

# THE BIOLOGICAL EFFECTS OF ELECTROMAGNETIC RADIATION (MICROWAVES)

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# AGENDA

- Mission Statement
- What Research Really Says
- Research Papers
- Microwave Sickness - Physiological or Psychological?
- Public Concerns
- Closing Statements

# MY MISSION

- To improve the public understanding of the health risks associated with Radiofrequency (microwave) exposure
- To demonstrate that there is a significant amount of evidence suggesting subjective symptoms are caused by EMR exposure
- To convince authorities to reassess their views and look for real solutions to help those who are suffering

# Key Scientific Question - Health Effects Linked To The Wireless Age?

No

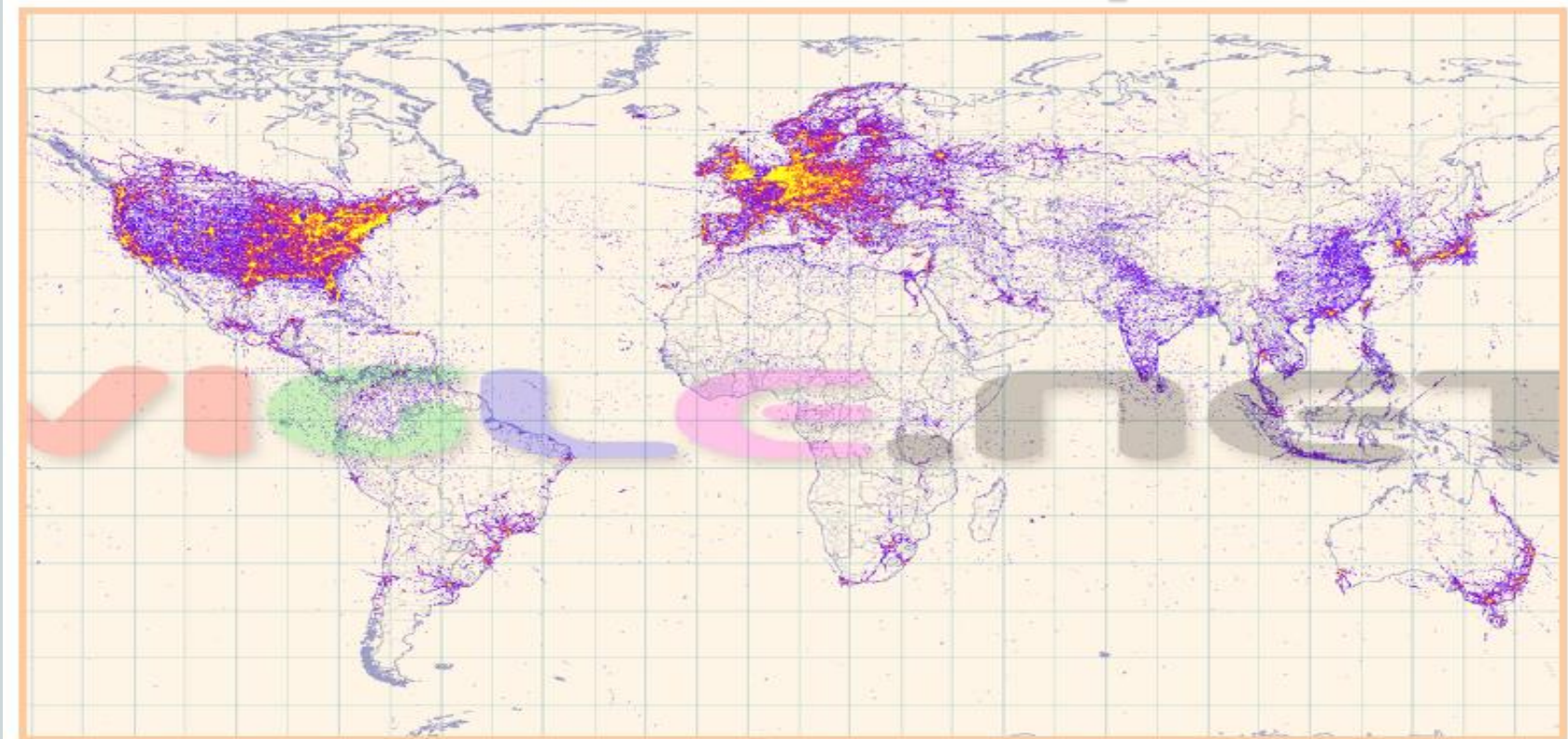
Government/  
Industry

Yes

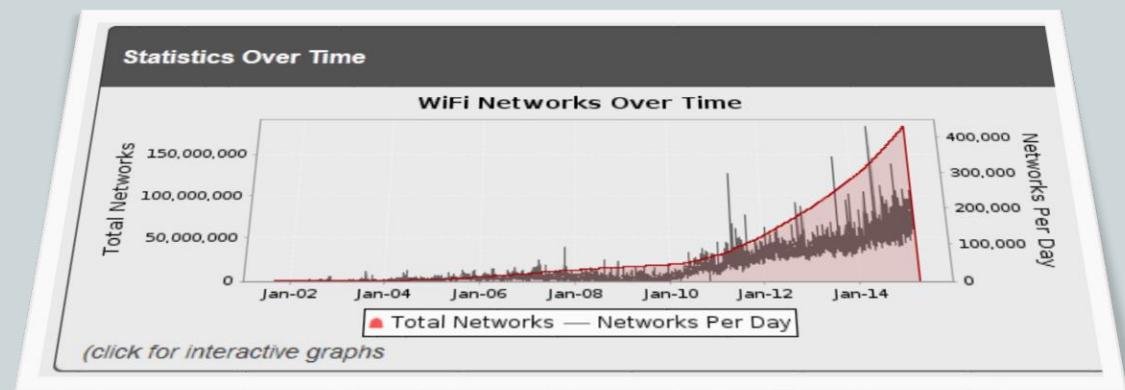
Concerned  
scientists/ Public

## The Great Divide

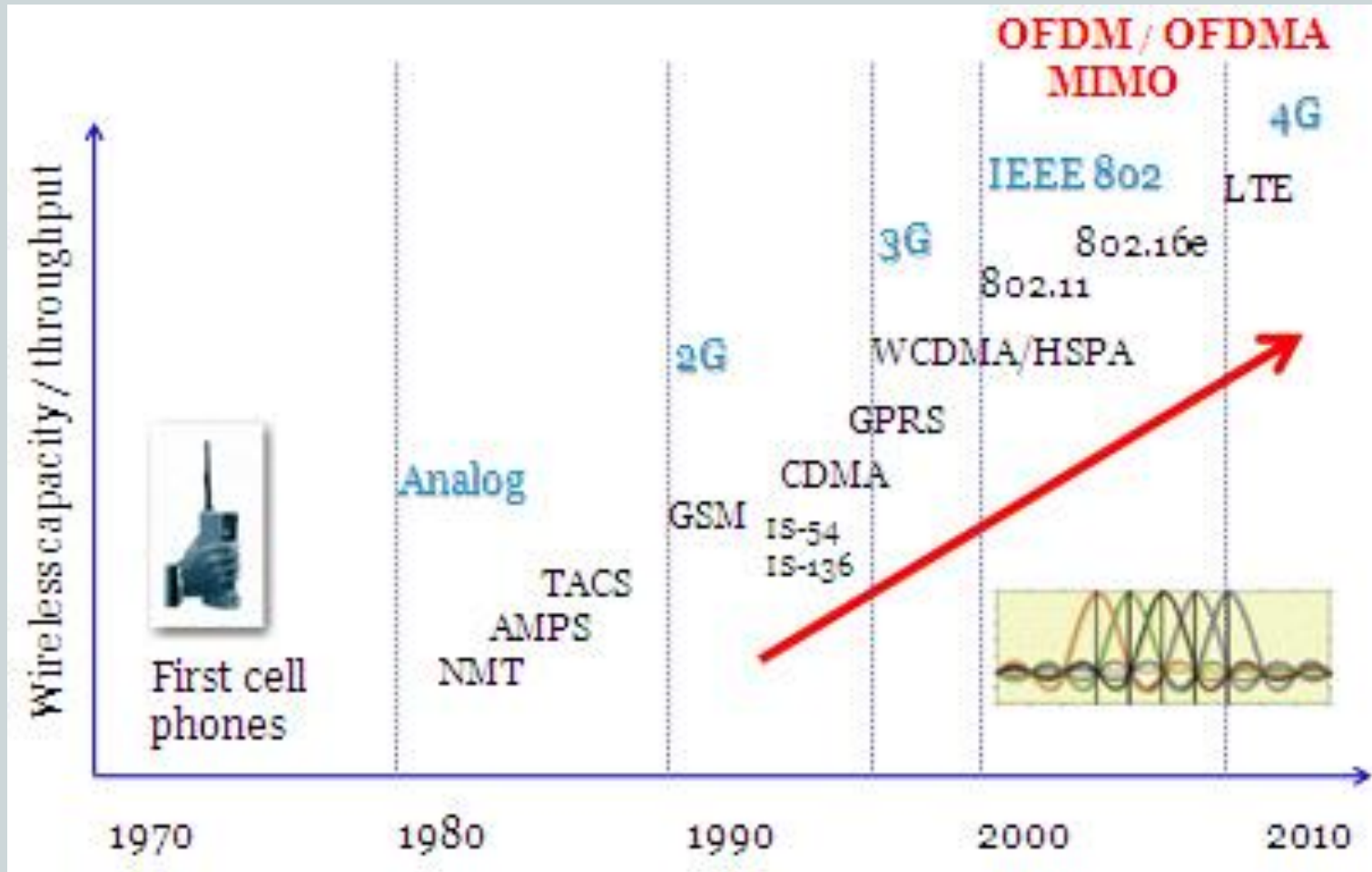
# Global Wireless Map



Source: [www.wigle.net](http://www.wigle.net)



# HISTORY OF CELL NETWORKS



# DEFINITION OF HEALTH



World Health Organization

## **WHO definition of Health**

**Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.**

Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. The Definition has not been amended since 1948.

# DEFINITION OF MICROWAVE SICKNESS

From Merriam Webster's medical dictionary:

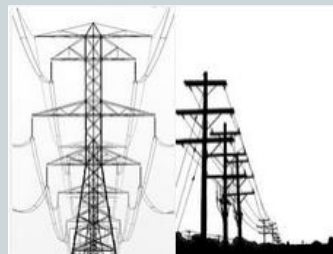
“**Microwave Sickness:** a condition of impaired health reported especially in the Russian medical literature that is characterized by headaches, anxiety, sleep disturbances, fatigue, difficulty in concentrating and by changes in the cardiovascular and central nervous systems...

