



Supplementary Materials

Occupational Co-Exposures to Noise and Chemicals— Review of Evidence and Regulatory Perspective †

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† This review does not necessarily reflect the views and policies of SafeWork SA or SafeWork Australia.

In conducting our review, we utilised a framework of questions to help determine the relevance and strengths and weaknesses of the work as published. This is exemplified using the approach detailed by Young et al. (2009) [4]. The exemplar given below relates to animal studies (selected to show breadth of chemicals) identified in Table 2 which explored health effects associated with co-exposures to noise and chemicals.



Table S1. Exemplar of critical appraisal outcomes (applying the Ten Key Questions tool) [4] for literature relevant to the animal studies identified in Table 2.

Article	Is the study question relevant?	Does the study add anything new?	What type of research question is being asked?	Was the study design appropriate for the research question?	Did the study methods address the most important potential sources of bias?	Was the study performed according to the original protocol?	Does the study test a stated hypothesis?	Were the statistical analyses performed correctly?	Do the data justify the conclusions?	Are there any conflicts of interest?	Total mark	Ranking
[5]	Yes.	Yes. No prior work on acrylonitrile.	Experimental/Causal. Looking at synergistic effects of noise and acrylonitrile	Yes, partially. Substance administration by subcutaneous route, which is of limited relevance to occupational routes of exposure. Also high levels of noise used.	Yes. Study designed to maximise conditions	Yes	Yes	Yes	Yes, partially. Evidence of synergism but outside of typical occupational routes of exposure and levels of noise that should be experienced.	No	9	High
[6]	Yes	Yes. Additional methodologies used for determining hearing loss.	Experimental/Causal. Looking at synergistic effects of noise and acrylonitrile	Yes, partially. As above.	Yes, as above.	Yes	Yes	Yes	Yes, as above.	No	9	High
[22]	Yes	Yes. No previous research on potential effects on male fertility.	Experimental/Causal. Looking at synergistic effects of noise and lead	Yes. Oral route relevant.	Yes. Study designed to maximise noise conditions	Yes	Yes	Yes	Yes, partially. Evidence of testicular damage resulting from high levels of noise.	No	8	High
[28]	Yes	Yes. Investigation of combined effects of noise and styrene at lower exposure levels than previously employed.	Experimental/Causal. Repeated exposure study of combined effects of noise and styrene	Yes. Inhalation exposure used.	Yes. Study conducted at levels of noise and styrene that each would have resulted in some toxicity.	Yes	Yes	Yes	Yes, partially. Did not explore lower levels of exposure.	No	10	High
[30]	Yes	Yes. Investigation of 'Impulse' noise and styrene.	Experimental, mechanistic. Repeated exposure study of combined effects of impulse noise and styrene.	Yes. Inhalation route delivered near NOAEL for animals. Impulse noise delivered at 'tolerable' level	Yes.	Yes	No	Yes	Yes. Synergism of ototoxicity observed.	No	10	High
[31]	Yes	Yes. Investigation of 'Impulse' noise and styrene.	Experimental/causal. Repeated exposure study of combined effects of impulse noise and styrene. Different	Yes. Styrene administration at higher exposure level but not one that affected hearing.	Yes	Yes	Yes	Yes	Yes. Synergism of ototoxicity observed.	No	10	High

methodology for hearing assessment.												
[35]	Yes	Yes. Repeated exposure effects of toluene and noise across a range of toluene doses.	Experimental/causal. Repeated exposure of combined effects of noise and toluene, with additional work on impulse noise.	Yes. Although noise level set at a level designed to create some harm.	Yes, partially.	Yes.	No	Yes	Yes. Synergism of ototoxicity observed at a level of toluene exposure where toluene alone did not cause ototoxicity.	No	9	High
[37]	Yes	Yes. Study used wide-band noise and impulse noise.	Experimental/Causal. Repeated exposure of noise and toluene comparing the effects of additional wide-band noise against impulse noise.	Yes. Repeated exposure inhalation study.	Yes	Yes	No	Yes	Yes. Synergism more marked with impulse noise.	No	7	High
[38–41]	Yes	Yes. This study of combined effects of noise and toluene completed extensive histopathology of many organs, not just hearing function.	Experimental/causal. Repeated exposure inhalation study investigating combined effects of noise and toluene.	Yes. Repeated exposure inhalation study but at levels of noise and toluene designed to create adverse effects.	Yes	Yes	Yes	Yes	Yes, partially. Study shows widespread organ damage resulting from noise-only. Synergism of harm also, but only at those elevated exposure levels.	No	9	High