

# Exposition professionnelle au mercure et anomalies de la grossesse

## Effets sur la reproduction d'une exposition professionnelle au mercure chez des femmes chinoises : une méta-analyse

Pan J, Song H, Pan XC. Zhonghua Liu Xing Bing Xue Za Zhi. 2007 Dec;28(12):1215-8.

Cette **méta-analyse** (portant sur des études chinoises, et concernant 2148 femmes exposées et 2044 témoins : femmes non exposées au mercure) a montré que l'exposition professionnelle au mercure pendant la grossesse était significativement associée à [...] une hypertension gravidique (RR = 2,17), à la naissance d'enfant mort né (RR = 2,54), à un petit poids de naissance (RR = 3,39) et à des malformations (RR = 2,67).

**Une femme exposée professionnellement au mercure a donc en moyenne 2,67 fois plus de risques d'avoir un enfant porteur de malformations qu'une femme non exposée.**

### Résumé medline :

#### Reproductive effects of occupational exposure to mercury on female workers in China: a meta-analysis

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OBJECTIVE: To analyze and evaluate the reproductive effects of occupational exposure to mercury among female workers and to identify relative sensitive indicators. METHODS: Documents on the relations of occupational exposure to mercury and reproductive effects on female workers were collected through computer and manually that were published in Chinese language during 1989-2006. After strict selection, homogeneity test and integrated analysis for the abstracted data of the eligible studies were conducted using Review Manager Statistic Software. Combined RR value was used as the index for total effect on each project for Meta-analysis. RESULTS: In total, 14 original research papers were included (totally 2148 subjects and 2044 controls). When comparing to the controls, the occupational exposure to mercury was significantly associated with longer menstrual period (RR = 1.82, 95% CI: 1.45-2.30), menstrual cycle delay (RR = 2.03, 95% CI: 1.74-2.37) and the changes of menstrual blood volume (RR = 2.06, 95% CI: 1.47-2.09), dysmenorrhea (RR = 2.14, 95% CI: 1.54-2.99), pregnancy-induced hypertension (RR = 2.17, 95% CI: 1.32-3.57), stillbirths (RR = 2.54, 95% CI: 1.41-4.56) and low birth weight (RR = 3.39, 95% CI: 1.38-8.33)/birth defect (RR = 2.67, 95% CI: 1.55-4.60) of their offspring (P < 0.05). CONCLUSION: Occupational exposure to mercury could cause dysfunction of the menstrual period, menstrual cycle, menstrual blood volume, as well as dysmenorrhea for female workers being exposed to mercury and inducing adverse reproductive outcomes, including pregnancy-induced hypertension, stillbirth, low birth weight and birth defects of their offspring.

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### Risques professionnels et santé reproductive chez la femme

Irene Figà-Talamanca. Occupational Medicine 2006 56(8):521-531; doi:10.1093/occmed/kql114

#### Extrait :

L'exposition au mercure chez des **assistantes dentaires** (indicateur : mercure capillaire) est associée à la **survenue de fausses couches** et de la **réduction de la fertilité**. La capacité du mercure (ainsi que du plomb) à interférer avec le système endocrinien peut expliquer les perturbations du cycle menstruel, le retard de conception et les autres effets sur la reproduction comme le **petit poids de naissance** et les **anomalies du tube neural**.

#### Occupational risk factors and reproductive health of women

### Excerpt :

Mercury exposure among female dental assistants preparing amalgams has identified mercury in hair samples.

Both spontaneous abortion and reduced fertility were found to be associated with exposure to mercury, especially among dental assistants working without appropriate protective measures [6]. Heavy metals such as lead and mercury have been shown to interfere with the endocrine system and this might explain why exposed women present menstrual disorders, delayed conception rates [7] and other reproductive effects such as LBW (low birth weight) and neural tube defects [8].

### Références :

6. Rowland AS, Baird DD, Weinberg CR et al. The effects of occupational exposure to mercury vapour on the fertility of female dental assistants. *Occup Environ Med* 1994;51:28–34.

7. Sallmen M, Antilla A, Lindbohm ML, Kyyronen P, Taskinen H, Hemminki K. Time to pregnancy among women occupationally exposed to lead. *J Occup Environ Med* 1995;37:931–934.

