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GRASSROOTS ENVIRONMENTAL EDUCATION  
*Fostering positive and lasting change in environmental health through science and advocacy*

Current Issues: Wireless Radiation Exposure

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## Doctors Present Evidence of Wireless Radiation Impacts on Children

Press Conference Wireless   USTREAM

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[Live streaming video by Ustream](#)

You can find all of the PAS handouts from our speakers at the following location:  
[ehtrust.org](http://ehtrust.org)

### Fast Facts

- All wireless devices emit radiation, including cell phones, tablets, DECT phones, baby monitors, laptop computers and "smart" utility meters
- Low level exposures to wireless radiation are now recognized as being capable of damaging DNA
- Studies show exposure in utero can result in behavioral problems in offspring

### Resources

We have many resources on this topic.

For a list of scientific studies regarding the biological impacts of wireless radiation please [click here](#).

Women who are pregnant or know someone who is pregnant may want to visit the [Babysafe Project](#).

[Devra Davis]

Good morning. It's a distinct honor to talk with you today, with folks online from Australia, to Israel, to India, and throughout the United States and Canada. You will hear today from some acclaimed experts on children's environmental and psychological health that cell phone radiation can and does produce damage to human cells—by changing their shape and changing how they function. And this cell damage in turn translates to a real impact on children's wellbeing as well as their physical health over the long term—not just immediately but over the long term. Today we have a very distinguished panel that will talk with you.

Professor Hugh Taylor is the Chief of Obstetrics and Gynaecology at Yale University Medical Center, a distinguished clinician and scientist. He has authored more than 400 scientific

publications and will talk with you today about just one of these, on prenatal impact of cell phone radiation on adult animals.

Martha Herbert is a pediatric neurologist, clinician, and a scientist who has established a renowned clinic at Massachusetts General Hospital and is working at Harvard University, where she has leading efforts to come up with analyses of the total load impact on children's health from both chemicals and electromagnetic fields and radiation.

Catherine Steiner-Adair is affiliated, also, with Harvard Medical School. And she is a clinical psychologist who will share with you her observations from studies of more than 1,000 children and their parents and the way that wireless radiation is changing parenting and childhood today around the world.

Now, I talk to you today as a scientist and as a grandmother of five terrific children. Now, as a scientist, I can tell you we have a lot of uncertainty—there's no question about it. But we have enough knowledge that, as a grandmother, I can tell you that we cannot continue to experiment on our children without any controls.

And the message that you'll hear from Professor Taylor at Yale, as well as from Dr. Herbert at Harvard and Dr. Steiner-Adair at Harvard, is that we can take some free and easy and simple precautions now to reduce exposures. And we should do that.

We were pleased recently to see that Consumer Reports advised in their magazine in November that no one should keep a phone in their pocket. And that's what Environmental Health Trust—the organization that I head—has been urging since its founding in 2007.

The reasons are simple: phones are two-way microwave radios that receive and send microwave radiation that has never been tested for its long-term safety.

We'll share here, briefly, the story of Tiffany Franz, who has stepped forward to talk about her struggles with breast cancer that she developed at the unusual age of 21, having no family history of the disease. She was not aware that today phones come with warnings that they're to be kept off the body. If those warnings had been available when she was a teenager, she would not have had her phone in her bra for more than 5 years, 12 hours a day.

That is why the American Academy of Pediatrics has called for standards to be revised for exposure to radiofrequency radiation, also known as microwave radiation—especially in light of such things as this, the iPotty. This is a real toy, so to speak, a real potty, with a screen that will protect the iPad from the damage of the baby's dribble and drool but, of course, it doesn't protect the child from the radiation; or this device, which I will show you in a moment, the virtual reality, which puts a two-way microwave radio directly in front of the brain of children as young as 6 or 7 and is being marketed now around the world, with more than 1.5 million examples of this device handed out by The New York Times to all of its readers in a partnership with Google, featuring virtual reality segments every day—again with no testing as to exposure, which I will be showing you we know that exposure of this device gets all the way through the head of a

child, according to our colleagues at Porto Allegro, Brazil who are world leaders in modeling exposure.

So where are we now? In fact, the City of Berkeley recently passed the Right To Know. And that law has been upheld by courts despite industry challenges. People have a right to know that within every cell phone there are warnings—in the operating system or in the online manuals—that say keep it off the body. If that law had existed then perhaps Tiffany Franz would not be struggling with more than 10 surgeries, starting with a double-mastectomy at age 21.

Her tumors occurred right under the antennas of her phones. Now, while that is anecdotal evidence, it's sufficiently powerful that her surgeon and her oncologist have published a report urging that pediatricians now have to advise their parents and their young patients not to keep phones directly on their body.

Schools around the world are taking steps to reduce wi-fi. The city of Haifa has recently removed wi-fi from the schools. France has policies to have no wi-fi in kindergardens and with young children. In Belgium, it is against the law to design or give a phone to a child age seven. And the Korean government has issued warnings about digital dementia, which they are diagnosing in increasing numbers of children.

