

Epidemiological Study Pre-screening Form

Reference:	Yeates, K.O., and M.E. Mortensen. 1994. Acute and chronic neuropsychological consequences of mercury vapour poisoning in two early adolescents. <i>J. Clin. Exper. Neuropsychology</i> . 16 (2): 209-222.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	Presentation of clinical case study.
Inhalation exposure	Y	
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Exposure to Hg ⁰ vapour took place over three months. Exposure was identified through urine and blood Hg levels (624 and 1314 µg/L, and 6.9 and 2.3 µg/dL, respectively).
Endpoint relevance (renal/neuro/immuno)	Y	Neurological

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	Presentation of neuropsychological evaluations of two adolescents shortly after exposure and one year later.
Study method described	N	
Control(s) Used	N	
Exposure characteristics described (groups, number of subjects, duration and level)	Y	Two adolescents were exposed to an undefined concentration of Hg vapour for 3 months.
Statistical analysis conducted	N	

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Endpoint and exposure relevant.

Epidemiological Study Pre-screening Form

Reference:	Yang, Y.J., Huang, C.C., Shih, T.H., and S.S. Yang. 1994. Chronic elemental mercury intoxication: Clinical and field studies in lampsocket manufacturers. <i>Occup. Environ. Med.</i> 51 : 267-270.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	Presentation of clinical case study.
Inhalation exposure	Y	
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Four humans with 1.5 to 7 years of occupational exposure. Hg concentrations were <1 - 237 µg/L in blood and 90 - 610 µg/L in urine.
Endpoint relevance (renal/neuro/immuno)	Y	Neurological (clinical).

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	N	Lack due to clinical case.
Study method described	Y	Methodology described.
Control(s) Used	N	
Exposure characteristics described (groups, number of subjects, duration and level)	Y	See exposure above.
Statistical analysis conducted	N	

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Exposure and endpoint relevant. However, due to nature of paper (case study) there is no control or statistical data reported.

Epidemiological Study Pre-screening Form

Reference:	White, R.F., Feldman, R.G., Moss, M.B., and S.P. Proctor. 1993. Magnetic resonance imaging (MRI), neurobehavioral testing, and toxic encephalopathy: Two cases. <i>Environ. Res.</i> 61 :117-123.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	Case study.
Inhalation exposure	Y	
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Chronic occupational exposure to Hg ^o from January 1981 to July 1984. Urine [Hg] was measured in August 1994 (690 µg/L).
Endpoint relevance (renal/neuro/immuno)	Y	Neurological

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	N	Presentation of a case study.
Study method described	N	As above.
Control(s) Used	N	As above.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	One 48 year old male occupationally exposed to Hg ^o for 42 months. Subject underwent chelation after exposure ceased; urinary Hg decreased over 2-3 months.
Statistical analysis conducted	N	

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Study lists clinical neurological symptoms. However, since this is only a presentation of a case study, only one subject is reported.

Animal Study Pre-screening Form

Reference:	Warfvinge, K., Hansson, H., and P. Hultman. 1994. Systemic autoimmunity due to mercury vapour exposure in genetically susceptible mice: Dose-responses studied. <i>Toxicol. Appl. Pharm.</i> 132 : 299 – 309
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	Complete study described.
Inhalation exposure	Y	Genetically mercury-susceptible female mice exposed to mercury vapour.
Dose groups defined	Y	Dose groups included 0, 75, 170, 360, 480, 690 and 2365 µg Hg/week/kg body wt absorbed dose.
Negative Control(s) Used	Y	Untreated group served as controls.
Endpoint relevance (renal/neuro/immuno)	Y	Immunological Effects

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	The aim of the study was to evaluate dose-response relationships for mercury vapor in genetically susceptible mice using autoantibodies, B-cell stimulation, and systemic IC deposits as indices of an adverse effect on the immune system.
Study method described	Y	Study method is well described.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	Six groups of mice, with 10 to 12 mice per group, were exposed to concentrations of Hg ranging from 0.3 to 1.0 mg/m ³ for 0.5 to 19 hr/day resulting in the following absorbed doses: 75, 170, 360, 480, 690 and 2365 µg Hg°/week/kg body wt.
Effect Level Identified or Positive Control Used	Y	LOAEL for serum IgG antinucleolar antibodies was 170 Hg°/week/kg.
Statistical analysis conducted	Y	Student t test was used to study differences in serum Ig concentrations, titers of tissue immune deposits and tissue mercury concentrations between controls and mercury-treated mice. The dose-organ concentration and the dose-response relationships were assessed by Spearman's rank correlation test.