*that is held to be caused by prolonged exposure to low-intensity microwave radiation.*”



# CAUSATIVE AGENTS

- **Exposures related to**
  - Smart Meters
  - Mobile Phone Base Stations
  - WiMax (WiFi on steroids)
  - WiFi/Bluetooth Devices
  - Mobile/Cordless Phones
  - Computers and Monitors
  - Power Lines, Transformers etc.
  - Digital Communications
  - Other Electrical Devices



..... can lead to the development of health problems

# RECOGNISED EFFECTS OF EVEN MINUTE LEVELS OF MICROWAVE RADIATION EXPOSURE HAVE BEEN SHOWN TO:

- Increase Permeability of Blood Brain Barrier and gut
- Open the blood-brain barrier to viruses and toxins
- Heat head and ear
- **Induce ringing in the ears**, impair sense of smell
- Increase excitability at neuronal synapses
- Damage nerves in the scalp
- **Cause diverse neuropsychiatric changes, including depression**
- Disrupt brain activity, alter brain waves (EEG readings), alter brain chemistry and alter the brain's electrical activity during sleep
- Lower levels of night time melatonin; **sleep disruption and insomnia**
- **Cause memory loss and mental confusion**
- Poor exploration of the local environment, motivation waning
- **Cause headaches and Induces extreme fatigue**
- Reverse cell membrane polarity (RBC's form Rouleaux formation)
- Altered chronobiology leading to stress response
- Cause blood cells to leak haemoglobin
- **Create joint pain, muscle spasms and tremors**
- Precipitate cataracts, retina damage and eye cancer
- Immune disruption leading to over active, under active, and autoimmune conditions.
- **Create burning sensation and/or rash on the skin**
- Reduce the number and efficiency of white blood cells
- Stimulate asthma by producing & releasing histamine in mast cells
- **Cause digestive problems**
- Stress the endocrine system, especially pancreas, thyroid, ovaries and testes
- Cause single strand and double strand breaks in cellular DNA (via Oxidative stress pathways) – can lead to Cancer
- Increase in tumour genesis due to fragility and altered expression of RNA and DNA
- Altered hormone and sex steroid levels
- Leads to both male and female infertility
- **Leads to changes to the electrical control of the heart resulting in tachycardia (rapid heartbeat), arrhythmia** and can result in sudden cardiac arrest
- **Peripheral neurological effects leading to noxious and abnormal sensations or Dysesthesia**

WHAT DOES THE  
RESEARCH REALLY SAY?

# WHAT SCIENTIFIC RESEARCH SHOWS –

- EMF exposure impacts the body on many levels including:
  - the nervous system, notably the brain
  - the endocrine system,
  - the immune system,
  - and genes (DNA)
  
- More specific effects include:
  - Calcium Flux
  - Circadian Rhythm Disruption
  - Oxidative Stress
  - Increased Glucose levels in blood
  - Increased Bilirubin (by-product of haemoglobin)
  - Changes in Neuro Transmitter levels
  - Changes in Cortisol levels
  - Reduction in Sex Hormones

Source: Naval Medical Institute Glaser 1971, Defense Intelligence Agency Study 1976, NASA EMF study 1981, US Air force study 1994

# PHYSICAL SYMPTOMS

- The effects of non-ionising radiation can produce a wide range of physical symptoms
- Some symptoms may take years to develop and manifest
- Some effects can be short-term while others can be long-term or even permanent
- Exposure to RF radiation, at a SAR values lower than levels where thermal effects occur have repeatedly been shown to affect both gene expression and cell regulatory functions

## ■ RF exposure leads to:

- **Increase in Serotonin Levels (initially)**
  - Possible mechanism relates to HF RF increasing Glucose Metabolism and Increase levels of Glucose in the Blood
  - Increase Glucose leads to increase in Serotonin levels (Temporary)
- **Reduces Melatonin**
  - Disrupts Circadian Rhythm
- **Cellular Stress/Oxidative Stress**
  - Depletion of Zn, Mn and Vitamin B6 – Leads to Pyroluria
  - Pyrroles (Pyroluria) depresses Serotonin (antagonistic)
  - Long term HF RF exposure reduces Serotonin levels
- **Alters calcium ion homeostasis i.e. CA flux (at athermal levels) via VGCC gate activation**

# BILIRUBIN

- Bilirubin is a by-product of degradation of red blood cells containing haemoglobin
- A high bilirubin level can be an indicator for high red blood cell turn over
- Animal tests show that exposure to microwave Radio Frequencies significantly increases bilirubin levels – El-Ghazaly et al. 2014, El-Bediwi et al. 2011, Moussa 2009

# THE BRAIN = CHEMICAL FACTORY

- Serotonin (5-HT), dopamine (DA), and other NT's are synthesized in the brain.
- The raw materials for NT synthesis are nutrients: vitamins, minerals, and amino acids
- Nutrient imbalances - genetic or acquired (Diet, Environmental Pollutants, Stress) can result in brain chemistry problems
- GABA synthesis requires Zn
- Serotonin synthesis requires B6
- Norepinephrine (NE) is  $\text{Cu}^{++}$  dependent
- DA, NE, 5-HT levels are impacted by RF

**Many studies found people living close to microwave transmitters have more neuro-behavioural symptoms**



# RF EFFECTS THE ENDOCRINE SYSTEM

- **High Frequency RF effects levels of monoamines in the body**
  - Monoamines refer to the neurotransmitters dopamine, noradrenaline and serotonin.
  - The precursor to melatonin is serotonin
- **Short term exposure to 900MHz results in increases in Serotonin**  
Eris AH. *et al.* 2015
- **Long tem exposure to HF RF leads to significant decreased concentrations of Dopamine, Norepinephrine (NE) and serotonin (5-HT)**  
Aboul E. *et al.* 2013, Maaroufi K. *et al.* 2014, Megha K. *et al.* 2015
- **Circadian rhythm is disturbed after chronic exposure to RF (1800Mhz and 900Mhz) affecting Melatonin and Testosterone levels (decrease)**  
Qin F. *et al.* 2012

# SYMPTOMS ASSOCIATED WITH HIGH/LOW SEROTONIN LEVELS

## Serotonin Syndrome symptoms:

- **Confusion**
- **Agitation** or restlessness
- Dilated pupils
- **Headache**
- Changes in blood pressure and/or temperature
- **Nausea** and/or vomiting
- Diarrhoea
- **Rapid heart rate/Irregular heart beat**
- **Tremor**
- Loss of muscle coordination or twitching muscles
- Shivering and goose bumps
- Heavy sweating
- **Insomnia**

## Serotonin Deficiency Symptoms:

- **Headaches**
- **Anxiety** in typically low stress situations
- **Impatience** without explanation
- **Fatigue** when you should feel rested and energized
- **Cognitive impairment** (inability to focus, **poor memory, lack of mental clarity**)
- **Agitation**
- **Mood swings**
- **Strong sugar cravings**
- **Insomnia**

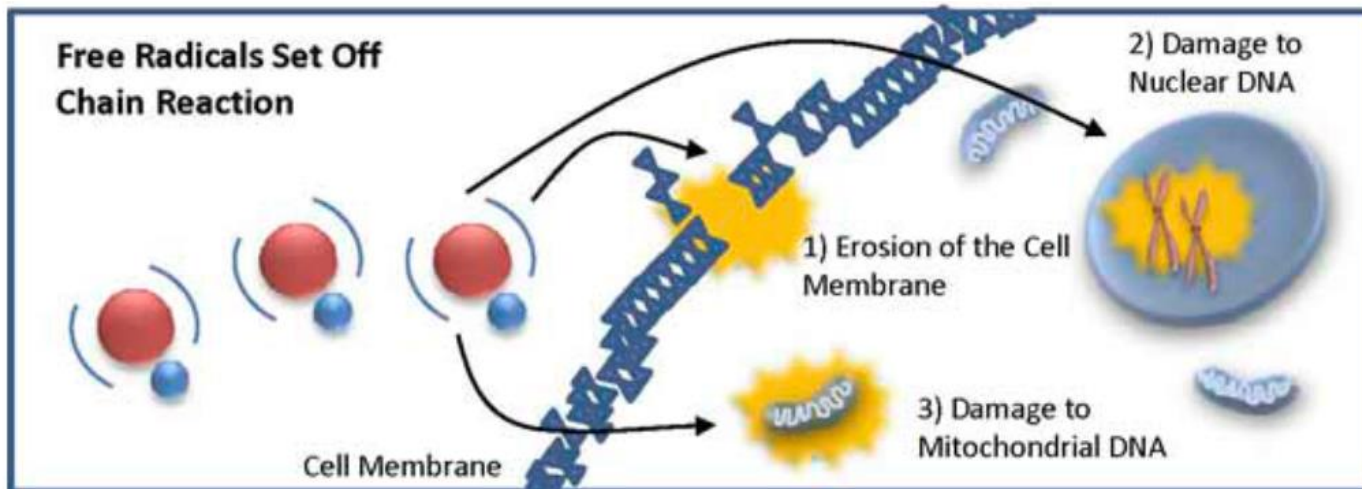
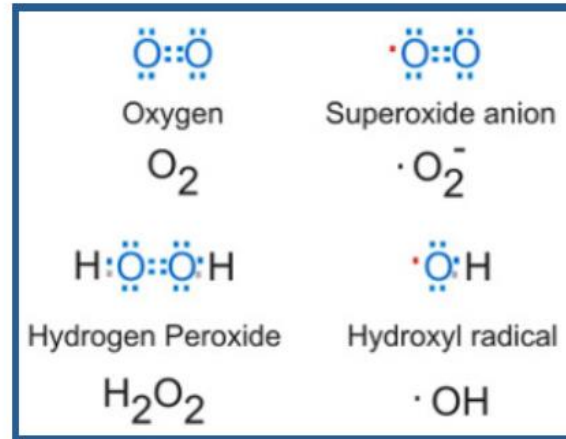
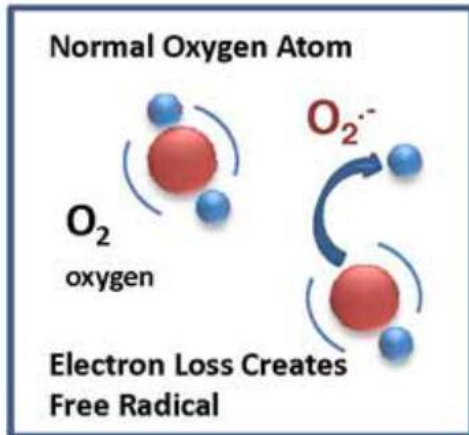
# BIOCHEMICAL ABNORMALITIES ARE ASSOCIATED WITH OXIDATIVE STRESS

- Man made EMR exposure depletes body of essential minerals and vitamins – as a result of stress response
- Exaggerated by other stress factors
  - Chemical, physical, mental, environmental and thermal
- Biochemical imbalances can adversely impact neurotransmitter synthesis & regulation
- Oxidative stress may be the decisive factor in those who are EHS

# WHAT IS OXIDATIVE STRESS?

- Excess of free-radicals that can destroy cells, damage DNA, proteins, and essential fats
- An imbalance between reactive oxygen species (ROS) and a biological system's ability to readily detoxify their damaging effects
- Almost 100 scientific studies indicate RF exposure leads to increased oxidative stress in cells

# FREE RADICAL DAMAGE



# SYMPTOMS EXPLORED IN MORE DETAIL

- **HF RF causes sleep disruption/insomnia**
  - Poor sleep is higher than ever in history
  - Parallels the proliferation of cellular telecommunication
  - Entrained the brain up to and beyond alert state to more stressful-beta states
  - Increases stress hormone production
  - Nearly impossible to quiet the brain effectively during the night to achieve adequate Delta-rhythm sleep
  - lack of Delta-rhythm for as little as 3 nights caused healthy college students' glucose profiles to look pre-diabetic
  - People who suffer from insomnia are more prone to developing certain illnesses including:
    - cancer, cardiovascular disease, diabetes, obesity, and gastrointestinal disorders





