

The American Institute of Stress

# HEALTH AND STRESS

Your source for science-based stress management information

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JULY 2016

## Why Stress is Likely to Soar in the Next Decade





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Your source for science-based stress management information

# HEALTH AND STRESS

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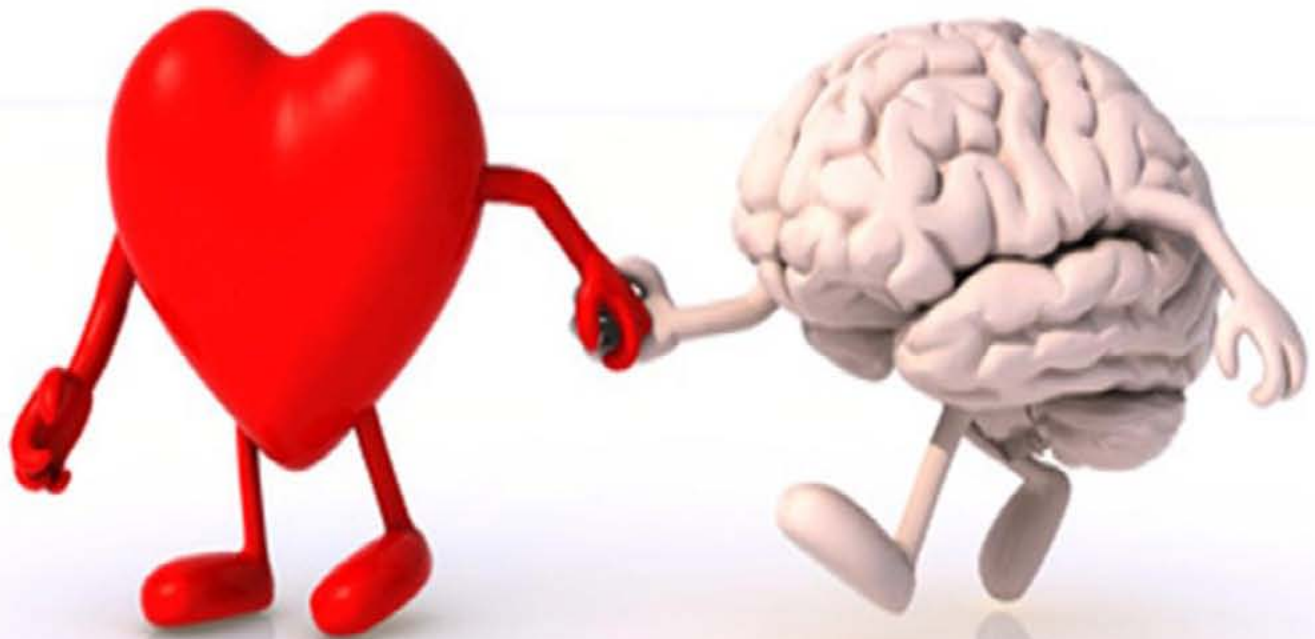
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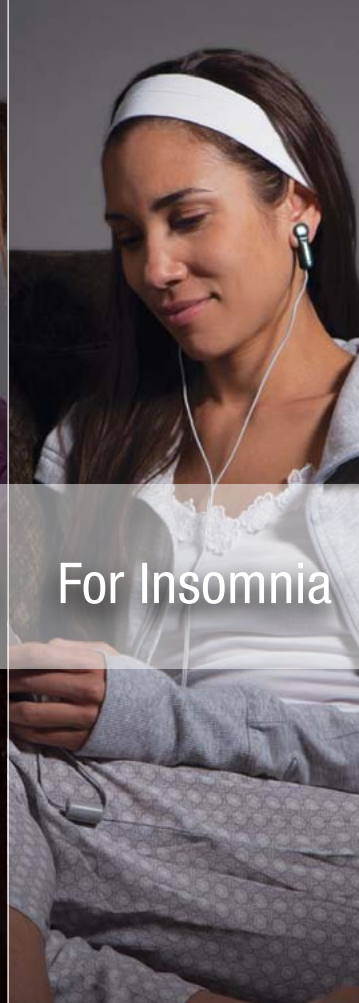
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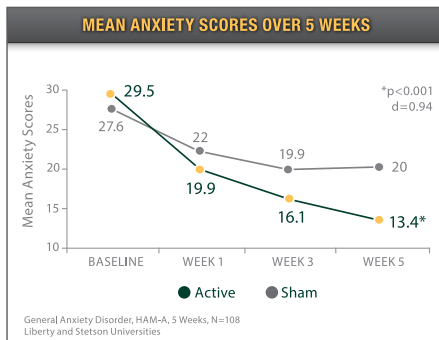


## Relieve anxiety, insomnia and depression symptoms quickly and safely with Alpha-Stim®

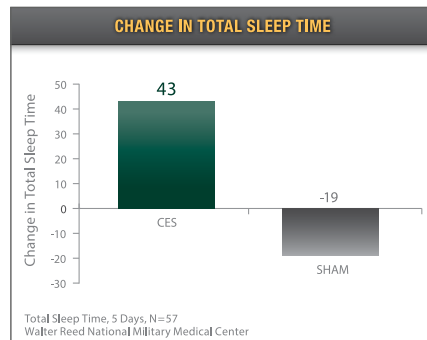
The brain functions electrochemically and can be readily modified by electrical intervention. The Alpha-Stim AID utilizes CES to deliver the only patented waveform which is clinically proven to significantly decrease anxiety and comorbid depression<sup>1</sup>.

- 82% of patients reported at least a 50% reduction in anxiety and comorbid depression scores<sup>1</sup>
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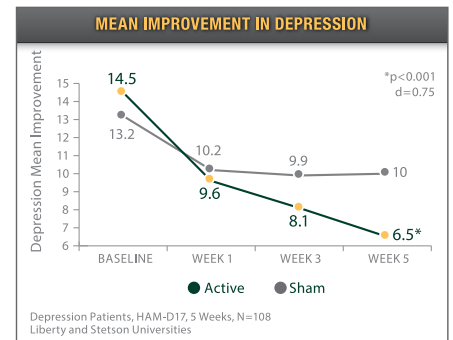
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After 5 weeks of treatment, the active Alpha-Stim CES group reported an average decrease of 75% in their depression<sup>1</sup>

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# Why Stress is Likely to Soar in the Next Decade

By Paul J. Rosch, MD, FACP



Our last three Newsletters dealt with what life will be like for our grandchildren, how technologic advances would enable us to live longer and what medical care would be like by 2050. As Winston Churchill warned, *"It is always wise to look ahead, but difficult to look further than you can see."* I was reminded of this by a summary I received of the recent Singularity University summit meeting predicting changes that will transform our lives just within the next decade or two. Singularity University is a Silicon Valley think tank that focuses on scientific progress and exponential technologies like Artificial Intelligence, robotics and 3-D printing. It was founded in 2008 by Peter Diamandis and Ray Kurzweil both of whom have been profiled in previous Newsletters as follows.

