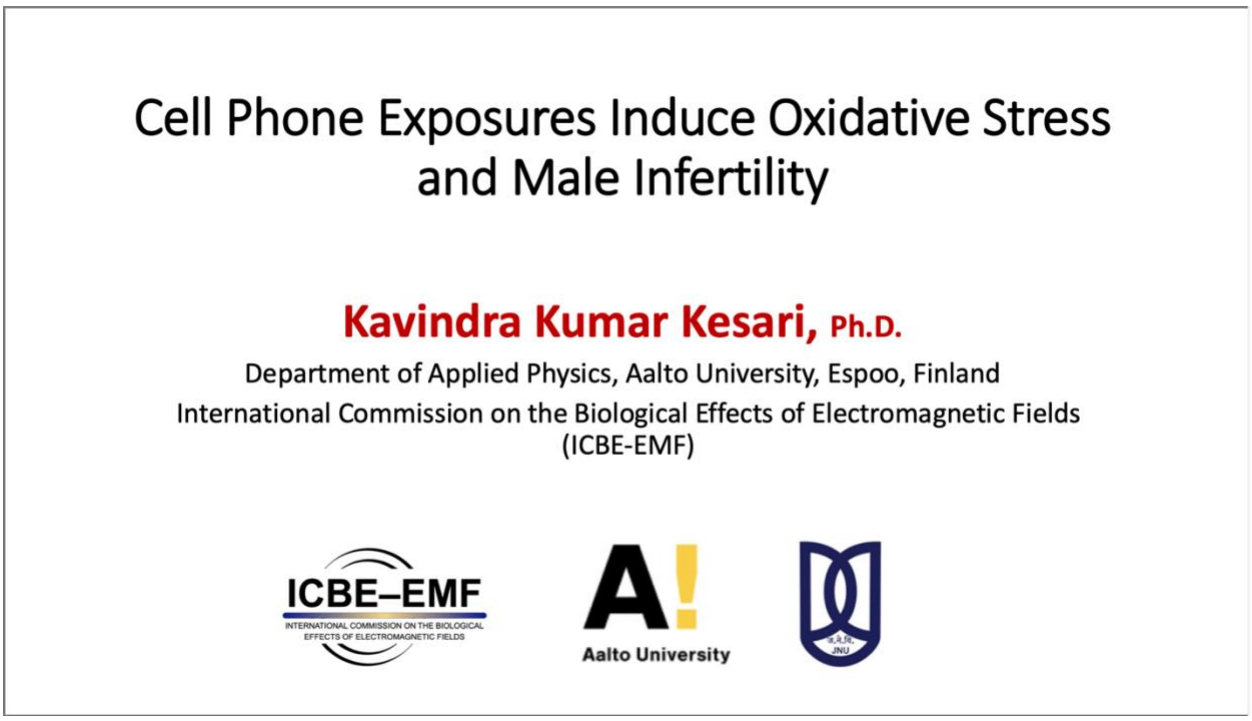
ICBE–EMF INTERNATIONAL COMMISSION ON THE BIOLOGICAL EFFECTS OF ELECTROMAGNETIC FIELDS