# CHRONIC EMR EXPOSURE CAUSES NEURODEGENERATION

- Neural cells suffer functional or sensory loss in neurodegenerative cases
- Imbalanced metabolism and excess reactive oxygen species (ROS) generation results in a range of disorders such as Alzheimer's disease, Parkinson's disease and autism
- A large number of studies demonstrate that EMR alters neurotransmitter levels, glucose metabolism, and causes oxidative stress ...  
... which directly impacts CNS





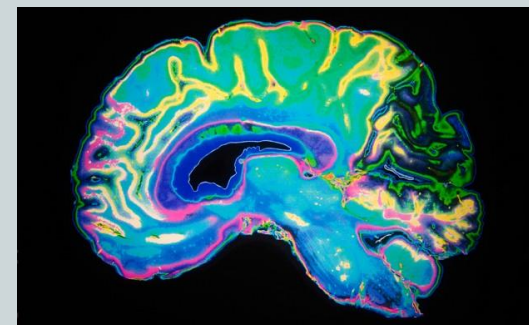
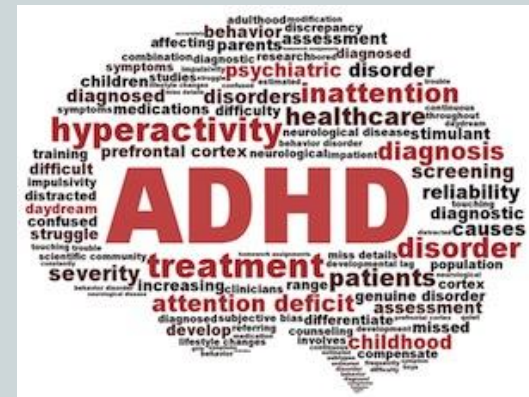
# CHRONIC EMR EXPOSURE CAUSES NEURODEGENERATION

- HF RF has been demonstrated to open the blood brain barrier allowing toxic substances to enter
- Neurodegenerative diseases are one of the main causes of mental and physical disabilities
- Neurodegeneration has been estimated to begin many years before the first clinical symptoms manifest
- Even a prompt diagnosis provides very little advantage for a more effective treatment as pharmacotherapies are based on disease symptomatology only
- The aetiology of the majority of neurodegenerative diseases remains unknown to scientists

**Further studies should be directed towards determining and confirming the roles chronic EMR exposure has on Neurodegeneration**

# RISE IN COGNITIVE DISORDERS

- Millions of individuals across the age spectrum suffer from cognitive disorders, ranging from:
  - children with ADD, ADHD, ASD,
  - developmental disorders,
  - or epilepsy to seniors with ALS,
  - autoimmune conditions,
  - MS, Parkinson's,
  - Stroke,
  - or various forms of Dementia



**Many of the above disorders are increasing year on year and corresponds with rise in digital wireless communications**

# WE HAVE KNOWN FOR MORE THAN 50 YEARS!

- The objective condition of physical sensitivity was discovered in 1932 (Germany) and convincingly established in detail in the 1960s.
- Dr Allan Frey was an early pioneer on Radio frequency research
- Dr Frey was the first American to publish (1961) on the **microwave hearing** effect
  - In his experiments, the subjects were discovered to be able to hear appropriately pulsed microwave radiation, from a distance of 100 metres from the transmitter
  - This was accompanied by side effects such as **dizziness, headaches,** and a **pins and needles sensation**

# RESEARCH PAPERS

**EFFECTS OF MICROWAVES AND  
RADIO FREQUENCY ENERGY ON  
THE CENTRAL NERVOUS SYSTEM**

**ALLAN FREY**

# THE GREAT DEBATE

## THERMAL VS NON-THERMAL

- In this paper Dr Frey looked at the conflicted understanding of Radio frequencies that is still present to this very day
  - *“The source of misunderstanding can be traced to the controversy on thermal vs non thermal effects”*
  - *“This controversy involved a good bit of emotion and investigators polarized into two opposing camps”*
  - *“Those who held the thermal position and were dominant, considered any discussion of or experimentation with neural function as a part of the non-thermal camp and thus deserving of censure”*
  - *“The tragedy in this is that the thermal vs non-thermal controversy is one of semantic, not science”*
- Dr Frey found that synchronizing the RF pulses with the R wave resulted in Tachycardia and frequent Arrhythmia and cessation of the heart

# BRAIN BARRIER

- Dr Frey's research found that weak radio frequency signals—just like those from today's cell phones—opened up this normally closed barrier
- Frey first injected the dye into the bloodstream of rats and then exposed them to very weak pulsed microwave signals
- Within a few minutes, the injected rats' brains began to fluoresce, signalling that the blood-brain barrier had been breached
- There have been numerous studies confirming and/or extending Frey's work i.e. Salford 1994, Nittby 2009, Vojdani 2014

# **US NAVAL MEDICAL RESEARCH**

**BIBLIOGRAPHY OF REPORTED  
BIOLOGICAL PHENOMENA  
( 'EFFECTS' ) AND CLINICAL  
MANIFESTATIONS ATTRIBUTED TO  
MICROWAVE AND RADIO-FREQUENCY  
RADIATION**

**1972**



- Review of more than 2300 references on the biological responses to radio frequency and microwave radiation, published up to June 1971
- More than 140 unique individual effects were listed against the following 17 categories:
  - Heating of Organs
  - Changes in Physiological Function
  - Central Nervous System Effects
  - Autonomic Nervous System Effects
  - Peripheral Nervous System Effects
  - Psychological Disorders
  - Behavioural Changes
  - Blood Disorders
  - Vascular Disorders
  - Enzyme and Other Biochemical Changes
  - Metabolic Disorders
  - Gastro-Intestinal Disorders
  - Endocrine Gland Changes
  - Histological Changes
  - Genetic and Chromosomal Changes
  - Pearl Chain Effect
  - Miscellaneous Effects

- A partial list of effects from the report included:
  - **Corneal Damage**
  - Tubular Degeneration of Testicles
  - Changes in the Oxidative Processes in Tissues and Organs
  - Decreased fertility
  - Sterility
  - Altered Foetal Development
  - Haemolysis
  - Cranial Nerve Disorders
  - Seizures
  - Convulsions
  - **Dizziness**
  - Depression
  - **Insomnia**
  - Hand Tremors
  - **Chest Pain**
  - Altered Adrenal Cortex Activity
  - Chromosome Aberrations
  - Tumours
  - Neuro-vegetative Disorders
  - **Fatigue**
  - **Alterations In Sensitivity to Light, Sound, and Olfactory Stimuli**
  - **Electrocardiographic (EKG) Changes**
  - Changes in Circadian Rhythms

**US DEFENSE INTELLIGENCE  
AGENCY (DIA) REPORT**

**BIOLOGICAL EFFECTS OF  
ELECTROMAGNETIC RADIATION  
(RADIOWAVES AND MICROWAVES)  
EURASIAN COMMUNIST COUNTRIES**

1976

# FINDINGS

- Open literature demonstrated the use of low-level microwave signals (on animals) to produce death by heart seizure or by neurological pathologies resulting from breaching of the blood-brain barrier
- Effects of electromagnetic irradiation on the blood include:
  - Biochemical variations,
  - Effects on red blood cells,
  - Changes in blood coagulation,
  - and alterations in the blood forming system
- **Microwaves significantly decreased the lifetime of red blood cells (erythrocytes)**
  - High turnover over red blood cells leads to increase in total bilirubin

# FINDINGS

- Comparison of a group (engineers and administrative officials) who were exposed to microwaves for a period of years with an unexposed control group revealed:
  - Significantly higher incidence of coronary disease,
  - Hypertension,
  - and disturbances of lipid metabolism among the exposed Individuals

Note: Hereditary predisposition to heart disease was approximately the same in both groups

- Hemodynamic indices for thirty men in the 25-40 year age range who had been exposed to UHF exposures for from two to ten years showed a tendency to bradycardia
- Personnel exposed to microwave radiation below thermal levels experience more neurological, cardiovascular, and hemodynamic disturbances than do their unexposed counterparts

# SUBJECTIVE SYMPTOMS

- Subjects exposed to microwave radiation exhibited a variety of neurasthenic disorders
- The most common subjective complaints were:
  - Headache
  - Fatigue
  - Perspiring
  - Dizziness
  - menstrual disorders
  - Irritability
  - Agitation
  - Tension
  - Drowsiness
  - Sleeplessness
  - Depression
  - Anxiety
  - Forgetfulness
  - Lack of concentration

The magnitude and intensity of the changes tended to increase with length of exposure

# CLINICAL STUDIES

- Clinical studies were done on thirty subjects, aged 25 to 40 years, exposed to industrial UHF radio waves ranging from 4 to 13 years.
- Subjective complaints included generalized weakness, afternoon and evening apathy, **fatigue, headache, sleep disorders**, and non-radiating precordial pain suggestive of asthenia or neurasthenia with autonomic dystonia
- Autonomic-vascular changes and emotional lability and reactivity were attributed to CNS changes and increased pituitary-adrenal gland function
- It was also noted that such **shifts to neuroendocrine function** could lead to circulatory disorders manifested by changes in the hemodynamic indices and electrical activity of the heart
- Chronic exposure to the effects of low intensity high frequency radiowaves **can influence the immune reactive state of the body**

# NASA STUDY

ELECTROMAGNETIC FIELD  
INTERACTIONS WITH THE HUMAN  
BODY: **OBSERVED EFFECTS AND  
THEORIES**

1981



# NASA STUDY

- This report characterises the good, bad and benign effects to be expected from non-ionizing EM fields
- “...it was generally assumed that others, called NIR (nonionizing radiation), had no effects besides the rather obvious ones, which were either avoidable or controllable, such as heating and electric shock. **More recently this assumption has been reconsidered...**”
- “...Of these controversial effects, the ones associated with the central nervous system are collectively termed ‘neurasthenia’. **Some of these are reportedly reversible.** That is, when the electromagnetic field vanishes, so do the effects...”
- “...results from controlled experiments show that removal of the earth's natural electric field **and/or the application of a manmade field can disrupt circadian rhythm...**”

# NASA STUDY

- In reference to RF Safety Standards - Different tables and figures emphasize different parameters of the electromagnetic field as the basis for comparison
- Some of them are:
  - frequency
  - duration of exposure
  - field intensity, regardless of power density
  - power density, regardless of field intensity
  - modulation, electrical (due to waveform) or mechanical (due to rotating antennas)
- None of the tables or figures seem to emphasize one essential characteristic of the field, namely, **polarization**

# NASA STUDY LISTS DOZENS OF **OBSERVED** HUMAN HEALTH IMPACTS

- **Headaches**
  - Eyestrain
  - **Fatigue**
  - **Dizziness**
  - **Disturbed sleep at night**
  - Sleepiness in daytime
  - Moodiness
  - **Irritability**
  - Unsociability
  - Hypochondriac reactions
  - Feelings of fear
  - **Nervous tension**
  - Mental depression
  - **Memory impairment**
  - **Pulling sensation in the scalp and brow**
  - Loss of hair
  - **Pain in muscles and heart region**
  - Breathing difficulties
  - Increased perspiration of extremities
  - Difficulty with sex life
- **Symptomatology**
    - **Bradycardia**
    - Disruption of the endocrine-humoral process
    - Hypotension
    - Intensification of the activity of thyroid gland
    - Exhausting influences on the central nervous system
    - Decrease in sensitivity to smell
    - Increase in histamine content of the blood
  - **Subjective Complaints**
    - **Increased fatigability**
    - **Periodic or constant headaches**
    - **Extreme irritability**
    - **Sleepiness during work**

Table 11 SUBJECTIVE EFFECTS ON PERSONS WORKING IN RADIO FREQUENCY ELECTROMAGNETIC FIELDS (FROM DWYER, 1978).

