

Your Cell Phone— Helpful...or Hazard?



Dr. Jerry C. Elliott
Former NASA physicist/DMin
Member, Sigma Xi Scientific Research Society



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Your Cell Phone

- ◆ Useful tool
- ◆ Handy communication gadgets
- ◆ Potential lifesavers
- ◆ Emergencies/Disasters
- ◆ Convenient
- ◆ Portable
- ◆ Fairly low cost
- ◆ Easy to operate
- ◆ Small
- ◆ Menacing distraction
- ◆ Potential danger to our health
- ◆ Radiation is invisible, intangible and enters and leaves our bodies without our knowledge or consent

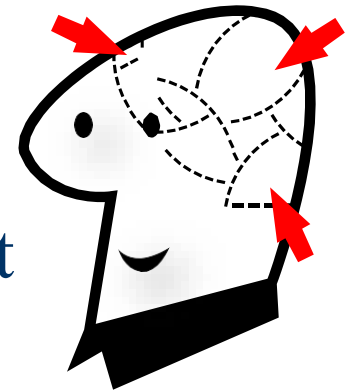
Quotes

- ♦ “It is irresponsible for users to continue gambling with their health when they don’t have to.”, *Les Wilson, London-based Microshield Industries*
- ♦ “None of the evidence provides any clear indications of adverse health effects”
—*Dr. Daniel Krewski, Royal Society of Canada, but also affiliated with an industry-established body to provide the public with info about phones and health*
- ♦ “We have evidence of genetic damage (and) of an increase in the risk of tumors.”—*Dr. George Carlo, Washington based epidemiologist and lawyer*
- ♦ “It’s wise not to use cell phones excessively”—*Margaret Young, Brain Tumour Foundation of Canada*
- ♦ ““We now have some direct evidence of possible harm from cellular phones”
—*ABCNEWS 20/20*
- ♦ “Exposing the body and brain to the radiation they emit could be ill-advised”
Isaac Ro, Aberdeen Group analyst
- ♦ “This is the first generation of people in history that has put relatively high-powered transmitters against the head”—*Dr. Ross Adey*

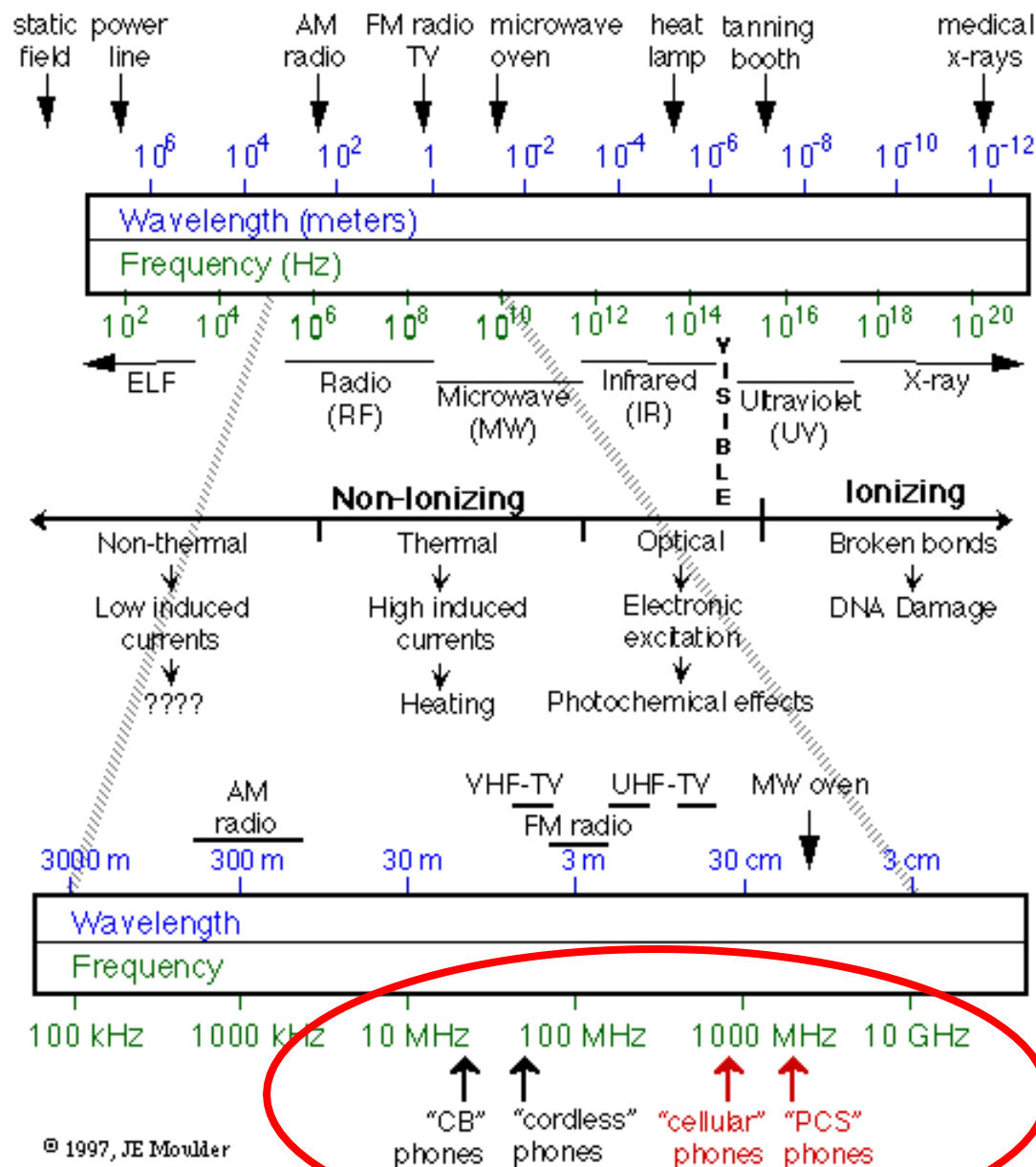


How Do They Work?

- Emit radio frequency radiation that transmit through the antenna on your phone
- Antenna lies next to your brain
- RF pulses off the device's antenna next to the user's head



The Electromagnetic Spectrum



Effects



Thermal & Non-thermal Effects

Reported Symptoms & Diseases Attributed to EMF

- ♦ Alzheimer's disease
- ♦ Anxiety
- ♦ Asthma
- ♦ Birth defects
- ♦ Blood pressure increases
- ♦ Brain cancers and tumors
- ♦ Burning sensations
- ♦ Calcium ion changes
- ♦ Chemical sensitivity
- ♦ Chronic fatigue
- ♦ Chronic stress
- ♦ Crohns disease
- ♦ Depression
- ♦ Diabetes
- ♦ Disorientation
- ♦ EEG changes
- ♦ Epilepsy
- ♦ Eye and ear discomfort and pain
- ♦ Numbness
- ♦ Multiple sclerosis
- ♦ Facial rashes and swelling
- ♦ Fibromyalgia
- ♦ Genetic damage
- ♦ Gliomas
- ♦ Hair loss
- ♦ Headaches
- ♦ Heart disease
- ♦ Kidney damage
- ♦ Leukemia
- ♦ Lymphoma
- ♦ Melatonin reductions
- ♦ Memory loss
- ♦ Tinnitus
- ♦ Thyroid cancer
- ♦ Testosterone reductions
- ♦ Sleep disorders
- ♦ Parkinson's disease
- ♦ Meningiomas

...And more!