The U.S. falls behind in these efforts. And what we have to see now is concerted information established and shared with people around the world, so that they will understand the risks of cell phone radiation—especially to the young developing brain and body—are real and they can be avoided. And that's what we're going to talk about today.

And now I'm pleased to introduce my colleague, Dr. Hugh Taylor, from Yale University Medical School.

Let me share with you this thought. If Flint, Michigan has taught us anything at all, it is that the failure to prevent exposure has resulted in tremendous human costs and extraordinary financial costs to clean up afterwards. We cannot afford to treat our children like they're in an experiment without controls.

Professor Taylor?

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[Hugh Taylor]

Well thank you, Devra. So I'm an obstetrician-gynaecologist and very interested in fetal development. A lot of the roots of many problems we have in society today are with the fetus and exposures during pregnancy. We're particularly interested in the role of cell phone radiation exposure during pregnancy.

What prompted us to get initially interested in this was a large Danish study—over 20,000 women followed—that looked at cell phone exposure both prenatally and in the first few years of life, correlated that with behavioral problems in their children. The study asked women to go

back and rate, one, their amount of cell phone exposure during their pregnancy, the cell phone exposure of their children, and then behavioral problems in school-aged children. And they found a significant correlation, in particular with the prenatal exposure—i.e., exposure during pregnancy—and to a lesser degree with the postnatal exposure. Of course, you could always postulate that this is just an association, just a correlation, that it wasn't necessarily cause and effect—that women who spoke on the cell phone a lot perhaps were doing other things as well that might lead to behavioral problems in children. Perhaps they just spoke on their cell phone too much and ignored the children, and that caused the behavioral. Could it... was it really cause and effect?

To clarify that we did a study in mice, where we randomized the mice, during pregnancy, to be exposed to cell phone radiation. Nothing different at all about these mice. And the cell phones were muted, so that the mice wouldn't even know if the cell phone was turned on or not. So the mice were randomized during pregnancy to have the cell phone on top of their cage. And this was done throughout their pregnancy. And then we let them give birth, turned off the cell phone, and evaluated them with various behavioral tests as adult mice.

What we found is that there were significant differences in these mice. The mice were hyperactive. Their memory was decreased. And they had decreased anxiety. So they weren't paying attention to their surroundings, they were very active, hyperactive, and didn't seem to be bothered by this. They were bouncing off the walls with really not a care in the world.

What we think this looks most like is Attention Deficit Hyperactivity Disorder. Of course, I want to just stipulate that mice don't get ADHD. But behavioral problems in mice after prenatal exposure looks very much like the behavioral problems that were seen in the large Danish study.

When you have epidemiologic evidence in people—tight correlations—corresponding to clear cause-and-effect relationship in mice, I think we have some pretty powerful evidence that cell phone exposure during pregnancy may be harmful to the developing brain. Pregnancy is a very vulnerable, delicate time that when organs are developing they are more sensitive to some environmental insults.

And I recommend to my patients that they keep their cell phone away from their pregnant abdomen when they are going through their pregnancy, and beyond.

Thank you.

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[Devra Davis]

Dr. Martha Herbert has written a book for Harvard University Press outlining a number of these issues and is now developing state-of-the-art treatment and analyses of children who are affected with the Autistic Spectrum Disorders.

Dr. Herbert?

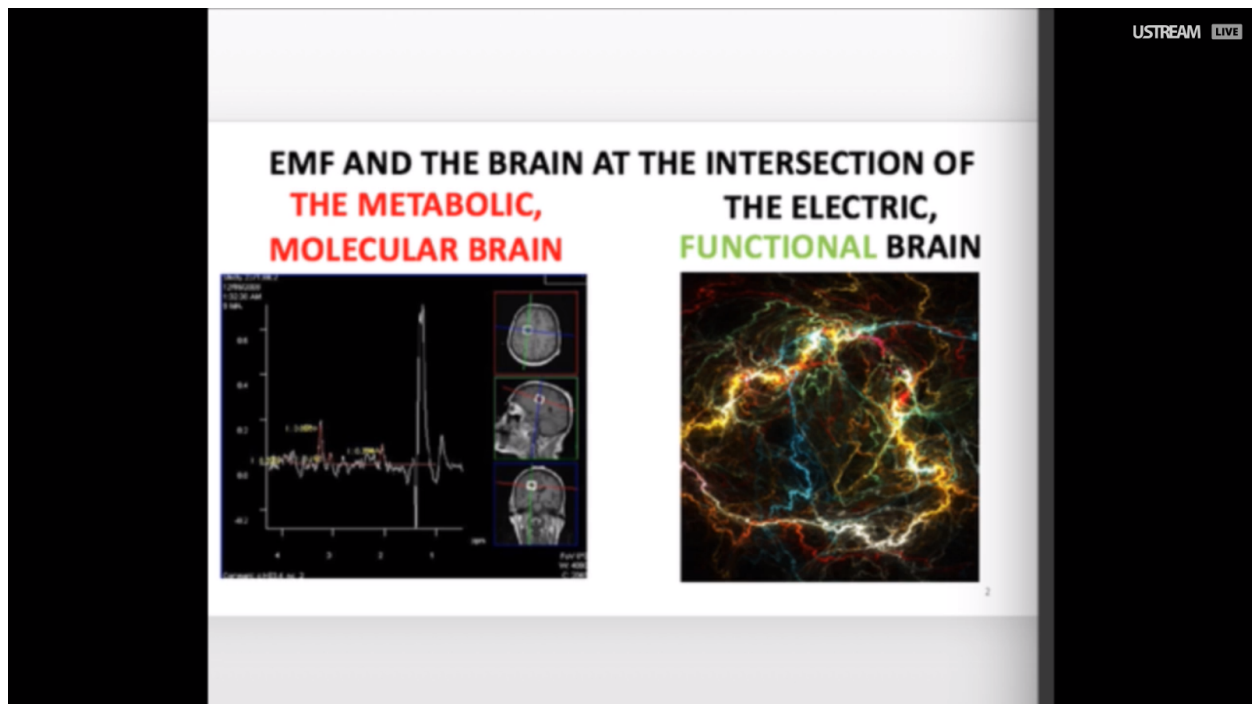
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[Martha Herbert]

