

**NH COMMISSION TO STUDY THE ENVIRONMENTAL AND HEALTH EFFECTS
OF EVOLVING 5G TECHNOLOGY**

Meeting held:

10/31/19

9:00-11:15am

LOB 202

Meeting called to order by Rep Abrami at 9:00 am.

In attendance: (12)

Rep. Patrick Abrami-speaker of the house appointee

Senator Tom Sherman-president of the senate appointee

Rep. Ken Wells- speaker of the house appointee

Kent Chamberlin-UNH-appointed by the chancellor

Denise Ricciardi-public-appointed by the governor

David Juvet-Business and Industry Association

Brandon Garod-AG designee, Asst. AG Consumer Protection

Bethanne Cooley-CTIA , trade association for wireless industry and manufacturers

Michele Roberge-DHHS- Commissioner of DHHS appointee

Dr. Paul Heroux- Professor of Toxicology, McGill University- speaker of the house appointee

Rep. Gary Woods-speaker of the house appointee

Senator Jim Gray-president of the senate appointee

Not present: (2)

Frank MacMillan, Jr. MD-NH Medical Society Environmental Medicine

Carol Miller-NH Business & Economic Affairs Dept.

Agenda: (attached)

I. Approval of minutes from 10-10-19:

-minutes were approved with changes to be made for proper spelling of Bethanne Cooley and Michele Roberge.

II. Webex (NIEHS) National Toxicology Program Study Presentation

Presented by Dr. Michael Wyde, toxicologist and Dr. John Bucher senior scientist and former Director of NTP Division, in the Division of the National Toxicology Program at the National Institute of Environmental Health Sciences (NIEHS), which is a part of the National Institute of Health.

- Interagency program (NTP) was established in 1978 with the: National Institute of Environmental Health Sciences, National Institute of Occupational Safety and Health, FDA (National Center for Toxicology Research).

- The NTP's mission is to evaluate agents of public health concern by developing and applying tools of modern toxicology and molecular biology.
- Their scope of work includes: research and testing agents of public concern; conduct literature-analysis activities to identify cancer and non-cancer human health hazards; develop new approaches to better predict how agents affect biological responses and communicate results to multiple stakeholder groups through technical report series, journal publication and the NTP website. (<https://ntp.niehs.nih.gov>)
- In 1999, the USFDA nominated radiofrequency radiation (RFR) of wireless communication devices to NTP for study.
- At that time, there were 100 million users. Today there are over 310 million Americans and 5 Billion worldwide, exceeding the number of people.
- Biological effects have been reported in cell-based tests and in laboratory animal studies. However, animal studies have not consistently demonstrated increased incidence of tumors at any site associated with exposure to cell phone RFR in lab animals.
- There are challenges and logistical issues associated with RFR study.
- According to FCC, RFR limit is 1.6W/kg. Needed to design a new way to expose to RFR for research. Study focused on 2G and emerging 3G technology at the time.
- Used reverberation chambers as recommended by National Institute of Standards and Technology (NIST): shielded room with RF antenna distributing frequency into the room with uniform exposure. The benefit is that they could control and monitor the exposure.
- Three phase study: 5 day, 28 day and 2 year, alternating on/off for ten minutes at a time and exposed to GSM and CDMA signals for both mice and rats.

NTP Findings:

- NTP's study on cell phone RFR is the most comprehensive assessment of health effects in rats and mice from exposure to 2G and 3G cell phone RFR.
- There was **CLEAR EVIDENCE** that exposure to cell phone RFR caused malignant schwannomas (heart tumors) in male rats.
- There was **SOME EVIDENCE** that exposure to cell phone RFR caused malignant gliomas (brain tumors) and pheochromocytomas (adrenal gland tumors) in male rats in addition to positive findings of DNA damage to hippocampus and equivocal findings in frontal cortex.
- In mice, equivocal evidence of carcinogenic activity in both male and female and positive findings for DNA damage in the brain in males and blood cells in females.
- Positive findings for lower weight babies exposed in utero for rats and at five weeks for mice.
- NTP uses a 4 level scale: no evidence, equivocal evidence, some evidence, clear evidence.