RF Radiation

Thermal Effects

- ◆ Thermal effects are those caused by the rise in temperature produced by the energy absorbed from oscillating electric fields
- ◆ Force produced by an electric field on charged objects, such as the mobile ions present in the body, causes them to move
- ◆ Results in electric currents, and the electrical resistance of the material in which the currents flow results in heating

RF Radiation

Thermal Effects

- ◆ This heat input causes the temp to rise and it continues to do so until the heat input is balanced by the rate at which it is removed
 - Mostly by blood flowing to and from other parts of the body
- ◆ It takes several minutes from the moment RF exposure occurs for the irradiated parts of the body to reach their final equilibrium temps
- ◆ The equilibrium temperature arising from the pulsed fields of mobile phones will be determined by the *average power* absorbed

RF Radiation

- ◆ While engineers and nuclear physicists are only concerned with the amount of energy absorbed by the human body, most researchers in the field are trying to work out what effects **variations in radio-wave type** (frequency, pulse, pulse-shape, confused or coherent, etc.) may have -- **not** just the **amount absorbed**.

RF Radiation

Heating in the Head

- ◆ It has not yet proved possible to measure these small changes in temp directly, except those at the outer skin (*Adair, 1999*)
- ◆ Although temperature is a more direct determinant of thermally induced tissue damage, the majority of theoretical studies up to the present time have restricted themselves to the computation of SAR alone

What Does It Do?

The Facts...

- ◆ Any potential health risk would be the result of low levels of radiation being absorbed by body tissue
- ◆ Cell phones send radiation into users' brains
- ◆ Approx. half of a cell phone's radiation penetrates about a centimeter into the head and hands of the user when it is held close to the ear



Laws & Standards



How Do They Measure SAR?

Specific Absorption Rate

- ◆ A way of measuring the quantity of radio frequency (RF) energy that is absorbed by the human body
- ◆ Dummy heads are filled with solutions to simulate brain conductivity and probed to measure depth and intensity
- ◆ Regulatory agencies have not deemed it necessary to measure exposure to eyes
- ◆ Eyes are unprotected by the skull and comprised of cells that are extremely sensitive to electromagnetic energy
- ◆ SAR testing is ***not*** adequate for judging a cell phone users safety!

Standards



- ◆ Every cell phone model sold in the U.S. has a specific measurement of how much RF energy from the phone can penetrate the brain
- ◆ Since SAR is difficult to determine, safety standards have also adopted maximum allowable power density exposure limits measured in units of watts per square meter (W/m^2)
- ◆ Although **no one really knows what level is safe**, the Federal Communications Commission (FCC) has set an arbitrary specific absorption rate (SAR) of 1.6 watts or less per kilogram of weight
- ◆ Council of the European Union is slightly more liberal: SAR up to 2.0 watts per kilogram
- ◆ You can determine your phone's rating by locating its FCC ID number on the back, and then looking up the matching SAR on the FCC Internet page: <http://www.fcc.gov/oet/fccid/>

Radiation Comparison Chart

Ten Highest Radiation Cell Phones

Manufacturer

		SAR Level
◆ Motorola V120c	◆ 1.55	
◆ Motorola V70	◆ 1.54	
◆ Motorola P8767	◆ 1.53	
◆ Motorola ST7868	◆ 1.53	
◆ Motorola ST7868W	◆ 1.53	
◆ Panasonic Versio	◆ 1.5	
◆ Ericsson T28 World	◆ 1.49	
◆ Nokia 5170i	◆ 1.49	
◆ Panasonic Allure	◆ 1.49	
◆ Panasonic EB-TX210	◆ 1.48	
◆ Panasonic EB-Tx220	◆ 1.48	

Data as of 2002

Standards

- ◆ Exposure standards are set to minimizing local heating problems and do not address all health concerns
- ◆ Standards set on basis of heating effects which don't exist, while ignoring cell-damage
- ◆ Watt ratings are based on heating effects, not penetration
- ◆ Same standards are in use around the world
- ◆ Limit power at any one frequency to one-tenth of the amount needed to raise local body tissues by 1 degree Celsius
- ◆ No attempts have been successful to establish which frequencies are safe

But Wait...

- ◆ This new FCC standard applies to all new transmitters licensed after 15-Oct-97, but existing facilities had until year 1-Sep-2000 to demonstrate compliance
- ◆ However the FCC doesn't check compliance, and it has never charged anyone with breaching conditions. It openly admits this to Congressional Inquiries

Safe Position

- ◆ “SAR rating of a cell phone is NO factor of RF safety at all!”—rfsafe.com
- ◆ 100's of millions of people are unaware they're part of just another experiment where industries push the line between profit & risk to public health
- ◆ SAR only tells you *how much* the radiation exposure has already ‘cooked’ your cells
- ◆ Only ‘*safe*’ cell phone is one that is shielded, deflecting or redirecting harmful RF away from you!
- ◆ Radiation absorbed into living cells will cause macroscopic manifestation of scattering effects on the atomic and subatomic levels of your genetic make-up



Advisories...

- ◆ The U.S. Food and Drug Administration and the National Cancer Institute have advised consumers they could consider limiting the time they spend on cell phones
- ◆ Although the balance of evidence doesn't indicate there's a problem, even the industry agrees there's still more work to be done...in the meantime, **your health may be at stake**
- ◆ Hard question: what do we do today, when science is uncertain?!



Lawmakers & Consumer Groups

- ◆ Pushing mobile phone makers to:
 - Gauge levels of exposure
 - Rank their products on radiation levels
 - Ensure that radiation falls below a certain level
- ◆ Maryland neurologist asked for \$800 million in damages against Motorola and Verizon, charging that his cell phone use had caused brain cancer
- ◆ Microshield Company has details of one user who has developed a tumor on his spine exactly where he used to keep his phone and is considering legal action

State Laws & Drivers



- ◆ New York aimed at keeping drivers from using handheld phones
- ◆ To drive and talk without a fine, cell phone users must wear a headset or earpiece for hands-free communications
- ◆ Growing number of studies show a clear link between cell phone use while driving and car accidents
- ◆ No one ever thinks it will happen to them, but it's only a split second mistake that kills innocent people



How To Buy A Cell Phone

- ◆ Manufacturers comply with requirements to list SARs in their literature...but don't believe it!
- ◆ Many companies have produced phone shields and headsets designed to protect the user from the harmful effects of radiation, but experts agree are mostly useless
 - Companies are 'accessorizing' on public fears
- ◆ Wearing headsets is a sure way for consumers to avoid overexposure—Joshua Muscat, American Health Foundation (*be sure your phone has available connection*)
 - Buy a phone design that moves the antenna away from the head
 - Get an old-fashioned cell phone for your car, so the antenna is outside the vehicle

Tests by ABCNEWS 20/20

- ◆ Tests conducted by 20/20 aired on television have found that some of the country's most popular cell phones *can exceed the radiation limit*
- ◆ U.S. Government testing guidelines are so vague that a phone can pass the FCC requirements when tested, and can *exceed* those maximum levels
- ◆ The Federal Drug Administration tells consumers that “available science does not allow us to conclude that mobile phones are absolutely *safe* or that they are *unsafe*.”

