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CELL PHONES: Questions and Answers

by Arthur Firstenberg

How much radiation does a cell phone emit, compared to what exists in nature?

If Neil Armstrong had brought a cell phone to the moon in 1969, it would have appeared from earth to be the brightest object in the universe in the microwave spectrum. In the daytime, the sun would have been brighter, but at night, the cell phone would have outshone every star.

There is a reason cell phones are outlawed in Green Bank, West Virginia: even a single cell phone, even from miles away, would blind the radio astronomers there and make it impossible for them to see the stars. Astronomers measure radio waves in units called janskys. A typical star shines at 10 to 100 janskys. The Sun shines at about 500,000 janskys. When you hold a cell phone against your head, you are pumping energy at the rate of about 100,000,000,000,000,000 janskys into your brain.[1]

How does that compare to radiation from a cell tower?

Suppose there is a 2,000-watt cell tower two blocks from your house. The part of your brain next to a cell phone is absorbing up to one hundred thousand times as much radiation from the phone as it is from the tower.[2]

Are the FCC's exposure limits the same for cell phones and cell towers?

No. Cell phones are exempt from the limits imposed on cell towers. The FCC measures exposure in milliwatts per square centimeter. Depending on frequency, the FCC's limit for whole body exposure to radiation from distant sources is about one milliwatt per square centimeter
(1 mW/cm^2). The limit for partial body exposure to a cell phone is approximately 20 mW/cm^2 (for the brain), which assumes the phone is held at least one and a half centimeters away from your head. It is 50 mW/cm^2 (for the hands, wrists and ears). If you hold the phone flush against your head, like most people do, or tightly between your head and your shoulder, the exposure to the brain can approach 50 mW/cm^2 also.[3]

Who set the exposure limits?

A radar scientist named Herman Schwan who was brought to the United States from Germany after World War II as part of Project Paperclip. He made some assumptions about the rate at which the human body is capable of getting rid of heat, and on that basis he estimated that the body could safely absorb an amount of radiation equal to 100 mW/cm^2. His assumptions were soon proven wrong, since experimental animals died within minutes when exposed to that much radiation. So over the years, the safe level was reduced first to 10 mW/cm^2 and later to the current limit of 1 mW/cm^2.

Why is the brain exempt from those limits?

Because those limits would make cell phones impractical. And because new assumptions were made about how much heat the brain could safely absorb, and the rate at which the body could dissipate that heat. It was decided that the brain could be safely heated by up to 1° C
(1.8° F).

Have these assumptions proven correct?

No. A 1° C rise in temperature is usually considered a fever. And although the brain as a whole is heated less than 1° C by a cell phone, the absorption is not uniform. DNA, for example, resonantly absorbs microwave radiation. In experiments done at the Food and Drug Administration during the 1980s, DNA absorbed 400 times as much radiation as expected.[4] Research done at the Max Planck Institute in Germany in 2006 found that brain synapses may be resonantly heated by up to 100° C while the brain as a whole is heated by only 1° C.[5]

I don't get a headache from my cell phone. Can it be that bad?

Because brain tissue has no pain receptors, we don't feel the injury. Even a headache doesn't tell you what's happening inside your head. Neurosurgen Leif Salford and his colleagues in Sweden found that a single two-hour exposure to a cell phone permanently destroys up to two percent of a rat's brain cells.[6] Superficially the rats are fine, but two percent of their brain is gone. The experiments gave similar results even when the exposure level was reduced a hundredfold. And in experiments on the blood-brain barrier, they reduced the exposure level ten thousandfold and found that damage to the blood-brain barrier was *worse* when the exposure level was reduced.[7]

That means that holding the phone away from your head does not protect you. It means that if you use a Bluetooth headset, which emits only 2.5 milliwatts, you are doing more damage to yourself than if you hold the phone to your head. The blood-brain barrier keeps bacteria, virusus, and toxic chemicals out of your brain and maintains the brain at constant pressure. Too much intracranial pressure can lead to a stroke.

How fast does the damage to the blood-brain barrier happen?

