

# **Review of Primary Investigation of Suspected Brain Cancer Cluster and Employee Health Complaints in RMIT Building 108**

**This Secondary-Level Peer Review was conducted by a Panel of Experts Jointly  
Nominated by RMIT University, the National Tertiary Education Union (NTEU),  
and the Australian Education Union (AEU):**

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## **Biographies of Secondary Review Panel Members**

Dr. Anthony D. LaMontagne is an Associate Professor in the McCaughey Centre: VicHealth Centre for the Promotion of Mental Health and Community Wellbeing at the School of Population Health, University of Melbourne. His background includes a Bachelor of Science (BS *summa cum laude*, 1982) in botany from the University of Massachusetts, a Master's degree (MA) in molecular toxicology from Harvard University (MA, 1987) a Master's degree in science and adult basic education from the University of Massachusetts (MEd, 1988), and a Doctor of Science in occupational and environmental health from the Harvard School of Public Health (ScD, 1994). After completion of his post-doctoral work, he held research appointments in Boston at the Harvard School of Public Health, New England Research Institutes, and the Dana Farber Cancer Institute before relocating to Melbourne in 2000. He was a Senior Lecturer in the Department of Epidemiology and Preventive Medicine at Monash Medical School (2000-2003) before coming to the University of Melbourne in 2003. His research areas of interest include the development, implementation, and evaluation of interventions to improve workplace and worker health. Interventions of interest include hazardous substance exposure controls, worker health and safety training programs, integrated occupational health and health promotion interventions, and national occupational health policies. He has published widely in the peer-reviewed scientific literature and is a contributor to leading texts in occupational and environmental medicine, occupational health, and health promotion.

Dr Deborah Glass MA, Cert Ed, MSc, PhD, Dip Occ Hyg, MAIOH, COH graduated from Cambridge University and did a Masters in Occupational Health and Hygiene at Aston and then worked in industry as an occupational hygienist. She joined the Institute of Occupational Health, University of Birmingham as a consultant occupational hygienist, and became a lecturer in Occupational Hygiene doing teaching, research and some survey work. She came to Australia in 1995 and worked on the Health Watch case-control study completing a PhD with Deakin University based on this work. She joined Monash University in 1998 and continues to work in the field of exposure assessment for epidemiology. She also supervised students doing Post Graduate Diploma projects in Occupational Hygiene at Deakin University between 2002 and 2006. She is a member of the Australian Institute of Occupational Hygiene, on the Certification committee, and is chair of the Education committee, a member of the British Occupational Hygiene Society, the American Conference of Government Industrial Hygienists (ACGIH) and serves as an expert member on the ACGIH Threshold Limit Value (TLV) committee.

Dr Geza Benke has a BSc (Physics), MAppSc (Environmental Engineering) and a PhD (Epidemiology), and is a Fellow of the Australian Institute of Occupational Hygienists. He is currently Senior Research Fellow with the Centre for Occupational and Environmental Health, Department of Epidemiology and Preventive Medicine, Monash University. Since 1989 Dr Benke has undertaken research in a range of occupational and environmental epidemiology studies. He is currently involved in the Morpheus study, a study investigating Mobile phone exposure and cognitive function in teenagers. This study is funded by the National Health and Medical Research Council through the Australian Centre for Radio Frequency Bioeffects Research. Dr Benke is also a member of the Radiation Advisory Committee to the Minister for the Department of Human Services and a member of International committees, associations and research groups involved in exposure assessment for cancer and respiratory disease.

## EXECUTIVE SUMMARY

This panel has been tasked with providing a second-level review of the primary investigation into the suspected brain cancer cluster at RMIT and possible occupational causation thereof. This report reviews the medical investigation report compiled by Southern Medical Services Pty (Southern Medical Services 2006a). We view our role in this regard as essentially providing a level of peer review to complement the primary investigation. This report builds on a previous public report dated 2 August 2006 (LaMontagne, Glass et al. 2006a) and an interim follow-up report to RMIT dated 30 August 2006 (LaMontagne, Glass et al. 2006b).

We reviewed the following primary investigation documents for this report:

- *RMIT Building 108 Outcome of Medical Consultations*, Southern Medical Services, 19 December 2006;
- Five Appendices including covering report dated 3 November 2006 detailing environmental monitoring findings from assessments conducted in October 2006 by other investigators (SRMA, AMCOSH, EMC, and Magshield);
- An updated covering report on environmental monitoring findings dated 21 November 2006
- Updated Magshield env monitoring report dated 12 December 2006;
- SRM “Environmental Testing Report Personal Monitoring Results,” 8 February 2007 and two associated Appendices on:
  - Radon & Gamma Radiation
  - ELF Personal Monitoring

Most importantly, we agree with the main findings of the cluster investigation (Southern Medical Services 2006b) and the findings of the medical investigation (Southern Medical Services 2006a) and environmental monitoring investigations (Jacka 2006). In outline, those main findings are:

1. Medical consultations were provided to investigate personal health concerns and to answer questions about health in relation to Building 108. This was a valuable service to individual staff members and to students. Finding a clear MRI scan will have provided reassurance to some individuals.
2. We see no evidence of a brain cancer cluster or an excess of malignancies as a whole, based on the cases identified in the investigation to date, defined as a statistical excess of brain cancers in the employees working on floors 16 and 17.
3. The report correctly identified that data are inadequate to assess the risk of brain cancer or malignant tumours as a whole for staff on floors 3-15 because of the lack of appropriate denominator data to derive the expected value (i.e., without the age and gender distribution of the entire work group, the number of cancers expected from the Victorian population of the same age and gender composition [so-called ‘expected’] can not be estimated).
4. The report correctly identified that the risk of brain cancer or malignant tumours as a whole for students cannot be assessed because of the lack of appropriate denominator data to derive the expected value.
5. The report correctly identified that the risk of tumours as a whole, benign and malignant combined cannot be adequately assessed as a result of the lack of comparative expected figures.

6. Environmental exposure assessments show no evidence of exposures at or above levels of concern for known or suspected occupational or environmental risk factors for brain cancer;
7. Further *personal* monitoring of EMF exposures was recently conducted and showed levels in line with international measures for office work environments. One workshift median level was high for office work (7.7 mG), and should be investigated further in consultation with employees and their OHS representatives in the area.

Detailed reviews of the medical and environmental investigations are provided in turn below, followed by discussion of possibilities for further investigation where indicated.

## **I MEDICAL INVESTIGATION**

The medical helpline and medical consultations were provided to investigate personal health concerns and to answer questions about health in relation to Building 108. This was a valuable service to individual staff members and to students. Finding a clear MRI scan will have provided reassurance to some individuals (page 50).

The discussion of workplace concerns including the incidence of headaches, stress and poor indoor air quality is a useful exploration of the issues.

### **Brain Cancers**

Page 33 of the report states that “Additional brain tumour cases were identified from brain MRIs offered to past and current staff and students who attended a medical consultation at SMS on a voluntary basis. These tumours have no histological confirmation and are still under investigation.” We assume that the additional brain tumours are the two abnormalities still under investigation (pages 29-30).

## **II EXTENDED CLUSTER INVESTIGATION**

We agree with the main finding of the medical investigation conducted by Southern Medical Services (SMS) (Southern Medical Services 2006a) page 13: “Currently, there is no evidence that specifically indicates that working on these levels increases a person’s chances of developing a brain tumour beyond that expected in the general population.”

It is likely that the methods used to identify tumour or cancer cases were fairly comprehensive, but because the identification process relied on voluntary reporting some tumour or cancer cases may not have been identified. Further, the total numbers of current and past employees and students, and the percentages contacted were not systematically determined. This could affect both the numerator (the number of cases identified, or ‘observed’) and the denominator (the number of cases ‘expected’ given a defined population at risk) in the assessment of observed/expected cases that constitutes the heart of the cluster analysis. This limitation was acknowledged by the SMS team.

The report correctly identified that the risk of brain cancer or malignant tumours as a whole for staff on levels 3-15 and for students cannot be assessed because of the lack of appropriate denominator data to derive the expected value.

### **Benign Tumours**

The medical investigation also identified benign tumours on floors 16 and 17. The report correctly identified that benign tumours are not reliably reported to the Cancer Registry (the prime purpose of which is to register *malignancies*). Thus there is no good population data to derive expected values (page 54). Benign tumours are under-reported to the Registry, thus any attempted comparisons would over estimate the risks.

## **III. ENVIRONMENTAL/EXPOSURE ASSESSMENT**

In our previous report (LaMontagne, Glass et al. 2006a) we identified known and suspected occupational and environmental risk factors for brain tumours from the current scientific literature, what sort of brain tumours are associated with each risk factor, and determined which might plausibly occur in Building 108 (summarised in Appendix table

below). All relevant risk factors that we could identify have been assessed (see Appendix).

### **Chemical, Biological and Ionising Radiation Exposure**

We conclude that most of the current exposures have been measured adequately and are clearly reported (water quality, VOCs, formaldehyde, acrylonitrile, and vinyl chloride). We would like to have seen in the reports the period of time over which the measurements were made and it would be helpful if a record was made of what the working conditions were on the day. All the chemical exposures appear to be very low and/or below the limits of detection and are well below current occupational or environmental exposure limits.

Biological hazard measurement is not an area that we have had much experience with but the methodology described seems appropriate and the results are reassuring.

The only known association between environmental/occupational exposure and brain cancer is that of ionising radiation (IR). Previously assessed ionising radiation exposures were well below levels of concern. Recently performed personal monitoring measurements (SRM report dated 8 February 2007) for radon and gamma radiation have confirmed these results. As expected, levels comparable with general ambient background.

### **Non-Ionising Electro-Magnetic Radiation**

Previous measurements conducted by EMC and Magshield (from November and December 2006) were reassuring, but limited by the fact that they were 'spot' or 'static' measurements. The workshift personal exposure assessment recommended by this Panel in previous reports was recently conducted (SRM report dated 8 February 2007).