Why the Cell Phone Scare Won't Go Away...



- ◆ Wireless proponents would rather err on the side of caution in case a link to brain cancer
- ◆ Now scientists raise cordless phone fear
 - *“Scientists say radiation emitted by the handsets could interfere with the brain causing memory loss. Headaches, dizziness and even cancer.”*—The Hobart Mercury, July 6, 1999
- ◆ A British Government study has already begun into the possible health effects of using mobile phones after a number of research studies linked them to brain interference and raised the possibility of radiation emissions causing brain tumors

The Questions...

- ◆ Not: “Does cell phone RF radiation cause cancer?”
- ◆ The questions are: “How strong is the evidence linking cell phone RF radiation and cancer?”
- ◆ “How hard have we looked for evidence that RF radiation causes cancer or other undesirable health effects?”

The possibility that RF radiation in the non-ionizing frequency range can cause genetic damage may have profound implications on the current controversy involving cell phones

Studies & Research



Questions Raised...



- ◆ Digital cordless phones are one of the biggest sellers in the industry
- ◆ Dr. Gerard Hyland, expert on electro-magnetic radiation and a biologist at Warwick University, *“Users could be exposing themselves to large doses of radiation because they are likely to spend long periods on the phone in their cars, offices and at home daily.”*
- ◆ There’s information to support virtually anybody’s argument: consumers are caught in the middle!

Questions Raised...

- ◆ At certain frequencies and power levels, RF energy can heat tissue: that's how your microwave works
- ◆ Questions have been raised over non-thermal effects: subtle biological changes that can occur even when levels of energy are absorbed at what is considered 'safe' limits
- ◆ Royal Society of Canada: "Exposure to RF fields at intensities far less than levels required to produce measurable heating can cause effects in cells and tissues."
- ◆ "This is the fastest growing technology in the history of civilization. Around the world, there is over half a billion people exposed to a product that we are not sure is safe."
—Dr. George Carlo



Major Studies Underway *Worldwide...*

- ◆ Brain cancer
- ◆ Genetic damage in human blood
- ◆ Genetic damage to DNA
- ◆ Memory-loss diseases
- ◆ Parkinson's Disease
- ◆ Multiple Sclerosis
- ◆ New studies suggest hazards exist at non-thermal levels of RF exposure
- ◆ Some studies have shown DNA damage at lower than cell phone handsets—www.rfsafe.com

RF Fields

- ◆ Oscillating electric and magnetic fields interact with electrically charged particles by exerting forces upon them
- ◆ If these forces cause charged or polarized particles to move, heat energy is introduced
- ◆ This heat energy in the material may or may not be detected as a temperature increase since RF absorption may be small, non-uniform or quickly dissipated
- ◆ Disturbances at an atomic level may induce changes in genetic code corrupting DNA that could unleash thousands of birth defects and medical disorders

RF Health Concerns~ 3 General

Thermal effects

- Resulting from a measurable temperature increase
- Occurs in exposed biological material (tissue, cell, etc.) by being heated by the RF fields
- **Athermal effects**
 - When the RF field deposits sufficient heat energy into a material to cause an increase in temperature, but not temperature rise is observed
- **Nonthermal effects**
 - When RF energy deposited into the material results in a temperature increase less than the normal temperature fluctuation of the material

Bioeffects

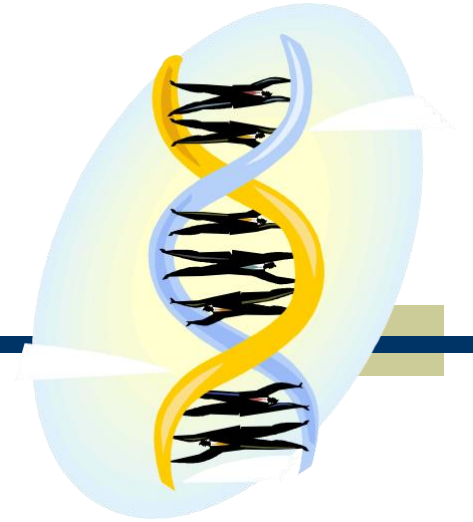
- Recent US studies are showing more significant bio-effects at lower and lower power densities.
- Dr. Henry Lai has reported DNA single and double strand breaks at levels below the current FCC exposure standard.
- Magras & Xenos have reported irreversible sterility in mice after 5 generations of exposure to .168 to 1.053 microwatts per square centimeter in an "antenna park."
- Note that the current applicable US exposure standard would be 579 microwatts per square centimeter, -- 500 times higher! -- and that this very low exposure level would relate more to a person living near a cellular tower, than a cell phone user.

Risks

DNA Damage



DNA Damage



- There are 50,000 billion cells in the body, and even in older people the body is still actively creating another billion new cells every hour, so the incorruptibility of DNA is all-important
- RF radiation affects bioatomic resonant frequencies damaging DNA directly, which might effect mechanisms of **Cellular Mitosis** becoming a precursor for cancer

Cellular Mitosis



What Is Mitosis?

Mitosis is the mechanism that allows the nuclei of cells to split and provide each daughter cell with a complete set of chromosomes during cellular division.

This, coupled with cytokinesis (division of the cytoplasm), occurs in all multicellular plants and animals to permit growth in living organisms.

The steps of cellular mitosis is only one important phase of the life of a cell--the phase during which genetic information is separated into two new nuclei and the cell divides.

What Is Mitosis?

Mitosis is one phase of the life of a cell—the phase during which genetic information is separated into two new nuclei and the cell divides

Interphase is the period of time when the cell grows and replicates its DNA

Cell growth, via protein synthesis and organelle reproduction, occurs throughout interphase, while DNA is only replicated during the synthesis phase.