Table 12 CLINICAL MANIFESTATIONS OF CHRONIC OCCUPATIONAL EXPOSURE OF 525 WORKERS TO ELECTROMAGNETIC RADIATION AT MICROWAVE FREQUENCIES (FROM DWYER, 1978).

# NASA STUDY – OBSERVED EFFECTS

Researcher	Number of Subjects	Frequency or Band	Field Strength/ Power Density	Effects
Sadicikova	1180	Microwaves	30-3,000 $\mu\text{W}/\text{cm}^2$	Fatigue, irritability, sleepiness, memory loss, bradycardia, hypertension, hypotension, cardiac pain, systolic murmur, "microwave sickness"
Eckert	494	60Hz		Crib death (Sudden Infant Death Syndrome)
Bogucka	72	Radio and TV		Functional disorders of central nervous system, hyperacidity, epigastric pain, disorders of cardiovascular system, leukopenia of blood, esinophobia of blood.
Katorgina	230	2-1000 kHz	3-5 V/m	Eye pain, headache, vascular changes in eye.
Holt		VHF	Below 10 $\text{mW}/\text{cm}^2$	Cancer growth stimulated

# NASA STUDY – OBSERVED EFFECTS

Researcher	Number of Subjects	Frequency or Band	Field Strength/ Power Density	Effects
Bise	10	0.1-960 MHz	$10^{-16}$ to $10^{-13}$ W/cm <sup>2</sup>	Changes in electroencephalogram, loss of memory, inability to concentrate, irritability, apprehension
Alberti	31	5-50 MHz		Decreased male fertility, insomnia, headache
Sadchikova		"microwaves"	0.03 - 3 mW/cm <sup>2</sup>	Reversible changes in nervous and cardiovascular systems and blood; "radio sickness"

**\*Nothing New\***

**Most of the symptoms listed match what people who are EHS are claiming today!!!**

# SYMPTOM OCCURRENCE OVER TIME

Symptoms	Length of Employment			
	1-6 years (average 4.3) (73 persons)		7-16 years (average 9.6) (73 persons)	
	percent of cases	number of cases	percent of cases	number of cases
Headache	20.5	15	32.9	24
Disturbance of sleep	13.7	10	23.3	17
Fatigue	12.3	9	17.8	13
General weakness	7.0	5	12.3	9
Disturbance of memory	5.5	4	8.2	6
Lowering of sexual potency	5.5	4	8.2	6
Drop in body weight	2.7	2	12.3	9
Disturbance of equilibration	5.5	4	11.0	8
<b>Neurological symptoms</b>	<b>0.0</b>	<b>0</b>	<b>15.1</b>	<b>11</b>
Changes in ECG	17.8	13	28.8	21

TABLE 20. OCCURRENCE OF SOME SYMPTOMS IN HUMANS EXPOSED OCCUPATIONALLY TO ELECTROMAGNETIC RADIATION IN THE FREQUENCY RANGE 750 KHZ-200 MHZ (FROM DWYER, 1978).

**US AIR FORCE**

**RADIOFREQUENCY MICROWAVE  
RADIATION BIOLOGICAL EFFECTS  
AND SAFETY STANDARDS: A  
REVIEW**

**1994**

# RFR/MW EFFECT FINDINGS

- Exposure of the human body to RF/MW radiation has many biological implications:
  - The effects range from innocuous sensations of warmth to serious physiological damage to the eye
  - Evidence that RF/MW radiation can cause cancer
  - Non-thermal responses can be less noticeable and are often more difficult to explain than thermal effects
  - Responses are related to the disturbances in the tissue not caused by heating
  - Evidence that RF/MW radiation can affect the blood and blood forming systems of animals and humans



# RFR/MW EFFECT FINDINGS

- Researchers reported that several CNS related disorders were discovered among 525 workers exposed to RF/MW radiation
- Symptoms were listed as:
  - Hypotension,
  - **Slower than normal heart rates** (Bradycardia),
  - Increase in the histamine content of the blood,
  - Increase in the activity of the thyroid gland,
  - Disruption of the endocrine-hormonal process,
  - Alterations in the sensitivity to smell,
  - **Headaches**,
  - **Irritability**,
  - and increased **fatigue**

# RFR/MW EFFECT FINDINGS

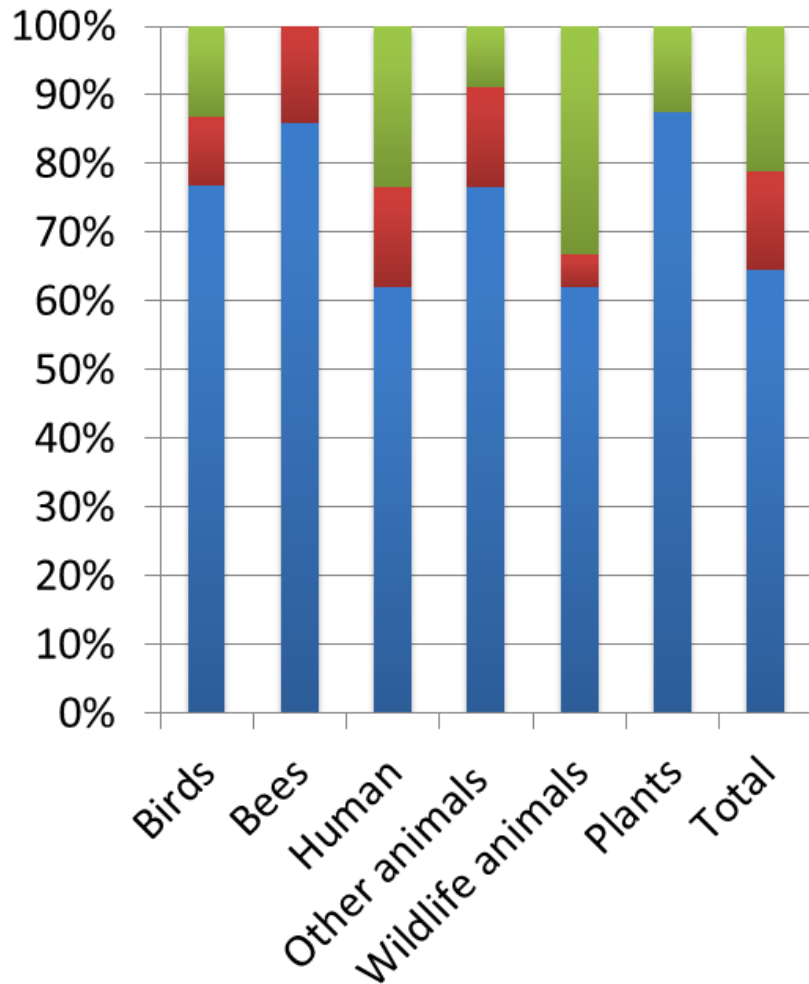
- Exposure to RF/MW radiation has been observed to cause a disruption in the behaviour of animals
- Experiments conducted on rats and nonhuman primates indicates that conditioned responses can be altered as a result of irradiation
- Researchers indicate that behaviour may be the most sensitive biological component to RF/MW radiation
- Experimental evidence has shown that exposure to low intensity radiation can have a profound effect on biological systems
- The nonthermal effects of RF/MW radiation exposure are becoming important measures of biological interaction with EM fields

***For both CW and pulsed EM fields the exposure time should not exceed 6 minutes at the recommended levels!!!***

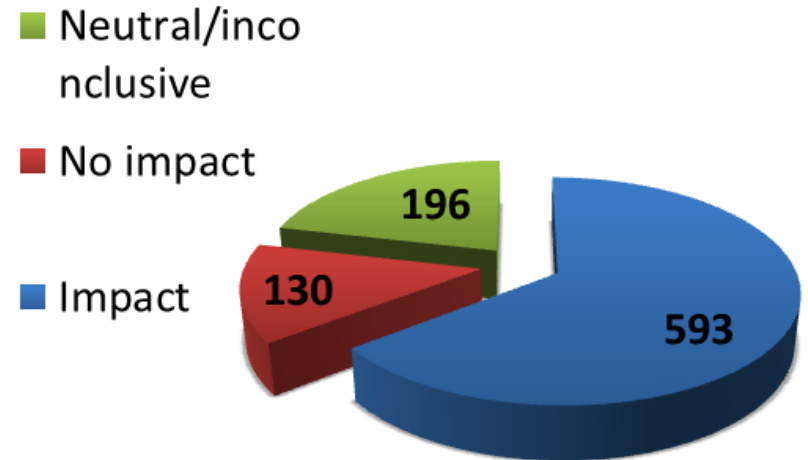
**MISCELLANEOUS  
RESEARCH**

# Many studies indicate risk from over exposure

***“EMF hypersensitivity can occur as a bona fide environmentally-inducible neurological syndrome,”*** McCarty et al. (2011).



**Number of studies on EMF impacts collected & collated based on study subjects & results** (Rahmani et al. 2011).\*



**Total 919 studies**

\* Similar results were observed in Cucurachi et al. (2013)'s review of 113 studies.

# RF exposures & health problems

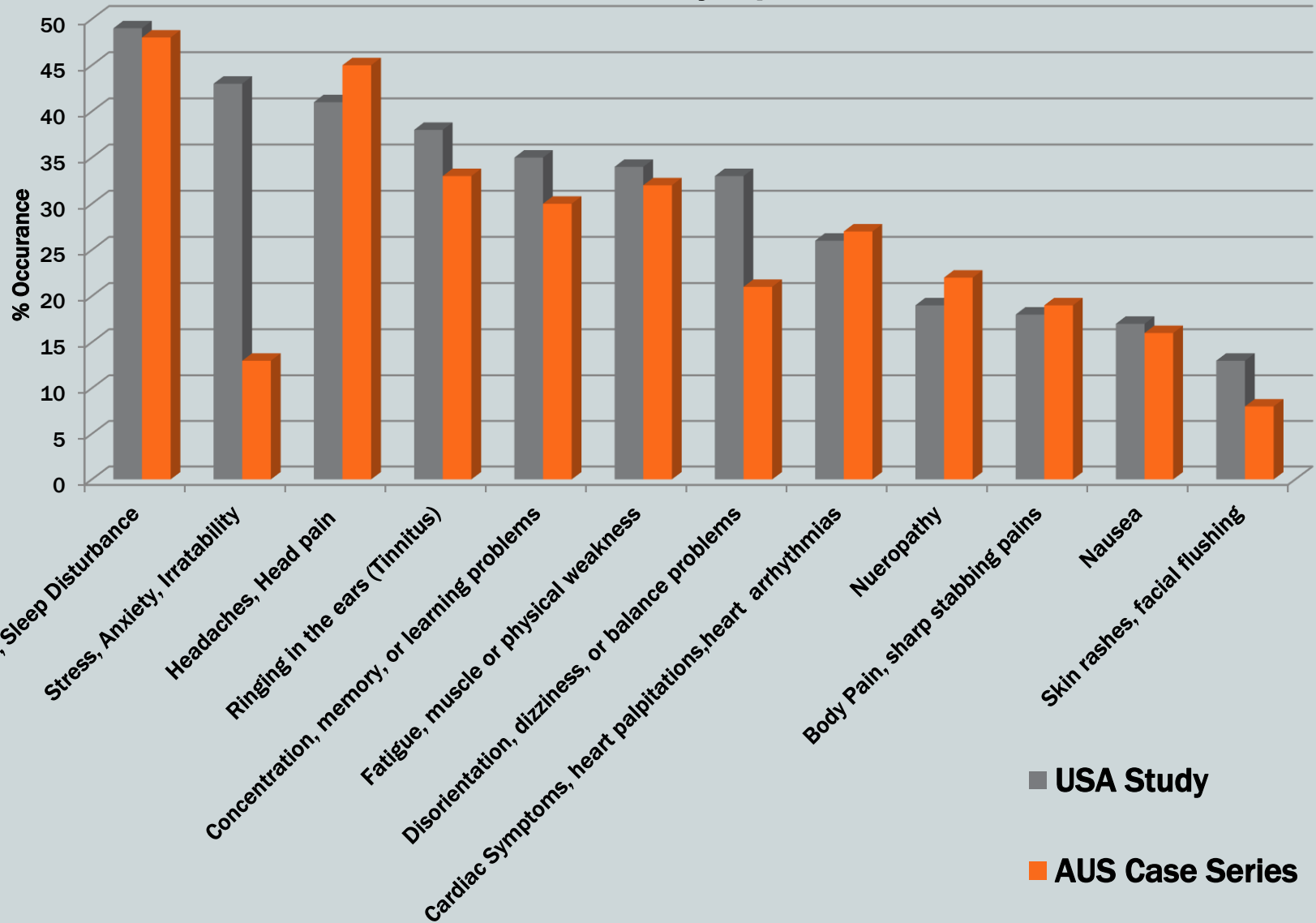
Specific Health Symptoms & RF radiation (n = 180) Eger & Jahn (2010, 2010a).