Diamandis is an engineer and physician best known for being the founder and chairman of the X Prize Foundation, which leads the world in designing and launching large incentive prizes, such as the \$10 million Ansari X PRIZE for private space flight. Kurzweil,

Google's Director of Engineering, invented the first flatbed scanner, the first omni-font optical character recognition, the first print-to-speech reading machine for the blind, the first text-to-speech synthesizer, the first music synthesizer capable of recreating the grand piano and other orchestral instruments, and the first commercially marketed large-vocabulary speech recognition program and has received 20 honorary doctorates.

His book, *The Singularity Is Near*, was a *New York Times* bestseller, and has been the #1 book on Amazon in both science and philosophy. The "singularity", refers to a time when machines will become as intelligent as humans, and subsequently much more intelligent. Singularity University offers a variety of educational programs for corporations and individuals interested in a particular technology. It also conducts an annual 2-day summit meeting in a key global city to showcase what has changed in the world of exponential technology and what startups have emerged

during the past year. What follows is a verbatim excerpt from the report I received detailing the highlights from the April summit meeting in Berlin.

In 1998, Kodak had 170,000 employees and sold 85% of all photo paper worldwide. Within just a few years, their business model disappeared and they got bankrupted. What happened to Kodak will happen in a lot of industries in the next 10 years - and most people don't see it coming.

Did you think in 1998 that 3 years later you would never take pictures on paper film again? Digital cameras were invented in 1975. The first ones only had 10,000 pixels, but followed Moore's law. So, as with all exponential technologies, it was a disappointment for a long time, before it became way superior and got mainstreamed in only a few short years. It will now happen with Artificial Intelligence, health, automatic/electric cars, education, 3D printing, agriculture and jobs.

Welcome to the 4th Industrial Revolution. Welcome to the Exponential Age. Software will disrupt most traditional industries in the next 5-10 years: Mind you, Uber is just a software tool, they don't own any cars, and are now the biggest taxi company in the world. AirBnB is now the biggest hotel company in the world, although they don't own any properties.

### **Artificial Intelligence:**

Computers become exponentially better in understanding the world. This year, a computer beat the best Go player in the world, 10 years earlier than expected. In the US, young lawyers already don't have jobs. You can get legal advice (more or less basic stuff) from IBM Watson within seconds, with 90% accuracy compared with 70% accuracy when done by humans. So if you study law, stop immediately. There will be 90% less lawyers in the future, only specialists will remain.

Watson already helps nurses diagnose cancer 4 times more accurately than human nurses. Facebook now has a pattern recognition software that can recognize faces better than humans. By 2030, computers will become more intelligent than humans.

### **Automatic cars:**

In 2018 the first self-driving cars will appear for the public. Around 2020, the complete automobile industry will start to be disrupted. You don't want to own a car anymore. You will call a car with your phone, it will show up at your location and drive you to your destination. You will not need to park it, you only pay for the driven distance and be productive while driving. Our kids will never get a driver's license and will never own a car. It will change the cities, because we will need 90-95% less cars for that. We can transform former parking spaces into parks. 1.2 million people die each year in car accidents worldwide. We now have one accident every 100,000 km, with autopilot driving that will drop to one accident in 10 million km. That will save a million lives each year.

Most car companies might become bankrupt. Traditional car companies try the evolutionary approach and just build a better car, while tech companies (Tesla, Apple, Google) will try the revolutionary approach and build a computer on wheels. I spoke to a lot of engineers from Volkswagen and Audi; they are completely terrified of Tesla.

Insurance companies will have massive trouble because without accidents, the insurance will become 100x cheaper. Their car insurance business model will disappear.

Real estate business is bound to change. Because if you can work while you commute, people will move further away to live in a more beautiful neighborhood. Cities will be less noisy because all cars will run on electricity, which will become incredibly cheap and clean.

Solar production has been on an exponential curve for 30 years, but you can only now see the impact. Last year, more solar energy stations were installed worldwide than fossil. The price for solar energy will drop so much that all coal companies will be defunct by 2025.

With cheap electricity comes cheap and abundant water. Desalination now only needs 2kWh per cubic meter. We don't have scarce water in most places, we only have scarce drinking water. Imagine what will be possible if anyone can have as much clean water as he wants, for nearly no cost.

### **Health:**

The Tricorder X price will be announced this year. There are pharmacy companies building a medical device (called the 'Tricorder' from Star Trek) that work with your phone, which takes your retina scan, your blood sample and your breath into it. It then analyses 54 biomarkers that will identify nearly any disease. It will be cheap, so in a few years everyone on this planet will have access to world class medicine, nearly for free.

### **3D printing:**

The price of the cheapest 3D printer came down from \$18,000 to \$400 within 10 years. In the same time, it became 100 times faster. All major shoe companies started 3D printing shoes. Spare airplane parts are already 3D printed in remote airports. The space station now has a 3D printer that eliminates the need for the large amount of spare parts they used to have in the past. At the end of this year, new smart phones will have 3D scanning possibilities. You can then 3D scan your feet and print your perfect shoe at home. In China, they already 3D printed a complete 6-story office building. By 2027, 10% of everything that's being produced will be 3D printed.