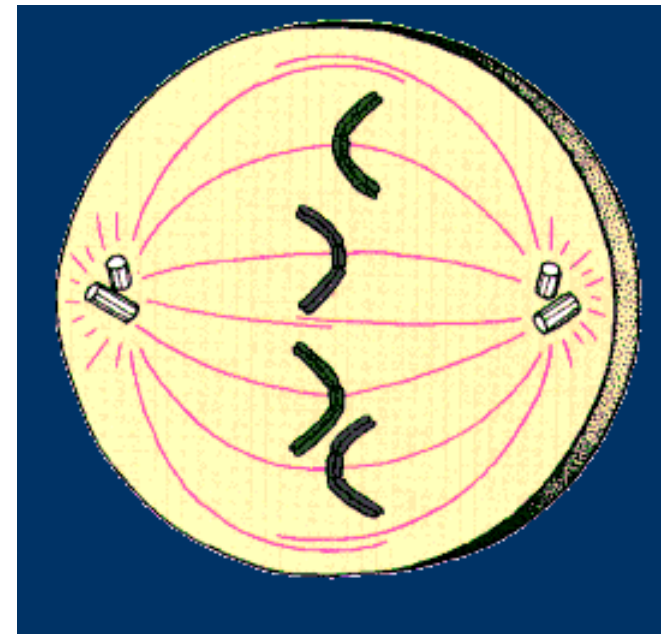
Steps of mitosis "Cell Division"

Prophase: Chromatin condenses into chromosomes. Each chromosome has already been duplicated and consists of two chromatids. Sister chromatids are connected by the centromere. The nucleus of the cell breaks down into vesicles. The mitotic spindle, composed of proteins and microtubules, forms and migrates to opposite ends of the cell. Microtubules growing from each spindle are thought to push the spindles to opposite ends of the cell.



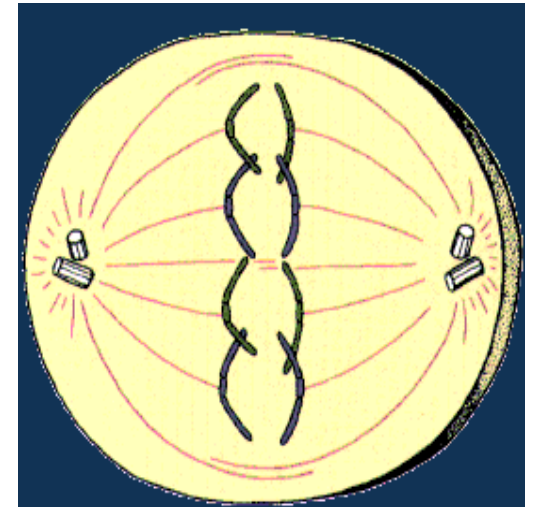
Steps of mitosis "Cell Division"

Metaphase: Capture surfaces (kinetochores) on chromosomes attach to growing microtubules from spindle poles. Each chromosome has two kinetochores (one for each chromatid) and these kinetochores face in opposite directions. Microtubules attached to kinetochores push and pull chromosomes to the center of the cell, aligning chromosomes along the metaphase plate.



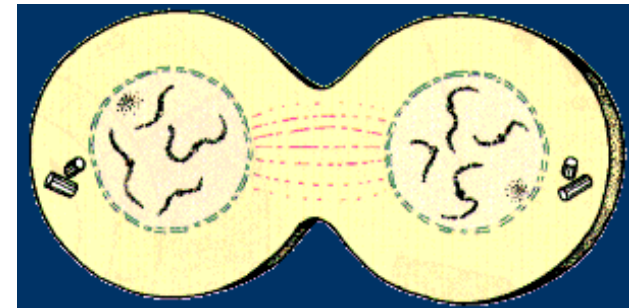
Steps of mitosis "Cell Division"

Anaphase: Sister chromatids from each chromosome separate and move toward the mitotic spindles. Microtubules shorten as the chromatids (each now called a *chromosome*) migrate to the poles.



Steps of mitosis "Cell Division"

Telophase: Each chromosome reaches its respective pole and begins to decondense. The nuclear membrane is re-established around each set of daughter chromosomes.



Cytokinesis: The cytoplasm divides, creating two separate cells. Cytokinesis starts during anaphase and is completed after telophase. In animals, a contractile ring of actin and myosin, pinches the cell in two.

DNA And The Microwave Effect

Penn State University

January 20, 2001

“Can microwaves disrupt the covalent bonds of DNA?

—Some recent studies have demonstrated
—that microwaves are capable of breaking
the covalent bonds of DNA.

—The exact nature of this phenomenon is not
—well understood, and no theory currently
exists to explain it.”

DNA Damage

- ◆ “There are at least six studies showing that cell phone radiation damages the DNA and therefore when you put a cell phone by your ear you are damaging the cells in your brain.” —Neil Cherry, New Zealand cellular scientist
- ◆ DNA-cancers are only one problem; many other short and long-exposure brain conditions such as Alzheimer and melatonin changes are also implicated.

DNA Damage

- ◆ In the DNA double-helix structure of human cells, the base-pairs (the steps of the ladder) are held together by hydrogen bonds, while the main protein is a chain of covalent bonds.
- ◆ It is well established that the weak hydrogen bond can easily be broken by energies lower than the ionizing threshold. This is obvious since the cell couldn't duplicate and divide its DNA if it weren't easier to break the ladder rungs than the protein molecule carrying all the essential genetic information.

DNA Damage

- ◆ As part of the division process, the two sides of the DNA helix are 'unzipped' (separated) by hydrogen bond breakages. If the covalent bonds of the DNA strands weren't more strongly held together, we'd get extraordinary numbers of single or double strand DNA breaks and massive mutations. (DNA breaks happen all the time but are quickly repaired

DNA Damage

- ◆ What appears to damage the DNA strands more than normal, is attacks by Hydrogen Peroxide (H_2O_2) molecules and Hydroxyl (OH) molecules manufactured by free-radicals outside the nucleus. These result from the process of energy formation (ATP to ADP conversion) and are long-lasting enough to migrate into the nucleus and attack the DNA.
- ◆ Free-radicals are highly charged and can be effected by both radio energy and magnetic fields at "levels too low to break covalent bonds."

DNA Damage

- ◆ There is no doubt that radio waves can't and don't break DNA proteins directly, but this doesn't mean they can't break them indirectly using the energy already available in the free-radical formation.
- ◆ Nor does it mean they must break bonds to have serious medical effects. DNA isn't the sole determinant of cell health; it's just one of many.

Photos Reveal Evidence...



Fig.1 Unexposed control. Bundle of DNA (No-Tail)



Fig.2 X-ray calibration 25.6 rads. DNA breaks are very obvious

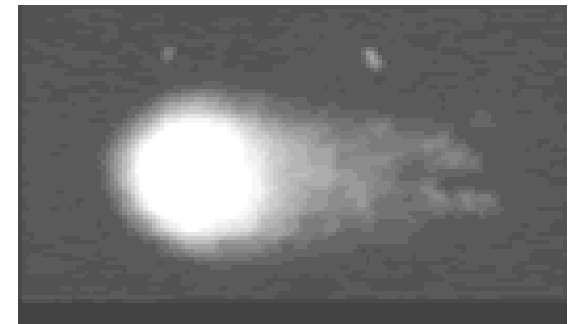


Fig.3 Cell Phone level microwave exposure 2hrs 2.45GHz reaching so called safe SAR levels Comet Tail = DNA Damage

DNA Damage

- Cancer is a disease of the DNA, and it appears in most cases after multiple assaults have taken place on the cell over long periods of time. Generally it is expected that there will be about four to six damaging attacks (or genetic faults) that eventually combine in effect, to 'cause' a cancer
- This is why it is so difficult to find cancer 'causes' for most of the more common types—and why there appears to be such genetic variability between people subject to similar exposures

DNA Damage

- ◆ Any thing suspected of effecting DNA, hormonal changes, and intercellular messaging, etc. will very obviously be likely to have a much greater effect on growing children, with cells constantly undergoing division, than it will on older people

The DNA Problem

The Problem: How do cells faithfully distribute genetic material to daughter cells?

