

WI-FI in our Schools: IS IT SAFE ENOUGH?



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Conclusions / Letters from Dr. David Carpenter, Dr. Olle
Johannsen, Dr. Magda Havas, Dr. Stephen Sinatra to
Kawartha Pine Ridge District School Board / Final Words.

What is Wi-Fi?

- A.k.a. 'wireless internet connection', or 'Wireless'
- Its sole function is to allow one or more computers to connect to the internet without the use of cables or wires
- But, a common misconception clarified:
Wi-Fi is **NOT REQUIRED** to use computers or access the Internet.



Industrial-strength transmitters that are installed on ceilings of classes.

How does Wi-Fi work?

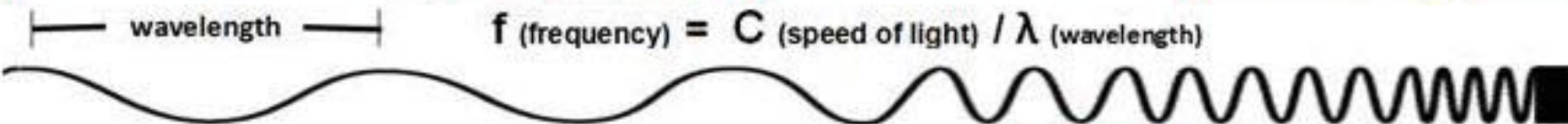
- Wireless technology transports data wirelessly between a computer and a wireless access point (WAP or router).
- It uses pulsed, high frequency radio signals between (2.4Ghz - 5.8Ghz) called 'Radiofrequency Electromagnetic Radiation' (RFR) on the Electromagnetic Spectrum
(aka "microwave radiation")

* Same frequency as cell phones/towers/microwave ovens

THE ELECTROMAGNETIC SPECTRUM

SELF DC 3Hz 3KHz 30KHz VLF LF/ MF/ HF/ VHF/ UHF 30KHz SHF 3GHz 5GHz 300GHz 430-750THz EHF 30PHz 3EHZ 300EHZ

non-ionizing ionizing



EMF Sources

												
earth & subways	AC power	CRT monitors	TV	cell phones	cell towers	microwave ovens	WiFi	satellites	sunlight	radioactive sources	medical x-rays	
		mobile AM/FM		wireless smart meters		cordless phones						

Gigahertz (GHz) 10-9 Terahertz (THz) 10-12 Petahertz (PHz) 10-15 Exahertz (EHZ) 10-18 Zetahertz (ZHz) 10-21 Yotahertz (YHz) 10-24

Why Are Schools Using Wi-Fi?

- **CHEAPER** than hard-wiring
- Heavily marketed as “**21st CENTURY TECHNOLOGY**” = a ‘must have’ for student success
- **CONVENIENCE** = portability of computers

Some Facts:

- **FACT**: Students and teachers are being exposed to **continuous** microwave radiation:

6 hours per day x 195 days per year

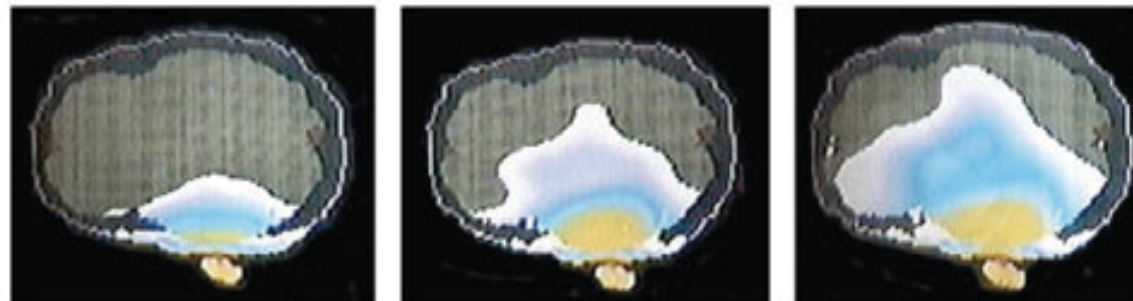
= **1200 hrs/year** for 14 years of their life

This exposure is cumulative.

- **FACT**: There have been **NO studies done on children** showing that long-term exposure to microwave radiation is safe. **Without parental knowledge and permission, such a study is unethical by research protocols and could not proceed.**

- **FACT: CHILDREN are much more susceptible** to the effects of any toxic substance, such as microwave radiation, due to their thinner skeletons, developing immune systems and rapidly multiplying cells. They will also face a greater lifetime exposure than adults.