So, I had gotten interested in the parallels between what we know about Autism in its systemic and brain biology, and what can be caused and what has been documented to be caused or contributed to by electromagnetic exposure by wi-fi and exposures related to that.

Autism has become a very common and expensive and difficult and challenging condition in childhood—highly heterogeneous all over the world. And during the same period of time that we've seen increase in reported rates, we have seen an enormous increase in the pervasiveness of electromagnetic exposures. I personally think of the contribution of electromagnetic exposures as really important, although, I always acknowledge that there are other contributors going on in parallel.

What are the parallels between Autism and electromagnetic fields? The first slide. The... where I think the parallels are most centrally important is in the relationship of the molecular and the metabolic brain and the electro-physiological electromagnetic brain. Because the chemical and molecular activity in the brain shapes very much how the brain will generate its brainwaves. And the brainwaves are the carriers of information and coordination of information.



Next slide. So, at the molecular and metabolic level, we've seen that wi-fi electromagnetic fields can damage DNA, can actually cause mutations in DNA. And in Autism we know that a certain subset of people with Autism have mutations that their parents didn't have. Once these mutations are passed on they can be carried on to subsequent generations. There's also damage to proteins, such as misfolding of proteins. There's damage to cell membranes, making them stiff and more brittle, so that the receptors and the channels that live in the membranes don't work so well and

the cell becomes inefficient. There's harm to energy production in the mitochondria of the cells. Mitochondria are exquisitely vulnerable to electromagnetic field injury as well as to injury by many toxicants, even pharmaceuticals—many, many thousands of things, but electromagnetic exposure is one of them. And immune function is harmed. So, we have documentation of problems in all of these domains in Autism. And we have documentation that all of these domains can be harmed by electromagnetic fields.

Press Conference Wireless
USTREAM

### Molecular and Cellular Injury: Parallels between EMF effects and Autism findings

#### Injury at the Cellular Level

#### Disturbances across levels

- Protein misfolding damage
- Injury to critical energy production in mitochondria
- Membrane damage: brittle and leakier
- DNA damage
- Leaky barriers: blood-brain, gut-blood, retinal

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So, minimally, I think the implication of that is that people with Autism are likely to get worse with more electromagnetic field exposure. And it's possible that this may also contribute to causing Autism.

Third slide. Now, the brain is dependent on all of these molecular and cellular functions in order to be the exquisitely calibrated, extraordinary information processing system that it is. And we have evidence in Autism that there are many problems with how the brain functions: poorer coordination, less richly-organized information, energy problems, antioxidant depletion. And all of these issues are also documented to be caused or contributed to by Autism. Worsening of stress management. Worsening of sleep; sleep is an enormous problem in Autism, and sleep is known to be interfered with by electromagnetic fields and wi-fi.


Wireless and Children  
45 WATCHING NOW • 77 TOTAL VIEW

USTREAM **LIVE**

## Degradation of Brain Tissue and Function: Parallels between EMF effects and Autism findings



Penetration of Cell Phone Radiation greater in younger children



Electromagnetic oscillations are the language of the brain and of WiFi-EMF – but are they out of sync?

- Challenges to health of brain cells documented in brain tissue studies
- Some evidence for increased stress response
- Melatonin depletion
- Altered sleep architecture
- Altered brain waves
- More brainwave “entropy” (disorganization)
- Can increase seizure risk
- Suspect creation of brain noise that interferes with signal and information

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So, what can we do? The biggest thing that we can do—and a lot of this is freely able to be done by everybody in their homes for absolutely no cost—is to reduce exposures.

It's really important to reduce exposures in the sleeping area. Put all of your electronic devices on one strip, unplug it at night, and sleep without the interference of those exposures, and then plug it in in the morning.

Very important for men not to carry their cell phones in their pockets, because that's associated with reduced sperm count and mutations including, perhaps, the *de novo* mutations that we're seeing in Autism.