The Issue: Each time a cell divides the daughter cells **must** get the right chromosomes.

For example, cells with missing or extra chromosomes will corrupt DNA and can become cancerous.

DNA Damage

- When there is a persistent increase in DNA breaks, a cell will respond by generating more enzymes (*so called 'DNA repair enzymes'*) to repair the breaks. This sometimes can lead to over-compensation and a decrease in breaks.

Thus, the number of breaks we observe depends on a balance between the rate of breaking (*e.g., due to RFR exposure*) and the rate of repair: increase and decrease in DNA breaks can result

- **“But, both outcomes indicate that RF causes DNA damage”**

Related DNA-Cancer Research

- ◆ The Adelaide Hospital animal study found mice tumors (lymphomas) doubled with 18 months of exposure, one-hour per day, at much the same power densities as experienced by a cell phone user.
- ◆ Humans get cancers in the same way as mice
- ◆ Since it deals with DNS/cancer changes, the relevance to humans is also very highly important.
- ◆ The Adelaide research results are well above the 1% level of confidence usually credited by scientists as being “High significant.”
- ◆ The Adelaide study established a causal link to B-cell (Basal) lymphomas at a very significant level

B-Cells

- ◆ B-cells are very important in immune responses. They produce antibodies against bacterial, foreign substances, etc., and also [provide] surveillance against appearance of cancer cells in the body.
- ◆ One would be more prone to infection if these cells are affected as in the case of B-cell lymphomas
- ◆ B-cell lymphocytes are involved in perhaps 85% of all cancers, and such a result is quite unique

Related DNA-Cancer Research

- ◆ In 1995, Lai and Singh showed radical double-strand breakages in DNA in live rat brains, with both pulsed and steady waveforms after a single 2-hour exposure period to microwaves.
- ◆ Double-strand breaks create serious genetic alterations of the DNA strands, and can lead to cancer, cell death or mutagenic problems.

Related DNA-Cancer Research

- ◆ In 1994, Sarkar looked at the effect of low power microwave on the mouse genome by direct DNA analysis.
- ◆ His mice were exposed to microwaves at less than half cell phone power densities for two hours a day over a period of 120, 150 and 200 days.
- ◆ DNA samples from the testis and brain were examined and substantial banding changes were found with the DNA in the exposed group.

Related DNA-Cancer Research

- ◆ In 1974, Skidmore and Baum irradiated tumor-prone laboratory mice with pulsed electric fields for 33 weeks. The exposed group had over twice the leukemia rate of the control group.

Related DNA-Cancer Research

- ◆ Smigielski (1982), exposed lab mice to microwaves for 2 hours a day, 6 days a week for varying period up to 10 months.
- ◆ Experiments suggested that RF exposure accelerated the development of breast cancer, skin cancer and lung cancers.
- ◆ In 1988, he did a similar experiment on mice injected with sarcoma cells and concluded that the radiation impaired the immune system and substantially lowered resistance to cancer growth.

Related DNA-Cancer Research

- ◆ In 1991, Chou studied 100 rats exposed for most of their lifetime to very low levels of pulsed microwave.
- ◆ Exposures were for 21.5 hours a day, between the ages of 2 and 24 months
- ◆ Exposed group had 18 malignancies while the control only had 5 (3.5-times)

Related DNA-Cancer Research

- ◆ In 1990, Cleary demonstrated an altered rate of DNA synthesis and increased proliferation of human glioma cells in a lab culture after a single exposure to microwave radiation.
- ◆ Gliomas are cancers of the brain and nervous tissue, and seem to be highly related to RF exposures
- ◆ What Cleary found was consistent with tumor formation, and these changes were observed in the cells up to five days after a single 2 hour exposure

Research

- ◆ In 1994 Sarkar looked at the effect of low power microwave on the mouse genome by direct DNA analysis. His mice were exposed to microwaves at less than half cell phone power densities for two hours a day over a period of 120, 150 and 200 days. DNA samples from the testis and brain (control and exposed) were examined and substantial banding changes were found with the DNA in the exposed group.

Research

- ◆ In 1995 Lai and Singh showed double-strand breakages in DNA in live rat brains, with both pulsed and steady waveforms after a single 2 hour exposure period. In a number of studies over the previous years, they had also shown excessive single-strand breaks (over controls), but improved detection techniques revealed excessive double-strand breaks were present also.
- ◆ The difference is important because single-strand breaks are common (but undesirable), while double-strand breaks create serious genetic alterations of the DNA strands, and can lead to **cancer, cell death or mutagenic problems**. Verschaeve et al. (1994) and Phillips et al (1997) have also shown DNA strand breaks.

How Much of this is Applicable to the Human Condition?

- ◆ “DNA is DNA whether in mice or men”—
Adelaide Study, Australia
- ◆ Your body is composed of cells which are essentially identical to those of mice
- ◆ The control over the functioning and proliferation of those cells (which when it gets out of control, is cancer) comes from the DNA within the nucleus of each cell



Studies

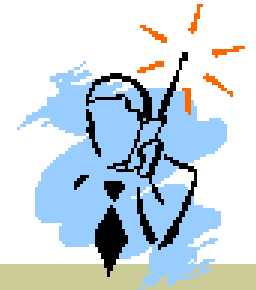
- ◆ There have been more than 200 scientific studies worldwide on the safety of cell phones and it is still continuing...most of these are *short term* studies
- ◆ Researchers at the University of Surrey say bad posture, particularly holding the phone between the shoulder and cheek to leave the hands free, can cause strain injury and spinal damage
- ◆ Dr. George Carlo, Epidemiologist, “*We already have enough data to know that there are biological effects from radio frequency radiation. We have evidence of genetic damage, and increase in the risk of tumors.*”

Studies



- ◆ Lack of conclusive evidence
 - Long-term health issue
 - Litigation issue
- ◆ Mounting concern about potential long-term health effects of mobile phone use
 - Radio frequency (RF) absorption by the body
- ◆ Studies look for a link between cell phone radiation and brain cancer and other neurological problems
 - Studies done so far are predominantly among adults and not children or teenagers who may be *more* susceptible

Studies



- ◆ Scientists at Sweden Lund University found that two minutes of exposure to emissions from mobile phones can disable a safety barrier in the blood causing proteins and toxins to leak into the brain
 - Can cause the chances of developing diseases such as Alzheimer's, multiple sclerosis and Parkinson's disease
 - Mobile phones heat the brain while making and receiving calls
 - Could cause high blood pressure which leads to strokes
 - Mobiles damage long-term memory