### **Business opportunities:**

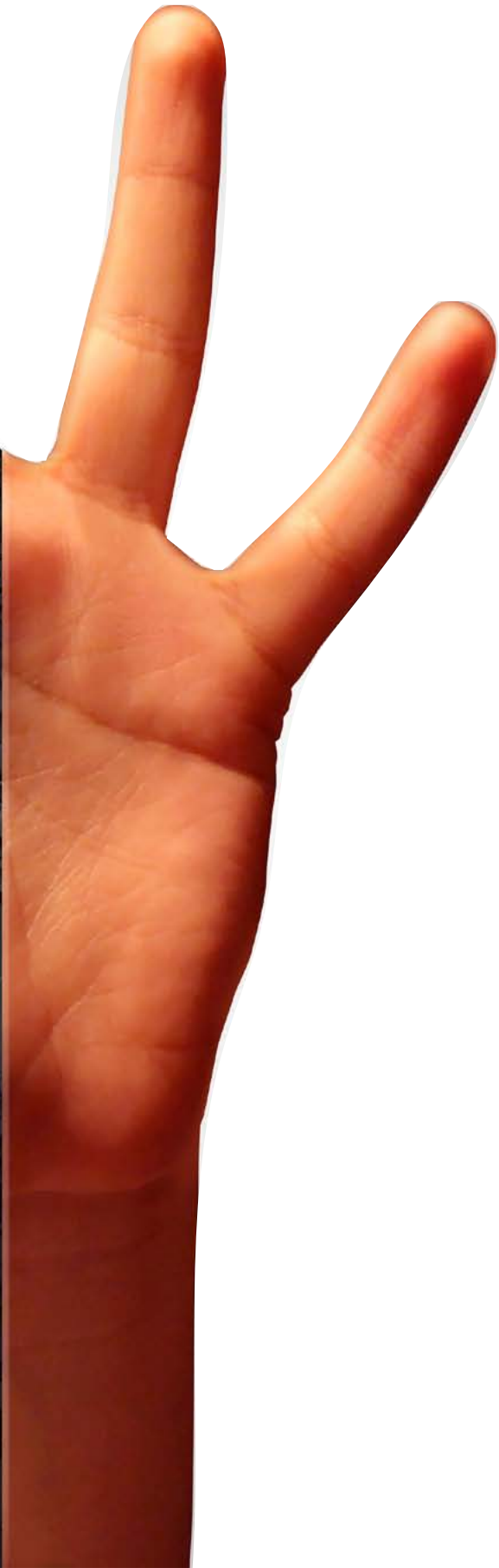
If you think of a niche you want to go in, ask yourself - in the future, do you think we will have that?, and if the answer is yes, how can you make that happen sooner? If it doesn't work with your phone, forget the idea. And any idea designed for success in the 20th century is doomed for failure in the 21st century.

### **Work:**

70-80% of jobs will disappear in the next 20 years. There will be a lot of new jobs, but it is not clear if there will be enough new jobs in such a small time.







### **Agriculture:**

There will be a \$100 agricultural robot in the future. Farmers in 3rd world countries can then become managers of their field instead of working all days on their fields. Aeroponics will need much less water. The first Petri dish produced veal is now available and will be cheaper than cow produced veal in 2018. Right now, 30% of all agricultural surfaces is used for cows. Imagine if we don't need that space anymore. There are several startups who will bring insect protein to the market shortly. It contains more protein than meat. It will be labeled as 'Alternative protein source' (as most people still reject the idea of eating insects).

### **New Apps**

There is an app called "Moodies": This can already tell in which mood you are. By 2020 there will be apps that can tell by your facial expressions if you are lying. Imagine a political debate where it's being displayed, if they are speaking the truth or not.

### **Bitcoin**

This will become mainstream this year and might even become a default reserve currency.

### **Education:**

The cheapest smart phones are already at \$10 in Africa and Asia. By 2020, most humans will own a Smartphone or a device that has access to world class education and information. Every child can use Khan academy for everything a child learns at school in First World countries about art, engineering, design, languages, science, music, mathematics, etc. We have already released our software in Indonesia and will release it in Arabic, Swahili and Chinese this Summer, because I see an enormous potential. We will give the English app for free, so that children in Africa can become fluent in English within half a year.

### **Longevity:**

Right now, the average life span increases by 3 months per year. Four years ago, the life span used to be 79 years, now it's 80 years. The increase itself is increasing and by 2036, there will be more than a one-year increase per year. So we all might live for a long long time, probably way more than 100. And this is only part of what we know about today's science and technology.

The author of this is involved in providing novel programs that teach individuals to rapidly understand new languages. I don't know how accurate some of the predictions are about work and agriculture, but if confirmed, we appear to be heading for what Alvin Toffler called "Future Shock", due to *"the shattering stress and disorientation that we induce in individuals by subjecting them to too much change in too short a time."* It is also not clear whether these changes will apply to everyone since some nations may not allow them. The biggest American technology companies appear to be headed for a global clash with governments that want to curb their practices. Amazon has already been compelled to build data centers in Germany to abide with laws on keeping personal information inside that country. Netflix must offer local content in Europe and Facebook has been forbidden from providing a limited type of free internet access. India has refused to allow Apple to sell refurbished iPhones since all smartphones must have at least 30% local parts. Europe worries about the massive computers of Google and Amazon, but not as much about similarly sized systems inside the Chinese giants Alibaba, which handles more business than any other e-commerce company, and Tencent, Asia's largest internet service with almost 2 billion users, since Chinese companies tend to stay in China. However, this could change if they are shown to be more cost effective.

Nevertheless, if artificial intelligence, driverless cars, 3-D printing, robotics and other technological advances replace workers and the population continues to increase and live longer, it will be much more difficult for young people to find a job, or marry and support a family. As Moshe Vardi, professor of computational engineering at Rice University explained in a speech earlier this year to the American Association for the Advancement of Science, *"You may also have nothing to do but laze around*

*(if you can afford it), play golf (if you can afford it) and eat (if you can afford it)." He predicts that within 30 years, unemployment will be greater than 50%, since computers will be able to perform almost any job that humans can. As he told one reporter, I do not find this a promising future as I do not find the prospect of leisure-only life appealing. I believe that work is essential to human well-being. I do not believe that technology can be stopped. The genie is out of the bottle. What we need to do is to start now thinking very hard and investing in research into how society can cope with the advance of automation. If we wait 25 years, we may find ourselves in a very difficult societal change. The Industrial Revolution brought about the Russian Revolution and the Chinese Revolution, with a human cost of about 100 million lives. I hope we are wiser this time.*

Others are also concerned. The eminent physicist Steven Hawking is worried that *"Artificial intelligence could be the worst thing ever for humanity"*, warning that *"The development of full artificial intelligence could spell the end of the human race."* He noted that the primitive forms of artificial intelligence developed so far have proved very useful, but fears the consequences of creating something that can match or surpass humans. *"It would take off on its own, and re-design itself at an ever increasing rate. Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded."* Elon Musk, founder of SpaceX, which develops and manufactures space [launch vehicles](#) and is CEO of Tesla Motors, called the prospect of artificial intelligence *"our greatest existential threat. . . . I'm increasingly inclined to think that there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don't do something very foolish. . . . I think there is potentially a dangerous outcome there."* Microsoft co-founder Bill Gates similarly indicated *"I am in the camp that is concerned about super intelligence. First the machines will do a lot of jobs for us and not*

*be super intelligent. That should be positive if we manage it well. A few decades after that though the intelligence is strong enough to be a concern. I agree with Elon Musk and some others on this and don't understand why more people are not concerned."*

Nevertheless, Google, Facebook and numerous tech companies have committed themselves to increasing the use of artificial intelligence as much as possible, without regard to any potential adverse consequences. They

insist they are all "working to make the world a better place", but others feel they are merely using it as a laboratory for their experiments, in which people are the guinea pigs. At present, all we can do is "hope for the best and prepare for the worst." Time will tell, and as one commentator replied when asked about the future, *"Ask me in 2045, when I hope to be playing golf somewhere in Portugal, while my robot caddy carries my clubs, pours my drinks and hugs me all night."*

## Update On Current Contentious Controversies - Who Can You Believe?

Are saturated fats now good for you? Do statins cause cancer or prevent it? Are generics just as effective and safe as brand name drugs? Do all carbohydrates promote weight gain? Which is more harmful, fructose or sugar (sucrose)? Should everyone restrict salt? As Mark Twain complained, *"If you don't read the newspaper, you are uninformed; if you do read the newspaper, you are misinformed."* The same holds true for watching TV and listening to the radio, which is where most of us get our news and information.