Cell Phone Radiation Penetrating Skull



ADULT Head

CHILD - 10 Years Old

CHILD - 5 Years Old

Study by Gandi et al. University of Utah, 1996.

1. Children **absorb** more **energy** than adults from the same phone.
2. Tumors in **mid brain** are more deadly than those in **temporal lobe**.
3. Children's **cells** are **reproducing** more quickly than adults.
4. Children's **immune system** is not as well developed as adults.
5. Longer potential for **life-time exposure** for children than adults.

* *WHO Training for health sector*

Children and Cancer

CHILDREN ARE NOT LITTLE ADULTS



Raphael, National Gallery of Art, Washington, DC

1. Different and unique exposures
2. Dynamic developmental physiology
3. Longer life expectancy
4. Politically powerless

Is Wi-Fi Safe?

- Much debate in the scientific and medical community
- Answer depends on whom you ask

Is Wi-Fi SAFE?

The view of:

■ Major World Authorities

Parliamentary Assembly of the Council of Europe (PACE), 2011:

- - represents 47 member countries
- “the limits on exposure to electromagnetic fields..set for the general public are obsolete”.
- Reduce exposure, particularly to young people
- Set preventive microwave exposure standards of 1 uW/cm^2 (Canada allows 1000 uW/cm^2)
- In schools and classrooms, use wired internet and strictly regulate use of cell phones



Parliamentary **Assembly**
Assemblée parlementaire

<http://assembly.coe.int>



COUNCIL OF EUROPE
CONSEIL DE L'EUROPE



World Health
Organization

World Health Organization (WHO)

- On May 31, 2011, “Radiofrequency Electromagnetic Radiation, such as but not limited to wireless phones” * was classified by the WHO as a Class 2B Possible Carcinogen
- **Same category** as lead, DDT, gasoline, chloroform, engine exhaust

*quoted from WHO website, confirmed by Dr. Jonathan Samet, Chair of IARC Working Group. **This includes Wi-Fi**, cordless phones, smart meters, baby monitors, wireless games, etc.

Is Wi-Fi SAFE?

The view of:

■ International Scientific/Medical Groups

DOCTORS AND SCIENTISTS CALLING FOR STRICTER REGULATION AND/OR A MORATORIUM ON WIRELESS TECHNOLOGY

- Vienna Resolution 1998
- Salzburg Resolution 2000
- Declaration of Alcal 2002
- Catania Resolution 2002
- Freiburger Appeal 2002
- Bamberger Appeal 2004
- Coburger Appeal 2005
- Oberammergauer Appeal 2005
- Haibacher Appeal 2005
- Pfarrkirchener Appeal 2005
- Freienbacher Appeal 2005
- Lichtenfelser Appeal 2005
- Hofer Appeal 2005
- Helsinki Appeal 2005
- Parish Kirchner Appeal 2005
- Saarlander Appeal 2005
- Stockacher Appeal 2005
- Benevento Resolution 2006
- Allgauer Appeal 2006
- WiMax Appeal 2006
- Schluchterner appeal
- Brussels Appeal 2007
- Venice Resolution 2008
- Berlin Appeal 2008
- Paris Appeal 2009
- London Resolution 2009
- Porto Alegre Resolution 2009
- European Parliament EMF Resolution 2009
- Dutch Appeal 2009
- Int'l Appeal of Wurzburg 2010
- Copenhagen Resolution 2010
- Seletun Consensus Statement 2010
- International Doctors Appeal 2012

Is Wi-Fi SAFE?

The view of:

 International Experts

Dr. David Carpenter

Public Health Expert,
Director, Institute for Health and Environment,
University at Albany
Co-Editor of Bioinitiative Report 2007/2012



- Member of International team that **reviewed 4,000 studies** on RFR effects.
- States the ‘weight of evidence’ is overwhelmingly that RFR radiation is UNSAFE.
- Wrote to KPR School Board advising that Wi-Fi be removed.
- “It is appropriate... to demand that Wi-Fi be removed from schools not because of definitive proof that it is harming the children, but because we have absolutely no proof that it is safe, contrary to what any government agency says.”

Dr. Olle Johannsen

Associate Professor, Experimental Dermatology Unit,
Department of Neuroscience, Karolinska Institute
Stockholm, Sweden.