And greatly limit exposures for children. Minimize.... You know, maybe facetime with grandma. But not a lot of playing—not playing with all of these devices. Children need to play in 3D with other human beings and with living things.

And finally, build resiliency. It has been shown that antioxidant depletion can contribute to vulnerability to damage from wi-fi. And on the other side, melatonin and a variety of other antioxidants have been shown in a number of studies to provide protection. So eat a healthy multi-coloured, antioxidant-rich diet. And overall, reduce total load of stress, because electromagnetic fields and wi-fi are not the only stress in our lives but they make everything else worse, so keep the load down.

So I think it's really important for us to go ahead and do serious research on this. But it's going to take a while, and meanwhile there are a lot of commonsense things that we can do to reduce risk. Even if that risk is not absolutely fully established, there's a lot of strong evidence suggesting that as the science pours in it will be there; so we may as well be precautionary now.

Thank you.

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[Devra Davis]

Thank you so much, Dr. Herbert. I know how busy you are with your clinical schedule, and we are very grateful to have you.

I want to introduce Dr. Steiner-Adair. She has traveled around the world talking about her study and the concerns she has about the impact of wireless radiation on the social and psychological life of children and their parents, and how it's really fundamentally changed the nature of discourse and what's considered normal today.

Her book, *The Big Disconnect*, is a wonderful book. And it really provides more information about why and how you should be able to reduce exposures.

And she is available to speak to schools and parents, and is doing that around the whole year and many, many countries.

Thank you for being here.

Dr. Steiner-Adair?

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[Catherine Steiner-Adair]

Thank you. For the last seven years, I've been researching the impact of technology on children, on parents, on family life, and on education—really trying to understand what is it like to be a child growing up in the digital age. Are we using these tools to be our best selves? And most important, is there any psychological fallout that we need to pay attention to that is coming clearer to us now that we've had smartphones and technology for several years?

It is the paradox of parenting in the digital age—that these devices make it unbelievably easy and wonderful to connect to our children 24/7 and to connect to the people we love the most, yet at the same time these same devices that let us Skype and Facechat with our babies are clearly turning our attention away from those we love the most and in fact really straining and stressing our children.

In the nine years since we've had smartphones, we've developed very radical, very different cultural norms. One of the biggest ones that really stresses everybody in families out is this. At the sound of a ping or your phone vibrating in your pocket, you can be in a conversation with your child, your husband, your wife, your colleague, and we do this. We go, "Oh, wait a second. I just have to check." And we turn away from the person we care about. And we actually ask them to stand frozen in time and just wait for us to come back. And it's not like we're just checking to see what time it is; we are literally checking out, going into a different conversation.



And it hurts. It's rude. It's frustrating. Especially when it happens a lot. And on average, adults today "just check" 60 to 100 times a day.

Now, everywhere I go around the world, adults use the language of addiction to talk about their relationships with their smartphones. "I'm so addicted to this thing." "Oh, it's like crack." But it is an entirely different thing when you hand a smartphone—something we describe either jokingly or with serious concerns about being addicted to as adults—to an infant. Often I heard parents say, "I don't know how you changed a diaper without a smartphone." And at first I didn't understand, because I thought, "It's not that hard." And then I realized what they were saying is when you hold a smartphone over an infant they will calm very quickly; they love the stimulant. Smartphones are stimulants to the baby brain. And humans of all ages love a stimulant, and they go into the zone. However, one of the first and most essential tools we give our babies—and we give this tool to our kids all the way 'til 18 when they leave home—is the capacity to self-soothe, to calm down. And giving children stimulants in the car, on the way to school, when you change a diaper, all day long is creating a very different brain in these babies. This is the greatest experiment on the developing infant brain without an ethical review board to fully understand the impact of technology on the infant brain, in history.

When I listened to children talk about what it's like to be a child with parents having all this tech, what struck me so profoundly was the kids of all ages—2, 14, 22, up to 30—all used the same adjectives. They said they're angry, and they're sad, and they're mad, and they're frustrated trying to get their parents' attention. And research suggests, actually, that in fact there has been a 40 per cent spike in people feeling lonely at home and disconnected when they are trying, in fact, to get somebody's attention and their eyes are down in the screen.

It is very important throughout the day that we protect critical moments of connection between children and families. Here are a few simple times that I think really will make a difference and help us outsmart our smartphones and be more smart about how we connect to our kids. Get up a half-hour earlier, do all your email, but have the understanding you're going to be fully present to your children 'til they're out the door. Kids need us to be calm and focused when they are nervous and hunting for sneakers. The second thing is in the way... in the car on the way to school. It's not a good time for you to be on your phone, because your kids feel like they don't matter to you when you're talking to somebody else. And also, children shouldn't play Candy Crush on the way to school. Their brains need to rest, they need to deal with whatever is worrying them, and they need to prepare for school and talk to *you* about whatever concerns they have. When you pick your children up from school, don't be on the phone; it really hurts their feelings. When they come home from school: many kids have the habit of coming home now, getting a snack, and instead of playing outside they play on a screen. Actually, we know that physically and neurologically and socially, the best thing for a child to do when they come home from a day of school is to play outside, to talk to people in real life, to hang out and socialize face-to-face, and to play and build with manipulatives on your kitchen floor. When you come home from work, kids don't like it when we walk in the door and say, "Hold on, honey, I want to hear about your day. I just have to finish this call." So stand outside, finish your call, but walk in the door and connect to those you love. And adults have a new habit too. We get in the house and we say, "Hi, everyone, I'm just going to check my email." And the research suggests that on average we disappear anywhere between 25 minutes to 2 hours when we check our email. The