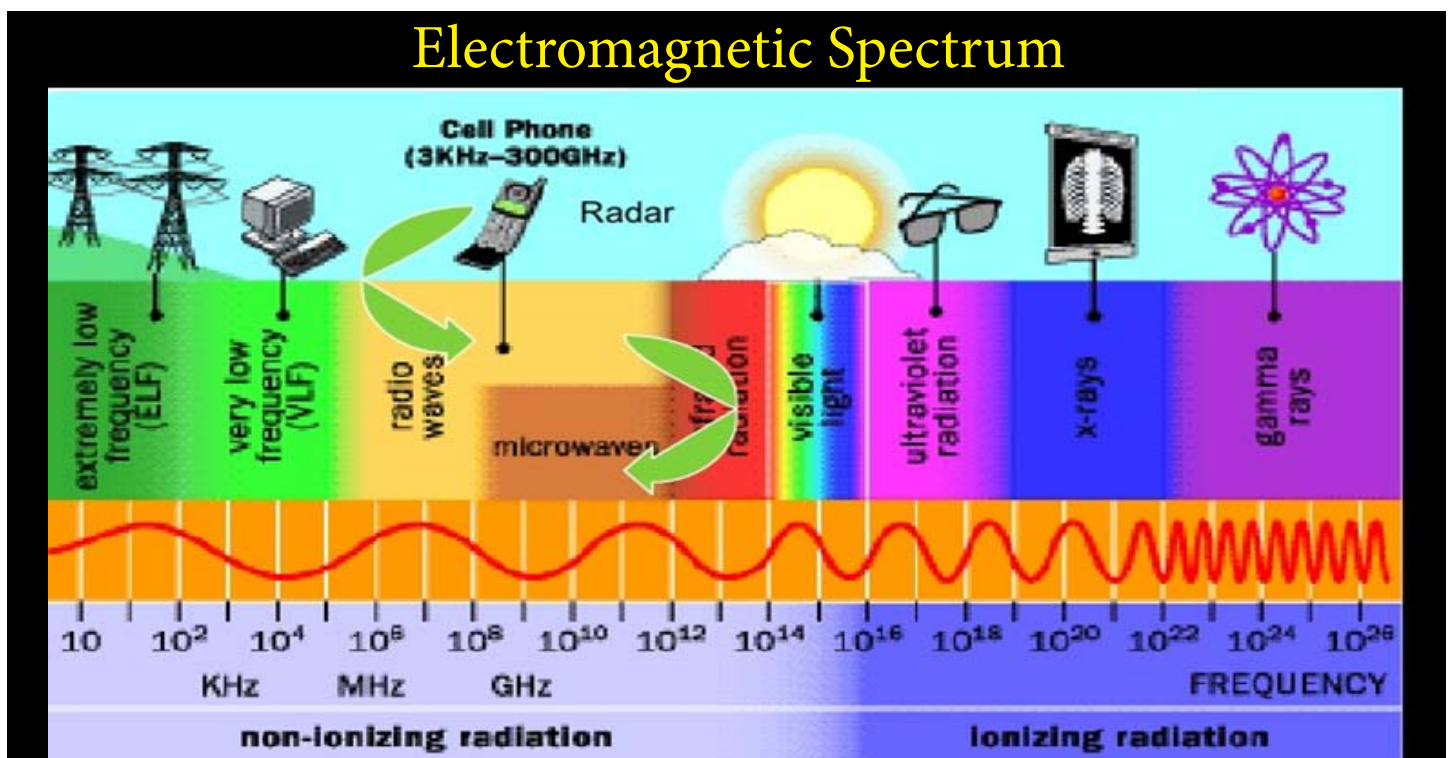
It also applies to medical journals, especially since John Ioannadis has demonstrated that as much as 90% of the published medical information that doctors rely on is misleading, exaggerated, heavily biased, or even wrong. This is especially true for drug company sponsored clinical trials that hype efficacy and ignore or minimize adverse effects. As explained in previous Newsletters, statin manufacturers present data as relative risk reduction rather

than absolute risk reduction. One ad boasts that LIPITOR REDUCES RISK OF STROKE BY 48%\*, which many will believe means that it will cut your chances of having a stroke in half. But this is relative risk. The asterisk refers to the following mice type explanation at the bottom of the page, *"\*That means in a large clinical study, 2.8% of patients taking a sugar pill or placebo had a stroke compared to 1.5% of patients taking Lipitor."* The absolute risk reduction here is a mere 1.3% and this is only in patients who are at increased risk due to family history, high blood pressure, age, low HDL or smoking. Another problem is that drug manufacturers have such power over medical journals, the media, academia and regulatory authorities, that they can prevent the publication of articles that threaten their income. Even when solid scientific studies contradict current dogma, the results can be distorted in the lay media.

# Do Cell Phones Cause Cancer? Yes, No, Or Maybe?

A good example is the heated debate over cell phone safety that has been going on for over two decades. It is no surprise that industry sponsored trials almost always give cell phones a clean bill of health, and safety standards are based on these rather than independent studies that have documented cause for concern. Those who maintain that cell phones pose no safety problems argue that the amount of non-ionizing radiation they emit is too feeble to cause any damage because their EMFs (electromagnetic fields) have no thermal or heating effects. As illustrated below, the electromagnetic spectrum consists of EMFs from varied sources that can be ionizing or non-ionizing. Ionizing radiation from X-Rays and radioactive substances generate high frequency waves that detach electrons from atoms or molecules, which changes their structure and function. These effects can be utilized for diagnostic and therapeutic purposes and

are particularly effective in detecting and treating various malignancies. Unfortunately, this is a two-edged sword, since repeated or prolonged exposure to radioactive substances or X-rays have cumulative effects that can also cause cancer. Non-ionizing EMFs include extremely low frequency and very low frequency electromagnetic fields from electrical appliances and power lines, as well as radiofrequency radiation (RF) from wireless devices such as cell phones, cordless phones, cellular antennas, and radio transmission towers. Because it was believed that these did not have enough energy to detach electrons from their orbits, it was erroneously assumed they had no cumulative biological effects. Microwave ovens emit two types of radiation, microwaves and extremely low frequency fields and since most have some leakage, it is important to avoid being near them while they are in use. Microwaves are measured in milliwatts



per centimeter squared (mW/cm<sup>2</sup>). The Russian safety limit for microwave exposure is .01 mW/cm<sup>2</sup>, but our current safety limit, established in 1993, is 1 mW/cm<sup>2</sup>, **100 times higher. Prior to that, it was a thousand times higher!**