Studies

- ◆ Experiments show that weak electrical and magnetic fields can also disrupt the ionic flows between cells (*which carry messages*) without breaking bonds. Cells communicate with each other all the time to keep overgrowth (*as in insipient tumors*) in check

Studies



- 20-year study proves there is the strongest link yet between mobiles and cancer among soldiers in Poland exposed to microwave radiation same as that emitted by mobile phones—Military Institute of Hygiene and Epidemiology in Warsaw, Professor Stanislaw Szmigielski
 - There were higher death rates from cancers of the skin, brain, blood, digestive system, blood and lymphatic system among the exposed group
 - Majority of those exposed to between 1 Watt/m² and 6W/m² of microwave radiation



Fallacies

- ◆ Cell phone transmission powers are all within the standards – False!
- ◆ Local heating is the only problem – False

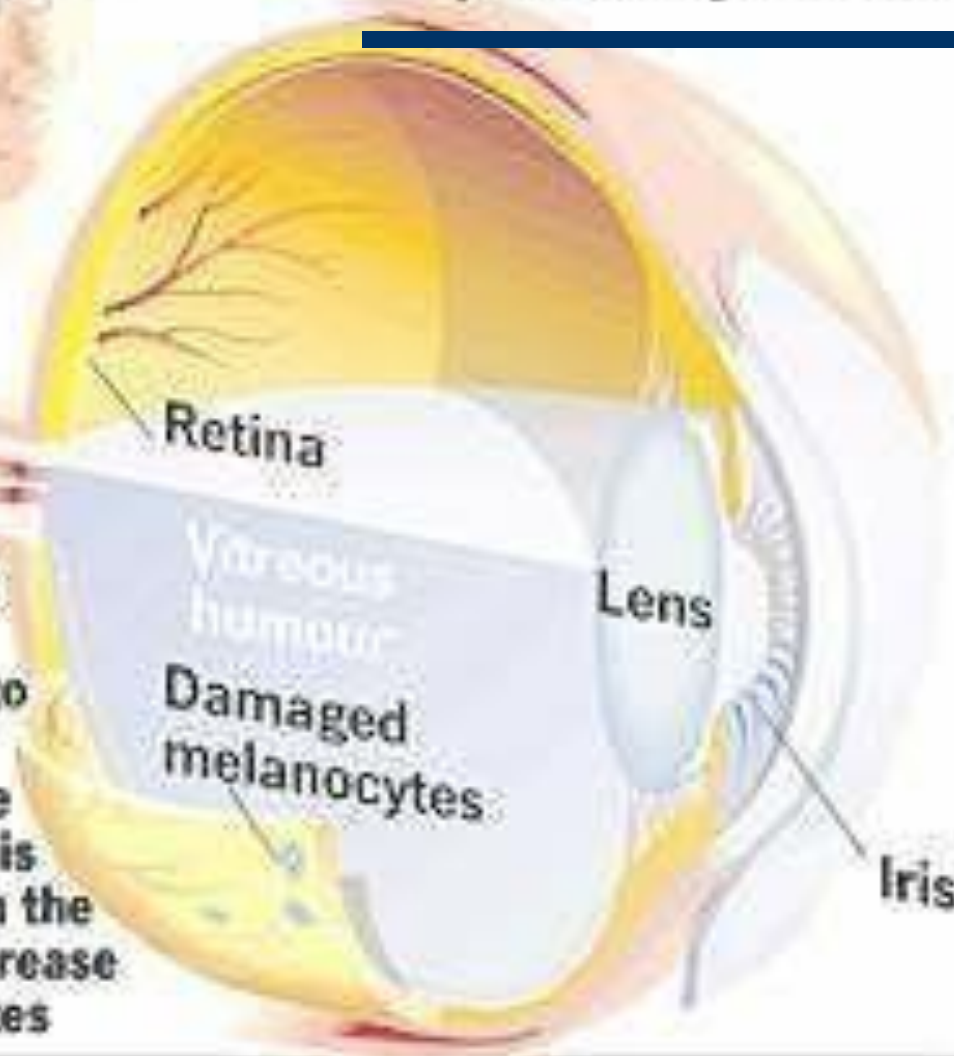
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Mobile danger?

Mobile phone radiation is absorbed by brain and eye tissues. The eye could be at risk because it is not so well protected by the skull

2

Eye cells called melanocytes may be susceptible to damage by mobile phone radiation. This could explain the apparent increase in cancer rates



*Other
Studies...*

Eye
Disorders

Heart & Kidney Damage?



- ◆ Exposure to the phones low-level of radiation causes red blood cells to leak hemoglobin
 - Build-up of hemoglobin, which carries oxygen around the body, can lead to heart disease and kidney problems
- ◆ Professor Edward Tuddenham, hematologist, Imperial College Medical School, West London:
“Accumulation of hemoglobin in the body could result in heart disease or kidney stones.”
- ◆ Recent studies have suggested that even low doses of mobile phone radiation may cause subtle changes at the cellular level

Risks

Birth Defects



Birth Defects

- ◆ Birth defects are the single leading cause of infant mortality in the U.S.
- ◆ Under normal conditions, the nervous system forms a closed tube after 4 weeks of gestation
- ◆ Failure to close results in both major or minor birth defects
- ◆ EMF changes the activity of the growth enzyme ODC making the availability of the enzyme inappropriate at critical stages in the development of embryos
- ◆ During formation of the neural tube the enzyme's activity is too little, causing incomplete closure of the neural tube on the chicken embryos