Measurements were conducted on 8 staff members using the recommended EMDEX II monitoring devices across a workshift, enabling comparison of workers in Bldg 108 with the exposures presented in the peer-review published literature. (Karipidis, Benke et al. 2006) It was not clear how these workers were selected, though likely as a representative sample. Measurements confirmed that levels were in the range of international estimates for office work environments reported in the US and Korea (Kim and Cho, 2001) with mean levels between 1 and 3 mG. One of the 8 measurements had a mean result of 6.62 mG, which is high for an office work environment. Further investigation would be warranted to identify exposure sources, and to consider exposure reduction strategies.

## **IV. CONCLUSIONS**

The environmental exposure reports appear well designed and professionally implemented and reported.

The results presented here are reassuring. We see no justification for carrying out further tests for chemical or biological exposures, or for exposure to radon or other radioactive sources. We recommend some further monitoring of EMF in consultation with employees as described above. The comparison with other buildings in the Magshield report is as expected, and should give some comfort to the occupants of Building 108 that the environmental exposures are similar to those in other offices. The removal of desk top VDU with CRTs and the replacement with plasma screens would further reduce exposure.

**APPENDIX: Summary of Known and Suspected Occupational and Environmental Brain Cancer Risk Factors and Exposures Assessed**

<b>Brain Cancer Risk Factor (known = K, suspected = S)</b>	<b>Source</b>	<b>Tumour type/histology</b>	<b>Exposure on Floors 16 and 17 RMIT plausible?</b>	<b>Exposure on Floors 16 and 17 RMIT assessed?</b>	<b>Assessment of <u>Current Exposure</u> adequate?</b>	<b>Current exposure at level of concern?</b>
Ionising radiation (IR) (K)	(Preston-Martin, Yu et al. 1983; Bondy and Ligon 1996)	Meningiomas, Glioma	No, radon typically collects in basements rather than top floors. Perhaps contamination from elsewhere or unidentified X or $\gamma$ -rays	Yes for radon and ionising radiation.	Yes. For radon and possible X or $\gamma$ -rays	IR not at levels of concern
ELF/EMF (S)	(Mack, Preston-Martin et al. 1991)	Astrocytomas	Possible	Yes	Better measured when building in full use.	No. Levels less than reported in (van Tongeren, Mee et al. 2004)
RF Broad Band (S)	(Hardell, Carlberg et al. 2005; Moulder, Foster et al. 2005; Schoemaker, Swerdlow et al. 2005)	Only Hardell showed an association for Acoustic neuromas	Possible	Yes	Better measured when building in full use.	No
Vinyl chloride monomer (K)	(Boffetta, Matisane et al. 2003)	All, none specifically	No	Yes	Yes	No
Metals (S)	(Schlehofer, Hettinger et al. 2005)	Gliomas	Implausible—if through water then should affect all floors, not just 16 and 17?	Yes	Yes	No
Food industry (S)			No	No	Not applicable	Not applicable

<b>Brain Cancer Risk Factor (known = K, suspected = S)</b>	<b>Source</b>	<b>Tumour type/histology</b>	<b>Exposure on Floors 16 and 17 RMIT plausible?</b>	<b>Exposure on Floors 16 and 17 RMIT assessed?</b>	<b>Assessment of <u>Current Exposure</u> adequate?</b>	<b>Current exposure at level of concern?</b>
Pesticides (S)	(Hepworth, Bolton et al. 2006)	Adult brain tumours and acoustic neuromas	Pesticides may have been used	No (letter from Chris White, RMIT)	Not applicable	Not applicable
Solvents (S)			Possible from major refurbishments in 1995/6?	Yes	Yes	No
Lead (S)	(Nurminen and Karjalainen 2001)		Implausible—if through water then should affect all floors, not just 16 and 17?	Yes	Yes	No
Aromatic hydrocarbons (S)			Possible from major refurbishments in 1995/6 and 2001	Yes	Yes	No
Precision metalworkers: Metal dusts and fumes, lubricating oils and solvents) (S)			No—except perhaps for some solvents see above.	Yes	Yes	No
Asphalt, welding Significantly associated (S)	(Pan, Ugnat et al. 2005)	ICD-O-2 brain cancers: astrocytoma, glioblastoma, oligodendroglioma, ependymoma and others	No	No	Not applicable	Not applicable
Asbestos, isopropyl oil, mineral/lube oils, wood dust Weak association (S)			No	No	Not applicable	Not applicable

<b>Brain Cancer Risk Factor (known = K, suspected = S)</b>	<b>Source</b>	<b>Tumour type/histology</b>	<b>Exposure on Floors 16 and 17 RMIT plausible?</b>	<b>Exposure on Floors 16 and 17 RMIT assessed?</b>	<b>Assessment of <u>Current Exposure</u> adequate?</b>	<b>Current exposure at level of concern?</b>
Benzene Weak association (S)			Unlikely	Yes	Yes	No

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