Although cell phones emit radiofrequency energy in the microwave range, there was no safety testing prior to their availability in 1983. In fact, cell phones are the only radiation emitting devices sold without pre-market safety testing. The reason for this is that the safety standards were established by an engineering society with strong ties to telecommunication and cell phone companies, with scant or no input from physicians or health authorities. Regulatory authorities have little expertise in the biologic effects of radiation, and accepted as gospel that since cell phone emissions had no heating effects on biological tissues, there was no need for any objective safety testing.

As noted previously, at least three out of four industry sponsored studies concluded that there was no biological effect from cell phone radiation exposure. In contrast, more than two thirds of independent studies did find biological effects, including changes in DNA that have been linked to cancer, as well as a significant increase in temperature and malignant tumors in brain tissues close to the ear the cell phone was applied to.

## The Interphone Fiasco

To investigate this, the IARC (International Agency for Research on Cancer), the cancer research arm of WHO (World Health Organization) initiated the Interphone study to determine whether mobile phone use increased the risk of certain tumors. It was conducted in 13 countries and involved some 50 scientists who interviewed over 5,000 patients with either a glioma or meningioma. The cost of \$30 million was partially funded by the cell phone industry with the stipulation that they would not be involved in the

collection or analysis of the data. It began in 2000 and the results were anticipated in 2006 after it had ended. However, nothing was published until 2010 because the researchers couldn't agree on how the results should be described. Their final conclusion was that mobile phone use did not increase the risk of tumors among most cell phone users, with the possible exception of an increased risk among the 10% of users who used their cell phones the most, **which they defined as half an hour per day over ten years.**

Elizabeth Cardis, head of the project, told reporters, "We have not demonstrated that there is increased risk but neither have we demonstrated that there is an absence of risk. These findings of increased risk in the heaviest users suggest a possible association but we don't have enough scientific evidence." Thus, the Interphone study was used to support either side of this debate, as illustrated by these conflicting newspaper headlines:

"Brain Tumour Link to Mobiles" — "Mobiles Do Not Increase Risk of Brain Tumor", "Talking on the Mobile Just 30 minutes a Day Linked with Heightened Risk of Brain Cancer" — "Mobile Phones Do Not Increase the Risk of Cancer", "Call Me on My Mobile Phone ... Or Better Not?", "Study on Cell Phone Link to Cancer Inconclusive", "Study Fails To End Debate on Cancer, Cell Phone Link", "Cellphone Safety Study Sends Mixed Signals About Usage", "Cell Phone Link to Brain Tumors — Still No Clear Answers", "Interphone Points to Long-Term Brain Tumor Risks; Interpretation Under Dispute", "The Link Between Mobile Phones and Cancer Is Not Proven", "Cell Phone Cancer Study Shows Problems with Method", "Children 'Should Not Use' Cellphones", "Interphone Study Finds Hints of Brain Cancer Risk in Heavy Cell-Phone Users", "Don't Hang Up: Cellphones Don't Cause Tumors (Probably)", "Mobile Phones Reduce Brain Tumours".

One critic complained the report was biased for the following reasons:

1. The study was designed to minimize adverse effects. A regular cell phone user was anyone who made at least one call on their cell phone a week for at least 6 months. Would you expect someone who smoked at least 1 cigarette a week to develop lung cancer?
2. People who use cordless phones at home are exposed to virtually the same type of radiation but were identified as not exposed in this study. This is analogous to comparing those who smoked one brand of cigarettes with others who smoked a different brand but are labeled as "non-smokers". In addition, even those who do not use cell and cordless phones are still exposed to radiation from nearby users, cell phone antennas, wireless routers and WiFi, which is similar to being exposed to second-hand smoke but ignoring its effects. These two biases, which favor a "no effect" conclusion, were so powerful that the final result showed that cell phones prevented brain tumors!
3. Brain tumors take decades to develop in adults yet only a small fraction (less than 10%) of people in this study used cell phones for more than 10 years. You would not likely find lung cancer in a smoker within 4 to 5 years and the same is true for brain tumors.
4. Participants were restricted to those between the ages of 30 to 59 so that younger and more vulnerable individuals were excluded.
5. The two major results from the Interphone study were that short-term use of cell phones provides protection against brain tumors but long-term use increases the risk

of gliomas. The authors attributed both of these findings to biases and error but the fact is that detrimental findings from the original document were deleted and published separately as the following two appendices.

6. Appendix 1 - While the original Interphone study stated there was a decreased risk of meningiomas or no effect with cell phone use, Appendix 1 showed an 84% increase risk of meningiomas for those who used a digital phone for 1640 hours or more and those who used both digital and analog cell phones. If the type of phone used was unknown, there was a **343% increased risk of meningiomas!**
7. Appendix 2 – This mini document that was also published separately compares regular users who used cell phones for less than 2 years (as the reference population) with those who used cell phones for longer periods. One of its tables shows a statistically significant increased risk (68%) of developing gliomas for those who used a cell phone for as little as 2-4 years and 118% increased risk for those who used a cell phone for 10+ years. In the original study, these exposure categories were associated with a reduced risk of gliomas! The 40% increased risk of glioma mentioned in the original study for those who used a cell phone for 1640 hours or more becomes an 82% increase when compared with regular cell phone users, so it is easy to understand why biased reviewers removed these documents from the report and only listed them as a reference.

Numerous objections were made by others in a white paper entitled "*Cellphones and Brain Tumors: 15 Reasons for Concern, Science, Spin and the Truth Behind Interphone*" that was en-

dorsed by 50 independent scientists, physicians and other experts from fourteen countries. We listed 11 serious flaws that would cause the risk of tumors to be underestimated, such as exclusion of people who had died or were too ill to be interviewed, as a consequence of their brain tumor; the exclusion of children and young adults, who are more vulnerable; not including data collected on the 1,100 acoustic neuromas and 400 parotid gland tumors that are closest to the ear. Cell phone use had also dramatically increased since 2000-2004 when the studies were conducted, and the small "heavy cell phone user" (30 minutes a day for ten years) was not relevant, since most subjects were now on their phones for several hours a day. Many could not accurately recall their daily use.

