

ORSAA

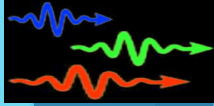
Oceania Radiofrequency
Scientific Advisory Association

ICNIRP/ARPANSA GUIDELINES need urgent review

Victor Leach

ORSAA - An Introduction

- ▶ Oceania Radiofrequency Scientific Advisory Association Inc., (ORSAA) is a Not-for-Profit scientific association.
- ▶ Full members and advisory panel members are non-industry scientists from various scientific disciplines: epidemiology, microbiology, biochemistry, physics, occupational hygiene, psychology, environmental science, endocrinology, immunology, neurology, oncology, building biology, pharmacology.
- ▶ Associate members are supporters (mainly retired) who offer their expertise (teacher, accountants, nurses etc.) as volunteers
- ▶ We are not an Advocacy Group.
- ▶ We are all volunteers.



Evaluating the Strength of Evidence

- ▶ Many disciplines are involved
- ▶ ORSAA database - analytical tool to evaluate the strength of evidence
- ▶ Over 3100 papers objective assessed and categorised

ORSAA.org (<https://www.orsaa.org/>)

Satellite Image of Victoria, 2009



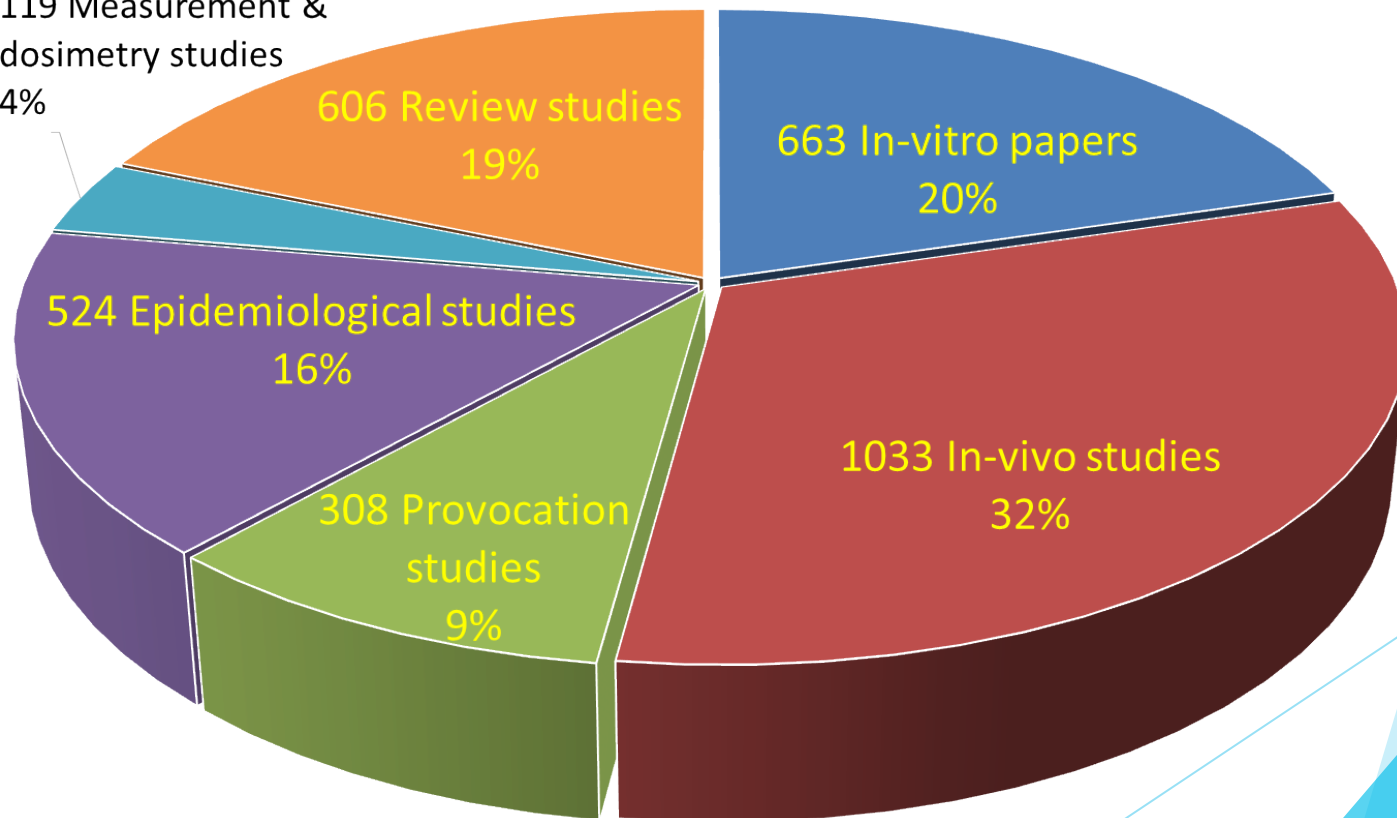
2009 Victorian Bushfires - “Black Saturday”

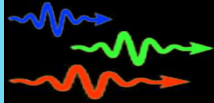
ORSAA database ELF to SHF (radar freq) publications

- ▶ Includes ARPANSA papers (1354) and Emeritus Prof Henry Lai papers (937)

119 Measurement &
dosimetry studies

4%





Trigger Points for Precautionary Approach

- ▶ Two main factors **triggers**:
 - ▶ **Strength of evidence**
 - ▶ Potential **cost of doing nothing**
- ▶ Full **biological explanation** can take years:
 - ▶ **Asbestos** (1898 to 1999): 101 yrs
 - ▶ **Water** with cholera bacterium, Dr John Snow (1854 to 1883): 29 yrs
 - ▶ **Smoking** Sir Richard Doll (1952 to 2000 - smoking bans on aircraft): 48 yrs