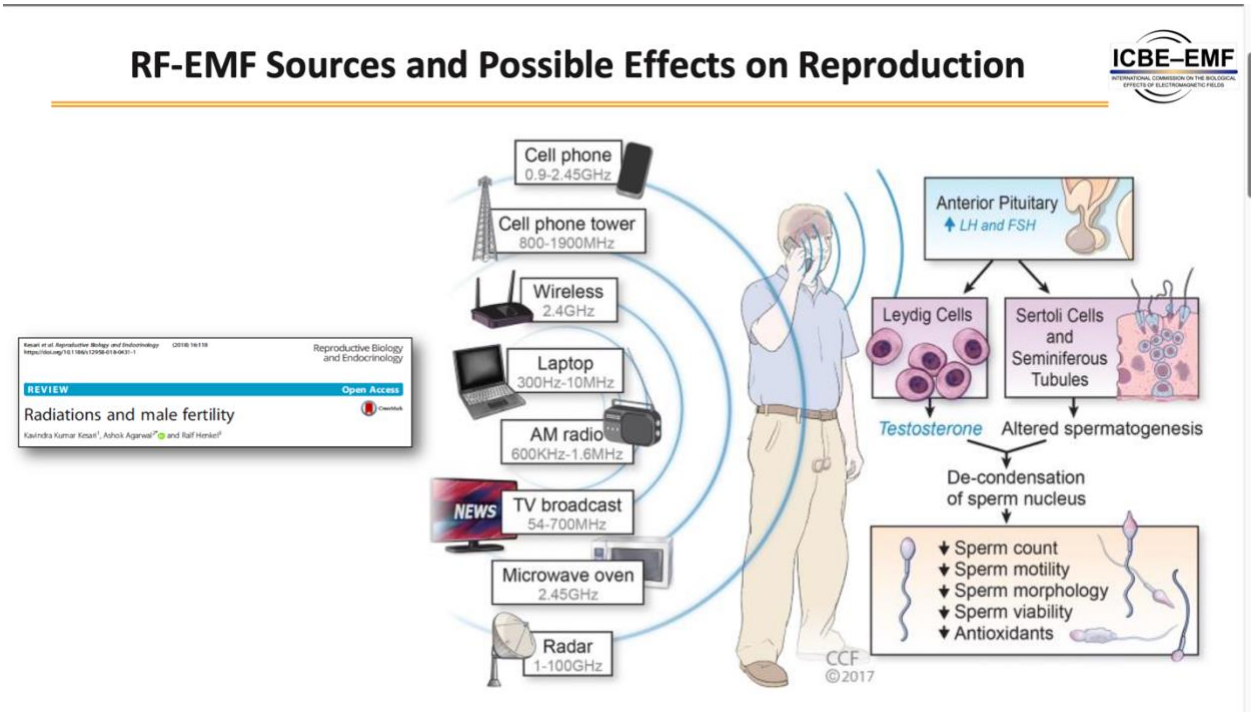
Cell Phone Radiation Impacts to Reproductive Health

WHO WE ARE Series Presentation by Kavindra Kesari PHD

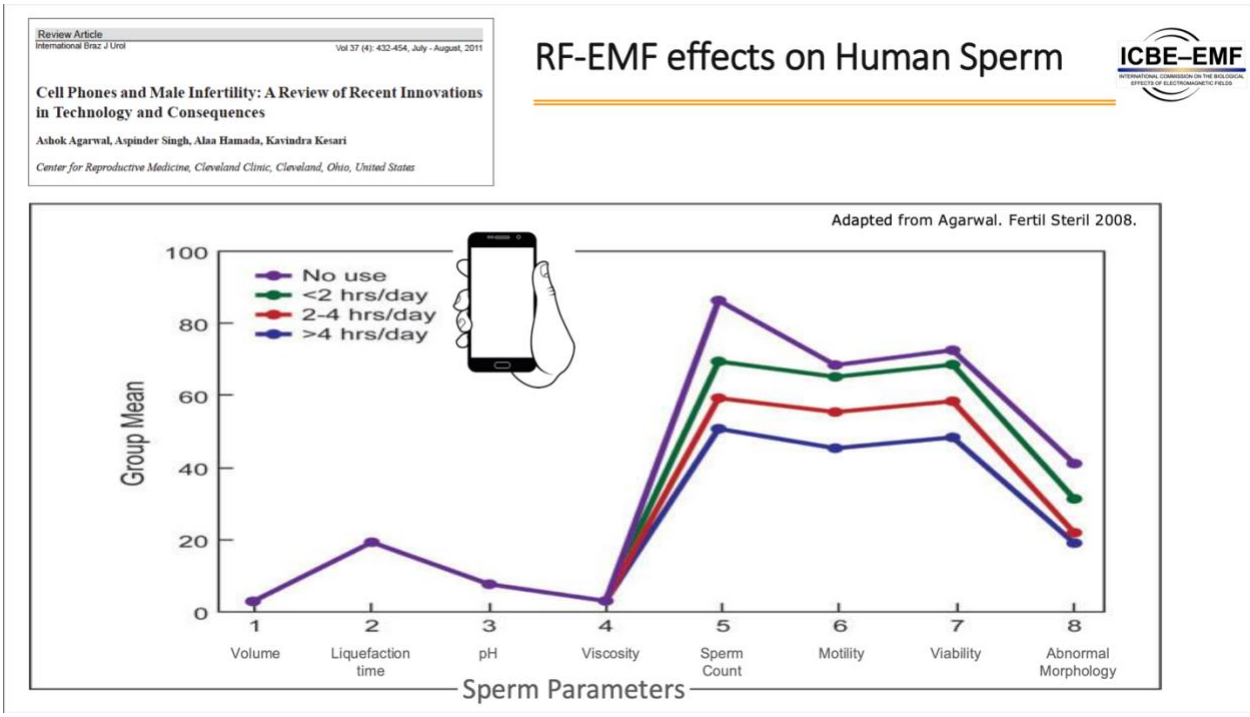
Accompanied by a slide presentation.