As the lead author concluded, *"This large long term study purported to determine if there is a connection between cell phone and brain tumors will not represent an accurate risk of brain tumors within the 20% of the brain's volume where the cellphone radiation is deposited. . . . This data is already past its 'sell-by' date. Further delays in releasing the other data are not acceptable. In my opinion, the whole Interphone study has turned into a*

*scandalous and expensive fiasco."* A copy of the report can be obtained at <http://www.radiationresearch.org/pdfs/15reasons.asp>

The Interphone study shed more heat than light on this controversy, and cell phone use has continued to escalate despite additional warnings. Some have pointed out that many are using wireless headsets, which could lower the risk. In addition, more people, especially teenagers and young adults don't talk as much as they text, so there is less application to the ear. However, if the phone is in a pants or shirt pocket or under a pillow while sleeping, it is still constantly emitting radiation, even if it is not in use. Some studies have shown that increased cell phone usage was associated with an 8.1% decrease in sperm motility and a 10% decline in viability. Cell phone radiation weakens the blood brain barrier, allowing more toxins to affect the hypothalamus and pineal, which eventually leads to lower levels of testosterone. Men who complained of serious unexplained erectile dysfunction were 2.6 times more likely to keep their cell phones in a front pocket. Sleep disturbances were also more common due to suppression of melatonin secretion.



Another important factor is exposure to radiation from microwave ovens and other electric appliances, TVs and monitors. Tablet computers (Pad, iPad mini, Samsung Galaxy, Google Nexus 7) and even e-readers such as Kindle and Nook all use RF (radiofrequency) signals like WiFi to connect to the internet so there is constant transmission and reception. Some studies suggest that exposure to RF radiation may be linked to Parkinson's and Alzheimer's disease, behavioral changes, autism, asthma, insomnia, childhood obesity and development, attention deficit disorder, and can impair brain activity

and child development. More specifically, tablet radiation exposure can lead to fertility issues in both males and females, DNA fragmentation, and skin problems.

The importance of this is underscored by a recent survey showing that U.S. teens spend about nine hours a day watching TV, videos and movies, playing video games, reading, listening to music and checking social media for their enjoyment. That's more time than they typically spend sleeping, and does not include time spent using media at school or for their homework. Some 13-year-olds check social media





100 times a day and tweens, 8 to 12-year-olds, spend an average of six hours on their laptops, smartphones and tablets. Children are using cell phones more often and at younger and younger ages, and with smaller ears and thinner skulls, absorb more radiation from cell phones than adults. In addition to brain damage, their developing organs would likely be more vulnerable, but these harmful effects may not be apparent for decades.



We have also become increasingly dependent on cell phones. A recent Motorola survey found that 54% percent of respondents would save their smartphone over their cat if a fire broke out. One in six smartphone users take their phone into the shower with them, and 26% percent would give up sex for a weekend rather than give up their phone. And it's going to get worse. The free Google Translate app allows you to translate 90 languages with the new text being overlaid on your Android or iPhone screen, even if you don't have an internet connection. This is useful when trying to decipher a menu in a foreign language. There is also a speak-to-translate option, the ability to translate images taken with the camera and to translate your speech into text in another language. Some people are essentially connected to their phones 24/7 since we now have technology built into our watches, shirts and shoes, and some experts predict that

phones or similar devices using wireless technology implanted in a hand, arm or skull could be commercially available by 2023. Pacemakers to keep hearts beating and cochlear implants to improve hearing have been in use for decades, and devices that connect to cell phones are already available to monitor glucose levels in diabetics, track activity levels for patients on heart monitors, and to detect certain diseases. In addition to mobile banking, you can purchase something on line by touching your iPhone's fingerprint sensor to buy it through Apple Pay. iPhones can now also pay parking meters in many cities in the U.S., Canada, U.K. and France. If you forgot to lock the doors, turn off the lights, or turn on a security camera, simply tell Siri to do it on your Apple TV. And if this is not available, use the new iPhone "Home" app and it will relay the message to your Apple TV. Siri can also direct your Mac to open a file or play music.

All of these as well as future advances increase our exposure to RF radiation, which regulatory authorities, cell phone manufacturers and the wireless industry maintain pose no health hazards, despite mounting contrary evidence. Their argument has been that such non-ionizing radiation could not affect tissues if it had no heating effect. However, one study found that those who logged the most amount of hours on their cell phones were twice as likely to develop gliomas compared to those who used them the least. Those who used either a cell phone or cordless house phone for more than 25 years had triple the risk of glioma, compared to those who had used wireless telephones for less than one year. In addition, current exposure guidelines are based largely on knowledge about acute injury from thermal effects, not long-term, low-level exposure.

To settle this dispute, the National Institute of Environmental Health Services funded a \$25 million study in an attempt to provide some definitive answers. To insure that the

results would be accepted by both sides, the protocol for this experiment was negotiated over a long period of time by experts with opposing views and was conducted by NTP (National Toxicology Program) to minimize any bias or conflicts of interest. NTP was established in 1978 to address congressional concerns about the health effects of chemical agents in the environment. It is composed of highly regarded toxicologists with expertise in carcinogenesis and no known conflicts of interest. In addition to chemical carcinogens, the FDA, which regulates radiation exposure, asked NTP to determine whether there was any association between cellphones and cancer.

These experiments were done on rodents, since all known human carcinogens induce tumors in these animals when administered in adequate doses. Rodents are also used to determine toxicity and carcinogenicity because it would be unethical to intentionally expose humans to agents that could cause an adverse health effects, especially cancer, which has a long latency period between exposure and clinical manifestations. Investigators had to design special equipment that would expose rodents to the RF energy from cellphones without raising the temperature of body tissues. In the first phase of the experiments, over 2,500 rats received varied amounts of RF exposure for approximately nine hours a day that were comparable to those humans might be exposed to in a wireless electronic environment.

The results showed an incontrovertible and statistically significant increase in 2 types of tumors, glioma, a tumor of the glial cells in the brain, and malignant schwannoma of the heart, which is very rare. None of the unexposed control rats developed either type of tumor. The Interphone study also found an association between cell phone use and gliomas and several epidemiological studies have linked cell phones to both gliomas and Schwann cell tumors. The myelin sheath of the nerve that connects the

inner ear to the brain is made of Schwann cells that can give rise to acoustic neuroma tumors. At least four different epidemiological studies have reported an association between the use of cell phones and acoustic neuromas. In another study, rats that received a single low-dose of gamma radiation early in life and were then exposed to RF magnetic fields, subsequently had higher rates of breast cancer, leukemia/lymphoma, and the rare but potentially lethal malignant schwannoma of the heart.

