

Time to pregnancy and occupational lead exposure

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Lead exposure has long been known to be harmful to male fertility. However, it is unclear whether there is any adverse effect at current occupational levels. In order to document the possible effects of current exposures on fertility, a study of men in lead-exposed occupations was undertaken. The findings are *preliminary* since data are still being collected.

Methods

The design was a retrospective cohort study. Time to pregnancy was used to measure couple fertility. The Asclepios questionnaire was used (1), which focuses on the most recent birth (youngest child) for detailed questioning. Confounding factors for both male and female partners were included.

Men were eligible for the study if they were married (or living as married). Attempts were made to identify nonrespondents who were not eligible, but they were not

very successful. The denominators therefore tended to be inflated so that the response rates shown in table 1 may be misleadingly low.

Exposure assessment was based on blood lead measurements. All the results presented were based on a short-term exposure model; analyses based on measures of long-term exposure will be presented in due course. The exposure was defined in relation to the target time, which was 6 weeks before the beginning of unprotected intercourse (figure 1). The measure used was the mean of up to 4 values: the closest value to the target time (if within 6 months), the next value after that, if within 12 months, and the 2 values before the closest value, if within 24 months.

Results

The types of product covered by the study are listed in table 1. Blood lead concentrations above 50 µg/dl were

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8 The Asclepios project on occupational hazards to male reproductive capability is a biomedical research project of the European Union that was carried out in 14 European centers in 1993–1998. The project was coordinated by The Steno Institute of Public Health, University of Aarhus Denmark, and it included the following researchers: Belgium, Gent (P Kiss, A Mahmoud, M Vanhoorne, H Verstraelen); Denmark, Aarhus (A Abell, JP Bonde, SB Larsen, G Danscher, E Ernst, H Kolstad), Copenhagen (A Giwercman); England, London (A Dale, M Joffe, N Shah); Finland, Helsinki (M-L Lindbohm, H Taskinen, M Sallmen), Turku (J Lähdetie); France, Paris (P Jouannet, P Thonneau), Strasbourg (A Clavert); Germany, Erlangen (KH Schaller, W Zschesche); Italy, Brescia (P Apostoli, S Porru), Milano (L Bisanti), Pietrasanta (L Lastrucci), Rome (M Spanò); The Netherlands, Nijmegen (N Roeleveld, H Thuis, GA Zielhuis), Zeist (W de Kort); Poland, Lodz (K Sitarek).

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Table 1. Characteristics of the populations.

Country	Number of companies	Products	Company size (number of male workers)	Duration of employment (years)	Blood lead ($\mu\text{g/dl}$)		Number of questionnaires	Response rate (%)
					Mean	Range		
Belgium ^a	1	Wire-drawing	141	1—36	25.2	3—55	99	85
Finland								
Exposed	3	Batteries, metal casting, foundry	20—67	<1—18	31.8	6—63	65	71
Unexposed	1	Sweets & pastries	340				126	73
Italy								
Exposed	10	Batteries, copper foundry, ceramics, dyes for paints	37—310	<1—36	29.2	11—70	485	85
Unexposed	3	Cotton mill, mechanic, toy assembling	60—115	<1—32			118	94

^a Data collection is still continuing in Belgium (and the United Kingdom).

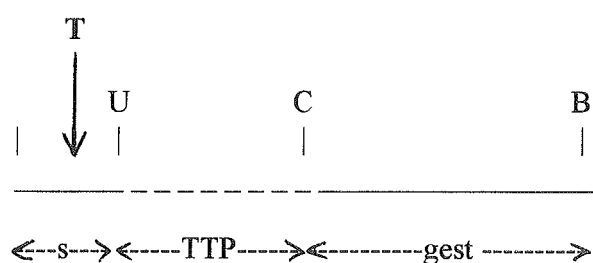


Figure 1. Lead exposure defined in relation to the target time. [T = target time, U = beginning of period of unprotected intercourse, C = conception, B = birth, s = duration of spermatogenesis (12 weeks), TTP = time to pregnancy interval (variable), gest = gestation length (default: 9 months)]

Table 2. Cox regression models^a, unadjusted and adjusted.

Unexposed (baseline)	388	1	
Unadjusted			
<20 $\mu\text{g/dl}$	46	1.11	0.81—1.52
20—34 $\mu\text{g/dl}$	132	1.12	0.91—1.37
35—49 $\mu\text{g/dl}$	69	1.12	0.86—1.46
50+ $\mu\text{g/dl}$	18	1.37	0.86—2.21
Adjusted ^b			
<20 $\mu\text{g/dl}$	46	1.15	0.84—1.58
20—34 $\mu\text{g/dl}$	132	1.09	0.88—1.34
35—49 $\mu\text{g/dl}$	69	1.11	0.85—1.45
50+ $\mu\text{g/dl}$	18	1.34	0.82—2.18

^a Likelihood ratio test for trend, $\chi^2(1)=2.66$, $P=0.10$

^b For maternal age and oral contraceptive use.

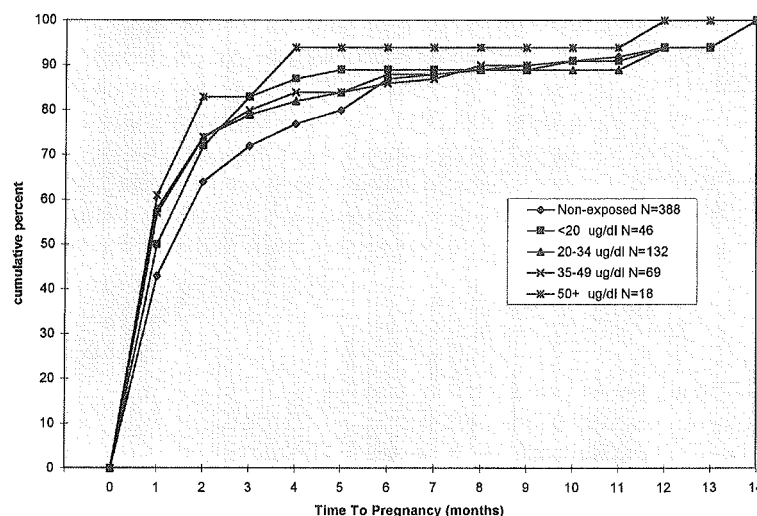


Figure 2. Time to pregnancy (TTP) distributions for each exposure category.

uncommon. The response rates varied considerably, being 85% or more in some countries.

Figure 2 shows the time-to-pregnancy distributions by exposure category, unadjusted. The same results are given in the top half of table 2, in the form of a Cox regression model. The lower part of table 2 shows the same findings, adjusted for maternal age and oral contraceptive use.

Concluding remarks

Preliminary findings indicate that these levels of lead exposure are not associated with decreased fertility.

References

1. Joffe M, Asclepios. Time to pregnancy: a measure of reproductive function in either sex. *Occup Environ Med* 1997;54:289—95.