Leakage of the blood-brain barrier is detectable within two minutes of exposure and probably begins within seconds.

What do the stroke statistics tell us?

The incidence of stroke overall is steady or declining but it is rising in adults younger than 50,[8] and shockingly so in very young adults. A Danish study published in 2016 examined the rate of strokes in people aged 15 to 30. The annual number of strokes in that age group in Denmark rose 50 percent between 1994 and 2012, and the annual number of transient ischemic attacks (mini-strokes) in that age group tripled.[9]

I'm confused. Which is safer, low power or high power?

Neither. The higher the power, the more heat. The lower the power, the more leakage of the blood-brain barrier. The higher the power, the more your metabolism is disturbed.[10] The lower the power, the more calcium leaks out of your cells.[11] Microwave radiation injures the body in many different ways. It depends on which effect you are looking at.

What about the near field plume? Isn't a cell phone safer when it is held more than six inches away from your head?

There is no such thing as a near field "plume." The near field is simply the region near a source of radiation where the electric field is separate from the magnetic field and the strength of either cannot be exactly predicted. There is no sharp boundary between near field and far field and the fundamental properties of the radiation do not change.

What about those shielding products that you stick on one side of your phone to block the radiation in the direction of your brain?

The people who designed those products forgot that your arm, being an electrical conductor, is also an antenna. When you hold a cell phone in your hand, your whole arm, and not just the cell phone, becomes a radio transmitter that sends and receives the cell phone signal and conducts it into the rest of your body. Putting reflective material on one side of the phone doesn't do very much. To the extent that it does anything, it makes the phone work harder and actually increases the amount of radiation instead of decreasing it. The designers of those products forgot to test them on phones that someone was actually holding.

Is a cell phone safe if I use a wired headset?

In 2000, testing by Consumers' Association in the UK showed that using a wired headset actually tripled the radiation to the brain. Instead of protecting the user, the wire conducts the radiation from the cell phone directly into the user's ear and brain.[12] In addition, phones operate at greater power and emit more radiation when held below the level of the head. And if you operate one while it is in your pocket, it is irradiating your hip, colon, and reproductive organs while the headset is irradiating your brain.

Is it safe to keep a cell phone in my pocket when I'm not using it?

That's what most people do. And total hip replacements have skyrocketed. Between 2000 and 2010 the number of annual hip replacements in the U.S. more than doubled, and the rate of hip replacements among people aged 45-54 more than tripled.[13]

Rates of colon cancer among Americans aged 20-54, which had been declining for decades, began to rise in 1997 when widespread cell phone use began. The rise has been steepest and began earliest (1995) in people aged 20-29: the rate of colon cancer in young men and women aged 20-29 doubled between 1995 and 2013.[14]

Rates of prostate cancer have been rising worldwide since 1997.[15] The number of cases of prostate cancer among Swedish men aged 50-59 was stable for decades until 1996 and rose ninefold between 1997 and 2004.[16] The incidence of metastatic prostate cancer among American men under 55 increased 62% between 2004 and 2013, and nearly doubled for men aged 55-69 during the same period.[17]

Several studies have found that men who keep their cell phones on standby in their pocket or on their belt lower their sperm count by up to 30 percent.[18] A study conducted from 2003 to 2013 found that young men now had lower sperm counts than their elders, and that people born between 1990 and 1995 had on average 40

percent lower sperm counts than men born earlier.[19] Almost every study that has been conducted has found a direct relationship between cell phone use and sperm count, motility, and/or morphology.[20]

Is it safe for women to keep a cell phone in their bra?

Women in their twenties and thirties who keep their cell phones in their bras are getting a distinctive type of breast cancer directly underneath where they keep their phones.[21]

How far does the radiation from my cell phone travel?

The signal goes out forever. It does not just travel to the nearest cell tower, and it does not travel in only that direction. It goes on forever, in all directions, as long as there are no hills or objects in the way. It pollutes your entire neighborhood and it travels upward to the sun and stars. It just keeps on going.

