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Note to Docket No. EN-84-05:

Attached are translations of studies I recently received from the Office of International Activities related to blood lead and blood pressure.

Rob Weissman

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BLOOD LEAD AND BLOOD PRESSURE

T. Moreau, G. Orssaud, B. Juguet, and G. Busquet

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Letter to the Editor

Blood lead and blood pressure.
Preliminary results of a cross-sectional study of 431 male subjects.*

Gentlemen:

An article dealing with the factors of variation of blood lead in the general population (Awad et al. [1]) was published in a recent issue of the review; among other things, it did not establish a relationship between blood lead and blood pressure.

We present here the preliminary results of a study in which this relationship is shown.

The study population is made up of 431 male subjects, aged 24 to 55 years (average 41.4), untreated for hypertension, belonging to the Paris police department. For each subject, examined during a routine medical visit, blood pressure was measured with a mercury apparatus; a blood sample was collected; the level of lead was measured on total blood by atomic absorption spectrometry (Jarell-Ash 850 apparatus); and the daily consumptions of wine and tobacco were obtained by questionnaire. Data were collected from May 1980 to February 1981. Statistical tests were carried out using the logarithms of the blood lead values, which appeared to be normally distributed.

Work carried out under INSERM CRL contract no. 79-5-430-8.
By: T. Moreau.

The average blood lead values as a function of systolic blood pressure are shown in Table 1: they differ very significantly ($p < 10^{-4}$) with an increase of about 25% between the lowest blood pressure class (less than 120 mm Hg) and the highest blood pressure class (over 160 mm Hg), the correlation coefficient value is 0.23 ($p < 10^{-5}$). Also, the blood lead, as in Awad et al. [1], appears very significantly correlated with age ($r = 0.20$, $p < 10^{-4}$), consumption of wine and tobacco ($r = 0.31$, $p < 10^{-4}$; $r = 0.21$, $p < 10^{-4}$, respectively). However, the blood lead-systolic pressure relationship persists after taking into account simultaneously the three variables (partial correlation coefficient 0.16, $p < 10^{-3}$). It was also corroborated by the existence of a significant correlation between blood lead and cardiac rate, itself very much linked to systolic pressure; the correlation disappears after taking the linkage into account. Taking into account corpulence (defined as the ratio Weight/Height^2), not correlated with blood lead ($r = 0.05$), does not alter these results. Finally it has been verified that the blood lead-systolic pressure relationship exists for each of the more homogeneous groups of subjects examined during a given month. As far as diastolic pressure is concerned, it is also linked in a significant manner to blood lead levels, but more loosely ($r = 0.10$, $p < 0.05$); the weakness of this correlation is probably explained by the poorer quality of the diastolic

pressure measurement, as suggested by its weak relationship to age and corpulence (r = 0.18, r = 0.21, respectively), compared to that observed for systolic pressure (r = 0.28, r = 0.34, respectively).

The existence of a positive connection between blood lead and blood pressure is controversial in the recent literature: it was shown by Beevers et al. [2, 3] and Khera et al. [4] who, with a group identical to ours with respect to sex and profession, compared average blood lead level of subjects with elevated blood pressure with that of other subjects. The statistical analysis chosen here, as well as in Awad et al., is different, since it consists of calculating the correlation between blood level and blood pressure in the general population.

Looking at these results together, it appears necessary to conduct other studies that will permit, in particular, approaching the physiological mechanisms of the blood lead-blood pressure relationship.

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TABLE 1. Means of blood lead values (µg/ℓ) according to blood-pressure (mm Hg)

1 – Pression systolique	2 – Plombémie ± e.t.	3 – Effectifs
- 119	162 ± 33	25
120 - 129	169 ± 47	161
130 - 139	193 ± 67	115
140 - 149	191 ± 57	79
150 - 159	203 ± 57	26
160 +	204 ± 61	25
4 – Signification	$p < 10^{-4}$	

[1]Systolic pressure. [2]Blood lead ± standard error. [3]Number of subjects. [4]Significance.

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