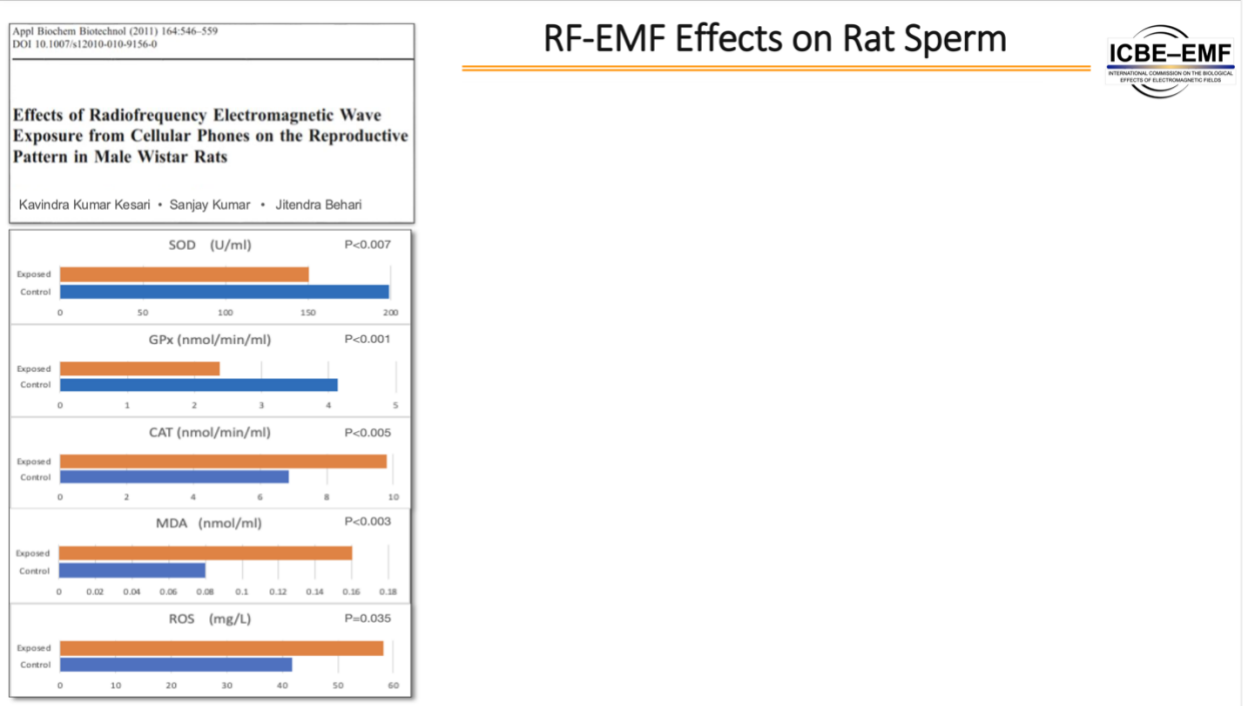
I am Kavindra Kesari. I am a Senior Scientist at Aalto University in Finland. I am also associated with ICBE-EMF as a Commissioner.



I am a radiation biologist working on cell phone exposure effects on male reproduction. This current slide shows several sources of exposure to radiofrequency electromagnetic fields and their effect on male reproduction. These exposures are mainly from cell phones, cell phone towers, routers, wireless laptops, AM/FM broadcast towers, microwave ovens, and many other sources. All these appliances emit non-ionizing radiations, and we are surrounded by these radiations in day-to-day life. Although we are surrounded by many types of radiation, however, keeping the cell phone in our trouser pockets (especially in active mode) close to the testicles causes severe changes in the sperm parameters. In this slide, our study shows that cell phone radiation affects the testicles causing reduced sperm count and affecting motility, sperm morphology, sperm variability, and sperm antioxidant parameters.