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Endpoints and exposures are relevant.

Epidemiological Study Pre-screening Form

Reference:	Vimercati, L., Santarelli, L, Pesola, G., Drago, I., Lasorsa, G., Valentino, M., Vacca, A. and L. Soleo. 2001. Monocyte-macrophage system and polymorphonuclear leukocytes in workers exposed to low levels of metallic mercury. <i>Sci. Total Environ</i> . 270 :157-163.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Airborne mercury concentration and urinary mercury concentrations used indicators of exposure.
Endpoint relevance (renal/neuro/immuno)	Y	Immunological

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	Determine if occupational exposure to low levels of metallic mercury effects the monocyte-macrophage system and polymorphonuclear leukocyte chemotaxis.
Study method described	Y	
Control(s) Used	Y	Twenty-five age matched male workers not occupationally exposed to inorganic mercury were used as the control group.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	One group of 19 male workers from a fluorescent light bulb factory were examined. Exposure was characterized by using urinary mercury concentrations, at the time of the immunological survey, and a cumulative exposure indicator based on biological monitoring from 1990 onwards.
Statistical analysis conducted	Y	Student's t-test and Pearson's correlation test.

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Endpoints and exposures are relevant.

Epidemiological Study Pre-screening Form

Reference:	Urban, P., Gobba, F., Nerudova, J., Lukas, E., Cabelkova, Z., and M. Cikrt. 2003. Color discrimination impairment in workers exposed to mercury vapor. <i>Neurotoxicology</i> 24 : 711-716.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	Occupationally-exposed workers were evaluated
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Workers occupationally exposed to Hg ⁰ vapour (59 µg/m ³) for a mean duration of 14.7 years, were evaluated
Endpoint relevance (renal/neuro/immuno)	Y	Study examined effects of color discrimination impairment due to neurotoxic effects

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	The purpose of this study was to examine colour discrimination impairment in occupationally exposed individuals
Study method described	Y	Methodology well-described
Control(s) Used	Y	Controls were matched for gender
Exposure characteristics described (groups, number of subjects, duration and level)	Y	24 exposed male subjects were studied for color discrimination impairment
Statistical analysis conducted	Y	Mann-Whitney U-test, chi-square, Multiple regression analysis

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Endpoint and exposure relevant

Epidemiological Study Pre-screening Form

Reference:	Stromberg, R., Langworth, S., and E. Soderman. 1999. Mercury inductions in persons with subjective symptoms alleged to dental amalgam fillings. <i>Eur J Oral Sci</i> 107 : 208 - 214.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	Volunteers with self-suspected 'amalgam' disease associated with dental fillings inhaled small doses of Hg ⁰ .
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Subjects randomly assigned to exposure levels of 0, 25, 50, 100 or 200 µg/m ³ for 5 or 10 minutes.
Endpoint relevance (renal/neuro/immuno)	Y	Renal, neurological symptoms reported

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	The purpose of the study was to determine if health disturbances were associated with mercury release from dental amalgams.
Study method described	Y	Methodology well described
Control(s) Used	Y	Unexposed group of individuals, with estimated background exposure similar to exposed subjects, were used as controls.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	39 male and female subjects were randomly assigned to be exposed to levels of 0, 25, 50, 100 or 200 µg/m ³ for 5 or 10 minutes.
Statistical analysis conducted	Y	One-sided Fishers exact test, Students t test

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	This is a blinded, controlled human study where the relevant endpoints were assessed.