ICRP and ICNIRP Philosophies

▶ ICRP = risk managers (Insurance)

- ▶ Risk may exist (X rays, gamma rays)
- ▶ Low radiation doses → Risk



▶ ICNIRP = Judge

- ▶ Certainty before action.
- ▶ Low exposure levels → “No risk”
- ▶ “People being protected”
However not all children,
the elderly, and some chronically ill



ICRP vs ICNIRP Philosophies

▶ ICRP - Risk management approach

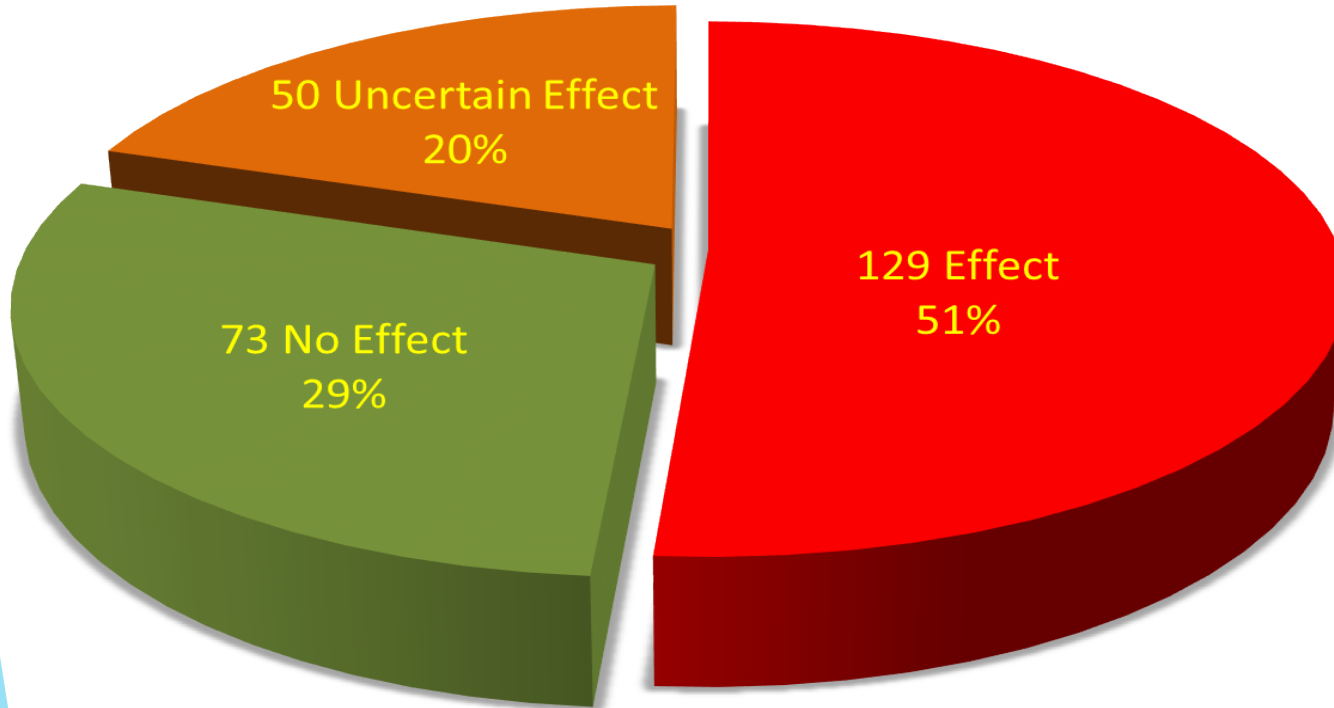
- ▶ <100 mSv is a Precautionary Approach using ALARA
mSv is a milliSievert a measure of radiation dose. No such concept with EMR-RF
we just have reference levels (exposure) only.

▶ ICNIRP (WHO 2002) Non-Risk management approach

- ▶ *But notes“...children, the elderly, some chronically ill people ... lower tolerance for one or more forms of NIR exposure”*
- ▶ Precautionary Approach not applied for these at-risk groups

Waiting for established evidence of harm is not a recognised risk management approach

ORSAA Database Epidemiological UHF Studies



IARC (WHO)
- RF-EMR
Group 2B
“Possible
human
carcinogen”
May 2011

In vitro (test tube) studies ARPANSA TRS -164

Topic	Y (TR-164)	Y (ORSAA/ARPANSA DB)	N (TR-164)	N (ORSAA/ARPANSA DB)
Genotoxic	16	34 (+9 Synergistic Effect with mutagen and +1 Effect DNA Repair)	32	39 (+2 Effect Positive)
Proliferation/Apoptosis	25	Apoptosis 26 Proliferation 33 (+1 Uncertain) Combined 59 (+1 Uncertain)	30	Apoptosis 22 (+1 Effect Positive) Proliferation 35 Combined 57 (+1 Effect Positive)
Gene Expression	4	61 (+6 Uncertain Effect)	10	14
Stress Response/Heat Shock Proteins (HSP)	4	28 (3 at thermal levels) (+1 Uncertain Effect)	17	19
Intracellular Signalling	1	10 (+1 Uncertain Effect - synergistic with potassium-induced depolarization)	3	2
Membrane Effects	17	27	4	4 (+1 Effect Positive)
Direct Effects On Proteins	15	77 (+5 Uncertain Effects)	1	3
Oxidative Stress	N/S	17	N/S	11
Totals	82	313	97	149