last thing, of course, is bedtime and bath time; these are important transitions in the lives of children, whether they are 4 or 14. They want us to say “goodnight,” they want us to beam on them. And somehow saying, “Goodnight, honey, sweet dreams” when we are texting does not have the same reassuring magical tone of voice.

We can’t let new apps, new games... . It’s the biggest growing market... one of the biggest growing markets in the tech industry are devices for infants and toddlers. We can’t let all these devices delete old truths. Children thrive in families that do the hard work of connecting to them in real life.

Thank you.

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[Devra Davis]

Thank you very much.

Dr. Maya Shetreat-Klein is unavailable today. She is a pediatric neurologist. And I’m going to just briefly comment on some of the material she was going to share with you. And I’m going to say that we will make slides available in the podcast of this that will go up online after our presentation. And among her slides are these.

Practical lessons for clinicians, parents, and children, and teachers. The first has to do with clinicians. Dr. Hugh Taylor, from Yale University, was one of the leaders along with Erica Mallery-Blythe, myself, and Charlie Teo—a distinguished neurosurgeon in Australia—of the BabySafe Project. That is information for clinicians, signed off on by more than 150 experts in pediatrics, obstetrics and gynaecology. The BabySafe Project is available online at [BabySafeProject.org](http://BabySafeProject.org). And I urge you to share it with your friends and your clinicians.

There are medical rules and advice from the Vienna Medical Association.

There is advice, as well, from Environmental Health Trust on our website [ehtrust.org](http://ehtrust.org).

And there is advice for schools that comes from EPA and from other groups that have been working on this field. The EPA noted that school environments are very important for children, because children spend 90 per cent of their time indoors and more than 6 hours a day in schools. And as a consequence, their exposures to wireless radiation in schools account for, what looks to be, the great majority of their exposure to wireless *unless* they have a home filled with wireless radiation.

The United Federation of Teachers for New York, the Los Angeles United School District, have all had very serious discussions about the need to reduce exposures and whenever possible to go to wired versus wireless.

Most recently, following an important documentary film in Israel, the city of Haifa made the decision to remove wireless from its schools.

The nations of Israel, Spain, France, Belgium, and others have all issued advice and rules about reducing exposure. And in Taiwan a person can be fined if they hand a cell phone to a child age two or younger.

You will see, when you get to look at the slides, there are some preposterous and, frankly, to me, horrifying applications of wireless now, with young children.

As Dr. Steiner-Adair just told you, we need to understand that the parent-child relationship can be undermined by some of this technology.

There is evidence—that Dr. Shetreat-Klein knows very well of and has written about in her book—that children whose parents rely heavily on wi-fi have delayed development of speech and other problems: understanding how to be empathetic, how to think about the other. And this problem—developing empathy—is one that led the Korean government to issue guidance to parents and teachers about reducing reliance on digital materials.

The experiment that we're now conducting in our schools where children as young as kindergarden are being given iPads is without precedence. This is no independent evidence that wireless computer-based learning actually conveys real sustained learning, yet we are assuming that it does. And as a consequence, we're exposing children to levels of wireless radiation that are, again, without precedence in the world.

So we at Environmental Health Trust as well as our colleagues who are here today want to share with you information, with Grassroots Environmental Education—who hosted this livestream.

And at this point we're prepared to take questions.

Thank you very much.

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[Devra Davis]

The first question, thank you. This is for Dr. Steiner-Adair.

[reading] What do they think when they see their parents text and drive? Are they afraid? What is the psychological fallout of social media sites on children's sense of self?

[Catherine Steiner-Adair]

One of the things I hear in elementary-age school children all the way through college and young adults is the following statement. "You know, I don't get it. My parents say they love us more than anything, and yet they text and drive. *And* when they're texting and driving, you know, I say, 'Mom, Dad, please don't text and drive. It's really dangerous. We learned that in school.'" And the most common things that parents say to their children when, in fact, their children are doing exactly the right thing, saying, "Don't do this please, it's dangerous." are the following.

“Shut up.” “This is important.” “This is work.” “I’m an expert driver.” “Trust me.” “Tell me if there’s an officer, I’ll put the phone down.” Very rarely do children report that their parents say what we should say: “Thank you so much. You are so right. I lost control. I should lock this up in the glove compartment, because I haven’t figured out how to control myself driving.” So kids struggle with what we mean by words like “trust” and “love,” when in fact we put their lives at risk and ignore them and get mad when they ask us not to.

