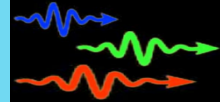




Oceania Radiofrequency
Scientific Advisory Association

Radio Frequency Exposure Risk Assessment and Communication Critique of ARPANSA TRS-164 Report: **Do we have a problem?**

Victor Leach and Steven Weller



ORSAA Database is a searchable EMR bio-effects relational database

- ▶ Categorizes experimental end-points for research (DNA breaks, biochemical changes etc.)
- ▶ Categorizes experimental outcomes (effect, no effect etc.)
- ▶ Categorizes type of investigation (*in vitro*, *in vivo*, *provocation*, *epidemiological* etc.)
- ▶ Categorizes frequencies and exposure details
- ▶ Categorizes biological effect findings
- ▶ Categorizes statistical information from epidemiological studies

Purpose of TRS-164

“RF Expert panel to assess the scientific literature to formally determine whether there are any significant changes to the science underpinning the Standard and whether it continues to provide adequate protection.”

From TRS-164:

“The RF literature database assembled by ARPANSA includes 1354 studies with health/biological outcomes from January 2000 till August 2012 (298 epidemiological, 238 human/provocation, 453 *in vivo* and 365 *in vitro*). The database also includes 72 major reviews or specialist reviews on *in vivo* / *in vitro* research published during that period.”

ORSAA chose to perform its own independent assessment to validate TRS-164 conclusions

ORSAA Database methodology for paper inclusion

- ▶ All ARPANSA papers for the period 01/01/2000 to 31/08/2012
- ▶ All ARPANSA monthly survey of literature with reviews after January 2008

All scientific studies in the following categories must appear in a peer-reviewed journal:

- ▶ *in vivo* experiments
- ▶ *in vitro* experiments
- ▶ dosimetry experiments
- ▶ epidemiological studies
- ▶ human provocation experiments
- ▶ Non-English papers with a published abstract in English, in peer-reviewed national journals in the country of origin.
- ▶ All review articles, government EMR summary reports, guideline material, measurement surveys, government-issued disease statistical reports and brochures which cited summarised opinions were classified as Non-Experimental Supporting Study (NESS).

In vitro studies

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 studies

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

- ▶ The primary reason for these obvious differences are:
 - ▶ 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].
 - ▶ Provocation studies relied on UK AGNIR report, Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) [5] and ICNIRP reviews.
- ▶ As the TRS-164 *in vitro* / *In vivo* review section has essentially reproduced the AGNIR report findings it has inherited all the flaws and deficiencies identified in Dr Sarah Starkey's paper[4]
- ▶ Some of the flaws identified by Dr Starkey include:
 - ▶ **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**

TR-164 is an inaccurate assessment of the available science

Summary of Bio-effects studies

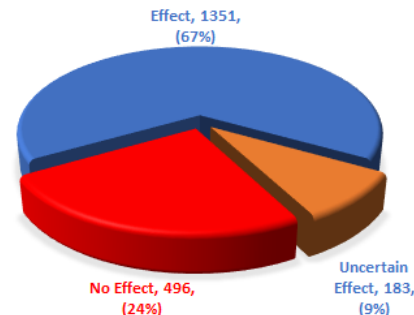
Find Search Summary Totals

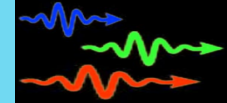
Peer Reviewed Studies Showing Biological Effects