TR-164
Effect 46% vs No Effect 54%

ORSAA
Effect 68% vs No Effect 32%

In vivo (living organism) studies TRS -164

Topic	Y (TR-164)	Y (ARPANSA/ORSAA DB)	N (TR-164)	N (ARPANSA/ORSAA DB)
Cell Physiology, Injury, Apoptosis	21	72 (+1 Uncertain Effect)	17	16 (+2 Positive Protective Effect)
Neurotransmitters	1	10	1	1
Brain Electrical Activity	3	13	2	2
Blood Brain Barrier and Micro Circulation	4	10	8	15
Endocrine System	3	27	5	7
Autonomic Function	0	2 (+1 Uncertain Effect)	2	0
Spatial Memory	7	15	4	10
General Learning	4	13 (+1 Effect - Thermal Levels)	5	9
Auditory Function	4	4 (+1 Uncertain Effect)	7	8
Genotoxicity and Mutagenesis	8	34	10	20 (+1 Protective Effect/ γ-Radiation)
Immune System and Haematological Effects	5	37 (+2 Uncertain Effect) (+13 Positive Effects)	3	16
Testicular Function	8	25 (+1 Uncertain Effect)	5	4 (+1 Positive Effect)
Pregnancy and Foetal development	9	17 (+2 Uncertain Effect)	10	23
Oxidative Stress	Not Stated	124 (+2 Uncertain Effect)	Not Stated	10
Totals	77	403	79	141

TR-164
Effect 49% vs No Effect 51%

ORSAA
Effect 74% vs No Effect 26%

Reason for the difference

ARPANSA TRS-164:

- Expert reviewer was not requested to use the ARPANSA literature database
 - Reproduced the findings obtained from the UK Health Department Report of the independent Advisory Group on Non-Ionising Radiation (AGNIR) [3].
 - *in vitro* / *in vivo* review section reproduced the UK AGNIR report findings
 - Provocation studies relied on UK AGNIR report, the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) [5] and ICNIRP reviews.
- inherited all the AGNIR flaws and deficiencies (Dr Sarah Starkey [4]) including:

Scientific inaccuracy - conclusions did not accurately reflect the evidence

Studies omitted, included in other sections but without any conclusions, or conclusions left out - Oxidative stress was not given the coverage it deserved. Fertility effects, cognitive function and behavioural effects were all misrepresented.

Evidence dismissed and ignored in conclusions

ARPANSA TRS-164 is an inaccurate assessment of the available science

In-vivo testing from Human UHF studies

Organ or fluids sampled	Studies			Top 6 major Bio-Effect categories
	Effect	No Effect	Uncertain Effect	
Saliva; Blood (Haemoglobin, chromosomes & lymphocytes); Sperm; Skin; Auditory system; Core Temperature; Pituitary Hormones; Urine; Faeces; EEG studies' ECG studies	51	10	7	DNA damage , Biochemical changes Altered Enzyme Activity; Cell Irregularities/ Damage/ Oxidative Stress; Cardiovascular/ Vascular Effects

Source : ORSAA database

In-vivo animal studies - All UHF studies

Cumulative Exposure (h)	Studies			Top Six Bio-Effect categories (# studies in brackets)
	Effect	No Effect	Uncertain	
Group 1 ≤100 h (≤ 4.2 d)	366 (79%)	85 (18%)	14 (3%)	<ol style="list-style-type: none"> Biochemical changes (167) Altered Enzyme Activity (144) Oxidative Stress (122) Cell Irregularities/ Damage (82) Neuro-behavioural Effects/ Cognitive Effects (53) DNA damage/ Mutagenic /Genotoxic (42)
Group 2 100 to ≤750 h (4.2 d to 1 month)	76 (76%)	21 (21%)	3 (3%)	<ol style="list-style-type: none"> Biochemical changes (35) Altered Enzyme Activity (33) Oxidative Stress (29) Cell Irregularities/ Damage (18) Apoptosis (Programmed cell death) (12) DNA damage/ Mutagenic /Genotoxic (11)
Group 3 >750 ≤8700 h (<1 yr)	19	11	1	<ol style="list-style-type: none"> Biochemical changes (7) Altered Enzyme Activity (6) DNA damage/ Mutagenic /Genotoxic (4) Oxidative Stress (4) Sperm effects (4) Apoptosis (Programmed cell death) (3)