Senior officials, including Dr. Michael Wyde, who directed the study, felt an immediate public alert was warranted because of the following:

1. Most of us are exposed to the intermittent amount of RF radiation used in the study and given the widespread use of cell phones, even a small increase in disease incidence could have major public health implications.
2. There is a very high level of public and media interest in the study.
3. The tumor types observed in these studies are identical to those found in human studies of cellphone users.
4. The results confirm prior classification of radiofrequency radiation as potentially cancer-causing in humans and this classification needs to be upgraded. Current safety standards established by the FDA and FCC may also need be revised.

The rats had been exposed to three different whole body exposures and two different types of cell phone radiation, and there was a significant dose-response relationship. Since as the intensity of the radiation increased, so did the incidence of cancer. One authority, who had been involved in designing the study, explained that it had *“tested the hypothesis that cell phone radiation could not cause health effects and that*

*hypothesis has now been disproved. . . . This is a major public health concern because the cells which became cancerous in the rats were the same types of cells as those that have been reported to develop into tumors in cell phone epidemiological studies. For this to be a chance coincidence would be truly amazing."*

The preliminary report was released on May 26, and as might be expected, made national headlines, including the following:

- "Game-Changing" Study Links Cellphone Radiation to Cancer (Mother Jones)
- Cellphone-Cancer Link Found in Government Study (WSJ)
- Questions abound after study links tumors to cellphone radiation (Science)
- Major US study links cellphone exposure to cancer — at least in rats (STAT)
- Major cell phone radiation study reignites cancer debate (Scientific American)
- Government study finds link between cell phones and cancer in rats (Yahoo!)
- Cellphone Radiation Linked to Cancer in Major Rat Study (IEEE Spectrum)
- Massive government study concludes cell phone radiation causes brain cancer (Natural News)

Dr. Christopher Portier, former Director of CDC as well as the NIH National Institute of Environmental Health Services, has been investigating this issue for decades and helped launch the study. He told reporters *"This is by far—far and away—the most carefully done cell phone bioassay, a biological assessment. This is a classic study that is done for trying to understand cancers in humans. There will have to be a lot of work after this to assess if it causes problems in humans, but the fact that you can do it in rats will be a big issue. It actually has me concerned, and I'm an expert."* The chief medical officer of the American Cancer Society hailed the report as "good science" and represents a "paradigm shift in our understanding of radiation and cancer

risk. . . . The findings are unexpected; we wouldn't reasonably expect non-ionizing radiation to cause these tumors. This is a striking example of why serious study is so important in evaluating cancer risk. Kids don't talk on cell phones anymore, they text. If the link between cell phone radiation and cancer is real, that may be a good thing". *Consumer Reports* called the results "groundbreaking", noting that it could dramatically shift the national debate over cell phone safety and force the CDC to reinstate the cautions it previously deleted from its web site. Both groups abandoned their long-held wait-and-see positions and urged people to limit their cell phone and other exposures as much as possible.

Cell phone manufacturers and other vested interests were quick to respond, noting that only male rats were affected and mice studies, although not completed, showed no tumors. And because of their clout, most of the mainstream media were skeptical. The *Washington Post* ran its story under the headline, "[Do Cell Phones Cause Cancer? Don't Believe the Hype.](#)" The *New York Times* featured an article entitled "Why It's Not Time to Panic About Cell Phones and Cancer" by Aaron Carroll, a pediatrician who noted that brain tumor rates had actually fallen since cell phones were introduced, and listed other reasons why the study was "imperfect". Each of these was refuted point by point in order to "correct numerous and misleading statements" by Dr. Ron Melnick who helped design the study.

The *New York Times* also downplayed the findings in a video by Gina Kolata, its senior journalist for science and health. This is not surprising since Mexican billionaire telecom magnate Carlos Slim, the world's second richest person, who is Chairman and Chief Executive of telecommunications companies [Telmex](#) and [América Móvil](#) and owns wireless assets globally, is the largest shareholder of New York Times stock. Kolata's opinion also clashed

sharply with a *Wall Street Journal* video featuring reporter Ryan Knutson, which concluded that the study supported the growing body of science showing an association between cell phone radiation and brain tumors. Space constraints preclude listing all the criticisms but the most common ones were listed by Dr. Joel Moscowitz, a Director of the School of Public Health, University of California, Berkeley in a recent presentation titled "Spin vs. Fact" along with the reason these are misleading, as follows:

**Spin** – Faulty conclusions. Dr. Michael Lauer, deputy director for extramural research at NIH, *"I am unable to accept the authors' conclusions"*.

**Fact** – The NTP is world renowned for the quality of its research and experts like Drs. Portier and Melnick agree that this is "by far the most carefully done cell phone" toxicology study of RF carcinogenic effects. All of Lauer's criticisms by Lauer and others were rebutted in the study report.

**Spin** – The study reported a "low incidence of tumors in the brain and heart in rats exposed to RF radiation.

**Fact**- The study found that one in twelve (8.5%) of the 540 male rats exposed to cellphone radiation developed cancer or pre-cancerous cells as compared to none of the 90 rats in the control condition.

**Spin** – The relevance of animal studies to humans is questionable.

**Fact** – The cells that developed tumors are the same cells that show elevated tumor risk in studies of long-term, heavy cellphone users, and rats are the preferred animal model for carcinogenicity studies.

**Spin** - The IARC (International Agency for Research on Cancer) rated cellphone radiation a "possible" human carcinogen (Group 2B), the same rating they gave to coffee, pickled vegetables, talc and diesel fumes.

**Fact** - Major studies published since the 2011 IARC classification consistently found that long-term, heavy cellphone users had an increased risk of brain tumors. This report confirms that RF radiation can cause cancer.

**Spin**- Prior research such as the Danish Cohort Study and British Million Women Study contradicts the National Toxicology Program report.

**Fact** - The Danish study has been criticized by many scientists for excluding heavy cellphone users and other defects. The British Million Women was originally designed to investigate the carcinogenic role of hormone replacement therapy in women over 50. Follow-up was only seven years, and while it did not show a statistically significant increase in gliomas or meningiomas, there was increased risk of acoustic neuromas with long-term users vs. never users, which increased with duration of use. As with tobacco and asbestos, it can take decades for the effects of a carcinogen to surface.

**Spin** - Epidemiological studies fail to show an increase in malignant brain tumor incidence since 1992 even though cellphone use has skyrocketed.