Number of records used : **1534** of **2486**

Auditory Dysfunction / Hearing loss / Tinnitus	38	Apoptosis (Programmed Cell Death)	92	Brain Tumours	51
Blood Brain Barrier Permeability Changes	15	Breast Cancer	13	Cellular Stress	62
Brain Development / Neuro Degeneration	37	Biochemical Changes	333	EEG changes / Brain Waves	98
Neuro Behavioural Effect / Cognitive Effects	191	Cell Irregularities/ Damage/ Morphological Changes	185	Effects on Mitochondria	30
Calcium Influx / Efflux	24	Fatigue	49	Altered Enzyme Activity / Protein Levels / Protein Damage	348
Circadian Rhythm Disruption	12	Altered Gene Expression	147	Headaches/Migraines	71
DNA Damage / Mutagenic / Genotoxic	142	Altered Glucose Level / Glucose Metabolism	20	Inflammation	24
Endocrine / Hormone Effects	69	Cardiovascular/Vascular Effects	76	Hepatic Effects (Liver)	27
Miscarriage / Spontaneous Abortion / Foetus Resorption	7	Immune System Effects	77	Impaired / Reduced Healing/ Bone Density Changes	4
Memory Impairment	67	Oxidative Stress / ROS/ Free Radicals	231	Speech Impairment	4
Sperm /Testicular Effects	87	Sleep Effects	63	Haematological Effects	55
Tumour Promotion	42	Neurotransmitter Effects	30	Synergistic/Combinaive Effects	52
Thyroid Effects	15	Visual Disturbances/ Ocular Effects	46	Autism	10
Leukemia	19	Parotid Gland Malignancy	4	Neoplasia/ Hyperplasia (Abnormal Tissue Growth)	5
Depression	25	Induced Adaptive Response	51	Dizziness / Vertigo / Vestibular Effects	25

EMR RESEARCH EFFECT BREAKDOWN





Chronic diseases that plague modern society - Does EMR have a role to play?

Top Diseases

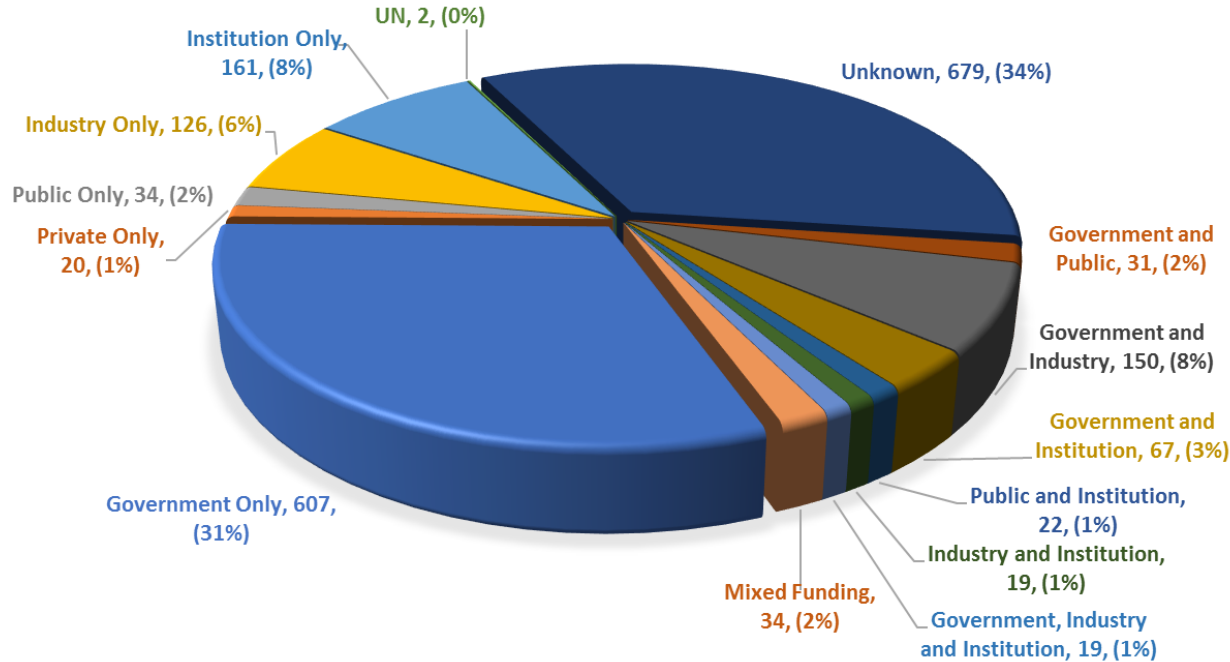
- ▶ Cardiovascular Disease
- ▶ Cancer
- ▶ Neurodegeneration
- ▶ Mental illness
- ▶ Allergies