In terms of self-esteem and social networking,. Let me say that there’s so much wonderful ways of connecting that teenagers and young adults, and kids, are doing online. We know certain really good educational games teach kids to be collaborative. We know that they share each other. We know that being online can be life-saving for some children. However, we also know that there are social networking sites that are being developed daily—when one goes down, another one comes up—like Secret, AskFM, Formspring, Whisper, and even innocuous seeming social networking sites like Instagram—can be used for social cruelty. And we have known for years, from research on the human brain, that anonymity makes us take risks—not the kind of risks we want kids to take in school trying out for new activities but—risks in being bold, and being cruel, and become disinhibited. And we know just simply the way the human brain interacts with texting. When we text, not only do we lose our filter, our empathy goes down, our auditory processing goes down. And one of the biggest challenges is we are now raising the first generation of teens to have the opportunity to choose: “Do I text or do I talk?” And most of them now prefer texting. Now, texting has some great uses—there’s no question about it. However, when we text we eliminate the two most essential tools for human communication. We eliminate tone of voice. So I can text s-o-r-r-y to my friend, but she won’t know if it’s a snarky “sawry” or if it’s a “I’m *really* sorry.” Which is why there is so much confusion and drama with texting. The other thing that is eliminated when we text is we don’t see the impact of our words on the other person. We don’t learn the essential tool of reading social cues. And therefore we are not engaged in a way that holds us to be accountable for the ways or potential misunderstandings of our texts. So what we see is that we have to educate children. We have to educate them to be their best self online and connect that to their best self as they are in families and in school when adults are present with them. We have to bring digital citizenship and social-emotional learning into the core curriculum in schools, as we educate kids to be good people in the digital age.

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[Devra Davis]

Thank you

The next question is for Dr. Hugh Taylor with Yale University. It’s [reads]: what do you tell pregnant women about cell phones and iPads; and what do you tell the fathers who want to become fathers; and is any exposure safe?

[Hugh Taylor]

Thank you. I think what’s important to know is that the distance from these devices matters a lot. The radiation dissipates with the square of the distance. So moving the cell phone only a small

amount of distance away from your body has a much more dramatic impact on the actual radiation exposure.

I know plenty of pregnant women who will carry a bag over their shoulder with their cell phone right at the level of their pregnant abdomen or will clip a cell phone to their belt, again right next to their baby. I tell them, “That’s probably not a good idea. Try and move the cell phone away.”

In general, there’s really no harm or downside to moving the cell phone away from you. And again, small distances can make a big difference.

When you’re sleeping, don’t have the cell phone at your side of your bed.

When you’re driving into work in the morning, you know, put the cell phone on the seat next to you. Don’t keep it clipped to your person.

When you’re at work, put it across the room on a table—not again clipped on your body.

Those simple things—moving the cell phone a little bit away from us—can make a powerful impact on babies’ development. And we do know that there is a dose response: that more exposure is worse.

In our mouse studies we looked at the synaptic electrical activity in the prefrontal cortex of the brain—the area that controls those types of behaviors that I mentioned earlier. And the longer the fetus... the pregnant mom was exposed to the cell phone, the more of an effect it had on the brain... the more of a permanent lasting effect it had on the brain. So even lowered levels of exposure, less exposure, less time exposed can make a big difference.

So I tell moms to move the phone away, have it on them less frequently, and to try to keep that impact to a minimum.

The same seems to be true in human. Even that large Danish epidemiologic study that I mentioned earlier, there was a trend towards a dose response. Those that talked fewer number of hours or fewer number of times a day had children that had less behavioral problems in school.

So clearly, anything we can do to minimize the exposure to the cell phone will probably make a big difference.

Thanks.

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[Devra Davis]

Thanks. The next question is for Dr. Herbert. [reads] Why are these biological processes so important as underlying the Autistic syndrome? And why is EMF overall a threat to brain health not just for children but for the rest of us? How does EMF really affect the functioning brain?

[Martha Herbert]

There are biological processes that research over the last 10 or 15 years, and at an accelerating pace, has been showing our characteristic of the many people with Autism.... And I should say that Autism Spectrum Disorders are very heterogeneous; people are not the same as each other, but there are certain final common pathways... features at the behavioral level. So we have a degradation of fundamental biological support systems. We have a degradation in Autism of the way the system corrects for damage from oxidative stress. And having that damage is a part of using oxygen, we keep it in control with enough antioxidants. But people with Autism can't keep up.

Wi-fi makes that worse because it also depletes antioxidants and creates pro-oxidant oxidative stress that damages DNA, cell structures, membranes, and more. What's really interesting about *that*—about the problem of oxidative stress—is it's not unique to Autism but it's characteristic of all of the major chronic illnesses of today: cancer, heart disease, diabetes, obesity, and much more. So what we're saying is that at the underlying level of environmental vulnerability, Autism is a chronic disease among many others that are causing catastrophic public health problems. And if it's really true—which it certainly is already documented to be, in many respects—that wi-fi electromagnetic exposures can make this worse, then what we're seeing is that our addictive, carefree use of wi-fi all over the place is a contributor to the healthcare crisis in the U.S. and in the world. So this is a very important thing.