Comparison of 1.17 V/m & 0.7 V/m exposure groups	Significance level p (t-test)
Sleep problems	0.001 = <i>highly significant</i>
<b>Symptoms of depression</b>	0.001
<b>Headaches</b>	0.001
Cerebral affections	0.001
<b>Concentration difficulties</b>	<b>0.001</b>
Joint problems	0.001
Infections	0.001
Skin problems	0.001
<b>Cardiovascular problems</b>	0.001
Auditory system Disturbance of equilibrium	0.001
Visual problems	0.001
Gastrointestinal problems	0.001
Dizziness	0.01 = <i>significant</i>
Nosebleeds	0.01

Similar levels of 0.72-1.31 V/m recorded 1m from single wireless laptop (Peyman et al. 2009). Levels would be substantially higher closer to it.

**Increased health problems shown below levels created by Wi-Fi radiation.**

# Smart Meter Symptoms



Halteman, Ph.D., statistics, Final Results Summary: Wireless Utility Meter Safety Impacts Survey, September 13, 2011, p. 22 ( <http://emfsafetynetwork.org/wp-content/uploads/2011/09/Wireless-Utility-Meter-Safety-Impacts-Survey-Results-Final.pdf>). 97 percent of respondents to full survey were in the USA, from 28 states with most in California (78 percent) and New York (16 percent). **(318 Individuals)**  
**Federica Lamech, MBBS**, Self-Reporting of Symptom Development from Exposure to Radiofrequency Fields of Wireless Smart Meters in Victoria, Australia: A Case Series. Alternative Therapies, Nov/Dec 2014, Vol. 20, No. 6, pages 28-38. NIH PMID 25478801 **(92 Individuals)**

# **DR BRUCE HOCKING - (FORMER CHIEF MEDICAL OFFICER OF TELECOM AUST. NOW TELSTRA)**

- Hocking (1998) interviewed 40 persons with symptoms they associated with their use of Mobile Phones
- 35 of the 40 reported cranial symptoms and the most common site was the temple area, ear and occipital area
- The majority felt the sensation less than 5 min after starting the call
- Many felt the sensation build up as the day progressed
- For almost half of them the sensation lasted more than an hour

## **Bruce Hocking, Australia**

**Preliminary report: Symptoms associated with mobile phone use.  
Occupational Medicine 48: 357-60, 1998.**

Telephone interview in 3 parts:

- General health and headache history
- Symptoms related to MP use
- Type of MP

- 40 people were interviewed, 75% male, age 30-49
- 10 associated symptoms with use off analogue phone,
- 28 with use of digital phone, 13 of these had used analogue phone without problem
- 34 had changed their use of MP due to symptoms: use it as a pager handsfree kit

**Headache most common reported**

**”different from ordinary headache”**



# SCANDINAVIAN STUDY 1995

- Many people in Sweden and Norway contacted manufacturers and researchers working with electromagnetic fields
- The symptoms reported were:
  - **headaches**,
  - feeling of **discomfort**,
  - warmth behind/around or on the ear,
  - And **difficulties concentrating**
- Statistically significant association between calling time/number of calls per day and the prevalence of warmth behind/around/on the ear, headaches and fatigue were found

Source: [http://www.salzburg.gv.at/Proceedings\\_%2817%29\\_Sandstroem.pdf](http://www.salzburg.gv.at/Proceedings_%2817%29_Sandstroem.pdf)

# TNO PHYSICS AND ELECTRONICS LABORATORY

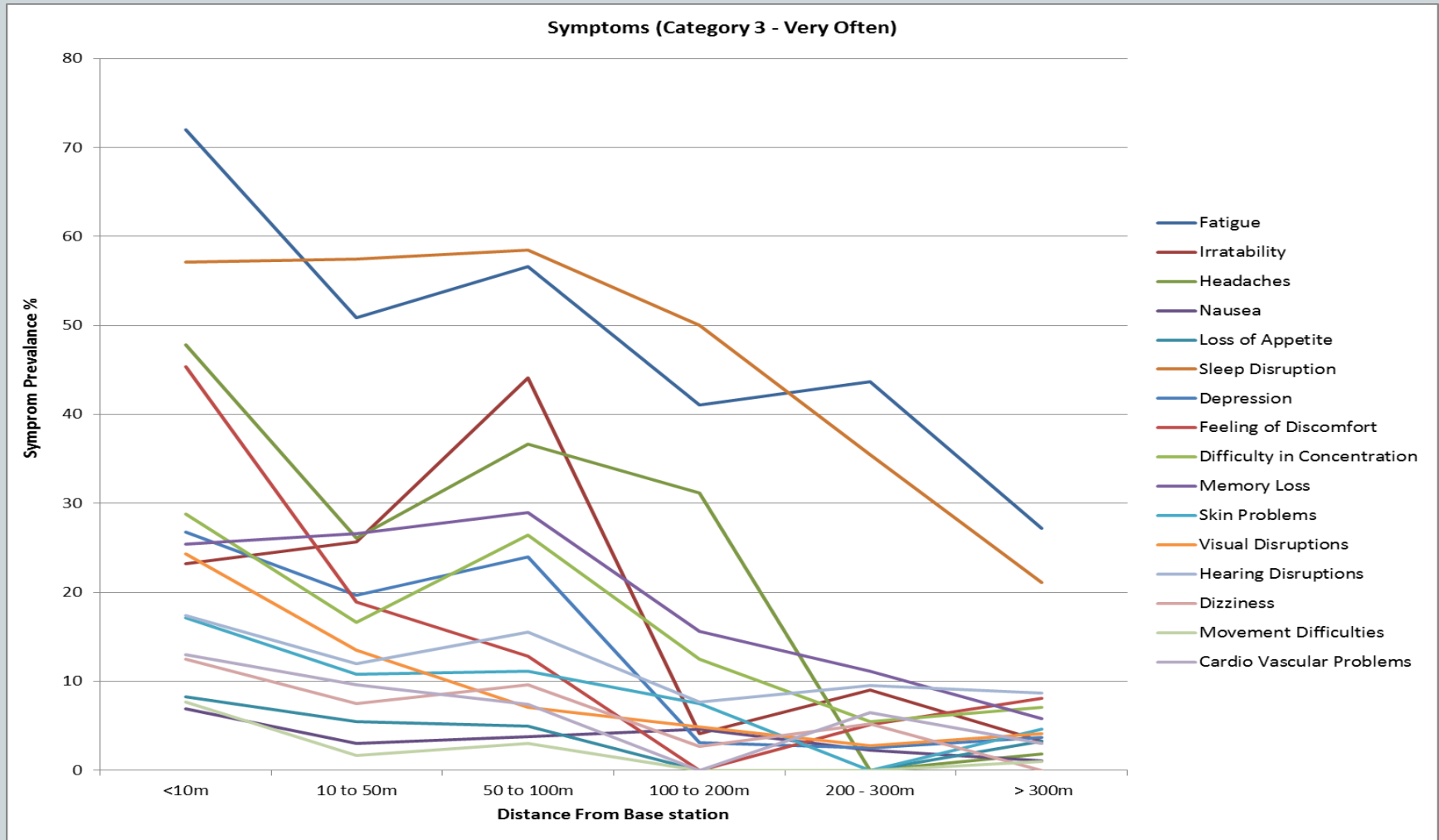
- TNO Physics and Electronics Laboratory in the Netherlands published the results of a study commissioned by three Dutch ministries 2003
- In double-blind experiments human volunteers were exposed to radiation mimicking common residential exposure to third generation(UMTS) cell towers
- a statistically significant relation was found between radiofrequency fields and the experience of wellbeing by the subjects

**The researchers confirmed, under laboratory conditions, the existence of a microwave syndrome that at least 23 teams of scientists in 16 countries have reported to be wide spread in the vicinity of cell towers, and among users of cell phones**

# TNO STUDY FINDINGS

- Exposed subjects frequently reported one or more of the following:
  - **dizziness and nausea,**
  - shortness of breath,
  - **numbness and tingling,**
  - **inability to concentrate,**
  - **irritability,**
  - nervousness,
  - **headaches,**
  - **fatigue,**
  - weakness,
  - muscle pains,
  - **heart palpitations**
  - and **chest pain**

- A number of studies provide clear evidence of an association between distance from an antenna and symptom prevalence
- This would not be expected if EMR was not the cause



**Investigation on the health of people living near mobile telephone relay stations: Incidence according to distance and sex” (Santini R. et al. 2002)**