RF bio effects

- ▶ Cardiological and vascular effects, oxidative stress
- ▶ DNA damage, altered gene expression, oxidative stress, inflammation
- ▶ Histopathological changes and neuronal damage, Pyramidal cell loss (hippocampus), oxidative stress
- ▶ Behavioural and cognitive effects, anxiety, neurotransmitter level changes
- ▶ Immunological effects, calcium flux changes, mast cell degranulation

Funding Research

FUNDING SOURCE



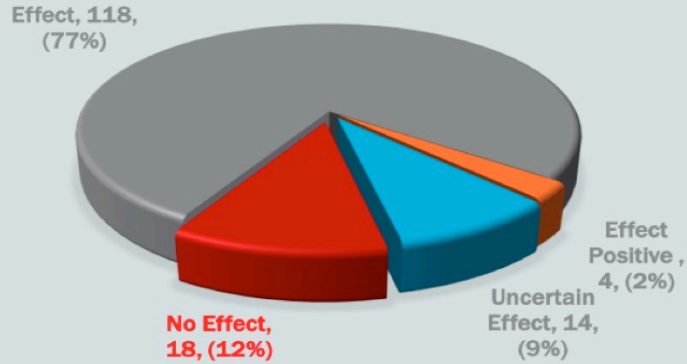
Approximately one third of all experimental studies in the ORSAA database do not declare their funding sources.

Funding sources are classified in the ORSAA database into the following major categories:

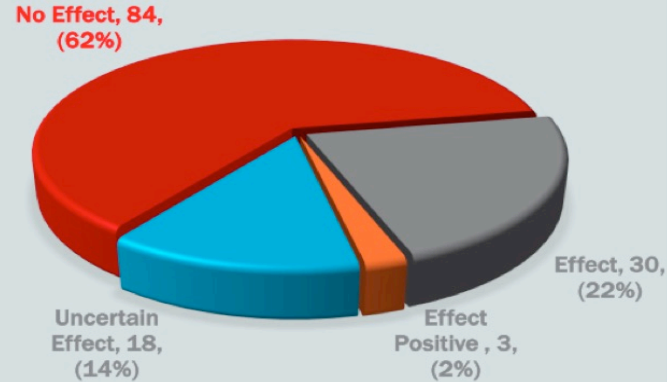
- Government;
- Private;
- Public Not-for Profit;
- Industry;
- Institutional;
- United Nations (WHO);
- Not known.

