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## STATEMENT OF EVIDENCE OF DR DAVID MCLEAN FOR

### Introduction

My name is Dr David John McLean.

### Qualifications and experience

My qualifications are listed in the attached CV.

I am a Senior Research Fellow at the Centre for Public Health Research (CPHR) at Massey University, with considerable experience in occupational exposure assessment and occupational disease epidemiology. I have been involved in studies of occupational cancer, respiratory disease and neurological disorders, and also in international collaborative studies including the INTERPHONE and INTEROCC studies coordinated by the International Agency for Research on Cancer (IARC), and have been an invited expert in an IARC Monograph evaluation committee. In my research role at CPHR I have been the Principal Investigator on recent population based case-control studies of leukaemia and lung cancer conducted at CPHR, and currently on a similar case-control study of occupational and environmental risk factors for motor neurone disease, as well as studies of exposure to, and health effects of, pentachlorophenol, wood dust, oncogenic viruses and respirable crystalline silica.

I am currently a member of the Work Related Health Advisory Group that provides advice to the Board of WorkSafe New Zealand, and a member of the Ministry of Health Interagency Committee on the Health Effects of Non-Ionising Fields. I am also the current New Zealand National Secretary of the International Commission on Occupational Health (ICOH).

### Code of Conduct

I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014 and I agree to comply with it. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where I state I am relying on the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my expressed opinion.

### Evidence

The acute effects of exposure to methyl bromide (MB) are well known <sup>(1)</sup>, in particular its neurotoxic effects <sup>(2)</sup>. In spite of the significant reduction in its use since it was recognised as an ozone-depleting substance under the Montreal Protocol there are

still regular reports of severe acute illness (and even deaths) <sup>(3,4)</sup> and of the effects of sub chronic exposure <sup>(5)</sup> resulting from its continued use as a fumigant. There are, however, remarkably few published studies of the chronic effects such as cancer or neurodegenerative diseases because of a lack of epidemiological research. Most of this type of research is conducted in occupational cohorts with clearly characterised exposure, however there is less opportunity to identify exposed groups of sufficient size now that its use is restricted to relatively few fumigation workers.

One such study conducted by the US National Cancer Institute involves a cohort of more than 50,000 pesticide applicators that has been followed from 1993 to 2007 to evaluate associations between specific agricultural chemicals and cancer. This Agricultural Health Study has extremely good exposure information based on questionnaires on lifetime pesticide use completed by all study participants, and a recent paper reported on their analyses of workers exposed to MB <sup>(6)</sup>. A statistically significant elevated risk of stomach cancer was observed in those with MB exposure, and most significantly there was a clear dose-response relationship shown with the risk increasing with increasing cumulative MB use. When compared with the reference group who had not used MB, the risk increased (Relative Risk =1.42; 95% confidence interval 0.51-3.95 and RR=3.13; 95% CI 1.25-7.80 for low and high cumulative use, with a p value for trend of 0.02).

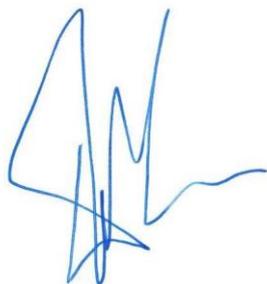
In an earlier analysis of the Agricultural Health Study data a significantly increased risk of prostate cancer was observed <sup>(7)</sup>, although this was no longer apparent in the later follow-up study <sup>(6)</sup>. However, several other studies of both agricultural workers exposed to MB or the population living adjacent to intensive agricultural areas where MB was used have all observed excess risk of prostate cancer. These studies have been reviewed recently <sup>(8)</sup>, and in a meta-analysis of the available studies assessed as being of good quality the authors concluded that overall exposure to MB is associated with an increased risk of prostate cancer (OR=1.2; 95% CI 0.98-1.49). One study of prostate cancer and ambient pesticide exposure <sup>(8)</sup> used historical Pesticide Use Reporting data combined with data from land use surveys to identify the exact location of specific crops on which MB was likely to be used with a Geographic Information System to link the residential history of study participants with pesticide use within a 500m radius, and the adverse health outcomes observed in this population provides evidence of the dispersion of MB from the location of its use and of the exposure of nearby residents.

Information on any association between chronic MB exposure and neurodegenerative disorders is much less clear than that for the cancer, however as MB is a known neurotoxin a link has been suggested. We (CPHR) have conducted a New Zealand population-based case-control study of Motor Neurone Disease (MND), funded by the Health Research Council (HRC 11/1041). We found significant associations between work in the agricultural sector, as a market farmer and crop grower, and as a fruit grower or worker and MND with risk estimates ranging from 1.5 to 2.7 <sup>(10)</sup>. These are the types of occupations in which soil fumigation with MB would have occurred in the past. We have also analysed data from our questionnaires and have found a very strong association between self-reported exposure to "fumigants" and MND (OR= 2.77, 95% CI 1.47-5.25, p= 0.0017). We have not yet written a paper outlining the results for publication in a scientific journal, which would be subjected to peer review prior to publication, however the results

have been presented <sup>(11)</sup> at the Epidemiology in Occupational Health Scientific Conference held in Barcelona in September 2016 and were subjected to peer review prior to acceptance for presentation. These findings are certainly not sufficient to prove causation; however they are relatively strong and when combined with the cluster of cases that occurred at Port Nelson they are suggestive of a problem with exposure to MB.

## References

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Signed:

Date:

28 July 2020