- Final conclusions represent the consensus of NTP and a panel of external scientific experts who peer reviewed the studies at a public meeting on March 26-28, 2018. Two technical reports: TR 595 (2018) and TR 596(2018) Note: these findings should not be directly extrapolated to human cell phone usage because they were done at higher exposure and to the whole body during research.
- NTP Publications published in journals: 2017 in IEEE and in Bioelectromagnetics in 2018.

Goals for further study:

- Address issues raised in peer review and do follow up studies.
- Smaller scale exposure facility and quicker time frame to get data out.
- Use newer technology: 3G and 4G
- 5G uses different modulation schemes and frequencies above 60Ghz which behave differently.
- Evaluate DNA damage, establish biomarkers of exposure and probe biological mechanisms for RFR induced effects.
- What role does DNA damage and repair play?

Questions:

Abrami: Was the level 1.6W/kg in 1999? Is it the same today?

Wyde: Yes. It is based on acute exposure based on tissue heating. NO changes have been made in twenty years to the standard.

Abrami: If current standard is 1.6W/kg, where did damage start at the three levels you tested?

Wyde: Heart tumors were significant at 6W/kg showing clear evidence with some at lower exposures.

Abrami: That is well above the standard of 1.6W/kg and I am assuming phones are lower.

Wyde: Theoretically, 1.6 W/kg is the limit for phone which is what device is allowed not the exposure to people. New evidence is that SAR from phones is actually higher than 1.6W/kg. Part of that is because phones are not supposed to be next to your head.

Chamberlin: Reverberation chamber to have homogeneous 1.6 W/kg exposure, but how does that correlate to holding phone next to your head for a human?

Wyde: You have pin point exposure to the head but we don't have data on what that exposure is to all areas of the body at the same time. This is why we can't directly apply results to humans.

Chamberlin: Frequencies for 5G. You mention 60Ghz but I heard 87-100Ghz which is much higher. That is significant. We also have Beth here from industry.

Wyde: I defer to the expert. I am not aware of any intention to move above 60Ghz.

Cooley: I am not allowed to be privy to future deployment plans as a rep for CTIA. I only have information that the public has because of antitrust laws.

Sherman: When we are in a network of wifi/phones like we are right now, is there a certain level of radiation we are exposed to without even using our cell phone?

Wyde: Yes. That is one of our concerns in an increasingly wireless world. What is our background level of exposure when we are sitting in a room surrounded by people with cell phones or a school with wifi? The way we use devices has changed. It's not just a cell phone. Actual exposures is important, not just what a device emits.

Sherman: So to get to 6W/kg in a human holding a cell phone to their ear, could they get to that level or exceed it? Or is it well beyond any potential exposure a human would have?

Wyde: That exceeds what a device is capable of. But independent studies have looked at that showing it exceeding 1.6W/kg.

Sherman: Does exposure increase with increasing 2G, 3G, 4G and 5G capable phones?

Wyde: no. the G means generation. (Woods, Heroux shaking heads...YES it does)

Gray: Does the energy emitted by antenna that is absorbed fall off as a cubed function?

Wyde: No, not cubed but squared.

Gray: Area is two planes, three dimensional is cubed. I would think it would fall between those two planes. I will explain later why I asked the question.

Wyde: That is not our area of expertise.

Chamberlin: I am not sure it's relevant.

Wells: Talking about intensity of field as opposed to photon energy. Photon energy definitely goes up as frequency increases.

Ricciardi: DNA damage was found without a degree of body temperature change which means non thermal effect. The FCC limits say that one degree of body heat is considered thermal heating. So what does that say about the FCC limit? Does that mean that this is harmful?

Bucher: That's one of the things we need to look at in the future. One idea is that there is an inhibition of the repair process. DNA damage happens all the time and is RFR slowing rate of DNA repair? We need to look at that.

Ricciardi: I am still not clear. Your study was designed to test non heating damage. You found damage so doesn't that mean that FCC assumption that only heating can cause damage is incorrect and no longer accurate? Would you agree?

Wyde: A lot of people believe unless you heat tissues, you won't see health effects with RF. This study disproves that as we did not have over heating but we did see damage.

Abrami: Dr. Chamberlin hopefully will bring in someone from IEEE to help us understand how they developed those standards.