**Fact** - The incidence of nonmalignant tumors has significantly increased in the U.S. since cellphones. More importantly, several studies have reported an increase of over 3% a year in glioblastoma multiforme, the most aggressive and lethal type of brain cancer since the advent of cell phones. One found that the incidence more than doubled over the period 1989-2010 and these malignancies occurred in parts of the brain in close proximity to where the cell phones were held. Brain cancers can take decades to develop, so it is premature to see overall increases in the general population

**Spin** - There is no mechanism to explain how cellphones could cause cancer. Unlike ionizing radiation, non-ionizing radiation from cell-phones cannot damage DNA.

**Fact-** A review of this claim reported that in 93 of 100 studies, RF exposure produced a cellular stress response known to produce DNA damage and cancer. This study also found evidence of DNA damage. In addition, several papers have presented different mechanisms that explain how RF from cell phones and other types of non-ionizing radiation can cause cancer.

**Spin** - The research has not yet been peer-reviewed. The findings are preliminary and it

is premature to conclude we should take precautions or change policy.

**Fact** - The NTP report has been peer-reviewed by experts and some of these reviews appear in the report along with the authors' responses. These are not preliminary findings since the ability of cell phone RF to produce gliomas and schwannomas is indisputable. The government released this partial report because the results "could have broad implications" for the public.

## Can Anything Be Done To Prevent Brain Tumors and Other Problems?

Brain tumors are not the only problem. The National Safety Council reports that cell phone use while driving leads to 1.6 million crashes each year. 1 out of every 4 car accidents in the United States is now caused by texting and driving and 11 teens die every day as a result of this. Texting while driving is 6 times more likely to cause an accident than drunk driving. 48% of drivers admit to

answering their cell phones while driving, and 58% of those that do continued to drive while talking on the phone even though it is illegal in most states, and some include hands-free conversations as well. Legislation has been proposed that would completely ban talking and texting while driving, even with hands-free devices in all states.



Over 90% of U.S. adults own cell phones and there are almost as many cell-phone subscriptions (6.8 billion) as there are people on earth (seven billion). Since almost everyone will be relying more and more on smart phones because of future enhancements, what can be done to lessen their adverse effects on as well as others? Authorities have the following 10 recommendations:

1. Save for life-threatening emergencies, children should not use a cell phone, or a wireless device of any type. Children are far more vulnerable to cell phone radiation than adults due to their thinner skulls and developing immune systems and brains.
2. Keep your cell phone use to a minimum and turn it off as much as possible since it emits radiation intermittently, even when it is not in use. Consider a landline phone at home and at work and forward cell phone calls to landlines whenever possible.
3. Reduce or eliminate your use of other wireless devices, especially wearable ones like smart watches, which emit extremely high levels of radiation.
4. If you use a portable home phone, use the older type that operates at 900 MHz since these are more likely not to keep broadcasting when not being used. This can be measured with RF meters that go up to 8 Gigahertz. Another red flag is that any home phone labeled DECT (digitally enhanced cordless technology) constantly emits radiation.
5. Try to keep the base station at least three rooms away from where you spend most of your time, especially your bedroom, or turn it off before you retire at night and forward calls to a landline.
6. Limit cell phone use to areas with excellent reception since the weaker the reception, the more power your phone uses to transmit and the more radiation it emits.
7. Avoid carrying your cell phone on your body, and do not sleep with it below your pillow or near your head. Placing a cell phone in a bra, shirt pocket over the heart or in a man's pocket is also dangerous, so keep it in a purse or carrying bag whenever possible.
8. A wired headset keeps the cell phone farther away but if it is not well-shielded, and most of them are not, the wire itself can act as an antenna attracting and transmitting radiation directly to your brain. Better headsets use a combination of shielded wire and an air-tube that operates like a stethoscope and transmits the sound to your head as a sound wave rather than a wire that goes to your head.
9. There is no such thing as a "safe" cell phone so don't assume one cell phone is safer than another. A specific absorption rate (SAR) for a phone only evaluates its thermal effects, which have been shown not to be an accurate measure of biological safety. Frequencies, peaks, pulsing and other signal characteristics are also biologically active and the longer one is exposed, the greater the risk.
10. Respect others who may be highly sensitive to cell phone radiation. Some people can feel the effects of others' cell phones in the same room, even when it is on, but not being used. If you are in a meeting, on public transportation, in a courtroom or other public places, keep your cell phone turned off out of consideration for its "second hand radiation" effects. Children are also more vulnerable, so avoid using your cell phone near them.

It is **not likely** that most people will follow all of the above suggestions since it is not clear how effective they will be and many are not concerned about possible damage in 20 or 30 years. Nobody wants to give up their cell phone and some refuse to believe they are dangerous, especially since regulatory agencies maintain they are safe. Others predict an epidemic of cancers in 30-40-year-olds in the near future because of the explosive growth in smartphone usage among teens and young children. More importantly, insurance firms have begun forecasting brain tumor costs between 2020-2030 and refuse to cover mobile phone health claims.

To protect themselves, wireless carriers like AT&T, Verizon Wireless, T-Mobile and Sprint-Nextel have a clause in their lengthy contracts that **few people read, in which you waive your right to sue, to participate in a class action lawsuit, or to appeal any health claim lawsuit.**

Instead, you agree to accept private, corporate-run “forced arbitration” proceedings to settle disputes. The only venue where you can obtain relief is a small claims court, where the limit is \$10,000, and \$5,000 or less in many states. T-Mobile is unique in its forced arbitration opt-out policy, but it must be completed within 30 days of activation to be valid, so read your contract carefully.

Lawsuits in the U.S can be based on (1) A design defect in which the foreseeable risks of harm posed by the product could have been

reduced or avoided, (2) Inadequate instructions or warnings that the product may not be reasonably safe, or 3) The seller’s failure to provide a health warning after the time of sale. Because our safety standards are so lax, there has never been a successful cell phone radiation product liability lawsuit against the cell phone industry in the USA. However, elsewhere, court

documents have been so damaging that the wireless industry frequently settles out of court. A middle-aged Israeli man who claimed that cell phone use caused an aggressive lymphoma near his left ear where it was usually applied, received \$400,000 in a settlement. Whether such successful suits will have any influence here is uncertain, but there is mounting pressure on regulatory groups to make and enforce stricter standards that could make this likely.

All of this will undoubtedly intensify the current dispute, with

numerous claims and rebuttals in the press. It is important not to accept anything at face value alone, but to determine the facts, regardless of the presumed reliability of the source. As with the *New York Times*, other publications as well as prestigious organizations may be biased due to influences that are not always apparent. There is much more that could be added about this and other developments in the cell phone saga — so stay tuned!

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