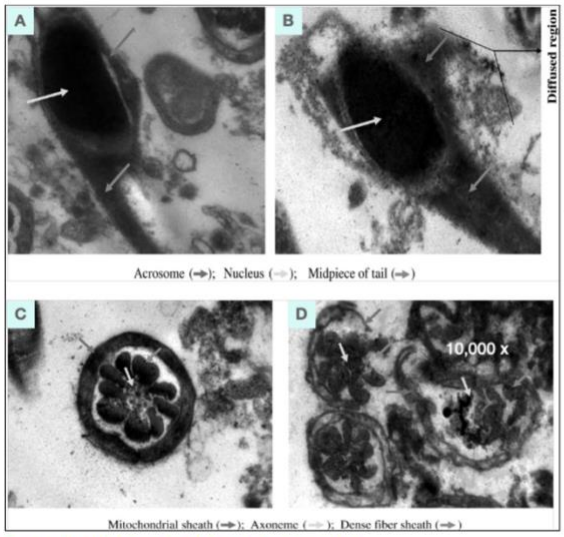


Researchers from the Cleveland Clinic, USA, are reporting that if someone is using a cell phone for two hours every day there will be some significant effects on male reproduction. Even the effects will be more severe if the person uses a cell phone for 4 hours or more every day. This may significantly affect their sperm count, motility, viability, and sperm morphology.



As you can see from this slide, animals not exposed to cell phones do not show any significant effects on male reproduction parameters. Many people in this world do not routinely use cell

phones or do not use them at all, and they do not have these effects. However, a person exposed partially or continuously to radiation may show health concerns. In our *in vivo* studies, we have measured cell phone radiation effects on antioxidant enzymes because these enzymes (SOD, GPx, CAT) play a very important role in our body. They can protect our cells from many internal and external, physical, and chemical exposures. So, if radiation is affecting the antioxidant enzymes may lead to significant changes in brain reproduction parameters. So, it has been reported on this slide that an animal being exposed to a cell phone may experience significant decreases in sperm count. The animal that is not being exposed to a cell phone shows no effects The data presented in this slide on animal studies shows radiation exposure decreases the level of superoxide dismutase (SOD), glutathione peroxidase (GPx) and also increases the level of catalase (CAT) and malondialdehyde (MDA) in male reproduction. Cell phone radiation also increases the level of Reactive Oxidative Species (ROS). ROS is especially important here because, if someone is exposed to a cell phone or other radiation-emitting devices, this increases free radicals within the cells. The increased free radical formation may attack cells and cause damage. Also in this slide, an increase in the level of apoptosis (dead cells) was measured. In the control group of animals, the apoptosis level was very low. But in the exposed animal, apoptosis levels were measured significantly high which may lead to testicular cancer.



Electromagnetic Biology and Medicine, 31(3): 213–222, 2012
Copyright © Informa Healthcare USA, Inc.
ISSN: 1536-8378 print / 1536-8386 online
DOI: 10.3109/15368378.2012.700292

informa
healthcare

Evidence for mobile phone radiation exposure effects on reproductive pattern of male rats: Role of ROS

Kavindra Kumar Kesari & Jitendra Behari

Bioelectromagnetic Laboratory, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India

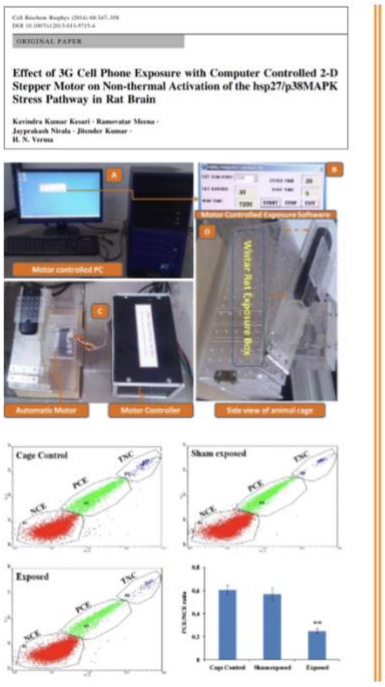
ICBE–EMF
INTERNATIONAL COMMISSION ON THE BIOLOGICAL EFFECTS OF ELECTROMAGNETIC FIELDS

Figure: A & B: section of a rat spermatozoa
(A) In a spermatozoa of an RF-exposed sperm section
(B) the nucleus was seen to be distorted (diffused) in the acrosome region.