Those few people who owned an analog cell phone back in 1996 may remember how far apart cell towers used to be. As long as there were no hills in the way, you used to be able to get a signal from 90 miles away. The only reason cell towers have to be so close together today is because a single tower can only serve a limited number of people. The more users, the more towers have to be built. Also the more bandwidth, the more towers have to be built: using cell phones as computers and not just phones means there have to be a lot more towers. That, and the fact that digital signals are more subject to interference than analog signals. But the radiation still goes on forever.

Isn't it my choice? The radiation is out there anyway, so why shouldn't I use it? I need my cell phone.

There are so many cell towers everywhere today that it is easy to assume you are not making anything worse when you make a cell phone call—that all you are doing is tapping into what's already out there, like putting one more automobile onto an interstate highway that has already been built.

That is an illusion. When everyone's phone is turned off, the cell towers are operating at minimal power on one setup channel that has to broadcast at all times in case someone wants to make a call. Things are a little more complex today because more frequencies are in use but that is the basic situation.

What happens when you turn on your phone and make a call is that the nearest cell tower has to turn on a voice channel just for you, which *also* broadcasts in every direction and *also* pollutes the whole neighborhood and goes on forever out into the universe. If you have a smart phone and use the Internet the cell tower also opens up a data channel just for you. And in order for you to reach the person you are calling, the cell tower nearest to him or her *also* has to open up a channel just for that person and send radiation in all directions and that person has to answer their phone and send more radiation in all directions. And on weekdays during the evening commute, and all day Saturday and Sunday, when everyone in the world is on their phone, every cell tower has hundreds of channels operating on hundreds of frequencies and emits much more radiation than late at night when everyone is off their phone. When your phone is off, multiple cell towers are quieter. When you are using your phone, you are polluting your own and at least one other person's neighborhood.

I only keep my phone for emergencies when I travel. That has minimal impact, right?

The other thing that happens when you make a call is you are demanding service. When you turn on your phone in a remote location where cell phone service is poor or non-existent, your provider registers that as a request for service. If it gets enough requests for service in that location, it will build a cell tower there. Even in a city, when more people make calls at the same time than there is capacity for in the nearest tower, or when everyone starts using more bandwidth or gets more apps than the tower can handle, calls start to be dropped, each dropped call is registered as a request for service, and soon your city has applications for even more cell towers to handle the increased traffic.

I got sick from a smart phone. My flip phone is much safer, right?

Smart phones didn't come among us until 2004. But the first wave of digital, voice-only cell towers in the United States in 1996 killed at least ten thousand people in a matter of months,[22] and millions more from diabetes, heart disease, and cancer in the succeeding years.[23]

How did the Cellular Phone Task Force get its name?

Pelda Levey and I named our organization the Cellular Phone Task Force in 1996 with several purposes in mind, foremost among them being that the threat to our world that we were facing was and is the cell phone. WiFi came among us in 2001, smart phones in 2004, smart meters in 2007, 5G in 2017, each building on a foundation that has become so big and so omnipresent that most people, even most of the injured, take it for granted. Like the proverbial blind men touching the different extremities of the elephant, we have become oblivious of the beast itself. The problem with smart phones isn't that they are smart, but that they are phones. Even smart meters are only an arm of the wireless torso, the central creature to which it is attached and to which our civilization and culture have become so dependent, in the short span of two decades, that we can no longer imagine that it is not only possible but necessary to live without it. Only then will we stop 5G. Only then will we keep our landlines. Only then will we save our planet.

[1] 1 jansky = 10^{-26} mW/m^2/Hz. The values given are for cell phone frequencies.

[2] Exposure decreases with the square of the distance.

[3] Cell phones are regulated by their Specific Absorption Rate (SAR), which is given in watts per kilogram (W/kg). The SAR limit for cell phones in the U.S. is 1.6 W/kg for the brain and 4 W/kg for the hands, wrists and ears. The far-field equivalents are 20 mW/cm^2 for the brain and 50 mW/cm^2 for the hands, wrists and ears.

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