8. Irgens A, Kruger K, Scorve AH, Irgens LM. Reproductive outcome in offspring of parents occupationally exposed to lead in Norway. *Am J Ind Med* 1998;34:431–437.

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### Exposition maternelle à l'arsenic (As), cadmium (Cd), plomb (Pb) et mercure (Hg) et anomalies du tube neural (ATN) à la naissance

As, Cd, Pb et Hg sont des neurotoxiques, et des études suggèrent qu'ils peuvent aussi être des tératogènes.

Dans cette étude cas-témoins (184 cas : femmes dont l'enfant avait une ATN ; 225 témoins), la relation entre l'exposition à ces métaux et la survenue d'ATN chez les enfants de femmes Mexicaines-Américaines vivant au Texas a été étudiée. Des questionnaires sur l'exposition environnementale et professionnelle à ces métaux durant la période périconceptionnelle ont été renseignés. Des analyses de sang et d'urine ont été effectuées pour ces métaux.

Globalement, les valeurs moyennes des marqueurs biologiques (plombémie, arsenic, cadmium et mercure dans les urines) ne différaient pas de façon significative entre les femmes du groupe témoin et les femmes du groupe ATN. Toutefois, **parmi les femmes de la plus haute catégorie de revenus, les femmes du groupe ATN avaient 9 fois plus de risques que les témoins d'avoir un taux de mercure urinaire élevé (> 5,62 µg/l).**

[...] Des rapports de cotes élevés ont été observés pour une exposition maternelle et paternelle au Hg (et As), mais les intervalles de confiance étaient proches de l'unité (càd : peu significatif). [...] Cependant, **la concentration élevée en mercure urinaire chez les mères ayant eu des enfants avec ATN demande de plus amples investigations.**

### Résumé medline :

#### Maternal exposure to arsenic, cadmium, lead, and mercury and neural tube defects in offspring.

**Brender JD, Suarez L, Felkner M, Gilani Z, Stinchcomb D, Moody K, Henry J, Hendricks K**

*Environ Res.* 2006 May;101(1):132-9. Epub 2005 Sep 19.

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Arsenic, cadmium, lead, and mercury are neurotoxins, and some studies suggest that these elements might also be teratogens. Using a case-control study design, we investigated the relation between exposure to these heavy metals and neural tube defects (NTDs) in offspring of Mexican-American women living in 1 of the 14 Texas counties bordering Mexico. A total of 184 case-women with NTD-affected pregnancies and 225 control-women with normal live births were interviewed about their

environmental and occupational exposures during the periconceptional period. Biologic samples for blood lead and urinary arsenic, cadmium, and mercury were also obtained for a subset of these women. Overall, the median levels of these biomarkers for heavy metal exposure did not differ significantly ( $P > 0.05$ ) between case- and control-women. However, **among women in the highest income group, case-women were nine times more likely** (95% confidence interval (CI) 1.4-57) **than control-women to have a urinary mercury 5.62 microg/L.**

Case-women were 4.2 times more likely (95% CI 1.1-16) to report burning treated wood during the periconceptional period than control-women. Elevated odds ratios (ORs) were observed for maternal and paternal occupational exposures to arsenic and mercury, but the 95% CIs were consistent with unity. The 95% CIs of the ORs were also consistent with unity for higher levels of arsenic, cadmium, lead, and mercury in drinking water and among women who lived within 2 miles at the time of conception to industrial facilities with reported emissions of any of these heavy metals. Our findings suggest that maternal exposures to arsenic, cadmium, or lead are probably not significant risk factors for NTDs in offspring. However, **the elevated urinary mercury levels found in this population and exposures to the combustion of treated wood may warrant further investigation.**

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### **Exposition professionnelle dans les cabinets dentaires et avortements spontanés**

**Lindbohm ML, Ylöstalo P, Sallmén M, Henriks-Eckerman ML, Nurminen T, Forss H, Taskinen H.** Occup Environ Med. 2007 Feb;64(2):127-33. Epub 2006 Oct 19.

222 cas (avortements spontanés) et 498 témoins (naissances).

Pour l'exposition au mercure : les rapports de cote, RC (odds ratio : OR) ajustés sur des facteurs de confusion étaient augmentés pour une exposition modérée et haute au mercure des amalgames (RC = 2 ; 95% IC 1,0 à 4,1 et RC = 1,3 ; 95% IC 0,6 à 2, 5, respectivement).

