Understanding Cell Phones, Radio Frequency Radiation, and Their Effects on Health

Narrator: Three hundred million, or 95% of Americans use cell phones. As these devices are now part of our daily lives, public concern over their safety has increased.

I sat down with Michael Wyde, a toxicologist at the National Toxicology Program, which is headquartered at NIEHS. We discussed how cell phones work using radio frequency radiation--also called RFR--and what his team is doing to better understand potential health effects from their use.

Michael Wyde: Cell phones communicate using radio frequency radiation to transmit signals between cell phones and cell towers, and cell phone towers back to cell phones. RFR, or radio frequency radiation, is a type of low energy radiation within the electromagnetic spectrum. The spectrum ranges from radio waves through infrared, visible light, UV, and all the way through to X-rays and gamma rays. These lower energy radiations are typically used for mobile communications and other types of communications.

Each cell phone emits different levels, so if you're using a cell phone in an area where you have a lot of bars or a very high signal, the phone is not working as hard to reach the tower – maybe you're closer and so your exposure is lower.

Narrator: In 1999, the National Toxicology Program was asked by the Food and Drug Administration to investigate possible health effects of radio frequency radiation.

Michael Wyde: Studying RFR is fascinating. It's very different from a lot of the toxicological issues that we're facing today. Mostly what the National Toxicology Program looks at are chemicals and environmental pollutants. This is more of a physical agent, and I think what's really more pertinent and what really piqued my interest is the number of people being exposed.

I think a lot of the concerns regarding health issues comes from the manner in which people use cell phones, the proximity to their heads. The early studies were specifically addressing the brain and they were not looking at anything else in the rest of the body. The brain is what drives everything, so if you affect the brain, then there is a lot of concern there. As the years have gone by and technologies have changed and the capacity of these devices to do more and more for us, we've become reliant on them. What happens is, now we're using them differently.

Narrator: Wyde said that because people use cell phones to call, text, and stream music and movies, it's important to design studies that consider all body organs. For this reason, the National Toxicology Program studied more than how RFR affects the brain.

These first studies used 2G and 3G signals, the common signals for cell phones at the time. The researchers exposed pregnant rats to RFR and continued exposure to their offspring for two years. They analyzed the animals' body temperature, growth, and development, along with tumor growth, in response to RFR exposure.

Michael Wyde: We exposed the animals starting while they were in utero, because pregnant mothers use phones. And so we were really trying to mimic the whole human exposure scenario.

We did see that exposure to radio frequency radiation in these rats was linked to increased incidences of tumors in the brain and the heart and also the adrenal gland. Looking at some other endpoints, we saw some genetic damage, some damage of DNA, in these rats.

Then we also did see some surprising effects. We did see, as I mentioned cancer of the heart. That was a very unexpected finding. As we move forward and try to characterize, and put this more into perspective, and better understand the findings here and try to bridge that gap to humans, that's something we're really going to focus on.

Narrator: The studies took more than 10 years to complete. They are the most comprehensive assessment of health effects in animals exposed to RFR to date. However, Wyde cautioned that finding tumors in animals after RFR exposures does not mean that people will develop tumors from using cell phones.

Michael Wyde: We can't just jump ahead and say well this happened in the animal study, so this is what it means for humans. Another difficulty in trying to interpret this data for humans is that we can very well control the exposures in animals in a laboratory setting, how many hours they get exposed, and the exact amount of radio frequency radiation they get exposed to at certain levels.

If we exposed animals to very high levels of radio frequency radiation and see nothing, we would feel a little better about saying that was safe. We are trying to answer the question about response – is it going to cause cancer?

I can't tell you that answer in humans because we don't fully know that answer yet. But what we do know that we know there is exposure.

Narrator: Wyde thinks of each radio frequency radiation study as a building block. Each new study builds upon the last one to tell us more about how RFR affects health. Over time, the studies will inform risk assessments. These assessments clarify what exposure means for people and recommend safety limits. Until there's more clarity about the effect of RFR on human health, Wyde suggests ways to minimize exposure.

Michael Wyde: Those include things like talking on speakerphone, put distance between you and the cell phone. The more distance you have between yourself and the source of the radiation, then your exposure drops off rapidly to the point of zero at some point. You can use a wired headset, you can do different things, minimize the amount of time you spend on a call, or you can text instead of call. I'm not going to say this is going to protect you, because we don't know that there's anything to be protected from. But we do know exposure is something that is happening, and we do have some level of control over that.

Narrator: The exposure studies conducted by the National Toxicology Program raised additional questions. In response, researchers designed follow up studies. They want to bridge the gap between studies on older technologies, like 2G and 3G networks, and studies on new technologies like 4G, 4G lite, and 5G.

To learn more about the radio frequency radiation studies and how to protect your health, visit our website at niehs.nih.gov. Thank you to today's guest, Michael Wyde, for joining us.

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