Sherman: Was there any way to determine cumulative exposure rather than dose related? Or did you not look at that?

Wyde: We did not look at that when we designed studies.

Woods: Question on the structure of cages? What was it made of? Were they metal? They look like a faraday cage. Where was RF measured?

Wyde: That's a very good question. The chamber is stainless steel. Anything in the chamber was non metal so it did not affect the signal. We did not want to heat anything or cause problems for the animals. NIST took measurements to make sure there was uniformity in the whole space.

Abrami: what is a faraday cage?

Woods: Faraday cage is a metal mesh network that prevents RFR exposure to what is inside.

Woods: Why did you use rats and mice? Why were rats started in utero and mice at five weeks? Any animal is much more sensitive in utero to damage. How much of result was attributed to in utero?

Bucher: Traditionally, all cancer studies use both rats and mice. We only use in utero exposure with rats because it's harder to use hybrid mice in utero. By using both, we get more information than we would normally.

Wyde: Part of the reason for in utero, is it mimics human exposure in utero.

Roberge: Were you able to see the difference where health effects occurred, with regard to various levels, knowing your exposure was above the 1.6W/kg that a device is permitted to emit?

Bucher: We need to backup and understand what we were trying to do. We needed to make sure we did not use thermal limits more than one degree of body temperature that animals could tolerate. Different sized animals absorb different amounts. Rats because they are larger, could only be exposed to lower levels because we saw the largest response on the largest animals. They were affected more with strongest responses to RFR.

Roberge: Are you looking at synergistic effects of multiple frequencies in your future studies? Does that influence exposure?

Wyde: yes that is part of what we are looking at. How are people's exposures going to change with 5G? That's very important as we move forward.

Chamberlin: Are the signals realistic by alternating regular modulation, since it's not realistic compared to the pulsed or bursts we are exposed to now. Cell phones don't radiate continuously. Did you look at that?

Wyde: We tried to create scenarios with spikes and ten minute on and off exposures. We had modulating patterns that would mimic conversation on cell phones. We tried to create relevant exposure scenarios.

Bucher: We used actual GSM and CDMA signals that spike. GSM modulation when signals are sent only 1/8 is the spike. That is what we used.

Abrami: Legislators are being faced with push back on small cell towers with 5G at street level and every 250 meters apart with millimeter waves.

Bucher: We are keeping close eye as 5G emerges.

Heroux: NTP study was designed quite a long time ago. Our situation is that we deploy things and the time to assess health impacts is much larger than rapidly evolving technology.

Sherman: Can you recreate background daily exposure to what we might anticipate by increased number of 5G towers in a neighborhood using this model? I would like to know BEFORE deployment.

Wyde: The technology is not capable of doing that with 5G frequency.

Bucher: Our exposure depends upon how we are positioned with respect to antenna. To study 5G and combine with lower level exposure, is an enormously difficult scenario to recreate.

Wells: For base station towers 250 feet apart, the energy density is 5x higher than a cell tower. The depth of penetration in tissue, the higher the frequency have higher photon energy, the amount of energy being absorbed in a thin layer is significantly higher. Would you agree?

Bucher/Wyde: yes. We would agree. But power levels are lower.

Ricciardi: power levels are lower but it's in close proximity 24 hours a day, which is microwave radiation. Would that not heat tissues over time? If so, would we assume 5G would not be safe?

Wyde: No. Our exposure is a function of distance and power levels and other factors. At this point, we don't know.

Chamberlin: Your category, Clear Evidence. Can you compare that to relative risk?

Wyde: No. clear evidence is a descriptor we use in our cancer studies. It does not relate to relative risk in the human population.

Chamberlin: Are you using P value of .05 as statistically significant value?

Wyde: We look at .05 as cutoff as statistical significance but often the clear evidence findings have a lower P value.

Sherman: We should get their peer reviewed articles. They may have more data in them.

Chamberlin: It would be nice if they could compare it to smoking or something.

Ricciardi: There is an online library at: <https://onlinelibrary.wiley.com> They just published new findings in October.

Woods: We need to be cautious because we cannot make one to one correlations with humans when we look at these studies. For example: if aspirin (dioxin) was tested today, it would be banned because it causes cancer in mice and rats. So we need to be careful when looking at these studies. Is there a significant difference between a rat and a mouse?