[...] **Une faible élévation du risque de fausses couches a été trouvée pour une exposition au mercure.** [...] Ces résultats indiquent que la possibilité d'une faible association entre l'exposition à ces agents et une augmentation du risque de fausses couches ne peut être exclue.

#### **Résumé medline :**

#### **Occupational exposure in dentistry and miscarriage.**

**Lindbohm ML, Ylöstalo P, Sallmén M, Henriks-Eckerman ML, Nurminen T, Forss H, Taskinen H.** Occup Environ Med. 2007 Feb;64(2):127-33. Epub 2006 Oct 19.

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**BACKGROUND:** Information on the reproductive effects of chemical exposures in dental work is sparse or inconsistent. **AIM:** To investigate whether dental workers exposed to acrylate compounds, mercury amalgam, solvents or disinfectants are at an increased risk of miscarriage. **METHODS:** The study was conducted among women dental workers and a comparison group of workers occupationally unexposed to dental restorative materials. Information on pregnancies was obtained from national registers and outpatient units of hospitals. Data on occupational exposure were obtained using postal questionnaires. The final study population included 222 cases of miscarriage and 498 controls (births). An occupational hygienist assessed exposure to acrylate compounds, disinfectants and solvents. Exposure to other agents was assessed on the basis of the questionnaire data. Odds ratios (ORs) and confidence intervals (CIs) were estimated using conditional logistic regression. **RESULTS:** The ORs adjusted for confounding factors were increased for moderate-exposure and high-exposure categories of mercury amalgam (OR 2.0, 95% CI 1.0 to 4.1 and OR 1.3, 95% CI 0.6 to 2.5, respectively). The risk was slightly increased for the highest-exposure category of 2-hydroxyethylmethacrylate (OR 1.4, 95% CI 0.7 to 2.6) and polymethylmethacrylate dust (OR 1.4, 95% CI 0.8 to 2.4). A slightly increased risk was also detected for likely exposure to organic solvents (OR 1.4, 95% CI 0.8 to 2.3) and disinfectants (OR 1.5, 95% CI 0.9 to 2.7). **CONCLUSIONS:** No

strong association or consistent dose-response relationship was observed between exposure to chemical agents in dental work and the risk of miscarriage. A slightly increased risk was found for exposure to mercury amalgam, some acrylate compounds, solvents and disinfectants. These findings indicate that the possibility of a weak association between exposure to these agents and an increased risk of miscarriage cannot be excluded.

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### **Exposition professionnelle aux vapeurs de mercure et conséquences sur la reproduction**

Elghany NA, Stopford W, Bunn WB, Fleming LE. Occup Med (Lond). 1997 Aug;47(6):333-6

**Extrait** : Chez les femmes enceintes exposées professionnellement au mercure inorganique, on observe une **fréquence plus élevée d'anomalies congénitales** (à des niveaux d'exposition inférieurs à 0,6 mg/m<sup>3</sup>). En revanche, on n'observe pas de différence significative pour le risque d'enfants mort-nés ou d'avortements spontanés dans les 2 groupes de femmes, exposées et non exposées au mercure.

#### **Résumé medline :**

### **Occupational exposure to inorganic mercury vapour and reproductive outcomes.**

Elghany NA, Stopford W, Bunn WB, Fleming LE. Occup Med (Lond). 1997 Aug;47(6):333-6

Department of Community and Family Medicine, Duke University, Chapel Hill, NC, USA.

The effect of exposure to inorganic mercury on the pregnant woman and her foetus has received little attention. Transport of elemental inorganic mercury into foetal tissues has been reported, and prior studies indicate a higher incidence of adverse pregnancy outcome. The effects of occupational exposure to inorganic mercury on pregnancy were investigated among 46 exposed women workers: controls were 19 women working in non-production areas of the same factory. There were 104 recorded total pregnancies during the period 1948-77. **The study revealed a higher frequency of adverse reproductive outcomes, especially congenital anomalies, among the women exposed to inorganic mercury levels at or substantially lower than 0.6 mg/m<sup>3</sup>; no significant differences in the stillbirth or miscarriage rates were noted between the two groups of women.** The overall foetal death rate in this study was similar to New York state (USA) and national levels for the same period.