Epidemiological Study Pre-screening Form

Reference:	Solis, M.T., Yuen, E., Cortez, P.S., and P.J. Goebel. 2000. Family poisoned by mercury vapor inhalation. <i>Am. J. Emerg. Med.</i> 18 : 599-602.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	Presentation of a clinical case study.
Inhalation exposure	Y	
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Air Hg ⁰ concentrations were 0.193 mg/m ³ ; blood and urine Hg levels were also analysed. Duration not defined.
Endpoint relevance (renal/neuro/immuno)	Y	Neurological (clinical).

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	N	Presentation of a case study.
Study method described	N	As above.
Control(s) Used	N	
Exposure characteristics described (groups, number of subjects, duration and level)	Y	Eight cases (13 months to 58 years old) of Hg ⁰ vapour exposure for an undefined duration at approximately 0.193 mg/m ³ . Urinary Hg concentrations ranged from 27-682 µg/L.
Statistical analysis conducted	N	

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	N	The acute, high level exposures identified in this case study are not appropriate for the establishment of a RfC.

Epidemiological Study Pre-screening Form

Reference:	Sandborgh-Englund, G., Nygren, A.T., Ekstrand, J., and C.G. Elinder. 1996. No evidence of renal toxicity from amalgam fillings. <i>Amer. J. Physiol.</i> 271 (4):R941 – R945.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	Complete study described.
Inhalation exposure	Y	Hg ⁰ exposure was due to amalgam fillings and removal. Assumption that exposure was inhalation.
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Subjects exposure measured through blood, plasma and urine Hg ⁰ levels. Whole blood average concentrations ranged from 8.9 nmol/L 1-day after removal to 4.5 nmol/L after 60 days.
Endpoint relevance (renal/neuro/immuno)	Y	Renal: measured urinary excretion of albumin, β_2 -microglobulin and N-acetyl- β -glucosaminidase.

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	To determine whether signs of renal toxicity can be observed when exposed to Hg ⁰ from amalgam fillings in conjunction with dental treatment.
Study method described	Y	The study methodology is well described.
Control(s) Used	N	
Exposure characteristics described (groups, number of subjects, duration and level)	Y	10 subjects (7 female, 3 male) each had an average of 18 amalgam filled surfaces removed and replaced with composite fillings. Measured exposure through blood, plasma and urine [Hg ⁰] before removal and days 1, 2, and 60 after.
Statistical analysis conducted	Y	ANOVA

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Exposure and endpoint relevant.

Epidemiological Study Pre-screening Form

Reference:	Queiroz, M. L. S., Perlingeiro, R. C. R., Dantas, D. C. M. Annichino Bizzacchi, J. M. and E.M. De Capitani. 1994. Immunoglobulin levels in workers exposed to inorganic mercury. Pharmacol. Toxicol. 74:72-75
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	The study addressed workers exposed in a mercury producing plant. In the plant, mercury is produced by roasting diatomaceous earth followed by the subsequent condensation of metallic mercury. As such, exposure is likely to have occurred to from inhalation of mercury vapour. However, the study does not exclude or include other sources of mercury exposure.
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Male workers in a mercury-producing plant exposed for a mean duration of 8-months were assessed. The level of exposure from mercury concentrations in air was not identified. However, the level of mercury in urine was measured.
Endpoint relevance (renal/neuro/immuno)	Y	Immunological endpoints assessed.

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	Investigation of the correlation between the length of mercury exposure and the serum immunoglobulin levels as well as urinary mercury content of occupationally exposed individuals. Evaluation of liver injury and protein synthesis also performed.
Study method described	Y	
Control(s) Used	Y	Control subject comparable in age and race with no history of mercury exposure were used as controls.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	One group of 44 workers from the same plant, who had been exposed for a mean duration of 8-months, were assessed. Mercury concentrations in urine ranged from 3.5 - 67.9 µg/g creatine.
Statistical analysis conducted	Y	Student's t-test and Pearson correclation coefficient

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Endpoint and exposures are relevant.