Studies

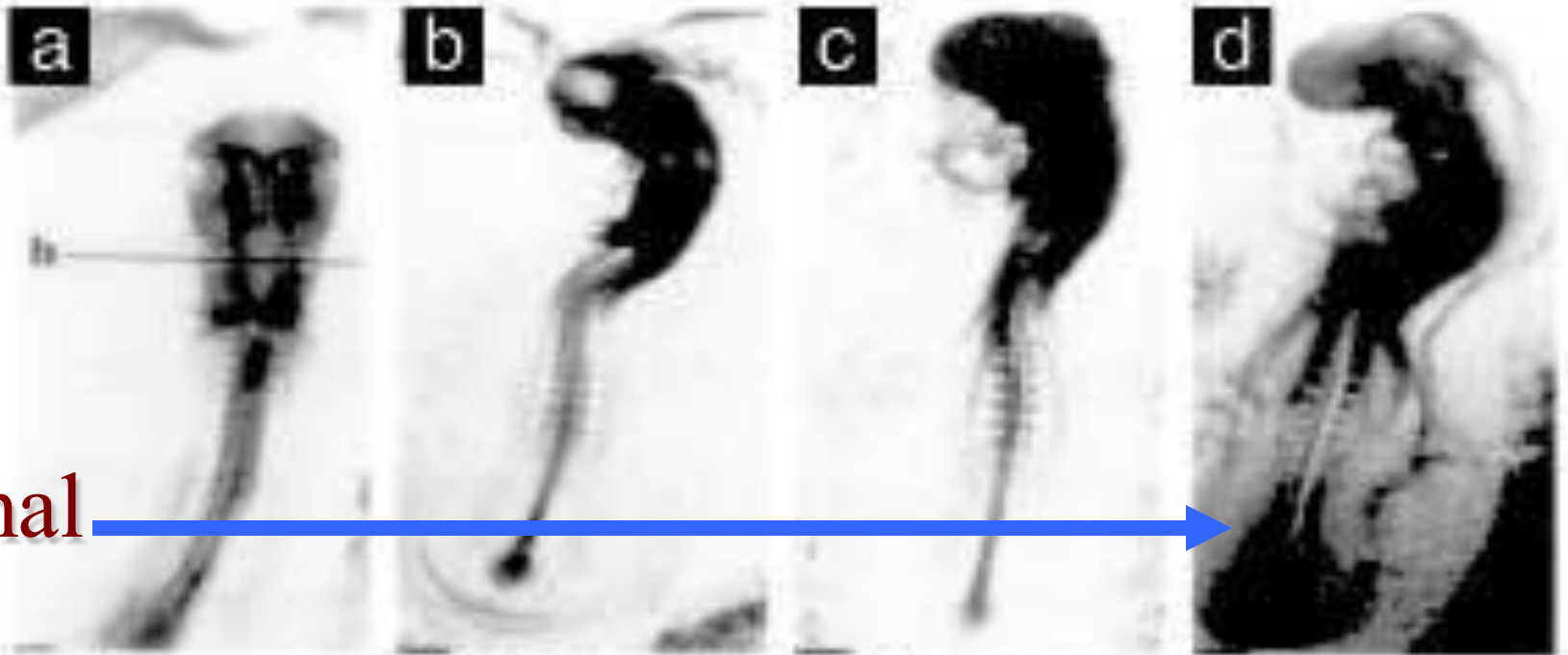


- Two independent Japanese studies have found a high level of growth retardation and birth defects in rats and chickens at low (non-thermal) levels of exposure.

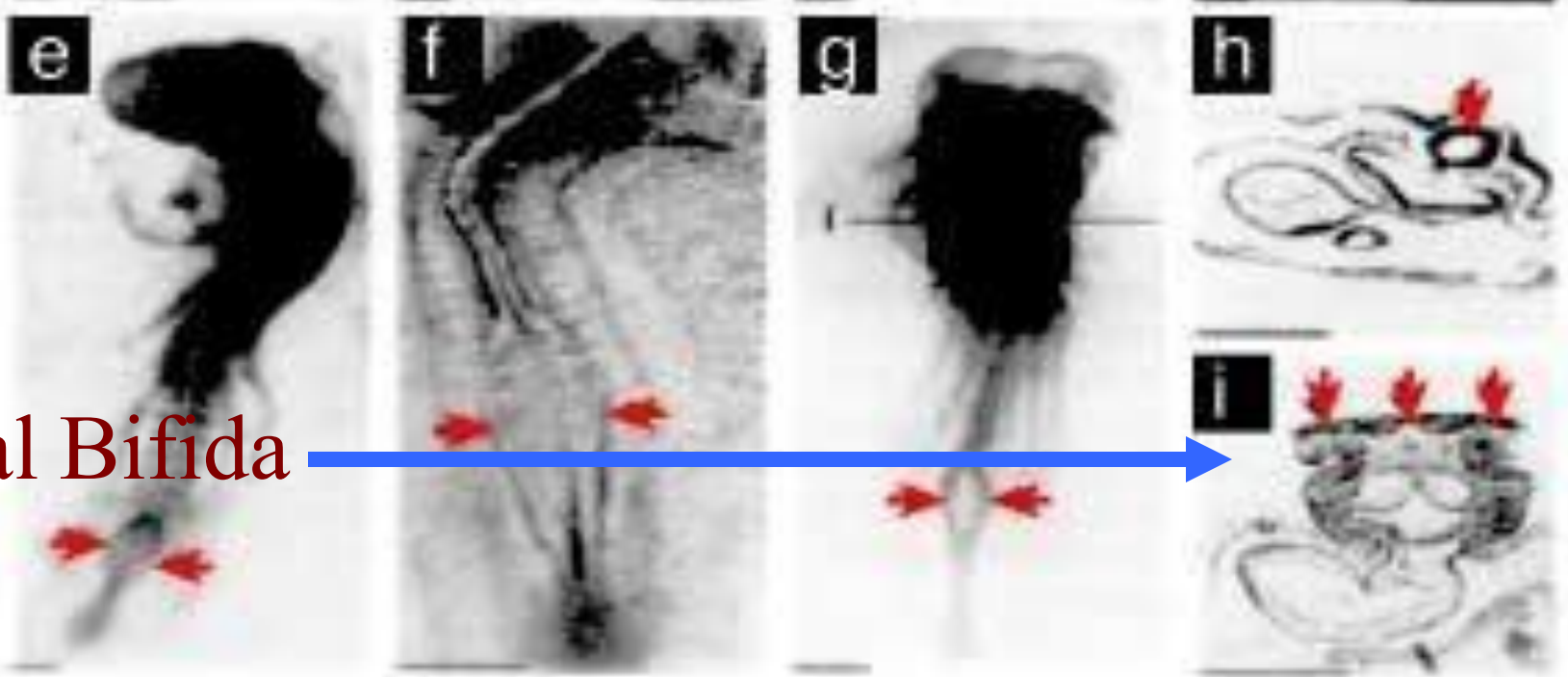
Birth Defects

NTD~*Neural Tube Defects*

- ◆ In 1997, a team of scientists in CUA's laboratories exposed 3000 chicken embryos to RF radiation. They found:
 - “Steady, oscillating radiation increases the rate of neural abnormalities in embryos by a factor of approximately 2.5”



Normal



Spinal Bifida

Strong Stand...

- ◆ “Those regulating the wireless industry and medical community have underestimated biological impacts of EMF to fetal development and public health.”—RF Safe
- ◆ “B12 and Folic Acid taken “BEFORE” becoming pregnant can lower risk of NTDs by 90% in high risk families.
- ◆ Take if you plan to be pregnant and are exposed to products that emit high EMFs, or in an EMF saturated area (i.e., computer desk stations, telecommunications, etc.) to help your body prevent EMF induced birth defects

Rebuttal to “No Cancer” Claims



- ◆ Although some researchers have found no direct evidence of increased risk of cancer from cell phone use, these studies have been based mostly on animals not humans, and most all have been testing users over a short duration of years
- ◆ Most people who have used cell phones have used them on average for about two or three years
- ◆ No long term effects are known
- ◆ “It is far too soon to grant cell phone use completely clean bill of health.”—*Susan Dentzer, Journal of the American Medical Association article*



Physiological Effects

- ◆ Primary health concern of microwave radiation is adverse effects associated with whole or partial body thermal exposure
- ◆ Microwave electromagnetic radiation “cooks” tissue
- ◆ Avoiding damaging thermal exposure levels is accomplished by keeping one’s exposure below recommended maximum Specific Absorption Rates (SARs)...*but this does not protect you!*