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### **Effets d'une exposition professionnelle au plomb et à d'autres métaux sur les avortements spontanés.**

Anttila A, Sallmén M. : J Occup Environ Med. 1995 Aug;37(8):915-21

**Extrait.** Etude (bibliographique) des effets d'une exposition parentale au Pb et autres métaux sur les avortements spontanés : **les études épidémiologiques indiquent qu'une exposition paternelle au Pb ou au Hg peut être associée à un risque d'avortement spontané.** Pour l'exposition maternelle, on ne peut conclure.

#### **Résumé medline en anglais :**

### **Effects of parental occupational exposure to lead and other metals on spontaneous abortion.**

Anttila A, Sallmén M. : J Occup Environ Med. 1995 Aug;37(8):915-21

Department of Epidemiology and Biostatistics, Finnish Institute of Occupational Health, Helsinki, Finland.

The aim of this article was to summarize the epidemiologic studies on the possible impact of parental occupational exposure to lead or other metals on spontaneous abortion. For paternal exposure, the total number of abortions in the studies with adequate exposure contrast were 340 for lead, 240 for mercury, and 90 for unspecified metals and, correspondingly, for maternal exposure, about 80 for lead, 80 for mercury, 70 for nickel, and 130 for exposure to unspecified metals. **Epidemiologic studies**

**indicate that paternal exposure to lead or mercury might be associated with the risk of spontaneous abortion. For maternal exposure, no clear conclusion could be reached.** In particular, paternal occupational exposure levels to metals were substantial compared with population values. Even though there are shortcomings in the present knowledge, protective goals for paternal exposure to lead and mercury are warranted. More well-designed studies on metals are needed.

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### **Effets sur la reproduction d'une exposition au mercure de travailleuses.**

Fu WZ. Zhonghua Yu Fang Yi Xue Za Zhi. 1993 Nov;27(6):347-9

**Extrait.** 704 femmes chinoises exposées professionnellement au mercure, et 583 témoins. Chez les femmes exposées à de faibles quantités de Hg sur de longues périodes : **dysménorrhées** (augmentant avec la dose), mais pas de relation significative avec la prématurité, les avortements spontanés, la mort fœtale, les complications de la grossesse...

### **Résumé medline :**

#### **Effects of mercury exposure on reproduction in female workers**

Fu WZ. Zhonghua Yu Fang Yi Xue Za Zhi. 1993 Nov;27(6):347-9

Shanghai Institute of Industrial Hygiene and Occupational Diseases.

**Reproductive hazards in 704 female workers exposed to low-level metallic mercury and 583 controls were investigated. Females exposed to low-level mercury for a long term** mainly manifested **dysmenorrhoea**, and the **incidence of dysmenorrhoea increased with exposure dose**, suggesting a dose-response relationship. At a level over 0.06 mg/m<sup>3</sup> of mercury, incidence of hypomenorrhea significantly increased, and in general, at a level below 0.06 mg/m<sup>3</sup>, menstrual cycles, quantity and duration of menstrual flow did not change significantly. **Differences in incidences of preterm delivery, spontaneous abortion, fetal death, still birth, and complications of pregnancy between the group exposed to 0.06-0.1 mg/m<sup>3</sup> of mercury and the control group did not reach a significant level. Incidences of birth defect, neonatal asphyxia, neonatal death, infant infection, low birth weight, retardation on physical and mental development in offsprings of the exposed females were not significantly higher than in those of controls.**

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### **Etudes publiées dans des journaux dentaires :**

#### **Toxicité pour la reproduction d'une exposition professionnelle au mercure. Revue de la littérature.**

Schuurs AH. *J Dent*. 1999 May;27(4):249-56.

Objectifs: Donner aux professionnels des soins dentaires une information sur les possibles effets sur la reproduction des manipulations d'amalgames dentaire à l'argent/mercure. SOURCES DE DONNEES : Etudes expérimentales sur les animaux, études de cas et études épidémiologiques. SELECTION DE L'ETUDE : Les études animales expérimentales montrent que de fortes doses/concentrations de mercure augmentent les risques de troubles de la reproduction, par exemple infertilité, avortement spontané, mort à la naissance et malformations congénitales. Certains rapports de cas envisagent un rapport entre ces problèmes chez les humains et des niveaux élevés de mercure. Cet article compile pour étudier cela des études épidémiologiques sur la relation entre l'exposition professionnelle au mercure, principalement sous forme de vapeurs dans le cabinet dentaire, et les capacités reproductives des femmes. De telles études concernant les hommes sont rares. Les risques reproductifs pour les patients liés à l'absorption de mercure provenant de leurs obturations à l'amalgame dentaire est évalué/ CONCLUSIONS : Il semble justifié de conclure qu'il n'a pas été prouvé d'effets négatifs sur la reproduction de l'exposition au mercure au cabinet dentaire ; cependant