Epidemiological Study Pre-screening Form

Reference:	Perlingeiro, R.C.R. and M.L.S. Queiroz. 1995. Measurement of the respiratory burst and chemotaxis in polymorphonuclear leukocytes from mercury-exposed workers. <i>Hum Exper Toxicol</i> 14 : 281-286.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	The study addressed workers exposed in a mercury producing plant. In the plant, mercury is produced by roasting diatomaceous earth followed by the subsequent condensation of metallic mercury. As such, exposure is likely to have occurred to from inhalation of mercury vapour. However, the study does not exclude or include other sources of mercury exposure.
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Male workers in a mercury-producing plant exposed for a mean duration of 8-months were assessed. The level of exposure from mercury concentrations in air was not identified. However, the level of mercury in urine was measured.
Endpoint relevance (renal/neuro/immuno)	Y	Immunological endpoints assessed.

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	The purpose of this study was to examine the potential effects of mercury on neutrophils isolated from occupationally exposed individuals.
Study method described	Y	Methodology well described.
Control(s) Used	Y	Control subjects were matched to exposed subjects by age, sex, and race.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	One group of 48 workers from the same plant, who had been exposed for a mean duration of 8-months, were assessed. Mercury concentrations in urine ranged from 1.0 - 97.4 µg/g creatine.
Statistical analysis conducted	Y	Students t-test and Pearson correlation coefficient were used.

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Exposure and endpoints are relevant, controls used.

Epidemiological Study Pre-screening Form

Reference:	Park, S.H., Araki, S., Nakata, A., Kim, Y.H., Park, J.A., Tanigawa, R., Yokoyama, K., and H. Sato. 2000. Effects of occupational metallic mercury vapour on suppressor-inducer (CD4+CD45RA+) T lymphocytes and CD57+CD16+ natural killer cells. <i>Arch Occup Environ Health</i> 73 (8): 537-542.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	
Exposure Identified Note: May be specific (e.g. concentration and duration of exposure measured for each individual) or more general (e.g. range of exposure, low vs. high).	Y	Male workers occupationally exposed to Hg ⁰ for a mean duration of 31 months were examined.
Endpoint relevance (renal/neuro/immuno)	Y	Immunological endpoints examined

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	The purpose of the study was to examine the effects of Hg ⁰ on the immune system in exposed workers
Study method described	Y	
Control(s) Used	Y	Controls were matched to exposed subjects by age and smoking status.
Exposure characteristics described (groups, number of subjects, duration and level)	Y	One group of twenty workers exposed for 4-62 (mean 31) months examined
Statistical analysis conducted	Y	Paired sample t-test, stepwise multiple regression analysis conducted

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	Y	Endpoint and exposure relevant

Animal Study Pre-screening Form

Reference:	Pamphlett and Coote. 1998. Entry of low doses of mercury vapour into the central nervous system. Neurotoxicology. 19:39-47.
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Primary Criteria	(Y/N)	Comments
Primary literature	Y	
Inhalation exposure	Y	
Dose groups defined	Y	First part of study was undertaken to detect the exposure at which mercury first appeared on neurons. Groups of 4 mice were exposed for 2, 4, 6, 8, 12, 16 or 20 hours to 25 µg mercury/m ³ or for 5, 10, 15, 30, 45, 60 or 240 minutes to 500 µg mercury/m ³ . Second part of the study, which assessed gender difference, exposed 4 male and 4 female mice to 50 µg mercury/m ³ for either 4, 6, 8, 12, 16, 20 or 24 hours.
Negative Control(s) Used	Y	Control mice placed in the chamber for the same times without exposure to mercury.
Endpoint relevance (renal/neuro/immuno)	Y	Nervous system

Secondary Criteria	(Y/N)	Comments
Study objectives clearly defined	Y	Determine whether female mice take up mercury vapor into their nervous system at lower exposure levels than do male mice.
Study method described	Y	
Duration of exposure indicated	Y	
Number of subjects indicated	Y	
Effect Level Identified or Positive Control Used	Y	
Statistical analysis conducted	N	

Results of Prescreen	(Y/N)	Comments
Inclusion in Critical Review	N	This study is not recommended for inclusion in the critical review as it addresses the gender difference in the presence of mercury in motor neurons and not adverse effects.

Screening by: Cindy Smith, GTIC
Date Screened: February 5, 2004