# INCREASED SYMPTOMS AROUND BASE STATIONS

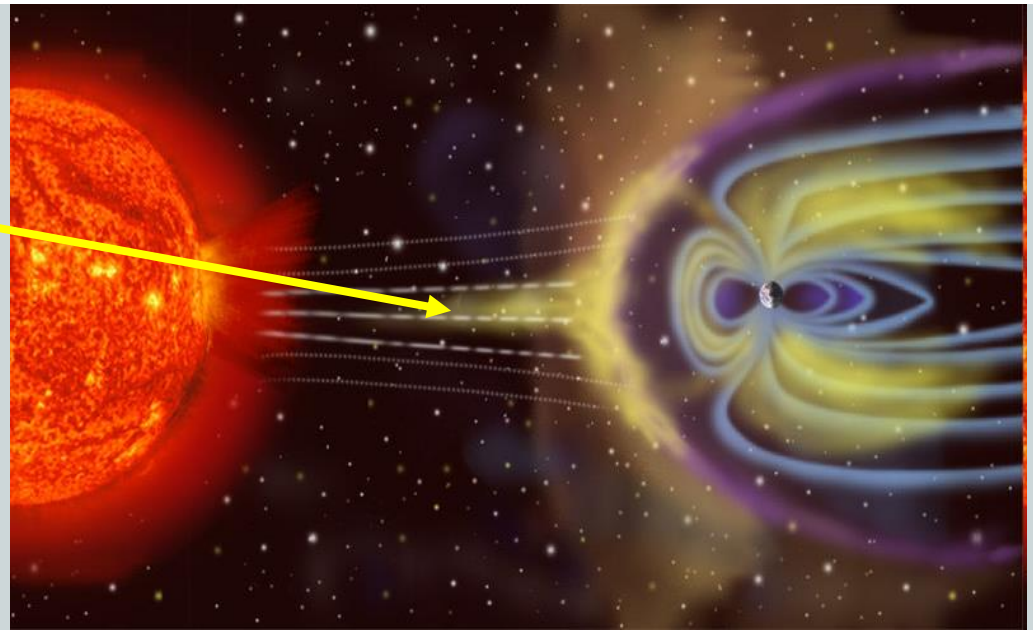
- **8 of the 10 studies evaluated from PubMed had reported increased prevalence of adverse neurobehavioral symptoms** or cancer in populations living at distances <500 m from Base Stations.  
Khurana VG *et al.*, (July 2010)
- **10 out of 14 peer-reviewed studies both found significant increases in the symptoms being analysed**, and conformed to the specified WHO / ICNIRP standards of scientific quality, including their assessment criteria of consistency and replication.  
Kundi M. London EMF Conference, 2008

# THIS IS NOT AT ALL NEW, IN FACT IT IS AS OLD AS MAN HIMSELF

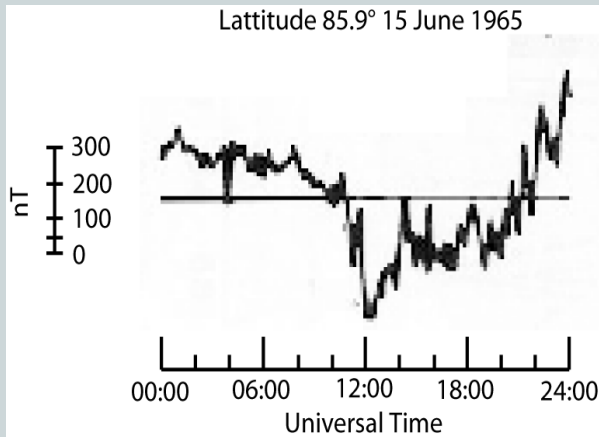
- The only thing that is new is the enormous rise in EMF pollution - hence the increasing reports of microwave sickness symptoms
- The next 2 slides describe the very well documented acute health effects from GM storms
- The effects occur with MF field fluctuations  $\sim 100$  nT - in line with many other MF responses in living systems
- The data are disparate in the sense that the many studies have been carried out at different times, not by epidemiologists, or in the lab from short-term exposures, but by diverse health/medical/scientific professionals
- **Much of this research was carried out as part of the US and Russian Space Programme**

# GEOMAGNETIC STORMS\*

- Arising from charged particles from the sun



**Typical MF profile (Campbell 2003)**  
(K-value – maximum fluctuation over a 3-hour period)



Storms of interest last 1–5 days and have a magnitude of about 100 nT

Strength of the Storm* (nT)	Frequency
> 100	4.6 per year
> 200	9.4 per 10 years
> 400	9.73 per 100 years

**Acute health effects include\*:** increase in depressive illnesses, melatonin disruption, heart rate variability, blood pressure changes.

\*Superimposed on the static GM field which in Nottingham is ~50  $\mu$ T

See: [http://www.ngdc.noaa.gov/stp/GEOMAG/kp\\_ap.html](http://www.ngdc.noaa.gov/stp/GEOMAG/kp_ap.html)

Love & Gannon Ann. Geophys. 27:3101-3131 (2009)

[http://en.wikipedia.org/wiki/Geomagnetic\\_storm](http://en.wikipedia.org/wiki/Geomagnetic_storm)

**However, only 10-15% of the population seem affected**

\*Pigeon migration is also disturbed by GM storms (Schiffner & Wiltschko 2011 J Comp Physiol A  
DOI 10.1007/s00359-011-0640-y

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# CHINESE RESEARCH

- From the total of 383 Chinese papers investigating EMF biological effects, 108 of these noted biological effects as a result of exposure
- Health effects for the 108 epidemiological studies included:
  - abnormal ECG;
  - disorder of immunoglobulin;
  - miscarriage;
  - neurasthenia;
  - poor sleep quality;
  - and sperm dysfunction.

Quoting Cao (2007): "***No matter what the exposure level may be, lower or higher than (Chinese) EMF exposure limits for public, health effects had been reported in these papers...***"

# MORE RECENT RESEARCH

- **More than 160 studies accumulated since 2012**
- **Challenges the claim that long term exposure below current RF safety guidelines are safe**
  - (3) Auditory dysfunction
  - (21) Apoptosis
  - (5) Blood Brain Barrier Permeability Changes
  - (1) Breast Cancer
  - (14) Behavioural Modification/Cognitive Function Impairment
  - (11) Brain Developmental Issues/Neurological degeneration
  - (9) Brain Tumours
  - (4) Calcium Influx/Efflux
  - (38) Cell Irregularities/Cell Damage/Morphological changes
  - (3) Circadian Rhythm Disruption
  - (3) Cellular Stress
  - (34) DNA Damage/Mutagenic/Genotoxic
  - (42) Altered Enzyme Activity/Altered Protein Levels
  - (6) Effects Mitochondria
  - (20) Altered Gene Expression
  - (1) Altered Glucose Metabolism
  - (4) Fatigue
  - (7) Headaches
  - (2) Heart Rate Variability
  - (1) Impaired/Reduced Healing
  - (6) Inflammation
  - (4) Insomnia
  - (16) Memory Retention/Impairment Issues
  - (1) Miscarriage (pregnancy)
  - (21) Sperm Effects/Sperm Damage - Viability/Motility Issues
  - (57) Oxidative Stress/Super Oxides, Free Radicals
  - (4) Sleep Performance Issues
  - (5) Tumour Promoter

**MICROWAVE SICKNESS –**

**PSYCHOLOGICAL OR  
PHYSIOLOGICAL?**

***“The psychogenic designation is logically vacuous, not meaningfully defined so not falsifiable, grounded in petitio principii (circular reasoning) — and functions as an assault.***

***It impedes a search, when warranted, for legitimate conditions, breaches patient-doctor trust, effectively abandons the patient, and blames him for his affliction while also casting the pall of mental infirmity.”***

**Golomb BA. Psychogenic Illness. In: Brockman J, ed. *This Idea Must Die: Scientific Theories That are Blocking Progress*. New York: Harper Perennial; 2014:511-4.**

# RISK PERCEPTION A CAUSE?

- Psychological causation is often suggested by researchers to explain syndromes that cannot be fully explained by current knowledge and understanding
- Many negative studies try to associate risk perception (worry and concern) to symptom development (nocebo affect)
- However a number of studies suggest that the prevalence of health complaints for sensitive people cannot be fully explained by attributions, concerns or risk perceptions. **Gómez-Perretta C. *et al.***, (December 2013), **Blettner M *et al.***, (November 2008), **Bortkiewicz A *et al.***, (2004) and **Levallois P *et al.***, (August 2002).

# PSYCHOLOGICAL TREATMENT INEFFECTIVE?

- Cognitive behavioural therapy (CBT) is put forward as a potential solution but not all researchers agree

*“Even comparing those patients who did reconsider their attributions against those who did not failed to identify any significant differences in symptom severity or perceived sensitivity. A similar phenomenon has been observed before in trials of CBT for patients suffering from chronic fatigue syndrome.” Rosa Nieto-Hernandez et al. (2008)*

- Functional neurologic or psycho-pathologic clinical symptoms such as cognitive impairment, depression, emotivism are prominent in those who are experiencing symptoms and are often misleading physicians and scientists towards a psychiatric causation

# RF IS A CELLULAR STRESSOR

- Physiological stress represents a wide range of physical responses that occur as a direct effect of a stressor causing an upset in the homeostasis of the body
- Psychological or physical equilibrium - the body responds by stimulating the nervous, endocrine, and immune systems
- The reaction of these systems causes a number of physical changes that have both short- and long-term effects on the body
- Stress produces changes in many body systems; examples include
  - Increased heart rate and blood pressure
  - Altered immune function

# **CELLULAR STRESS RESPONSE – NOT CONSIDERED IN STUDY DESIGNS**

- **Whether cells mount a protective or destructive stress response depends to a large extent on the nature and duration of the stress as well as the cell type**
- **There are many defences at the cell's disposal to deal with cellular stress but when subject to stress or stresses that are too strong and/or too persistent, they can lead to disease**
- **Responses to cellular stress ramp up with exposure and can take many hours to return to normal**
- **Depending on the severity and duration of stress encountered, cells either re-establish cellular homeostasis to the former state or adopt an altered state in the new environment**



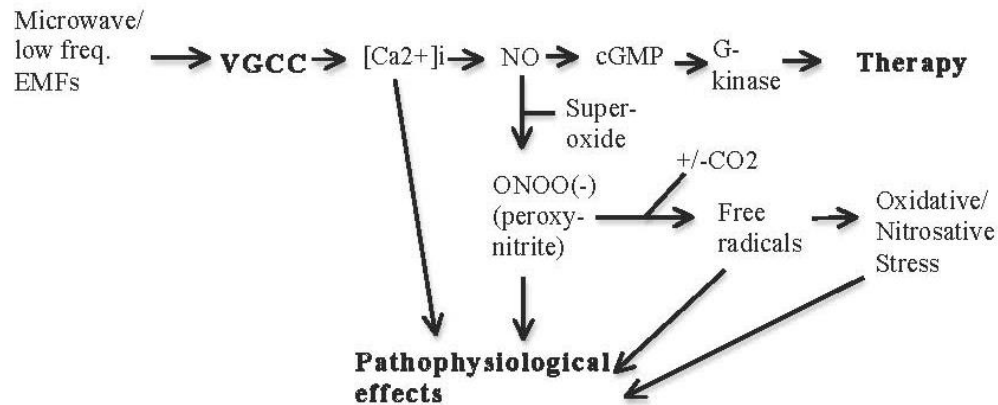
# WE ARE ALL SENSITIVE TO EMR....