aucune valeur limite sans effet n'a été établie. Apparemment il est peu probable de rencontrer des problèmes sauf si une mauvaise hygiène entraîne une concentration atmosphérique du mercure supérieure au seuil féminin de « valeur supportable sur le long terme ». En conséquence, étant données les faibles quantités de mercures relarguées en bouche par les amalgames dentaires, la population générale court encore moins de risques que le personnel dentaire. Cependant, il est nécessaire d'approfondir les recherches concernant les effets d'une exposition professionnelle à des concentrations de mercure inférieures à la valeur limite sur le cycle menstruel, la conception, la fertilité masculine et le comportement des enfants.

### **Résumé medline :**

#### **Reproductive toxicity of occupational mercury. A review of the literature**

**Schuurs AH.** J Dent. 1999 May;27(4):249-56.

Department of Cariology, Endodontology and Pedodontology, Academic Centre for Dentistry Amsterdam (ACTA), The Netherlands.

**OBJECTIVES:** This paper aims to give the dental practitioner insight into the potential reproductive effects of handling dental silver amalgam, c.q. mercury. **DATA SOURCES:** Experimental studies on animals, case reports and epidemiologic studies. **STUDY SELECTION:** Experimental animal studies show high doses/concentrations of mercury to increase the risk of reproductive disorders, e.g. infertility, spontaneous abortion, stillbirth and congenital malformations. Some case reports suggest an association between the disorders in humans and high levels of mercury. Therefore, the present article reviews epidemiological studies on the relationship between occupational exposure to mercury, mainly as vapour in the dental practice, and females' procreative ability. Studies concerning the reproductive effects of males' occupational mercury body burden are scarce. The reproductive risk of patients' mercury uptake from silver amalgam fillings is assessed. **CONCLUSIONS:** It seems warranted to conclude that negative reproductive effects from exposure to mercury in the dental office are unproven, but safe levels have not been established. Seemingly problems are unlikely to occur, unless a poor hygiene causes the mercury concentration in the air to exceed females' time-weighted long-term Threshold Limit Value (TLV). Consequently, in view of the in general low amounts of mercury stemming from dental amalgam fillings, the population at large is at even less risk than dental staff. The effects of occupational elemental mercury concentrations lower than the TLV on the menstrual cycle, conception, male fertility and children's behaviour need, however, more research.

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#### **Problèmes de reproduction chez le personnel dentaire : revue de diverses expositions**

**Olfert SM. : J Can Dent Assoc.** 2006 Nov;72(9):821-5

**Extrait :** Jusqu'à ce jour, les preuves d'une relation entre une exposition au mercure élémentaire et des fausses couches, des anomalies congénitales et une réduction de la fertilité sont limitées. Une bonne hygiène du dentiste vis-à-vis du mercure pourrait réduire les risques sur la reproduction.

### **Résumé medline en anglais :**

#### **Reproductive outcomes among dental personnel: a review of selected exposures.**

**Olfert SM. : J Can Dent Assoc.** 2006 Nov;72(9):821-5

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Since the late 1960s, investigators have assessed the risks associated with exposure to a variety of potentially harmful agents used in dental practice. This paper provides a brief overview of the epidemiologic literature examining the associations between occupational exposures to elemental mercury and anesthetic gases and reproductive outcomes, such as spontaneous abortion, congenital abnormalities and reduced fertility. Most of the epidemiologic evidence points to a significant relationship between exposure to nitrous oxide and both spontaneous abortion and reduced fertility. There is also evidence for an association between exposure to ethylene oxide and spontaneous abortion, but on the basis of the limited research available, this relationship does not appear to be statistically significant. At this time, evidence of a relationship between exposure to elemental mercury and spontaneous abortion, congenital abnormalities and reduced fertility is limited. Good mercury hygiene by dental personnel and the use of scavenging equipment on nitrous oxide systems and exhaust systems on ethylene oxide sterilizers may reduce the risk of adverse reproductive outcomes.