- A neurologist who has studied the biophysical and epidemiological effects of electromagnetic fields for over 30 years...
- Wrote to Peterborough County City Health Unit advising of the dangers of Wi-Fi.
- **“Health effects occur at exposure levels many orders of magnitude below existing public safety standards... New biologically-based standards taking into account long-term as well as non-thermal exposures, are urgently needed to protect public health.”**

Dr. Magda Havas

Internationally Renowned Expert on Biological Effects of RFR; Associate Professor, Environmental & Resource Studies at Trent University; Provides Expert Testimony in International Courts of Law



- In 2010 conducted a ‘heart provocation study’ showing that microwave radiation from 2.4Ghz cordless phone affects the autonomic nervous system at levels 0.3% of Health Canada’s safety guidelines.
- Has written to KPR School Board advising against the use of Wi-Fi on basis of studies showing sperm, fertility, and DNA damage, increased cancer risks, as well as other symptoms of electro-hypersensitivity.
- “We are heading for a **health tsunami** if we expose young children to pulsed microwave radiation generated by Wi-Fi routers in the classroom for the duration of their school education.”

Dr. Devra Davis

Epidemiologist, Toxicologist, Author: *The Secret History of the War on Cancer*; former Director, The Center for Environmental Oncology, Univ. of Pittsburgh; Co-Founder, Environmental Health Trust



- In her book, *Disconnect: The Truth about Cell Phone Radiation, What the Industry has done to Hide it and How to Protect Your Family*, she argues fervently about the need to protect children from serious risks of cancer.
- “We are conducting an uncontrolled experiment on our children.”

Dr. Stephen Sinatra

Chief of Cardiology, Director of Medical Education,
Manchester Memorial Hospital, Connecticut
Lecturer, Public Speaker on RF Effects on the Heart



- Believes young people are at risk with Wi-Fi exposure in schools, particularly those with undiagnosed heart problems.
- Has written to the KPRDSB warning that the heart is sensitive and can be adversely affected by Wi-Fi at levels a fraction of federal guidelines.
- "The greatest threat to health in this millennium is wireless technologies without a doubt."

Is Wi-Fi Safe?

The view of:

Major Scientific Studies and Latest Developments

Major Studies

- The body of evidence showing health effects from microwave radiation has accumulated since the 50's, with **scientific studies numbering in the thousands**.
- In the last 5 years, over 1800 studies have been done which overwhelmingly link microwave exposure to serious health effects and disorders.

Peer Reviewed, Published and Replicated Science shows:

- Blood brain barrier Permeability
- Irreversible Infertility
- Reduced sperm motility in males
- DNA damage
- Effects on cellular stress protein
- Effects on skin
- Increase in Cancer Risk
- Melatonin reduction
- Sleep disorders
- Neurodegenerative diseases
- Salivary gland tumours
- Tinnitus and ear damage
- Effects on eyes
- Electro hypersensitivity

2012 Latest Developments:

- **2012 - The Austrian Medical Association: "Wi-Fi environments will lead to high microwave exposure for students and teachers which might increase the burden of oxidative stress. Oxidative stress might slow down the energy production especially in brain cells and may lead e.g. to concentration difficulties and memory problems in certain individuals. The Austrian Medical Association recommends Wi-Fi free school environments."**

2012 Latest Developments

■ Israel's Deputy Health Minister Yaakov Litzman implored Education Minister Gideon Sa'ar to immediately suspend the installation of wireless Internet in schools due to the hazards of electromagnetic radiation.

2012 Latest Developments

- **Russian National Committee on Non-Ionizing Radiation Protection (RNCNIRP):** "Electromagnetic radiation from Wi-Fi creates an additional burden for the child brain, whose body is in a state of development and the formation of mental activity. (WHO, publication number 3, April 2003)... **[RNCNIRP] recommend the usage of wired networks in schools and educational institutions, rather than a network using wireless broadband systems, including Wi-Fi.**" June 2012

2012 Latest Developments

■ **Switzerland's Physicians for the Environment (MfE):** " the risk of cancer for this type of [wireless] radiation is thus similar to that of the insecticide DDT, rightly banned... From the medical point of view, **it is urgent to apply the precautionary principle for mobile telephony, wifi, power lines, etc.**

2012 Latest Developments

- **The American Academy of Environmental Medicine:**
"Adverse health effects, such as learning disabilities, altered immune responses, headaches, etc. from wireless radio frequency fields do exist and are well documented in the scientific literature. **Safer technology, such as using hard-wiring, must be seriously considered in schools** for the safety of those susceptible individuals who may be affected by this phenomenon."