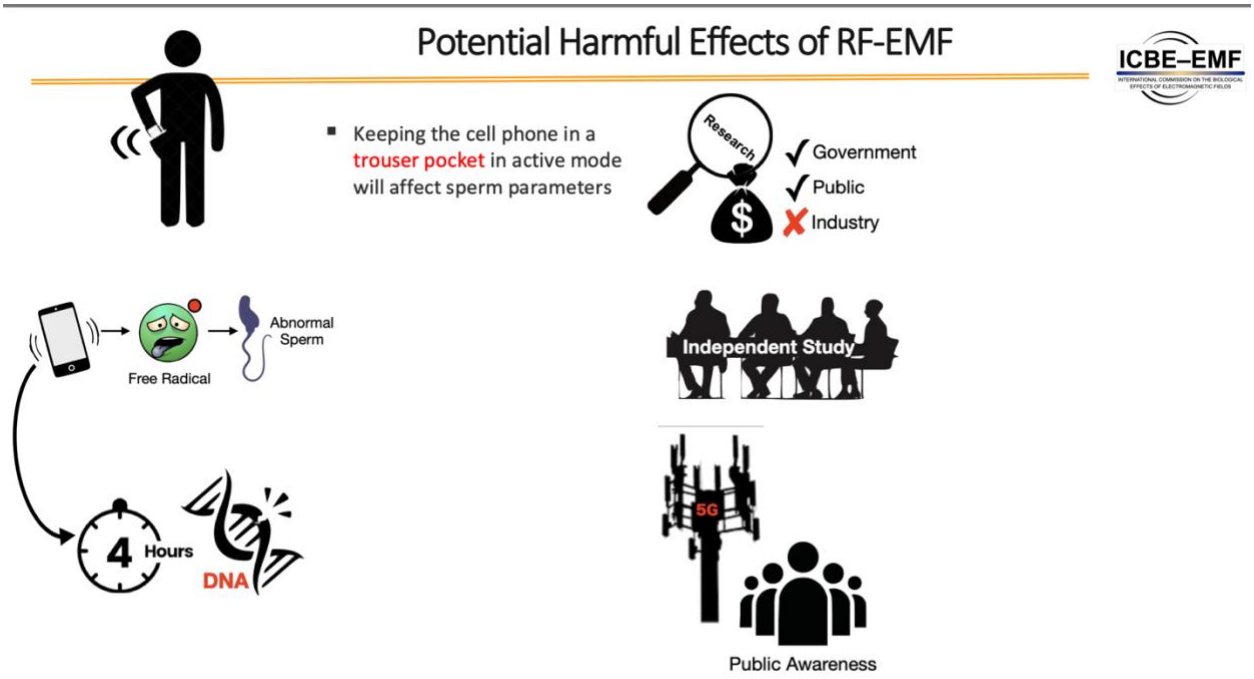
Figure C & D: Cross section of midpiece region of a spermatozoa
(C) showing whole 9 + 2 axoneme, outer dense fibers, mitochondrial sheath, and plasma membrane
(D) midpiece region, microtubules of axoneme, outer dense fibers of mitochondria, and membranes were seen to be disrupted in RF exposed.

I have also done microscopic testing on the sperm cells of these animals and, as you can see from the slide, there are four figures (A to D), where A and C show groups of normal animals that have no exposure effects. However, B and D are a group of exposed animals that show changes in sperm cell morphology. There is a significant difference between normal (control) and cell phone-exposed animals in these figures. The head of the animal sperm cell that did not receive any radiation is normal, however, the head of the sperm cell that did receive a significant level of radiation exposure has destroyed the sperm head. We found similar results in the animal sperm mitochondrial sheath. In the normal group of animals, mitochondrial sheath floral structure was