General Background

Cancers

- ◆ Most cancers appear to be the result of multiple impacts (maybe over 20+ years) on cell DNA, although there are other non-DNA causes also
- ◆ Some cancer specialists now believe that humans constantly experience cancer-cell proliferation as a 'normal' condition, but that the body's normal immune system keeps these in check

General Background

Immune System

- ◆ There is good evidence that the receptor sites on cell membranes are sensitive to EMR

General Background

Cancer-enzyme Production

- ◆ EMR alters enzyme synthesis in a way which is similar to known actions of chemical cancer promoters (*these drugs are used in lab work to promote cancers so the mechanisms can be studied*)
- ◆ Enzymes act between cells to inhibit growth, and when these fail, tumors result
 - Way in which calcium transfers across cell membranes (*called Ca^{++} efflux*)
 - Stimulation of production of ODC (*enzyme widely linked to cancers*)
 - Ca^{++} regulates lymphocyte proliferation

Summary



Summary

The Jury's Still Out...

- ◆ Scientists are split on cancer risk, and tissue damage
- ◆ Consumers will be the big losers if a real health threat emerges
- ◆ Unless the mobile phone industry advocates the proper preventive measures before such a discovery occurs, it could be subjected to massive lawsuits which only the lawyers would win
- ◆ Consensus of scientific *opinion* is that there is no consistent evidence that mobile phone operating within guidelines on radiation emissions have any adverse health effects...but the studies *are not over!*
- ◆ Cell phone industry and their hired consultants are trying to play down the study results because of the dynamic and political nature of the findings

Conclusions

"The question is not"

~~==~~ *If cell phone level radiation can cause DNA damage!*

"The question is"

**Can your body repair DNA damage
without mutating genes?**

There may be significant adverse health effects (of a wide range,
not just cancer) associated with cellular phone use

**USE YOUR COMMON SENSE AND DETERMINE
WHAT IS 'RIGHT' FOR YOU**

Am I Safe?

- ◆ With cell phones, up to 60% of the energy can transfer to the head by inductance
 - Radiation then often plays a relative minor role
- ◆ One article states that hands free kits are not totally reducing exposure to the head
 - Up to 30% is leaking out of the earpiece itself, thereby concentrating exposure into the ear canal
- ◆ It would be fairly safe to assume that inductance+radiation would likely create greater, not less, effects than radiation alone
- ◆ Somewhat akin to passive smoking

Am I Safe?

- ◆ Unless the phone is placed some distance away from the user, the remaining radiation still coming off the handset is merely being redirected to another part of the body, e.g. organs around the waist area, which ironically may not be as able to defend itself as well as the brain which is given some protection by the skull



Cell Phones & Risks to Children

- Consider limiting the use of cell phones by children
- Children may be more vulnerable because of:
 - Their developing nervous system
 - Greater absorption of energy in the tissues of the child's head
 - Longer lifetime of exposure
- British experts have recommended no cell phone use until age 16, when brain development is complete
- When cell DNA is rapidly dividing, as it is in young children, then there is more opportunity for disruptive changes. And when children are exposed constantly, perhaps 24 hours a day, cumulative effects may be possible even with very low levels of additional exposure -- especially if the individual is genetically susceptible.



Cell Phones & Risks to Children

- Absorption of microwaves of the frequency used in mobile telephony is greatest in an object about the size of a child's head – the so-called 'head resonance' – whilst, in consequence of the thinner skull of a child, the penetration of the radiation into the brain is greater than in an adult.
- The increased mitotic activity in the cells of developing children makes them more susceptible to genetic damage.
- A child's immune system, whose efficiency is, in any case, degraded by radiation of the kind used in mobile telephony, is generally less robust than is that of an adult, so that the child is less able to 'cope' with any adverse health effect provoked by (chronic) exposure to such radiation.
- The worries are the use of cell-phone over the lifetime of a human might produce tumours and other health effects later in life.

Hazard Identification

- ◆ “Issue: Does RF radiation cause or contribute to cancer under exposure conditions that are relevant to human health? Even after decades of study, we have not identified RF radiation as a carcinogen.
- ◆ On the other hand, it is also clear that we can never prove that health hazards from exposure to cell phone RF radiation are impossible. The very nature of risk research, and of the scientific method, means that there will always be loose ends and unexpected findings will always be matters of judgment.”— Dr. J.E. Moulder, Radiation Research, 151, 513-531, (1999).



Landmark Study

Highlights Health Threats of 5G on People + Planet

The New Hampshire Commission to Study the Environmental and Health Effects of Evolving 5G Technology heard from 13 experts in epidemiology, occupational health, toxicology, physics and engineering, plus one wireless industry expert. All except the industry rep agreed RF radiation coming from wireless devices affects humans, animals, insects and plants.

By Dr. Joseph Mercola 12/20/20

5G Hazards

- ◆ **Story at-a-glance:**
- ◆ Newest data from the New Hampshire legislative commission confirms wireless technology produces significant negative effects on humans, animals, insects and plants.
- ◆ In the race for hyper-fast internet speed and connectivity, experts are making comparisons between the release of 5G and the lies told by the tobacco and oil industries.
- ◆ The structure required to support 5G will place cell antenna ports close to your home and workplace, making it nearly impossible to avoid and raising your risk of excessive oxidative stress that may lead to anxiety, depression and Alzheimer's.
- ◆ It is important to get involved in helping to prevent implementation of 5G by contacting your local lawmakers and signing local petitions. Consider taking steps in your home to reduce exposure.
- ◆ Flying under the radar, so to speak, during the media coverage of the COVID-19 pandemic, is the rollout of a hyper-fast speed 5G wireless network. As millions of Americans are suddenly working remotely, it has proven to be a powerful opportunity for regulators to move 5G forward.

Future

- ◆ Raise questions more about the potential for cell-phone handset radiation to effect people nearby (passive exposures) than just the user him/herself.
- ◆ And remember also that DNA-cancers are only one problem; many other short and long-exposure brain conditions such as Alzheimer and melatonin changes are also implicated.
- ◆ Also remember that not all studies have resulted in positive findings -- but very many have.

How To Protect Yourself

Reasonable things to do...



- ◆ Limit the use of mobile phones daily
- ◆ Keep conversations short; avoid long chats
- ◆ Fully extend the antenna to keep the most intense spot of energy slightly away from your head
- ◆ Use a headset and microphone to keep the sources of radiation away from your body
- ◆ Place the phone itself far as possible from your body
- ◆ Avoid using a phone wherever the signal is weak
 - If possible, check signal strength. If it's weak, the phone will use more power and emit more radiation. Find a spot where the signal is stronger.
- ◆ Beware of “free” phones from service companies



Remember...

*“There are no precise rules
for deciding how much
research is “enough”,
the answers will always be
matters of judgment.”*

~ J.C. Elliott, Physicist