And you can say similar things for immune problems, for particularly for inflammatory problems, and for energy metabolism problems. These are characteristic of *all* of the chronic diseases that I mentioned, again: heart disease, cancer, diabetes, obesity, much more.

So when we talk about having a more rational and modulated and more, honestly, minimalist use—when necessary—of wi-fi communication, a return to emphasizing hardwired ethernet cabling—as opposed to wi-fi everywhere—we're talking about protecting public health and protecting the biological health and the brain health of people with Autism and with many, many other conditions. And I neglected to mention that these problems of inflammation, oxidative stress, and energy metabolism are characteristic of myriad psychiatric conditions as well.

And brain health is something that we really need to get through every single day, to have a successful life, to be able to earn a living, to get through life without ending it in dementia. So we need to minimize the drains on our brain health and maximize the supports. And one of the ways that's really important to do this is to get control of our wi-fi addiction and improve the deployment of alternatives that don't carry these risks.

Thank you.

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[Devra Davis]

Now, there are a few other questions here. One of them deals with: [reads] what are pediatricians supposed to do now?

And I'll just say that, well, the American Academy of Pediatrics has a stated policy of recommending no screen time for children under the age of two. And that is still their policy. And that policy is based on two different considerations.

First of all, it's based on the developmental impact and the fact that the very young developing brain needs interaction with a parent to develop bonding. And that bonding... direct bonding is absolutely critical to a child's sense of self, their ability to develop a sense of the other, their ability to understand their place in the world. And when, as Dr. Catherine Steiner-Adair said, they start to feel that that's threatened because this device comes in between them, you can see—and she writes about it in her book *The Big Disconnect*—the feeling of abject sadness on the face of a two-year-old when the mom or dad says, “Just a second. I'll grab this right now.” And there are... one child told her, “My dad calls it a smartphone, but I call it a stupidphone because it's always interrupting us.” And children as young as 18 months can get really angry with their parents, and they learn how to turn the phone off as a way of saying, “Pay attention to me.” So there's really growing evidence for the impact undermining parenting today.

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[Devra Davis]

Another question has to do with how do we set standards for these things? Well, that's unfortunately a big problem. The standards for phones today were set almost two decades ago when the phones were like a small shoebox, when the people using the phones were military and medical people for the most part, and no one ever dreamed that there would be millions of infants and toddlers getting devices to sit on the potty with or a plastic teething rattle case for the iPhone. And for that reason, we have to recognize that 20-year-old standards would not be adequate to fly a plane; they really are not adequate for these devices today.

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[Devra Davis]

Finally, we were asked about sleep. What's wrong with looking at your device just before you go to bed? And again, there are two different things here. There's the physiological response and then there's the socio-cultural psychological.

Before you go to sleep, if you're married you might cuddle, you might talk to your spouse. But if one of you is, “Just a minute, I want to check something,” and the other checks out, you're missing a very private, intimate time for interaction.

The other is physiological. Your brain is, in fact, stimulated by blue light. And blue light—it doesn't have to be blue in color—is part of the light that comes out of these electronic devices.

Now, the interesting thing about blue light—440 nanometers—is that blue light is used in medicine to treat disease. When babies are born with hyperbilirubinemia—that's they're blue babies, they don't have enough synthesis of iron in their bodies so they look blue—the treatment used to be to expose the whole baby—with covering the eyes—to blue light so that the blood

running through the surface of the skin would be exposed enough—because babies’ skin is so, so thin—to blue light, which would get their liver to synthesize Vitamin D. That’s the way we used to treat it; now we wrap them in blankets with this blue light.

So if we’re treating babies that have not enough Vitamin D with blue light to stimulate something, what we know in medicine is that any compound that we use to treat something can also cause a problem. Think about aspirin. Think about the chemotherapy drugs, they work against some cancers, some of them cause others. So we have to understand blue light has biological properties. Now, specifically what it does is it interferes with the production of melatonin. And as you’ve heard today, melatonin can be a very powerful antioxidant. It’s naturally produced when we sleep in the dark. If we sleep in a room with a lot of flashing lights, that interferes with our ability to produce melatonin and we wake up tired and unrested, because we haven’t really got a good night’s rest.

Children need 12 hours of sleep for much of their lives. And they are sleep-deprived nowadays. Children are spending more time online, more time in front of the screen than they’re spending at school. More time in front of a screen than at school. This is having an effect on their sleep. It’s having an effect on their brain—as Dr. Maya Shetreat-Klein will say.

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[Devra Davis]

We have one more question? Okay. [reads] What is the Academy of Pediatricians’ opinion on EMF? Do they say there is no proof and we need more studies? Do they agree on EMF radiation as possibly carcinogenic, as classified by the International Agency for Research on Cancer? This is a question from my wonderful colleague, Prakash Munshi, in Mumbai, India. Hello, Prakash. Thank you for the question.

