access to the internet rather than W-Fi, are reasonable if they are present in or can be inserted into the classrooms.

I set forth below my involvement with this emerging medical issue and how it has informed my conclusion about “G”

I became interested in the health and brain effects of electromagnetic frequency (EMF) and radiofrequency radiation (RFR) exposures in relation to my brain research because I was interested in how such exposures might alter brain function. In order to familiarize myself in more detail existing literature on the pathophysiological impacts of EMF/RFR, I coauthored a 40,000 word chapter in the 2012 update of the Bioinitiative, ¹ and published an updated 30,000 word version of that paper (“Autism and EMF? Plausibility of a Pathophysiological Link”) in 2013 in two parts in the peer reviewed journal *Pathophysiology*. ^{2,3} My intention was to assess the plausibility of an association between

increasing incidence of autism spectrum disorder and increasing EMF/RFR exposures. Rather than directly address the epidemiological issues, I looked at the parallels between the pathophysiological features documented in autism and the pathophysiological impacts of EMF/RFR documented in the peer-reviewed published scientific literature.

I will include here a brief summary of the paper (prepared for a lay audience) of the features of EMF/RFR that I reviewed (with citations at the end of this letter):

- EMF/RFR stresses cells. It lead to cellular stress, such as production of heat shock proteins, even when The EMF/RFR isn't intense enough to cause measurable heat increase. ⁴⁻⁶
- EMF/RFR damages cell membranes, and make them leaky, which makes it hard for them to maintain important chemical and electrical differences between what is inside and outside the membrane. This degrades metabolism in many ways – makes it inefficient. ⁷⁻¹⁵
- EMF/RFR damages mitochondria. Mitochondria are the energy factories of our cells. Mitochondria conduct their chemical reactions on their membranes. When those membranes get damaged, the mitochondria struggle to do their work and don't do it so well. Mitochondria can also be damaged through direct hits to steps in their chemical assembly line. When mitochondria get inefficient, so do we. This can hit our brains especially hard, since electrical communication and synapses in the brain demands huge amounts of energy.
- EMF/RFR creates “oxidative stress.” Oxidative stress is something that occurs when the system can't keep up with the stress caused by utilizing oxygen, because the price we pay for using oxygen is that it generates free radicals. These are generated in the normal course of events, and they are “quenched” by antioxidants like we get in fresh fruits and vegetables; but when the antioxidants can't keep up or the damage is too great, the free radicals start damaging things.
- EMF/RFR is genotoxic and damages proteins, with a major mechanism being EMF/RFR-created free radicals which damage cell membranes, DNA, proteins, anything they touch. When free radicals damage DNA they can cause mutations. This is one of the main ways that EMF/RFR is genotoxic – toxic to the genes. When they damage proteins they can cause them to fold up in peculiar ways. We are learning that diseases like Alzheimer's are related to the accumulation of misfolded proteins, and the failure of the brain to clear out this biological trash from its tissues and fluids.
- EMF/RFR depletes glutathione, which is the body's premier antioxidant and detoxification substance. So on the one hand EMF/RFR creates damage that increases the need for antioxidants, and on the other hand they deplete those very antioxidants. ^{1, 16}
- EMF/RFR damages vital barriers in the body, particularly the blood-brain barrier, which protects the brain from things in the blood that might hurt the brain. When the blood-brain barrier gets leaky, cells inside the brain suffer, be damaged, and get killed. ^{1, 16, 17}
- EMF/RFR can alter the function of calcium channels, which are openings in the cell membranes that play a huge number of vital roles in brain and body. ¹⁸⁻²⁷
- EMF/RFR degrades the rich, complex integration of brainwaves, and increase the “entropy” or disorganization of signals in the brain – this means that they can become less synchronized or coordinated; such reduced brain coordination has been measured in autism. ²⁸⁻⁴⁰

- EMF/RFR can interfere with sleep and the brain's production of melatonin. ⁴¹⁻⁴³
- EMF/RFR can contribute to immune problems. ⁴⁴⁻⁵⁰
- EMF/RFR contribute to increasing stress at the chemical, immune and electrical levels, which we experience psychologically. ^{51-57 17, 58-62 63-68}

Please note that:

1. There are a lot of other things that can create similar damaging effects, such as thousands of "xenobiotic" substances that we call toxicants. Significantly, toxic chemicals (including those that contain naturally occurring toxic elements such as lead and mercury) cause damage through many of the same mechanisms outlined above.
2. In many of the experimental studies with EMF/RFR, damage could be diminished by improving nutrient status, particularly by adding antioxidants and melatonin. ⁶⁹⁻⁷²

I understand that the concept of electromagnetic hypersensitivity is not always well understood in the medical and scientific communities. Indeed, the inter-individual variability is perplexing to those who would expect a more consistent set of features.

But given the range of challenges I have listed that EMF/RFR poses to core processes in biological systems, and given the inter-individually variable vulnerability across these symptoms, it is really not surprising that there would be subgroups with different combinations of symptom clusters.

It also appears to be the case that the onset and duration of symptoms or even brain response to EMR/RFR can be variable. This again is to be expected given the mediation of these symptoms through a variety of the above-listed pathophysiological processes, many of which differ in scale (ranging from molecular to cellular to tissue and organ) and time course of impact. The different parts of the body also absorb this energy differently, both because of their biophysical properties and as a function of their state of health or compromise thereof.

Here is a list of subgroups of symptom clusters identified by a group of German physicians, that exemplifies these variability issues:

- | | |
|----------------|---|
| Group 1 | no symptoms |
| Group 2 | sleep disturbance, tiredness, depressive mood |
| Group 3 | headaches, restlessness, dazed state, irritability, disturbance of concentration, forgetfulness, learning difficulties, difficulty finding words |
| Group 4 | frequent infections, sinusitis, lymph node swellings, joint and limb pains, nerve and soft tissue pains, numbness or tingling, allergies |
| Group 5 | tinnitus, hearing loss, sudden hearing loss, giddiness, impaired balance, visual disturbances, eye inflammation, dry eyes |
| Group 6 | tachycardia, episodic hypertension, collapse |
| Group 7 | other symptoms: hormonal disturbances, thyroid disease, night sweats, frequent urge to urinate, weight increase, nausea, loss of appetite, nose bleeds, skin complaints, tumors, diabetes |

In the above set of symptoms we find virtually all of G's symptoms, and then more that he hopefully will not develop in the future from further avoidable deterioration. Further deterioration can occur with continued exposure to radiofrequency radiation.

Sincerely yours,



Martha Herbert PhD, MD

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