- ... but we also have varying capacities to deal with it
- Body/Cells have compensation mechanisms to counteract and protect themselves from these artificial signals – e.g. HSP's, Antioxidants etc.
- Effectiveness is limited by:
  - State of health
  - Age
  - Genetic differences
  - Stress
    - Other environmental toxins (chemical, biological, radiological)
    - Life's pressures (Work, Relationships etc.)
  - Sleep patterns
  - Exposure duration

**A vulnerable proportion of the population does exist!**

# A POSSIBLE MECHANISM OF HARM

- A suggested mechanism of harm of RF/EMF has been elucidated by Martin Pall, Emeritus Professor of Biochemistry at Washington State University
- Using calcium channel blockers has been claimed to stop most RF/EMF symptoms



# PUBLIC CONCERNS

# PUBLIC CONCERNS

- ARPANSA does not investigate complaints it receives – suggests sufferers seek medical advice – Is there a lack of medical expertise in ARPANSA?
- Majority of the medical profession are completely unaware of Microwave Sickness, have no formal training to recognise and treat sufferers
- Current medical and pharmacological treatments only deal with symptoms and don't treat underlying cause
- Researchers are looking at this syndrome from the wrong perspective - **Perception of signal is irrelevant - After all, we don't ask allergy sufferers if they can detect pollen**

# PUBLIC CONCERNS

- Incorrect advice being suggested by researchers who do not have medical qualifications – **Don't seek to reduce exposure, instead seek psychiatric support (Repocholi 2014)**
- Token gestures offered with technical studies (measure RF levels) to appease the public but are of little value - they don't address the issue
- The Public do not want Cell Phone or NBN towers next to their homes
- Community concern is being ignored and waived off with bogus claims of safety
- Authorities are not listening which is generating conflict and a lack of trust

# THE PROBLEM

- Scientists are providing lip service and ignoring the problems being raised
  - It is not about concern that health could be impacted
- Our health is being impacted and you're not listening**
- There is a significant lack of awareness of the REAL risks by the public
  - Developing a Precautionary Approach is useless if it is not applied

# MORE FOCUSED STUDIES NEEDED

- Establish research grants to look at health effects of long term exposures covering:
  - Subjective symptoms resulting from smart meter operations
  - Subjective symptoms living near mobile phone base stations
  - Subjective symptoms working in a WiFi environment
  - Epidemiological studies looking at cancer incidence around mobile phone base stations
  - Studies to look at rising prescription of pharmaceuticals that deal with headaches, nerve pain, insomnia, depression over the last 30 years
  - Studies to look at the incidence of chronic fatigue over the last 30 years
  - Studies to look at the rising incidence of autism and EMR in our environment

# CLOSING STATEMENTS



Opinions of committees are defined by the expert composition

In an ideal world experts would not have conflict of interests, would be independent of any kind of lobbying and only science would matter

Nearly all the committees dealing with health effects of radiation emitted by wireless communication devices have:

- A problem of biased expert selection
- Potential conflict of interest and/or are potentially influenced by industrial lobby group(s)
- May occur in spite of “firewalls” being set-up

The majority of the committees consist of scientists having the same expert opinion

Individual committees' experts commonly do not reflect all current scientific opinions

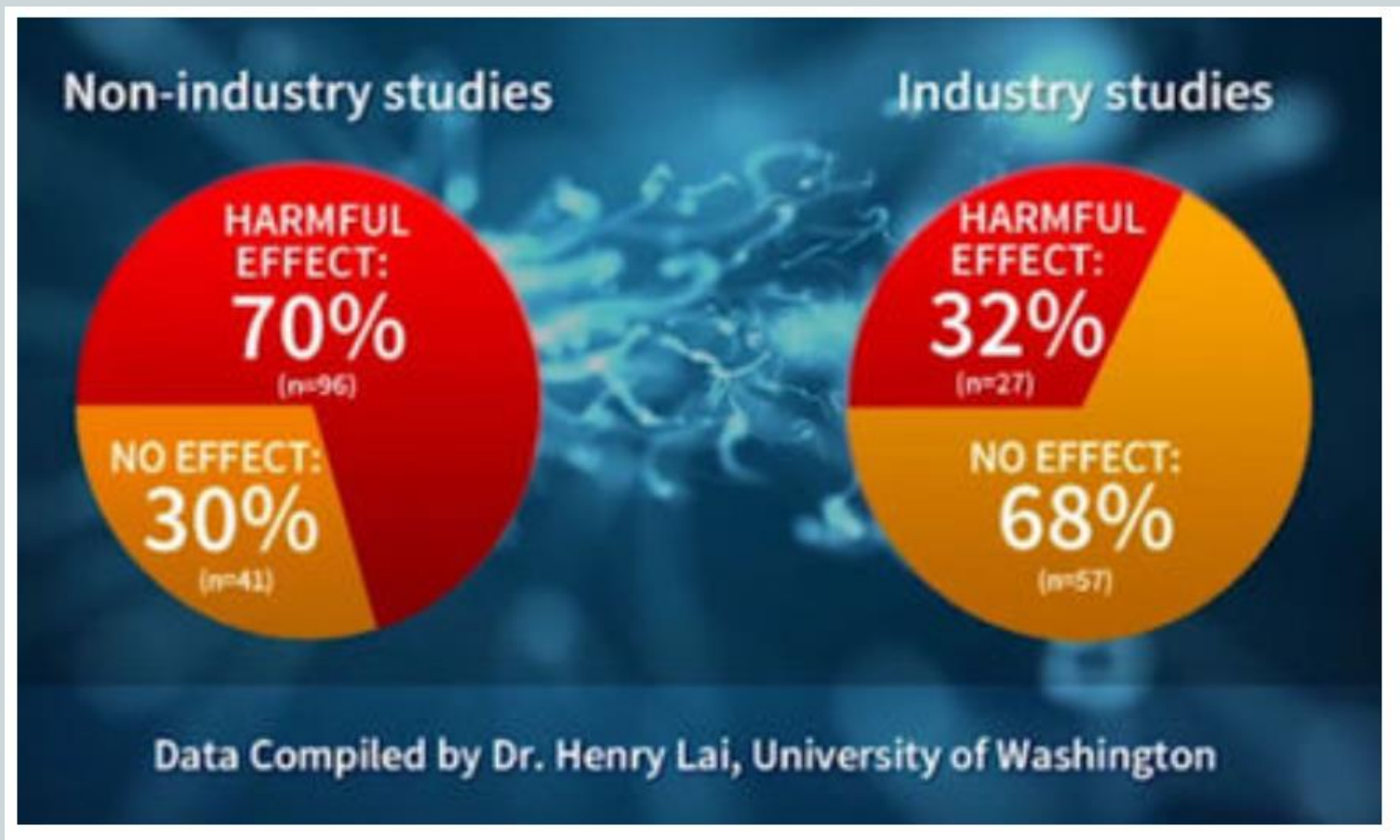
**Professor Dariusz Leszczynski (April 2015)**

# IS CONSISTENCY NECESSARY?

- Complete “*consistency*” of study findings is not to be expected, and it should not be interpreted as a necessary precondition for a consensus linking EMF exposure to health impacts. “*Consistency in nature does not require all or even a majority of studies finding the same effect. If all studies of lead showed the same relationship between variables, one would be startled, perhaps justifiably suspicious*”

*Seletun Scientific Panel referencing Needleman HL. “Making models of real world events: the use and abuse of interference. 1995”*

# RF RESEARCH: DOES FUNDING SOURCE MATTER?

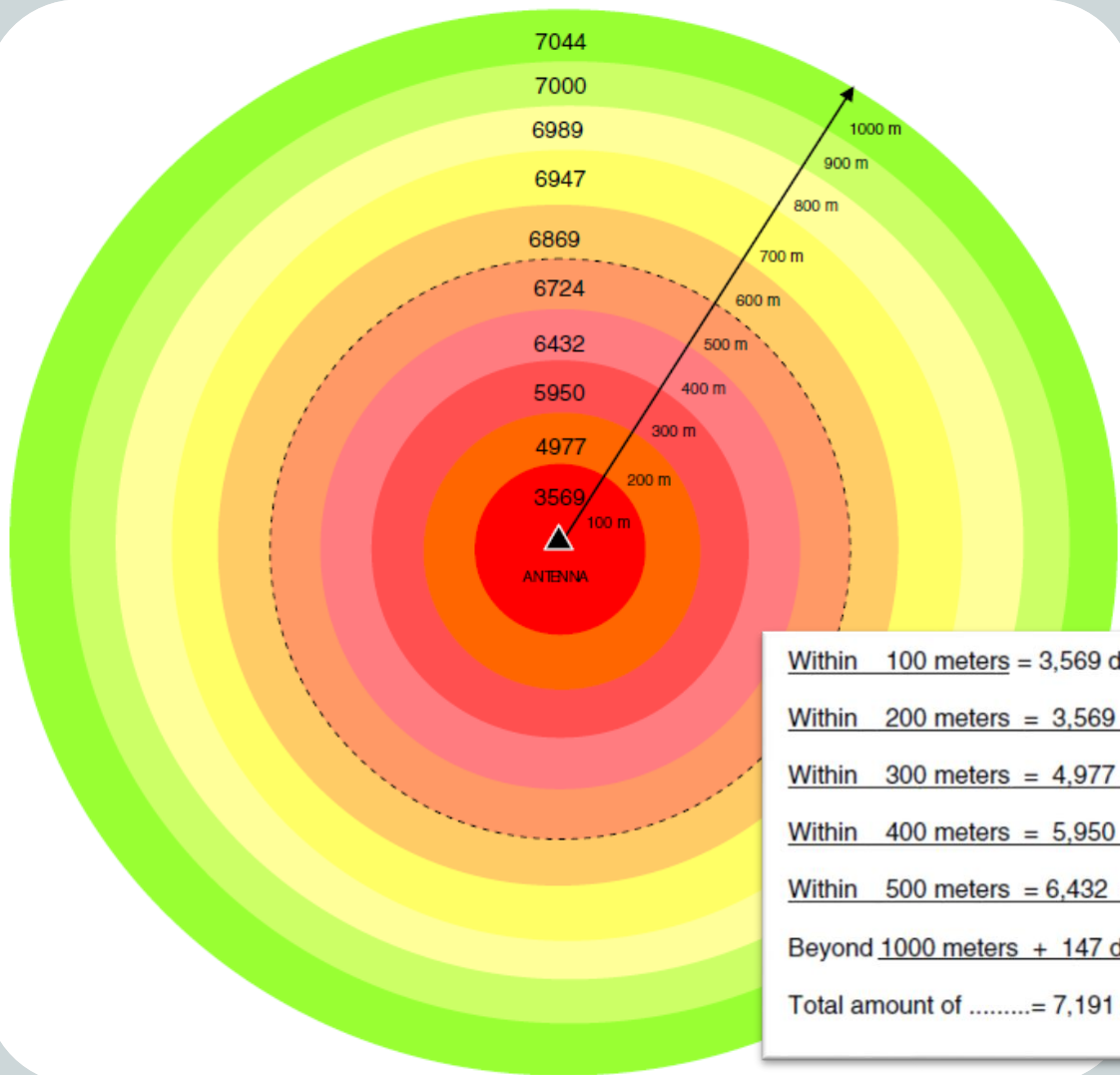


**Clearly it does.....**

# SCIENCE IGNORING MEDICAL EVIDENCE?

- Science based evidence should not be the sole mechanism to validate EHS
- Science based evidence is obviously limited to the current understandings held by scientists – there are gaps
- Scientists need to take into consideration medical evidence which suggests:
  - EHS sufferers who remove or minimise their exposure to certain triggering EMF fields/devices see a cessation or reduction of their symptoms
  - Military personnel who are exposed to a variety of EMFs show a higher instance of non-specific subjective symptoms associated with EHS than the less exposed public

# Cell Towers Cause Cancer



Within 100 meters = 3,569 deaths  
Within 200 meters = 3,569 + 1,408 deaths = 4,977 deaths  
Within 300 meters = 4,977 + 973 deaths = 5,950 deaths  
Within 400 meters = 5,950 + 482 deaths = 6,432 deaths  
Within 500 meters = 6,432 + 292 deaths = 6,724 deaths and so on within 1000 meters  
Beyond 1000 meters + 147 deaths  
Total amount of ..... = 7,191 deaths