There is no disagreement by major professional societies that the International Agency for Research on Cancer has concluded that cell phones and other sources of wireless radiation are classified as a “possible human carcinogen.” This is the same category as lead, and DDT, and other pesticides. Now, we don’t give lead or DDT to children. And yet we are giving children the opportunity to be exposed to these devices in schools.

So the American Academy of Pediatrics has a committee on the environment. They are now reviewing further all of this evidence And, as some of you know, a number of colleagues from the IARC—including Lennard Hardell who was a member of the group that decided that this was a “possible human carcinogen”—and Anthony B. Miller, Professor Emeritus at the University of Toronto, and I, and others have published a series of articles pointing out that newer evidence released since the IARC made its determination in 2011—that’s the International Agency for Research on Cancer, of the World Health Organization—newer evidence released since 2011 clearly shows that cell phone and wireless radiation increases the risk of brain cancer.

Now, the brain cancer story is complex because we know—as Dr. Michael Thun from the American Cancer Society points out on a YouTube video that I recently put up on my Facebook page—we know that brain cancer has a long latency. The time from exposure to the development



of cancer can be 40 years. That's generally agreed in the epidemiologic literature, from a variety of sources. So if we say we have to wait 40 years from the time that heavy exposure started here and now, we're going to be in tremendous trouble. We will share a slide, after this press conference is over, that shows the following.

The French national study, published in 2014 and led by Dr. Coureau and her colleagues, found that those who used cell phones for the equivalent of one hour a day for slightly more than two years—836 hours—had significantly increased risks of brain cancer, and that those who lived in the urban environment, compared to rural environment, had eight times more brain cancer.

Now, what is it about the urban environment? Could it be they were the heaviest users? Could it be they were the earliest adopters? Could it be the urban environment contains a lot of other exposures to multiple sources of wireless radiation? We don't know. All we know is that right now the human data are compelling enough that growing numbers of scientists, including myself, have concluded that cell phone and wireless radiation is a *probable* cause of cancer in humans.

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[Devra Davis]

[reads] Are you saying we should not have wi-fi in homes and schools, or just turn devices off?

Well, I think I'm going to let each colleague comment on that, because it's a question of an opinion.

I would say it this way. There's growing evidence that some small percentage, but a real percentage, of people are hypersensitive, hyper-reactive to wireless radiation. For those people, the modern world has become unlivable. A documentary film in Israel recently disclosed that, went to Green Bank, Virginia, etc.

It would seem to me pretty clear that we should not have wi-fi in schools with young children. And many schools are now moving to wired, as opposed to wireless, whenever possible.

And the Israeli government recommends: no wi-fi for children under the age of... I think it's six or eight, and then very limited exposure to *wired* online learning throughout elementary school. Now, when I say they "recommend" it, we know that—in Israel and every other country—what the government recommends doesn't mean that's what's being done. But it does mean that the experts in the government who look at this do advise that there should be less wi-fi radiation and *no* radiation for very young children. And I agree with that.

I'm going to ask Martha to comment on that. Dr. Herbert?

[Martha Herbert]

What we really need to be doing here is being clear on what we're being upset about. When you say "no wi-fi," it doesn't mean no internet access. It just means you don't walk around without it

being plugged in. You can have all the internet access you want with wired. People conduct businesses that way. People conduct many, many different kinds of activities. So it is not a deprivation thing. It's a logical, healthy thing to keep it confined into a certain area, use it intensively there, and then have other areas where you're free of the exposure.

[Catherine Steiner-Adair]

One thing that we understand is that under the age of two, children, first of all, don't learn to read and, second of all, parents are being bombarded by a growth industry saying all these Baby Einstein apps and games will educate your child. And there's so much false marketing. Common Sense Media did a fabulous study of over 30,000 games and very few had evidence-based research that they in fact were educational.

Babies learn from playing in real life. They learn from being spoken to, and crawling around, and rocking and rolling in the 3D world. When it comes to toddlers and infants, we'd be very selective about where we exposure them to evidence-based research-proven educational toys. We know that the baby brain and the child's brain needs up until the age of six to fully engage in playing in real life. After that, there are all sorts of very good ways to think about using technology educationally in school, but they have to be limited and they have to be very well thought out. And what we want to avoid is children sitting at desks, being on screens, doing activities that we know are actually better done from a real book, with a real hand working a real pencil or putting a real puzzle into place than swiping with your finger and reading on a screen hour after hour.

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[Devra Davis]

Thank you. I would close by saying we are living in the age of a technological imperative, where there's a confusion. Where the fact that we *can* do something is being translated into the sense that we *ought* to. There are onesies for babies. You can weigh the baby's poop with a certain wireless device. You can tell if your baby is wet—there are actually more traditionally ways of doing that. The fact that the technology exists *does not* and *should not* mean that we use it.

As all of us have said today, children here need more lap time and not app time.

And I think that message of the science behind that is clear and strong. And while we do not have definitive research on many things today, we know enough now. And if you will look at the website for the BabySafe Project, the website for EnvironmentalHealthTrust.org, and Grassroots Education, you will find more information about this as well as a full video of this press conference.

Thank you, all, very much.

[end of recording]