Non-thermal Effects exposures: *in vivo* animal studies ≤ SAR 2 W/kg

19 Uncertain Effect

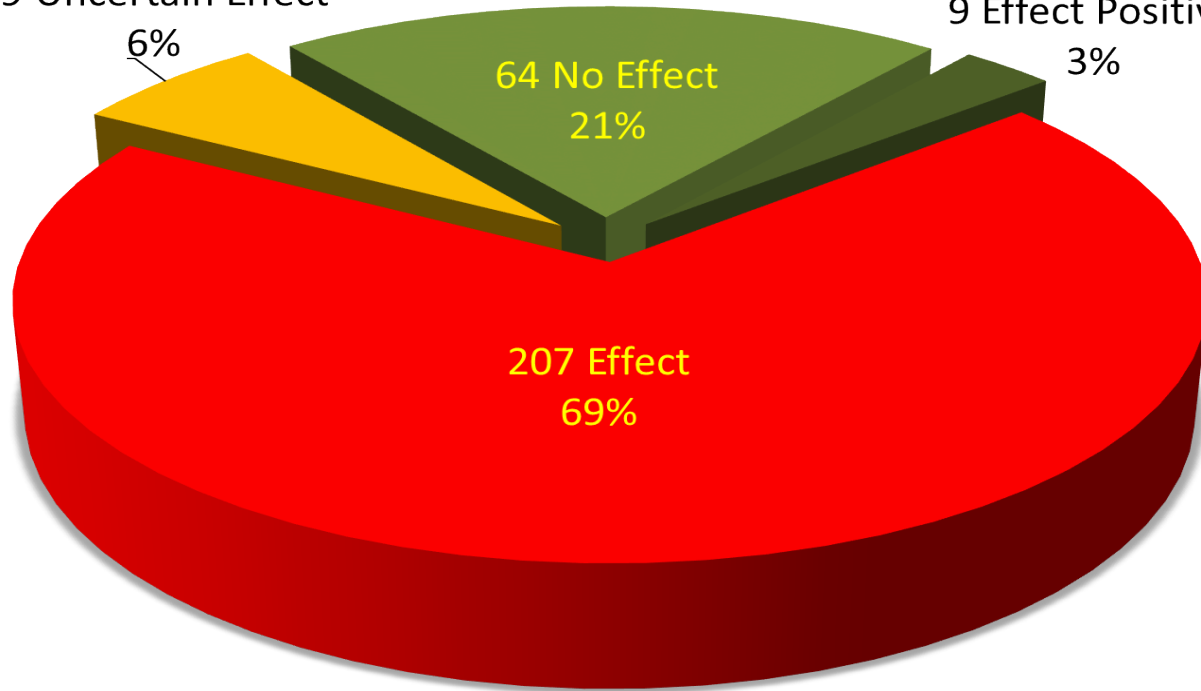
9 Effect Positive

6%

64 No Effect
21%

3%

207 Effect
69%



Source : ORSAA database

Simulated vs Real Mobile Phones Signal

Table 3. Number of bio-effect Mobile phone studies with Signal Type and Wave-form

Research Categories	Real Mobile Phone used in Experiments			Simulated Mobile Phone Signals used in Experiments					
	Pulsed			Pulsed			Continuous		
Wave form	#Effect	#No Effect	#Uncertain Effect	#Effect	#No Effect	#Uncertain Effect	#Effect	#No Effect	#Uncertain Effect
<i>in vivo</i>	120	18	11	69	49	8	6	4	0
<i>in vitro</i>	28	8	1	60	63	7	10	17	2

All Microwave (UHF-SHF) Studies

Find Search Summary Totals

Peer Reviewed Studies Showing Biological Effects

Number of records used : **1173** of **3063**

Auditory Dysfunction / Hearing loss / Tinnitus	29	Apoptosis (Programmed Cell Death)	90	Brain Tumours	39
Blood Brain Barrier Permeability Changes	15	Breast Cancer	6	Cellular Stress	56
Brain Development / Neuro Degeneration	47	Biochemical Changes	307	EEG changes / Brain Waves	93
Neuro Behavioural Effect / Cognitive Effects	152	Cell Irregularities/ Damage/ Morphological Changes	174	Effects on Mitochondria	34
Calcium Influx / Efflux	16	Fatigue	30	Altered Enzyme Activity / Protein Levels / Protein Damage	326
Circadian Rhythm Disruption	12	Altered Gene Expression	127	Headaches/Migraines	46
DNA Damage / Mutagenic / Genotoxic	137	Altered Glucose Level / Glucose Metabolism	18	Inflammation	21
Endocrine / Hormone Effects	59	Cardiovascular/Vascular Effects	52	Hepatic Effects (Liver)	20
Miscarriage / Spontaneous Abortion / Foetus Resorption	2	Immune System Effects	56	Impaired / Reduced Healing/ Bone Density Changes	4
Memory Impairment	51	Oxidative Stress / ROS/ Free Radicals	223	Speech Impairment	4
Sperm /Testicular Effects	83	Sleep Effects	47	Haematological Effects	44
Tumour Promotion	28	Neurotransmitter Effects	31	Synergistic/Combinative Effects	45
Thyroid Effects	12	Visual Disturbances/ Ocular Effects	34	Autism	6
Leukemia	3	Parotid Gland Malignancy	4	Neoplasia/ Hyperplasia (Abnormal Tissue Growth)	2
Depression	18	Induced Adaptive Response	46	Dizziness / Vertigo / Vestibular Effects	18