2012 Latest Developments

■ **The American Academy of Pediatrics:**

Although wireless devices sold in the United States must ensure that they do not exceed the maximum allowable SAR limit when operating at the device's highest possible power level, concerns have been raised that **long-term RF exposure at this level affects the brain and other tissues and may be connected to types of brain cancer, including glioma and meningioma."**

2012 Latest Developments

■ **Toronto Women's College Hospital is First to Recognize Symptoms from Wireless Radiation**

Women's College Hospital says family doctors must learn to detect the symptoms of exposure to wireless radiation...Symptoms include disrupted sleep, headaches, nausea, dizziness, heart palpitations, memory problems, and skin rashes. These symptoms are now labelled **Electro-magnetic Hyper-sensitivity."**

* **The Clinic currently has a 13 month waiting list.**

2012 Latest Developments

- **Wi-Fi Study in Pediatric Urology Journal** finds increased exposure to Wi-Fi .. causes DNA damage to rat testes at the cellular level.
- This study raises questions about the safety of radiofrequency exposure from Wi-Fi .. for growing organisms of reproductive age, with a potential effect on ... fertility...
- * Most concerning is the fact that the full study reveals that levels used in the experiment were LOWER than what a child using a wireless laptop in school would be exposed to.

2012 Latest Developments



Bioinitiative Report 2012

- 5 year follow-up to 2007 Bioinitiative Report (a review of >2,000 studies dealing with effects from rf-emf radiation).
- Examination of **1800 new studies** done in the past 5 years on the health risks of rf-emf.
- Reviewed by **29 independent scientists and health experts.**

Bioinitiative Report 2012

Summary of Key Findings



- Evidence For **Damage to Sperm and Reproduction**
- Evidence that **Children are More Vulnerable**
- Evidence for **Electrohypersensitivity**
- Evidence for Effect from Cell-Tower Level RFR Exposures
- Evidence for Effects on the Blood Brain Barrier
- Evidence for **Effects on Brain Tumours**
- Evidence for Effects on Genes (Genotoxicity)
- Evidence for Effects on the Nervous System (Neurotoxicity)
- Evidence for **Effects on Cancer (Childhood)**
- Effects on Melatonin, Breast Cancer and Alzheimer's Disease
- Disease Stress
- Effects on Stress Proteins, DNA and Neural Activity

Bioinitiative Report 2012

Conclusions



- Risk to health from wireless technology has increased substantially since 2007
- Cell phone users, parents-to-be, children and pregnant women are at particular risk
- Calls for microwave radiofrequency radiation to be classified as a “human carcinogen”
- Calls for even more restrictive standards for safe microwave radiation exposures than Bioinitiative Report of 2007

Table 1 - RFR Standards vs Levels Found in Schools with Wi-Fi

POWER DENSITY in uW/cm ²	RFR STANDARDS USED OR RECOMMENDED AS COMPARED WITH LEVELS FOUND IN SCHOOLS WITH COMMERCIAL-GRADE Wi-Fi SYSTEMS	Reference
0.0003-0.0006	NEWLY RECOMMENDED RFR Exposure Limits by BIOINITIATIVE REPORT 2012 (N.B. 3 million – 6 million times lower than Safety Code 6 limits)	Bioinitiative 2012
0.001	Exposure Limit in NEW SOUTH WALES, AUSTRALIA	
0.1	RECOMMENDED RFR Exposure Limits, by BIOINITIATIVE REPORT 2007 (N.B. 10,000 times lower than Safety Code 6 limits)	Bioinitiative 2007
0.1	Exposure Limit in SALZBURG, AUSTRIA (pulsed transmissions)	
1.0 - 3.8	Sample RFR level measured in a KPRDSB classroom NB – no computers using Wi-Fi during measurements (N.B. 263 - 1000 times lower than Safety Code 6 limits)	KPRDSB website
2.0 - 10.0	Exposure Limits in RUSSIA, BULGARIA, HUNGARY, SWITZERLAND	
3.0	Exposure Limit in BELGIUM	
5.0-20.0	Level of RFR emissions from one laptop streaming video via Wi-Fi (levels vary from device to device, and increase with multiple devices in use) (N.B. 50 - 200 times lower than SC6)	
7 - 10	Exposure Limit in CHINA	
8.8	Level of RFR exposure in a KPR portable classroom (N.B. 113 times lower than Safety Code 6 limits)	KPRDSB website
10	RFR exposure limits as per City of Toronto Prudent Avoidance Policy (NB: 100 times lower than Safety Code 6 limits)	City of Toronto
1000	Exposure allowed under Health Canada’s SAFETY CODE 6	Health Canada

