Re: The Report of the Royal Society of Canada Expert Panel:
A Review of Safety Code 6 (2013): Health Canada's Safety Limits for Exposure to
Radiofrequency Fields
Spring 2014

The Panel:

Dr. Paul Demers (Chair)
Dr. Richard Findlay
Dr. Kenneth Foster
Dr. Bryan Kolb, FRSC
Dr. John Moulder
Dr. Anne-Marie Nicol
Dr. Frank Prato
Dr. Rianne Stam

Of these Panel members, Paul Demers is an epidemiologist, specializing in occupational cancer epidemiology. Anne-Marie Nicol indicates that her research focuses on the communication of complex scientific and public health information to a range of audiences. She is the current Principal Investigator of the CAREX Canada project. The remaining members of the Panel are basic scientists, some with major links to the telecommunications industry.

Thus this is a conflicted panel, with insufficient expertise in Epidemiology – it is unfortunate that the Royal Society failed to amend the membership of the panel as requested by some of us.

This is a report to the Royal Society of Canada, not a report of the Royal Society.

Citation: Demers, Paul *(chair),* Richard Findlay, Kenneth R. Foster, Bryan Kolb, John Moulder, Anne-Marie Nicol, Frank Prato, Rianne Stam. (2014). Expert Panel Report on A Review of Safety Code 6 (2013): Health Canada's Safety Limits for Exposure to Radiofrequency Fields. Royal Society of Canada, Ottawa, ON. ISBN: 978-1-928140-00-9

The Preface to the report acknowledges "In recent years there has been an explosion in the use of wireless technologies, from smart meters and wireless local area networks to bluetooth devices and both cordless and cellular phones. While delivering incredible convenience and mobility, these technologies have increased human exposure to electromagnetic frequencies ranging from 3 kHz to 300 GHz."

In 2013, Health Canada proposed several revisions to bring SC6 in line with current knowledge and other international standards and asked the Royal Society of Canada to form an Expert Panel to review the proposed changes to SC6. The Panel was asked to determine whether SC6 limits provide adequate protection from established adverse health effects, whether there are other

potential health impacts that should be considered, and whether additional precautionary measures should be recommended.

The Panel considered an “established adverse health effect” as an adverse effect that is observed consistently in several studies with strong methodology. For example, the Panel reviewed conflicting evidence about effects of exposure to RF energy on cancer, concluding that effects are possible but are not “established” in accordance with its definition of “established health effects” maintaining that its conclusion on cancer “is in agreement with a recent report from the International Agency for Research on Cancer (IARC, 2013).” This ignores more recent evidence, including some produced by Hardell, and the opinion of Davies et al (2013) where we conclude that the correct classification should be 2A – i.e. that radiofrequency fields (RFF) are a probable Human Carcinogen.

In the report of the Panel the avoidance of tissue heating remains the basis for the reference limits in the frequency ranges of RFF considered. In reaching this conclusion the panel quoted a paper by Adair (2003). This approach enabled the Panel to downgrade the increasing number of studies that are pointing to adverse biological effects, some of which are consistent with future carcinogenicity.

In contradistinction to the Panel, I start from the belief that when new technology is introduced, the burden of proof that it is safe is placed upon those who promote it, not on those who are concerned that there is a potential hazard from its introduction. But the Panel’s viewpoint has led it to concentrate on what it regards as “known adverse health effects”, i.e. the Panel concluded that the human exposure limits in the Safety Code “are science-based and do reflect the current state of knowledge regarding health effects”, relegating those it does not classify as adverse to a grouping where “Health Canada should continue to monitor the literature for emerging evidence and that it aggressively pursue scientific research aimed at clarifying the RF energy-cancer issue”.

This philosophy is illustrated in the introduction to the report, when it is stated: “Safety Code 6 sets recommended limits for safe human exposure to electromagnetic energy emitted from devices such as cellular phones, Wi-Fi equipment, cellular phone towers and radio/TV broadcast antennas.” Given the uncertainty whether or not the current exposure limits are safe, it could have been anticipated that the Panel would have stated “Safety Code 6 (SC6) sets recommended limits for *what are believed to be* safe human exposure to electromagnetic energy emitted from devices such as cellular phones, Wi-Fi equipment, cellular phone towers and radio/TV broadcast antennas.”

The Panel admits that the current version of SC6 reflects the scientific literature published up to August 2009. This means that it does not reflect Monograph 102 (IARC 2013). Although the charge to the Panel repeatedly mentions “established

adverse health effects" question 5 is: "Should additional precautionary measures be introduced into the human exposure limits in Safety Code 6 (2013)? If so, what is recommended and why?" We therefore are entitled to expect full consideration of all potential adverse health effects, and not just those that the panel judges to be "established". However, it would seem that the Panel did not conduct a full, independent review, but rather relied on prior reviews, though it is stated they conducted a literature search to identify research published since the previous reviews. The Panel's defense of this is the statement: "The Panel's mandate was to examine Health Canada's proposed changes in light of recent expert reviews regarding the adverse health effects of exposure to RF energy. It was not expected to do a comprehensive analysis of the literature."