Source: ORSAA Database - RF Bioeffect summary

 May have a role in disease pathway/ well-being

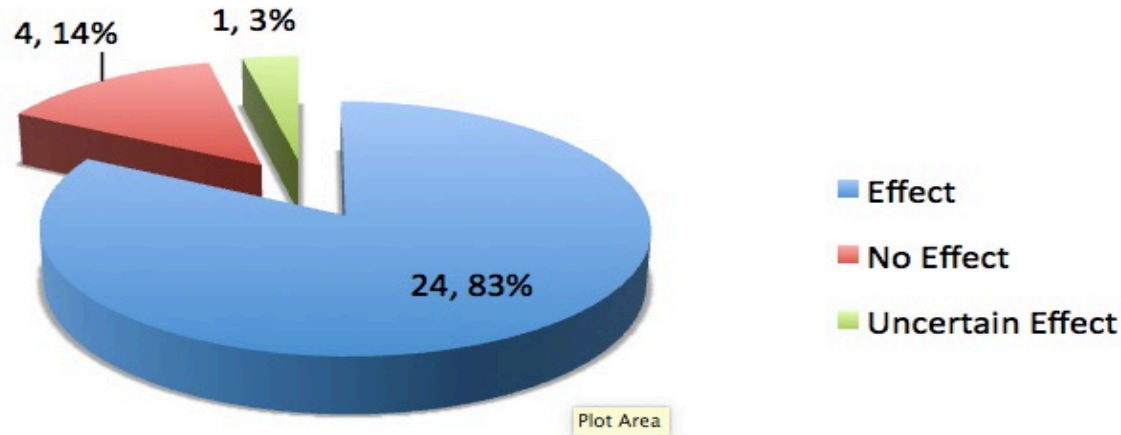
 A known cause in disease

Continue

Mobile Phone Base Station - Epidemiological Studies

ORSAA database has 29 Studies

4 “No Effect” studies funded: 3 x German Government and 1 x UK telecom

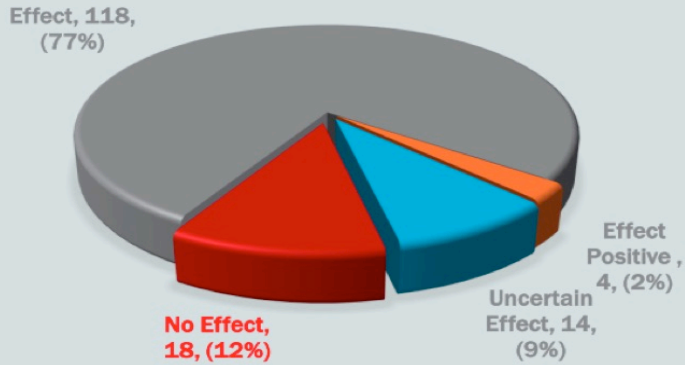


Summary slide on *in vivo* human testing associated with Mobile Phone towers

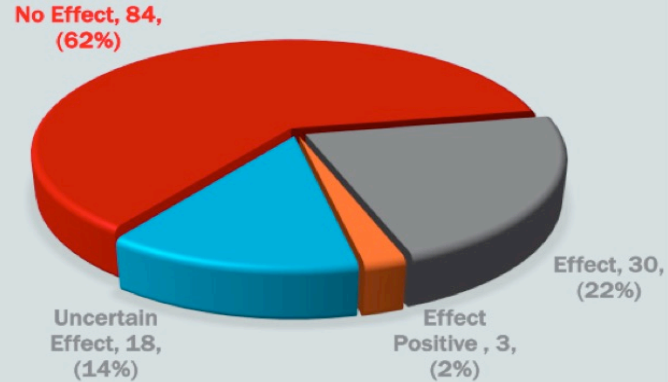
- Not a single study in Australia with objective biochemical markers to see if there is an impact on people's health around Mobile Phone Base Stations (MPBS)
- Only one large population study (epidemiology) by Dr. Bruce Hocking (ex Telstra CMO) and colleagues - found increased cancer risk near broadcasting towers VHF (another source of RF-EMR)
- A study in Brazil found 93.5% (6,724/7,191) of cancer deaths over 10 years have occurred within 500m of a MPBS. Risk decreased steadily with distance from MPBS.
- Several studies done other countries have shown clear adverse effects such as more DNA damage, increased oxidative stress, increased risk of diabetes, altered hormone levels in people near MPBS
- It is risky to install powerful RF-transmitters near sensitive locations like homes, schools and hospitals.
- **Lilienfield Report (1978) From 1953 -1978 systematic low-level pulsed exposure of US Embassy staff in Moscow. (20-280 mW/m² (3% of ICNIRP limit) 0.6-9.5 GHz (5G 6 GHz), 6-8 hr/day 5 day/wk, 2- 4 yrs Symptoms eczema, psoriasis, allergic and inflammatory reactions**

Review of funding sources in ORSAA database

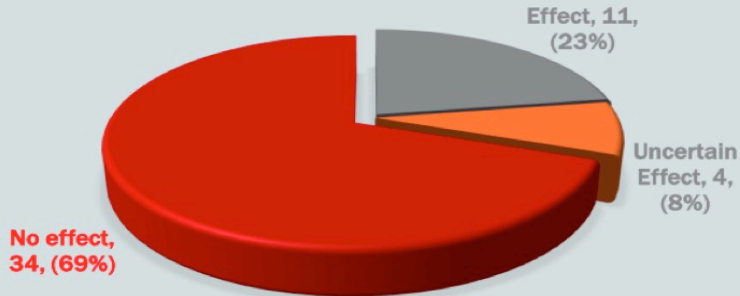
INSTITUTION ONLY FUNDED



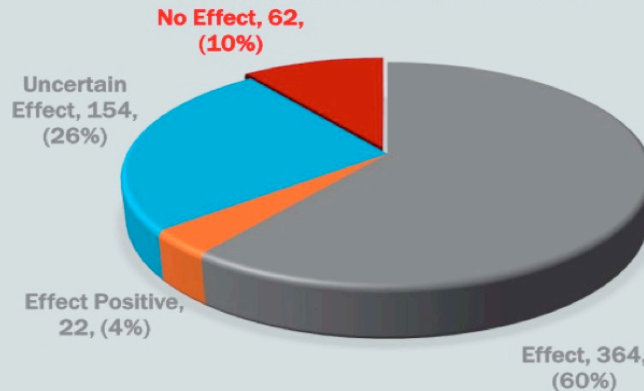
INDUSTRY ONLY FUNDING



GOVERNMENT COMMUNICATIONS AGENCY FUNDING OUTCOMES



GOVERNMENT ONLY FUNDED



Source: ORSAA database as of 23/05/2017

Review of research by Country of Origin

BALANCE OF EVIDENCE

Leading EMF Effect Countries

Country	Effect Papers	No Effect Papers
CHINA	141	13
TURKEY	131	22
USA	103	61
INDIA	80	5
SWEDEN	66	13
IRAN	50	4
RUSSIA	40	2

Leading No Effect Countries

Country	Effect Papers	No Effect Papers
USA	103	61
DEU	38	51
JPN	33	44
ITA	61	35
FRA	41	35
GBR	22	34
KOR	26	25
AUS	36	23
FIN	20	23