Table
1A

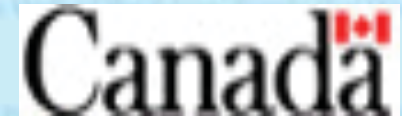
POWER DENSITY in uW/cm2	SAMPLES OF REPORTED BIOLOGICAL EFFECTS FROM RADIOFREQUENCY RADIATION (RFR) AT LOW-INTENSITY EXPOSURE (ie. cell tower, wi-fi, smart meter intensities)	Reference
0.00034	Chronic exposure to cell phone pulsed radiofrequencies significantly reduced sperm count	Behari, 2006
0.0009	Radiofrequency radiation exposure induced 10 – 40% increase in DNA synthesis in glioma cells (brain tumour cells) ie. Tumours grow faster	Stagg 1997
0.0006-0.0128	Fatigue, depressive tendency, sleeping disorders, concentration difficulties, cardiovascular problems reported with exposure to cell phone signal at base station level exposures.	Oberfeld, 2004
0.003-0.02	In children (8-17) , short term exposure caused headaches, irritation, concentration difficulties in school	Heinrich, 2010
0.003-0.05	In children (8-17) , short-term exposure caused conduct problems in school.	Thomas, 2010
0.0003-0.0006	Newly Recommended RFR exposure limits, Bioinitiative Report 2012	Bioinitiative2012
0.006-0.01	Chronic exposure to base station RF (whole body) in humans showed increased stress hormones, dopamine levels substantially decreased, higher levels of adrenaline and nor-adrenaline, chronic physiological stress in cells even after 1.5 years	Buchner, 2012
0.05-0.1	Radiofrequency radiation exposure linked to adverse neurological, cardiac symptoms, and cancer risk.	Khurana, 2010
0.05-0.1	RFR related to headache, concentration, and sleeping problems.	Kundi, 2009
0.07-0.1	Sperm abnormalities in mice exposed for 6 months to base station level radiofrequency.	Otitoloju, 2010
0.1	Recommended RFR exposure limits, Bioinitiative Report 2007	Bioinitiative2007
0.16	Motor function, memory, and attention of school children affected	Kolodynski, 1996
0.168-1.053	Irreversible infertility in mice after 5 generations of exposure to radiofrequency from an “antenna park”	Magras & Zenos, 1997
0.2-8	Radiofrequency radiation caused a two-fold increase in leukemia in children	Hocking 1996
0.5-1.0	Wi-Fi level laptop exposure for 4 hours resulted in decrease in sperm viability, DNA fragmentation with sperm samples place under laptop connected to Wi-Fi.	Avendano, 2012
1.0	RFR induced pathological leakage of the blood-brain barrier	Persson, 1997
1.3-5.7	Radiofrequency radiation associated with a doubling of leukemia in adults	Dolk, 1997
2.0	RFR induced double-stranded DNA damage in rat brain cells	Kesari, 2012
2.5	RFR affected calcium concentrations in heart muscle cells (crucial in regulating heartrate)	Wolke, 1996
1.0-3.8	Sample RFR level measured in a KPRDSB classroom NB – no computers using Wi-Fi during measurements	KPRDSB website
4-15	Memory impairment, slowed motor skills and retarded learning in children	Chiang, 1989
5.0 – 20.0	Level of RFR emissions from one laptop streaming video via Wi-Fi (levels vary from device to device, and increase with multiple devices in use)	
8.8	Level of RFR exposure in a KPR portable classroom	KPRDSB website
10	RFR exposure limits as per City of Toronto Prudent Avoidance Policy 1999/2007 (NB: 100 times lower than Safety Code 6 limits)	City of Toronto
50	Cell phone radiofrequency radiation caused pathological leakage of the blood-brain barrier after 1 hour of use	Salford, 2003
60	Radiofrequency radiation caused structural changes in cells of mouse embryos	Somozy, 1991
1000	Exposure allowed under Health Canada’s SAFETY CODE 6	Health Canada

Is Wi-Fi Safe?