Review of funding sources in ORSAA database

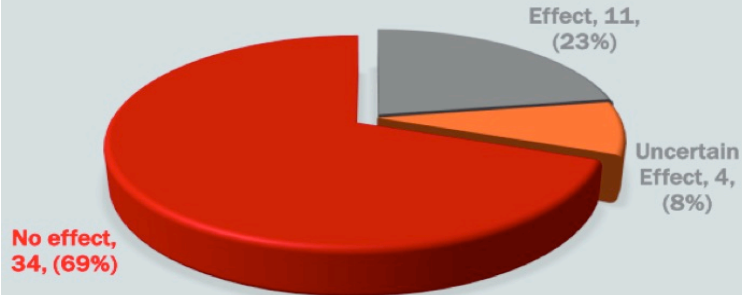
INSTITUTION ONLY FUNDED



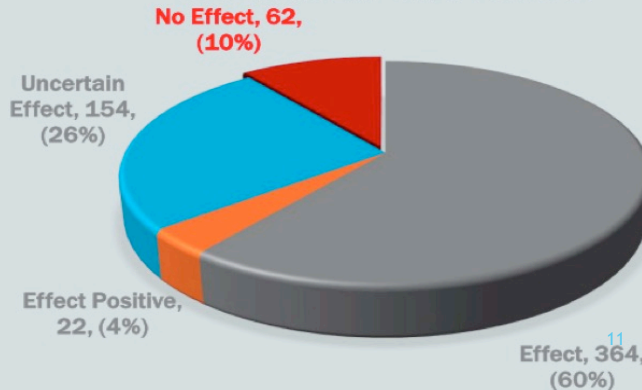
INDUSTRY ONLY FUNDING



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

TRS-164 - A poor state of affairs

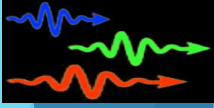
- ▶ The TRS-164 terms of reference (page 64) for the 'Expert Panel' was to prepare an independent assessment
 - ▶ Sections relied almost exclusively on UK HPA's AGNIR report and SCENIHR report (both reports have been heavily criticised by independent scientists)
- ▶ TRS-164 was supposed to be an “examination of the science in this area from January 2000 till August 2012”.
 - ▶ AGNIR report did not cover this entire period and ARPANSA database (*in vivo* / *in vitro* studies) were not reviewed
- ▶ AGNIR referenced papers were not meant to be looked at in isolation. They are a 'supplement' to the existing pool of papers
 - ▶ Author of the TRS-164 *in-vivo* / *in-vitro* section has simply performed a paper count of 'no effect' versus 'effect' studies referenced by AGNIR report which is meaningless
 - ▶ Important papers available within the time period have not been considered
- ▶ TRS-164 is being cited in the literature and [industry websites](#) as being another independent review of the science
- ▶ The Australian public is being misled into believing TRS-164 is a comprehensive and independent review of ARPANSA's extensive database

Missing In Action - Robust Risk Management Policies

- ▶ The type of risks are not clearly identified
- ▶ The probability for many risks are not being assessed
- ▶ Strategies to manage risks are not made clear (facts sheet strategy!!)
- ▶ Absence of a precautionary approach is palpable – 4G, 5G, IoT, wireless smart meters etc.
- ▶ **Inconsistent policies for radiation protection**
 - ▶ Ionising radiation implements **As Low As Reasonably Achievable (ALARA)** in conjunction with a well defined hierarchy of controls
 - ▶ Non ionizing radiation – compliance to RPS3 (ICNIRP) limits is assumed safe without any scientific validation and anything goes (cell towers and Wi-Fi located in or near sensitive locations such as hospitals, schools and homes). Industry code of practice “C564:2011 Mobile Phone Base Station Deployment” effectively ignored
- ▶ Why is Australia’s regulatory body not dealing with risks responsibly?
 - ▶ Concern that it may raise public concern and alarm?
 - ▶ Potential economic fallout and legal challenges?
- ▶ **To continue avoiding the issue of not providing full public disclosure of risk is reckless and irresponsible**

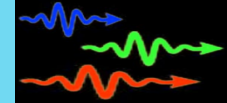
“All scientific work is incomplete - whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time.”

Sir Bradford Hill



Question for the Radiation Protection Community

Do we have a problem?



Provocation Studies

Topic	Y (TR-164)	Y (ORSAA)	N (TR-164)	N (ORSAA)
All Studies		132 (+25 Uncertain Effect)		87
ARPANSA Studies available for TRS-164	Not Stated	126 (+26 Uncertain Effect)	Not Stated	85
Electroencephalograph (EEG) Studies		78 (+5 Uncertain Effect)		7
EHS Studies		24 (+5 Uncertain Effect)		18

- Relied on UK AGNIR report, Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) [5] and ICNIRP reviews.
- TRS-164 the important finding showing Brain Wave electrical activity are altered (cortical excitability) are ignored because it's not seen to be related to any potential health problems