- Some countries finding a large number of “no effects” have corporations significantly investing in wireless technology (i.e. Siemens, Samsung, Nokia, Sony, Motorola ... etc.)
- ICNIRP was founded in Germany (DEU) and receives funding from the German Federal Ministry for the environment. Germany is one of the few countries finding more “no effects” than effects
- Many countries that are finding a significantly higher proportion of effects also typically have the most protective RF exposure limits (excluding USA)

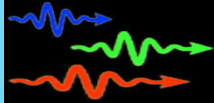
Source: ORSAA database as of 23/05/2017

US Defence Intelligence Agency (DIA) Report 1976

- ▶ “Animal experiments reported in open literature have demonstrated the use of low level microwave signals to produce death by heart seizure or by *neurological pathologies* resulting from breaching of the blood-brain barrier”. (page viii)
- ▶ “Personnel (military) exposed to microwave radiation below thermal levels experience more *neurological, cardiovascular,* and haemodynamic disturbances than do their unexposed counterparts.” (page 6)
- ▶ “Subjects (military personnel) exposed to microwave exhibited a variety of neurasthenic disorders against a background of angiodystonia (abnormal changes in the tonicity of the blood vessels). The most common subjective complaints were *headache, fatigue, perspiring, dizziness, menstrual disorders, irritability, agitation, tension, drowsiness, sleeplessness, depression, anxiety, forgetfulness and lack of concentration.*” (page 8)
- ▶ “Long term non-thermal microwave irradiation of male mice evoked diffuse changes in the testes. Subsequent mating of the animals resulted in reduction in the size of the litters” (page 13)

Identified Risks

- ▶ Brain Tumours
- ▶ Other Cancers
- ▶ Cardiovascular Disease
- ▶ Diabetes
- ▶ Neurodegeneration
- ▶ Mental illnesses
- ▶ Pregnancy Complications, Developmental Problems
- ▶ Immune Disorders
- ▶ Infertility/Sterility
- ▶ Chronic Illness
- ▶ Nuisance Effects
- ▶ Sleep Disorders



Chronic Diseases. Does EMR have a Role?

Top Health Burdens

- ▶ Cardiovascular Disease
- ▶ Cancer
- ▶ Neurodegenerative diseases
- ▶ Mental illness
- ▶ Allergies

RF-EMR bio effects with evidence

- ▶ Cardiac and vascular effects, oxidative stress and effects on voltage-gated Ca^{2+} channels
- ▶ DNA damage, altered cell metabolism, altered gene expression, oxidative stress, inflammation.
- ▶ neuronal damage (evidence of functional and histopathological changes), oxidative stress, metabolic changes, blood brain barrier damage.
- ▶ Neurobehavioural changes - anxiety, cognitive impairment, changes in neurotransmitters
- ▶ Serological evidence of elevation of IgE antibodies and Th2 cytokines, lowering of cytotoxic activity of white blood cells, mast cell degranulation

Conclusions

- ▶ Converging evidence on health effects.
- ▶ Non-thermal bio-effects are real
- ▶ Enough SMOKE to say we have a FIRE
- ▶ Devices need a higher safety design standard
- ▶ Stronger consumer advice on safe use
 - ▶ especially children
 - ▶ Advice on safer use is hidden
 - ▶ Needs to be very obvious
- ▶ The data together with best risk management practice suggests:

***A trigger point has been reach for adopting a proper
Precautionary Approach to this new RF-EMR
technology***

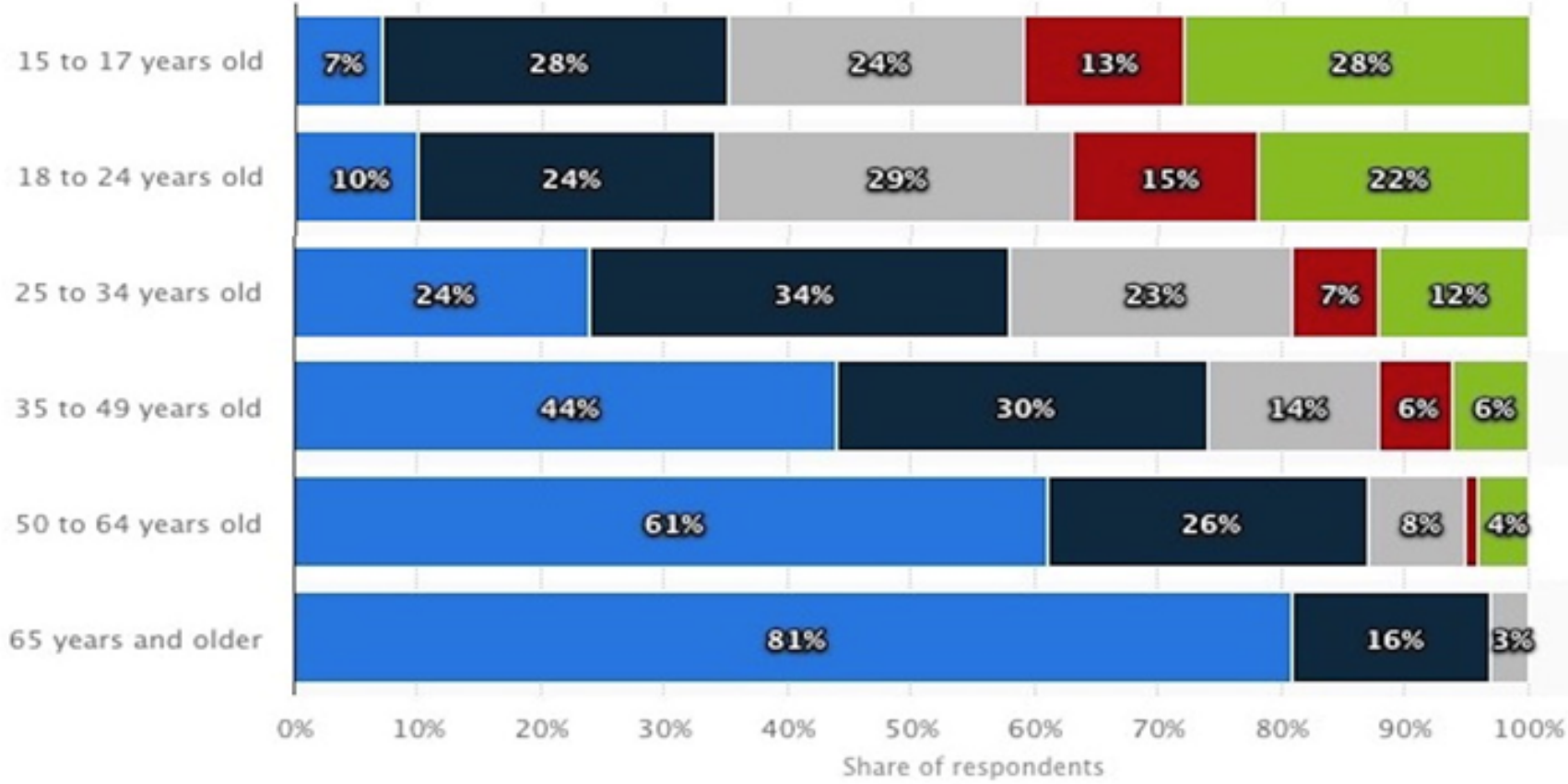
Extra Slides Follow

Slides that followed were
not used

Current Australian EMF- RF Regulation

- ▶ Regulator =Australian Communications Media Authority (ACMA)
- *Radiocommunications Act 1992. S162 (3) (f)*
- “health and safety protection to persons who operate, work with or use wireless equipment via the establishment of standards”
- ▶ “Inclusion of the precautionary principle in the ACMA regulatory instruments would place a regulatory burden on industry which would require strong justification.”
- ▶ The ACMA does not discern that justification





- Less than one hour
- One to two hours
- Two to three hours
- Three to four hours
- Over four hours

Source Statista.com

Epidemiological Studies of Note

- ▶ Interphone → glioma in the group with the longest duration of use (≥ 1640 h) (OR=1.40; 95% CI 1.03 to 1.89), higher for ipsilateral use and temporal tumours.

Patients interviewed	Tumour	Organ
2708	Glioma	Brain
2409	Meningioma	Brain
1100	Acoustic Neuroma (Vestibular Schwannoma)	Acoustic nerve
400	Parotid gland	Salivary gland

- ▶ CERENAT multicenter French case-control study 2004-2006.
- ▶ Among heaviest users (cumulative duration ≥ 896 h), time since first use was occasionally less than 5 years (11%) but mostly 5- 9 years (49%) and 10 years and more (40%).
 - 33 % commercial agents or sales people
 - 22% chief operating officers, production & operation managers
 - 62% reported occupational mobile phone use.
- ▶ COSMOS Study (75,993) - Self reported vs Telco usage figures
 - 14% reported health effect following use

in vivo long-term (Near Field) animal studies - UHF study

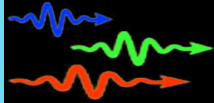
- ▶ The US FDA - nominated cell phone RFR emission for toxicology and carcinogenicity testing in 1999
 - ▶ Took a decade to start
- ▶ NPT study - 2-year study on rats & mice
 - ▶ Huge \$25 million study is the world's largest most carefully done study ever done on long term wireless health risks. Reporting started in 2018.
 - ▶ Near-field exposure intensity was at low non-thermal or non-heating levels
 - ▶ Evidence of Carcinogenic activity was rated as:
 - ▶ Clear evidence;
 - ▶ Some evidence;
 - ▶ Equivocal evidence of carcinogenic activity is demonstrated by studies that are interpreted as showing a marginal increase of neoplasms that may be test agent related;
 - ▶ No evidence;
 - ▶ Inadequate study.
- ▶ Mice Study showed no effects
- ▶ Exposure to Sprague Dawley (SD) Rats different
 - ▶ Occurrence of these rare nerve sheath tumours were statistically significant and others where not
 - ▶ Rare nerve tumours were found being malignant schwannoma in the heart of male rats
 - ▶ Same cells in nerves of the human ear.
- ▶ Significant positive trends were found for gliomas in male rats exposed to CDMA-modulated RF radiation
 - ▶ Ditto heart Schwannomas in male rats exposed to GSM or CDMA-modulated RF

in vivo long-term (far-Field) animal studies - UHF study

- ▶ Ramazzini Institute in Italy.
 - ▶ Long-term animal study - just concluded
 - ▶ Interim paper:
 - ▶ Same rare nerve tumours were found in male rats as in the NPT study.
 - ▶ These rare nerve tumours also present in control male rats
 - ▶ Same findings as NPT study.
 - ▶ Results less convincing than NPT study.
- ▶ **Does rat research inform human health risk?**
 - ▶ Rats are the preferred animal models for carcinogenicity studies
 - ▶ Regulatory agencies rely on rodent carcinogenicity bioassay data → a given chemical → cancer in humans.