Towards the end of their discussion on the epidemiological evidence on cancer (page 78) the Panel makes the statement: "Unfortunately, the measures of exposure used in the epidemiologic studies, based on duration of use in years or cumulative use based on estimated hours, do not translate well into data that can be compared to make specific recommendations regarding SC6." This follows an earlier section on exposure measurements. Surely this means that within the Panel there was a failure to address the fact that the recommendations with regard to "safe" levels in SC6 are not relevant to a clear understanding of human exposure and risk, given that the strongest human evidence comes from the type of measures the Panel appears unable to quantify with regard to SC6. This conclusion is re-enforced by a statement on page 83: "If exposure to RF energy is actually associated with cancer risk, the relevant measure of dose, and the dose-response, are both unknown." In fact a clear association has already been demonstrated. It is appropriate to remind all that in Appendix 2 of the paper documenting the main results of the Interphone study (Interphone Study Group, 2010) the authors attempted to correct for a downward bias in the risk estimates for mobile phone use by undertaking analyses using the lowest category of users as the reference category for risk estimates in higher categories. This resulted in a dose response relationship for glioma risk: with 1-1.9 years since start of regular use as the referent, the OR for 2-4 years use was 1.68 (95% CI 1.16-2.41), 5-9 years use 1.54 (1.06-2.02) and for 10+ years use 2.18 (1.43-3.31). In a subsequent paper, Cardis et al (2011) re-analyzed in detail data from five Interphone countries, and found, when risk was examined as a function of dose received in different time windows before diagnosis, an increasing trend with increasing radio frequency dose (p.0.01) for exposures 7 years or more in the past. Increasing risk with increasing duration and intensity of exposure is precisely what one would expect of a human carcinogen. Unfortunately this strong evidence of a dose-response relationship seems to have been ignored by the Panel who in a Conclusion on page 83 stated "The epidemiological evidence is largely limited to a weak association of prolonged mobile phone use with increased incidence of glioma and acoustic neuroma." It is also relevant that subsequently, in the section on *Studies of Life-time Mortality and Tumour Initiation* (page 79) the Panel failed to mention that the IARC (2013) Working Group concluded that there is *limited evidence* in experimental animals for the carcinogenicity of radiofrequency radiation.

I am a strong advocate of the view that at this time the Precautionary Principle should be applied and that exposure to RFF should be reduced as far as possible, perhaps particularly with regard to exposure to children and in schools. However, the Panel, at the beginning of their discussion on the Precautionary Principle (pages 110-114) appear to have dissociated themselves from any responsibility in this regard, as in a box at the beginning of the section, they state: “The Panel was also in agreement that the decision to apply the Precautionary Principle is a question of risk management, as opposed to a question of risk assessment. In other words, the decision to apply the Precautionary Principle is a policy decision to be made by organizations with the legislative mandate to create policy, regulations and/or guidelines. It is not a decision to be made by an Expert Panel with a mandate to provide scientific advice.” The Panel does however state on page 114 “A broader dialogue with Canadians that included the risks and benefits of RF technologies could assist government agencies in setting acceptable options for management of RF exposures in the future.” It is not yet clear whether Health Canada will follow through with this suggestion.

In Conclusion, I find the Conclusions and recommendations of the RSC Panel profoundly disappointing, an opportunity to provide greater safety to the public has been missed. The Panel should have recognized that the RFF emitted from cell phone towers, mobile phones and other devices using RFF (Wi-Fi) is so widely distributed that current approaches to the determination of possible health risks are largely unable to do so. This is completely different from proof that there is no risk. An agent in high dosage may produce a detectable risk, with widespread low exposure there could still be an important risk not currently detectable, but which could get substantially greater with time. It is because of this possibility that it is wise to apply the Precautionary Principle now. It should be noted that an individual, if appropriately informed and empowered (not the case of children in schools that rely on SC6), can reduce their exposure to RFF from devices that use Wi-Fi, but that in the case of cell phone towers and smart meters introduced by electric utilities the exposure they receive is outside of their control. This lack of empowerment of individuals against RFF exposure explains the major opposition to such exposure from concerned members of the public. It is the purpose of government safety codes to provide such protection, and in failing to acknowledge this and propose strengthening the provisions of Safety code 6 (2013) under conditions of uncontrolled exposure, the Panel have failed in their obligations to the public.

Anthony B. Miller, MD, FRCP, FRCP(C)

Professor Emeritus
Dalla Lana School of Public Health
University of Toronto