The view of:

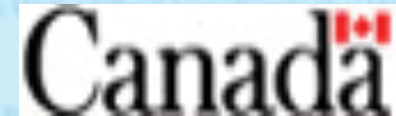
■ Health Canada

Health Canada



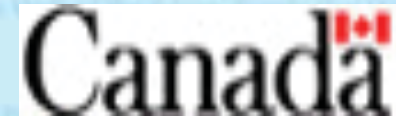
- Health Canada adheres to “**Safety Code 6**” - a federal guideline which sets out maximum acceptable RFR levels as outlined by ICNIRP (International Commission on Non-Ionizing Radiation Protection).
- Existing RFR standard ($1000\mu\text{W}/\text{cm}^2$) was derived from measuring ‘**thermal effects**’ only (ie. how long it takes to heat the skin of a 6’, 200lb male by 1 degree, over a 6 min period).

Health Canada



- SC6 does not take into account the biological (non-thermal) effects or the long-term effects of exposure
- One of the **least protective** RFR standards in the world

Health Canada



- Health Canada states ‘**non-thermal effects are not well established and currently do not form a scientifically acceptable basis for restricting human exposure to RF energy.**’
- It further states: “**Safety Code 6 limits are considered to be well below the threshold for any potential harm.**”

Funding Bias

- Funding source of studies is **not recognized** by Health Canada
- Dr. Henry Lai, University of Washington 2005 review of 200 studies and scientific outcomes:
 - 25% **industry-funded** find biological effects
 - 75% **independently-funded** find biological effects



Is Wi-Fi Safe Enough?

Summary of Views

Summary of Views

- Huge divide between all those who advocate for Precaution and those who do not.

Other Wi-Fi Concerns

- Growing research is showing that the use of pervasive Wi-Fi is exacerbating the problem of **'cyberbullying' in schools** as well as **access to pornography**, with students using school Wi-Fi to access Facebook and other social media websites. (e.g. recent CBC video on 'sexting')

The **societal consequences** of bullying and the sexualization of our youth are **disturbing**, especially if being aided by pervasive Wi-Fi and student-owned technology in schools.

- **WHERE IS THE RESEARCH THAT INDICATES THAT A 'Wi-Fi CONNECTION' (vs Hardwiring) CONTRIBUTES TO STUDENT SUCCESS? There is none.**

WHY allow Wi-Fi ?

- Health Canada - “not enough evidence” to prove harmful effects. Safety Code 6 is “adequate”.
- ICNIRP/Telecom industry agree.
- Cost/Convenience.

WHY NOT allow Wi-Fi?

- **Voluminous research/Experts/Authorities** --> possible serious health risks and **need for Precaution**, especially for children.
- **Unprecedented exposure** to RF-EMF in last 30 years.
- Canada’s **Safety Code 6 is considered ‘outdated’**
- Bioinitiative 2012’s review of 1800 new studies recommends even greater precaution required (3-6,000,000 times lower than SC6)
- **Health Canada’s history: Waiting too long** for full evidence, with tragic results (smoking, asbestos, DDT, thalidomide, DES, tainted blood...)
- **NO STUDIES HAVE BEEN DONE ON CHILDREN TO PROVE THAT LONG-TERM RFR EXPOSURE IS SAFE.**
- May be **contributing to cyberbullying and sexualization of our youth.**
- No studies show that Wi-Fi, per se, contributes to student success

SAFER Alternatives

1. **Hardwire all computers/netbooks. Disable all Wireless access points.** Install additional ethernet access ports OR use broadband over power lines (HD Network/adapters).
2. **Use less powerful 'home style' routers which can be mounted on netbook carts. Disable all commercial-grade Wireless access points which radiate continuously.** These can be easily shut off when not in use and turned on only when required.
3. **Restrict wireless use to clearly-marked areas.** Remainder of school should be Wi-Fi-free.
4. **Designate a number of Wi-Fi-free schools.** Provide a choice to parents who have objections/health concerns.

Wi-Fi in our Schools:

IS IT SAFE ENOUGH?



The Precautionary Principle:

*The threat of plausible, serious and irreversible hazards to children from exposure to particular environmental stimuli justifies public policy action to reduce such exposure, despite a lack of full scientific certainty. **Waiting for such proof may be more damaging to the public health in the long run.***