Sherman: We have to be cautious before we extrapolate to humans but we can't test humans without a long period knowing their cumulative exposure. You can't recreate it because it takes 20 years for people to die before we know anything. Hopefully, we will take as much evidence as we have. Because what we have seen in other industry settings with contaminants, we don't know until a lot of people die. They cannot recreate this in a lab. It's a warning on both sides.

Woods: We have to be able to say, we don't know. Some of the other literature, they were criticized for poor standards.

Ricciardi: Ramazzini Institute studies duplicated that study, using very low standards.

Wells: These are very difficult studies to do. The human body is an antenna. Larger animals are more exposed. Humans are much larger than mice or rats. They are studying critters smaller than the wavelength. When we talk about base stations for 4G transmitting at 100watts but KM away, that is much less than the magnitude of intensity from 10's of meters away of 5G antenna, even if it's only 7 watts. A flaw in this study is that they are treating them as chemical exposures. The room has a uniform feel but when it hits the skin, it's no longer uniform. Penetration depth is important. With 5G that's a very thin piece of tissue getting a lot of penetration. It's difficult to study.

Heroux: Mice and rats are only superficially similar. They are used because they are cheap, easy to handle. We know they are different and provide different information. Toxicologists know about these things. That is why they design a model on how to use animals in these experiments, which is extremely complex.

Cooley: What is on the towers is not line of sight technology. Small cells are. They are not beam forming. We will talk about this at future meetings as well.

Sherman: I have a comment on autonomous vehicles. People claim you need 5G for those. My nephew is one of the lead engineers for the Google vehicle, Waymo and he said the very definition of “autonomous” is autonomous. It does not or should not need wireless or power networks to depend upon. I don’t think the ongoing claim that autonomous vehicles need 5G, is true.

Heroux: I agree MIT as well has a car that does not rely on 5G. There are many ways autonomous vehicles can operate using: vision, laser scanning, ultrasound. EMR is not required.

III. General Discussion:

We will hear from Prof. Eric Swanson, U. Pittsburgh provided from Bethanne Cooley at the next meeting: Thursday, November 21st at 8:30am.

Interim report: Agreed upon with correction for non-ionizing statement to reflect properly Ken Chamberlin’s opinion from his presentation.

IV. Frank Clegg Video: Framing the Issue:

- Former CEO of Microsoft Canada, 40 years in technology sector.
- Current implementation of wireless is not safe.
- 5G is not tested.
- Millimeter waves are used by the military for crowd control.
- We are advocates for safe technology, not, no technology.
- FCC is made up of previous telecom, lawyers and engineers not doctors.
- No oversight provided by FCC. Telecom industry is self-policing.
- 1996 Telecom act prevents anyone from suing Telecom for health injury.
- Countries like China, Russia, Italy and Switzerland have safety limits 100x safer for citizens.
- Today we have significant exposure in our homes, schools, work and public spaces.
- Many states and cities are questioning safety, while the Federal Govt and some other states are fast tracking 5G.
- Many health and mental health effects, including permanent DNA damage.
- Individual, state and local rights are being passed over to telecom industry. That is a significant and historic power shift in rights. Telecom has over 500 lobbyists.
- Swiss RE has designated 5G as a significant insurance risk.
- Convinced there are safer alternatives available so we can have technology safely.
- We need to advocate for change to allow industry to become more responsible.
- Most important thing you can do is to get educated and educate your family, friends, co-workers, state, local and school officials. Knowledge is power and your power is in your hands.

Abrami: If anyone has any questions for Frank Clegg, we can contact him to talk with us.

That video encapsulates a lot of the issues we are dealing with here.

V. Dr. Heroux Completion of Presentation of Biological Effect:

-Human evidence: two documents that are very detailed human evidence: ELF (power systems) and RFR(communication). Both classified both high and low as possibly carcinogenic Class 2B. IARC repeats old notion that there is no mechanism that supports this. They are great epidemiologist but not cognizant of other things. Anthony Miller is worried about rollout of 5G because he is seeing an increase in student 15-19 increase 1%/year in lethal brain tumors. He would like IARC to go back to reclassify because IARC said there was a lack of animal studies but there are many studies which was the reason for the Class 2B. How many will they ignore? He would like it classified as a class I carcinogen.