Source: Mortality by neoplasia and cellular telephone base stations (Dode 2011)

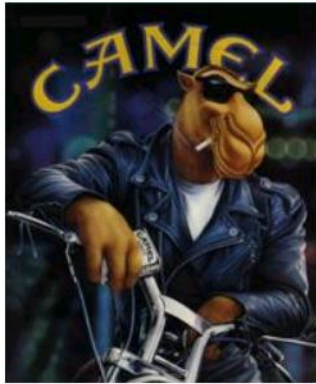
# CHANGES IN THINKING REQUIRED

- The standard answer today from industry and government officials is we need more studies, while we are enticed with the latest gadgets to make our life more comfortable
- Regulation of EMFs appears to follow a “**Dead body policy**” which requires definitive proof of sufficient harm before changes will be considered
- Paradigm shift in decision making urgently required asking: “**How can we prevent harm?**” rather than “**What level of Harm is acceptable?**”

# A TIME TO ACT

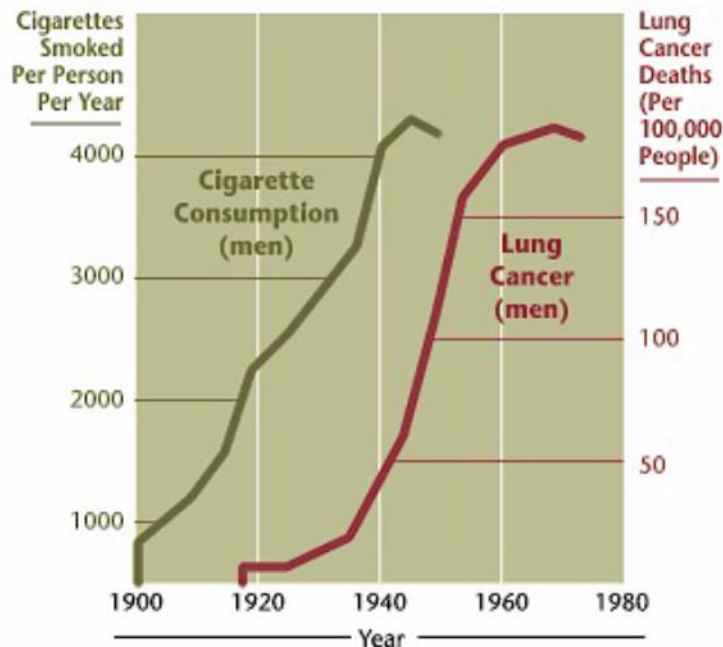
- Most effects on the Human body have been well known for 50+ years and were identified in a time period where commercial interests were not fully realised
- Today, Research has become politicised and unduly influenced by commercial and military interests
- It is time to act with moral and ethical decency - No more buck passing – Public health needs to be protected and ownership of this problem needs to be resolved urgently

# Tobacco : Textbook Case of Governments Ignoring Precautionary Principle



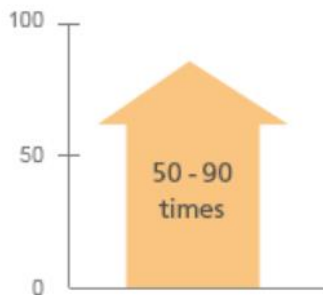
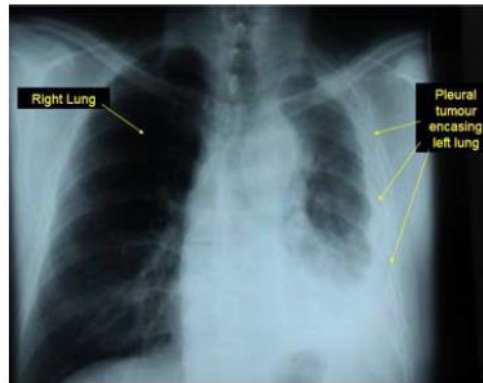
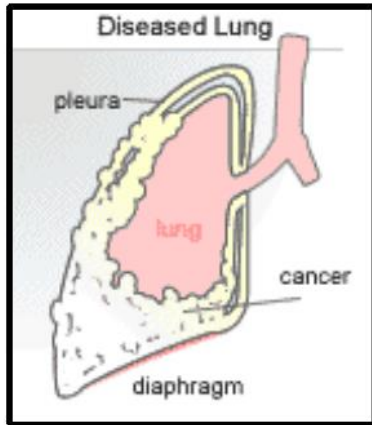
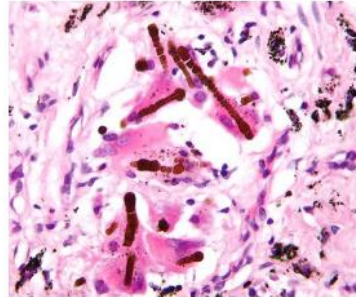
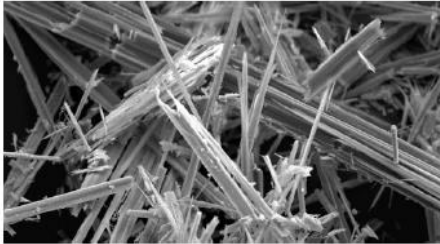
- Sir Richard Doll identified smoking as major cause of increase in lung cancer in late 1940's; upsurge in motor traffic during war was suspected cause.
- Tobacco industry demanded proof, including precise mode of action.
- Due to 20-yr lag, irrefutable population-based studies took decades to complete.
- Governments waited far too long before launching tobacco tax, advertising ban, smoke-free public buildings & anti-smoking ads.
- How many of ~ 100 million people killed by tobacco in 20th century might have been saved if action were taken earlier?
- Since smoking is addictive, even today many suffer from various tobacco-related, life-threatening diseases.

20-Year Lag Time Between Smoking and Lung Cancer





# Asbestos Exposure: Industry & Government Downplay Health Risk



- Gained widespread use as fire-retardant & insulation material
- Reported to cause serious ailments as early as 1898 (Lucy Deane, London)
- Despite early warnings, industry continued production, failed to protect workers & insisted no substitute for it.
- Not until 1998 was it banned totally in UK
- Former workers developed debilitating diseases: asbestosis, mesothelioma & lung cancer.
- Long latency period between asbestos exposure & disease appearance: asbestosis (10 yrs); lung cancer (15-25 yrs)
- Smoking or second-hand smoke, together with asbestos exposure, greatly increases risk of lung cancer.
- Mechanism of action still uncertain.

↑ lung cancer risk if person smokes & exposed to asbestos

# Diethylstilbestrol: World's First Drug Disaster

g HEALTH

"Really?"

Yes...  
**desPLEX**  
to prevent ABORTION, MISCARRIAGE and  
PREMATURE LABOR

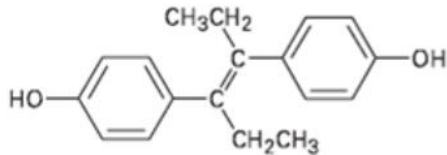
recommended for routine pregnancy  
in ALL pregnancies . . .

95 per cent live delivery with desPLEX  
in one series of 1200 patients\*—  
— bigger and stronger babies, too.†

No gas or other side effects with desPLEX  
in either high or low dosage\*\*†

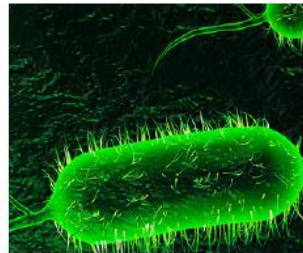
**NO. NOT REALLY.**

40 YEARS AGO, DES WENT FROM WOMEN'S DRUG TO INFANTS'  
NIGHTMARE. NOW, DES DAUGHTERS SUCH AS CHRYLIS MCCARTHY  
ARE CONCERNED THE NEXT GENERATION MAY BE AT RISK.  
BY BERNHARD RITZ / PAGE 10



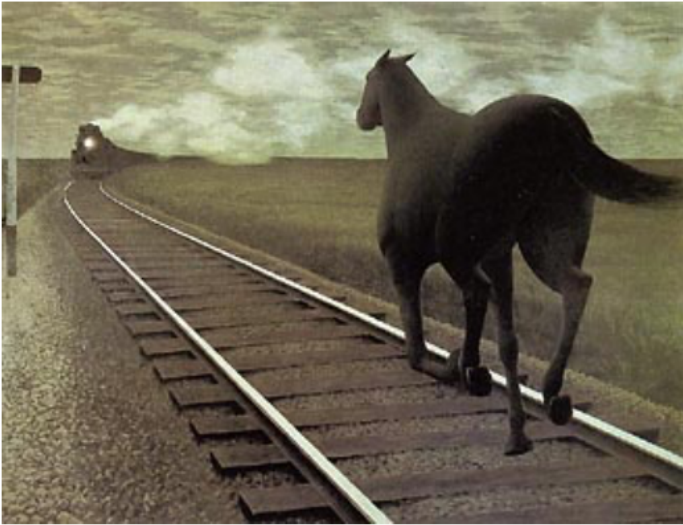
- DES: synthetic estrogen developed in late 1930's to prevent miscarriage.
- First danger signs: breast cancer link in animal studies & severe GI issues at clinical trials stage
- Yet prescribed to millions of pregnant women for 3 decades in US & 4.5 decades elsewhere
- Transplacental carcinogen, causing abnormal reproductive organs, infertility & cancer in offspring of women exposed during pregnancy
- Despite 20,000 articles on DES, mechanism of action still uncertain
- No sign of toxicity in newborn offspring
- Timing of dose, not amount, determines toxicity.
- *DES story should remind us that 'we will never know the long-term safety of a product until long term safety of the product is proven.'* (Elizabeth Watkins)

# London's Cholera Outbreak of 1854: Benefit in Heeding the Precautionary Principle



- Dr. John Snow mapped the location of deaths & found them to be clustered around the Broad Street Drinking Pump.
- His findings suggested that cholera is conveyed by water polluted with sewage.
- Royal College of Physicians rejected his thesis as 'untenable', believing disease caused by noxious vapors (*miasma*).
- As precautionary measure, Snow removed pump handle & outbreak came to an end.
- College's certainty proved incorrect.
- The link between human feces-polluted water and cholera in 1854 and Robert Koch's isolation of *Cholera vibrio* as the causative agent in 1883 took 30 years.
- Lengthy interval between a compelling association and conclusive causality is a common feature of scientific inquiry.

# Status Quo is Not an Option



Horse and Train, 1954 Colville

***'If there is even a reasonable possibility that cell phone radiation is carcinogenic, the time for action ... is upon us. Even though the financial and social cost of restricting such devices would be significant, those costs pale in comparison to the cost in human lives from doing nothing.... If the probability of carcinogenicity is low, but the magnitude of the potential harm is high, good public policy dictates that the risk should not be ignored.'***

# ACKNOWLEDGEMENTS

- Slide 28 Dr William J. Walsh PhD. “Biochemical Therapy for ADHD Autism, and Depression”
- Slides 69-70 Dr Isaac Jamieson “Changing perspectives – improving lives” – Public Hearing EESC 2014
- Slides 80-82 Denis Henshaw, Emeritus Professor of Human Radiation Effects, University of Bristol
- Slide 86 Dr Beatrice Golomb “2014:What Scientific Idea is ready for retirement?”
- Slides 31, 122-126 Dr Malcolm Paterson “Electromagnetic Age: A Sleeping Giant?”
- Dr Gary Deed – For putting me on the right track