Prof Henry Lai's life-time collection

- ▶ ORSAA database incorporates:
 - ▶ ARPANSA database
 - ▶ Prof Henry Lai's personal collection of 937 papers:
 - ▶ 1. ELF-EMF-Apr1-comet-assay.docx (46 papers)
 - ▶ 2. ELF-oxidative-effect-11-21-2017.docx (186 papers)
 - ▶ 3. RFR-12-14-neurological-effects-2007-2017.docx (325 papers)
 - ▶ 4. RFR-Apr1-comet-assay.docx (76 papers)
 - ▶ 5. Electrohypersensitivity-50pg-2017.docx (124 papers)
 - ▶ 6. Final RF oxidative stress papers (180 papers)
 - ▶ Lai classified studies as "Effect" or "No Effect"
 - ▶ ORSAA classification different only **27 / 937** times
 - ▶ **7** in new category "Uncertain Effect"
 - ▶ **10** "Effect" to "No Effect"
 - ▶ **10** "No Effect" to "Effect".
 - ▶ **Good agreement** on the final bio-effect category for each paper.



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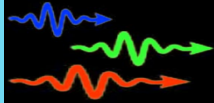
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ANRES research (190 individuals surveyed)

Table 1. Environmental Sensitivity Conditions

Environmental Sensitivity Conditions	Number	Percentage %
MCS	144	75.8
Fragrance Sensitivity	142	74.7
EHS	80	42.1
Food Sensitivity	131	68.9
CFS/ME	84	44.2
Fibromyalgia	54	28.4
Lyme Disease &/or it's co-infections	18	9.5
Biotoxin-related illness	13	6.8
Other	46	31.9

As registrants can select more than one condition, the percentages do not add up to 100%

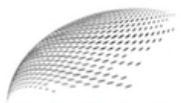


What is the Precautionary Approach?

- ▶ Simple definition of Precautionary Approach:

A risk management framework in the face of scientific uncertainty

- ▶ **Not** an admission of guilt
- ▶ **Implementation** of Precautionary Approach
 - ▶ Complex
 - ▶ Requires trust
 - ▶ Fair and reasonable
 - ▶ Transparent and open
- ▶ As Low As Reasonable Achievable (**ALARA**)
As Low As Reasonable Practicable (**ALARP**)
 - ▶ Both historical Precautionary Approaches
 - ▶ Lack **structure** of proper Precautionary Approach

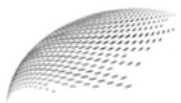


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Movie - Generation Zapped

<https://vimeo.com/221492864>



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Evidence of harmful effects has
been known for more than 40 years

Bio Effect Research: 1970 Conclusions*

- ▶ RF (Microwaves) may have both pathogenic effects and, under certain conditions, a therapeutic action on the human organism
- ▶ Many aspects of this pressing problem remain almost totally neglected; in particular, our information on the mechanism by which microwaves affect the human organism is inadequate
- ▶ **Microwave radiation on the organism can be dealt with successfully (and the literature material critically generalized) in its present state only by a team of scientists representing various specialties**
- ▶ It was established from study of the nonthermal (specific) action of radio waves that the changes that appear in the organism cannot be explained solely in terms of the amount of heat formed in it

*Source: Influence of Microwave Radiation on Man and Animals (1970) - NASA Translation

Bradford Hill System of Causation

- ▶ ORSAA database
 - ▶ Uses Bradford Hill (BH) indexes for causation of cancer
- ▶ BH Criteria for causation
 - ▶ Minimal conditions necessary to provide adequate evidence of a causal relationship between an incidence and a possible consequence

Article	Exposure	Study Categories	Effects Categories	Study Statistics	Bradford Hill Criteria
					Temporal Relationship Exposure must precede the effect, taking into account the latent period of the condition <input type="radio"/> N <input checked="" type="radio"/> Y
					Strength Strength of the association, commonly expressed in terms of relative risk <i>i.e.</i> the factor by which the probability of developing the disease is increased in the exposed over the non-exposed population groups. <input type="radio"/> N <input checked="" type="radio"/> Y
					Dose Response Effect Biological gradient. An increasing amount of exposure increases the risk. If a dose-response relationship is present, it is strong <input type="radio"/> N <input checked="" type="radio"/> Y
					Plausibility Biological plausibility, <i>i.e.</i> whether it is reasonable to postulate that the cause acts through a mechanism which corresponds to biological knowledge of the adverse effects of the agent. <input type="radio"/> N <input checked="" type="radio"/> Y
					Experimental Reproduction of the condition experimentally (either in animals or in man). <input type="radio"/> N <input checked="" type="radio"/> Y
					Specificity Specificity of the association (although it has become obvious that the rule "one cause – one effect" is hardly applicable for conditions with a multi- factorial aetiology (Aetiology- the cause, set of causes, or manner of causation of a disease or condition)) <input type="radio"/> N <input checked="" type="radio"/> Y
					Coherence Coherence of the cause-to-effect interpretation with generally known facts on the natural history and biology of the disease. <input type="radio"/> N <input checked="" type="radio"/> Y
					Consistency Consistency of results between independently performed studies. <input type="radio"/> N <input checked="" type="radio"/> Y

Bradford Hill Summary Report

Bradford Hill System - Moving from Association to Causation

- ▶ **Temporal Relationship:** Exposure must precede the effect
- ▶ **Strength:** Strength of the association - Relative Risk
- ▶ **Dose Response Effect:** Biological gradient
- ▶ **Plausibility:** Biological plausibility
- ▶ **Experimental:** Reproducibility with repeated studies
- ▶ **Specificity:** Specificity of the association
- ▶ **Coherence:** Coherence between cause-to-effect interpretation with generally known facts about disease
- ▶ **Consistency:** Consistency between independent studies

Biology vs Physics views of EMR Interaction

- ▶ **Biology:** microwave radiofrequency transmissions → increases oxidative stress and DNA damage -> can cause cancer
- ▶ **Physics:** photon energy cannot break covalent bonds → No DNA damage

Bad science

We know

- ▶ Chronic inflammation → **cancer**
- ▶ Cigarette smoke → **cancer**
- ▶ Toxins and autoimmune disease → **cancer**