-Another study shows with a cell phone one and off, that glucose metabolism is increased in the brain when cell phone is on. This is not thermal or heat related but it is an effect.

- Also troubling evidence on increasing gray matter changes.

-Hypersensitive: those who feel its impacts. In Finland, there is software to plot a path from where they live to where they want to go to minimize exposure to radiation. This software has been downloaded 200,000 times. These people are very real. Contrary to what a lot of the medical community is telling them, it's not in their mind. They are physical reactions and not everyone has same effect, nor should they. That is typical of medicine. One of the reasons is that many of them have variants in Glutathione enzyme which is a major detoxifier. EHS people have variations in this enzyme 10x higher than non EHS. Genes will not allow them to produce effective versions of glutathione transferase. The next generation will likely be more sensitive if both parents have this variant. You see a lot of people with EHS, who also have multiple chemical sensitivities because they share the same detoxification mechanisms.

- Proton tunneling: basic mechanism of action of EMR on tissues. Ionizing argument is beside the point. Biological systems are ionized. This is relevant. Stability of materials is an illusion. Every molecule of water decomposes and recomposes. PH of pure water is 7. This is based on the mobility of protons. In every living system, mobility of protons is very important.
- - Oxidative phosphorylation is arguably the most important process in the body. Science did its work on this very quickly after concerns of EMFs on this process. Essential mechanisms of action were discovered of EMFs but ignored. A group of enzymes from 1-5 synthesize ATP. Protons and electrons have to move through our body. EMFs affect the movement of these affects function of enzymes. When protons and electrons are free, they are vulnerable to EMR especially ELF components. Within Mitochondria, you have a PH of 1. You have the highest electric field. If you apply EMF to this system, you disrupt the flow of electrons and mainly protons. Entry channel is completely hydrophilic. It has the same structure as ice and the way enzymes work is proton tunneling. Through this, the proton is vulnerable to fields as small as 20 nano-tesla as

confirmed in experiments. This is very vulnerable to EMR. The semiconductor industry has devices that work on the same principle. If you reduce ATP activity, electrons have to jump across distances and are vulnerable. There are 400 publications that talk about these effects on enzymes from EMF. These electrons form ROS (reactive oxygen species) and have a hard time functioning. The jumping of charges from one place to another creates a lot of room to interfere with propagation of electrons that support metabolism of cells. The science behind tunneling mechanism is... If you have a quantum of energy of any frequency, you are going to have a change in probability to jump from one place to another. This happens at levels way below thermal levels of FCC.

At Duke University in 1985, research showed changes the function of mitochondria but he was ignored. Nobody reads science or a paper unless someone needs them. The mechanisms and science are there but they are unknown.

I agree with Frank Clegg. We can get everything we want. You don't to fear you will lose your cellphone or go back to the dark ages. We can do this very well. We know engineers can do this.

Woods: Buran zones are happening at mitochondria level.

Sherman: Can we get the digital link to the slideshow?

Abrami: We have a website now where all info is posted.

Sherman: When you talk about impacts at exposure much less than our limit, does it increase cell death in terms of end organ damage?

Heroux: Biology is an electrical motor. We are electrical. Any field is possibly going to interfere with this.

Heroux: I exposed cells to radiation and see how cells died. It's not to kill them but does it change how they die by being exposed to EMF. If you compare the power of fields in everyday life, their ability to kill cells is higher than oxygen, creating ROS. ELF component of Telecommunication signals is a significant component.

It increases cell death and diverts cells toward necrosis vs apoptosis. The cell doesn't have enough (energy) ATP and it gives up and goes into necrosis. EMF has power to increase ROS leading to chronic diseases with inflammation like Alzheimer's and Diabetes. So why add on to the load we already have with ROS? We can control electric and magnetic exposure. If you ask at a hospital how many Parkinson's, are related to EMF exposure? They say none and claim EHS people don't exist at all. It is a part of chronic illness. I am not saying it's all of it but it is a part. We have just gotten used to these illnesses. If you can decrease diabetes 20% by reducing this effect, you will save a lot of money in medical care if you address this issue.

V. Meeting Adjourned at 11:15 am.