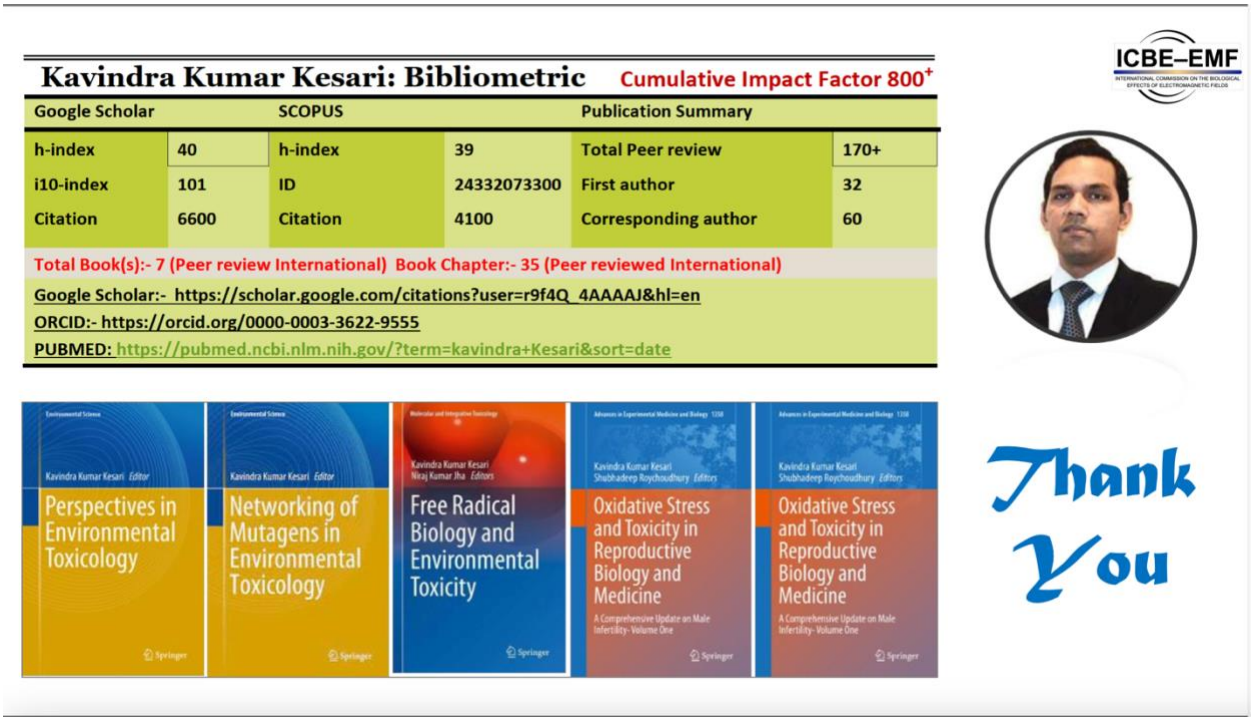
found to be normal with a total count of 9 (you can see a floral-like structure). However, one in of the exposed sperm cells, the mitochondrial sheath has been found destroyed. I also analyzed that the testosterone levels were significantly decreased in the exposed animals, as compared to the levels found in the unexposed ones.



I also did some experiments reporting cell phone radiation effects on DNA strand breaks. We have reported DNA strand breaks in animal sperm and brain cells after cell phone exposures. Based on our studies and several others, if cell phones are causing DNA damage, this could present a very serious health concern for people who are being exposed significantly. What is the concept behind this experiment? As you can see on this slide, we prepared a computational model where we tested a cell phone using a moving platform. The concept here is that we are trying to apply real exposure conditions. This platform is moving from a 0 to 30 angle continuously. It stops for 5 seconds at every 5 degrees of angle and then keeps moving. This experiment ran for two hours daily for about a one-month exposure period. So, what we found is the sperm count, and the micronuclei were decreased in the exposed group. These are extremely important parameters, especially if we are talking about genetic effects.



So, what can we do? What precautions can we take? And how is this radiation harmful? If you keep your cell phone in trouser pockets, the radiation is interacting with the testicles and that can be very harmful. Our recommendation is, when you are not using your cell phone, keep it away from your body. Cell phone exposure can increase free radical formation in your testicular organs and due to this, it may significantly decrease sperm count, motility, viability, and testosterone levels. Cell phone exposure causes DNA damage, especially when using the cell phone for long hours continuously every day and this is a serious health concern. Therefore, we need well-funded independent studies, not industry-funded studies, to be able to do assessments and obtain accurate data to apply in setting health-based exposure standards. We need more public campaigns to raise awareness and to advise people on ways to use their cell phones more safely and provide proper guidelines that how to limit their use. We should keep spreading awareness to cell phone users, to see the manufacturers provide information on the packaging of new cell phones, where they can check the value of the Specific Absorption Rate (SAR).



As a senior scientist, I have published about 150 papers and several books on environmental toxicology, including radiation and other toxic parameters. Thank you.