

CHRONIC CHLORACNE IN WORKERS IN A LINDANE PRODUCING FACTORY IN CHINA.

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ABSTRACT

Of 118 workers in a factory department 44 had clinical signs of chloracne of many years' duration. The department produces pentachlorophenol (PCP) from non gamma isomers of hexachlorocyclohexane. Most affected workers were stationed in a factory section where trichlorobenzene (TCB) was produced as intermediary step samples from the production line were analyzed on the presence of dioxins and dibenzofuranes. A sample of TCB was found to contain no TCDD or TCDF and a sample of PCP contained 6.3 ppb TCDD and 104 ppb toxicity equivalents of TCDD congeners. Repeat samples are currently analyzed and detection of chloracnegens in serum are planned to elucidate the cause of these workers' skin problem.

INTRODUCTION

The level of exposure to chloracnegens, especially low-level long term exposure, which is sufficient to induce chloracne is not known. This study was undertaken to elucidate the cause of chloracne in 44 affected factory workers. It was also undertaken to study the feasibility of an epidemiological cohort study among workers with known long-term exposure to chloracnegens.

MATERIAL and METHODS

The study took place in a department of a large chemical factory (Dagu Chemical Factory, 10,000 employees) located near the city of Tianjin, about 200 kms from Beijing, China. In this department of the factory non-gamma isomers of hexachlorocyclohexane (6-CCH) are processed into pentachlorophenol (PCP, see fig 1 and 2). As indicated in fig 1 by dotted lines, the department consists of 4 separate buildings. Workers almost never rotated between these buildings.

All workers in the 4 buildings of this department were examined by a dermatologist, had a full history taken, and underwent blood sampling and a skin biopsy. At each production stage / work station described in fig 2 a 10 ml sample was taken from the product in the reactor vessel. Ambient air samples to measure TCB air concentrations were obtained in building I, near the 6-CCH melt tank and near the resolve tank using the dinitration

method: 6 l/hr was led through a "bubbler and impinger" filled with nitration mixture.

Blood and urine samples were examined on Hb, leucocyte count, GOT, GPT, delta ALA, Tri- and Tetraiodothyronine and coproporphyrin.

TCB concentration in air was analysed by spectrophotometry after treating the nitration mixture with acetone and KOH.

The samples of the intermediate and final products listed in table 2 were analysed on the presence of dioxins and dibenzofuranes by chromatography after spiking with <sup>14</sup>C labelled standards, followed by reversed phase HPLC and capillary gaschromatography.

Fig 1.

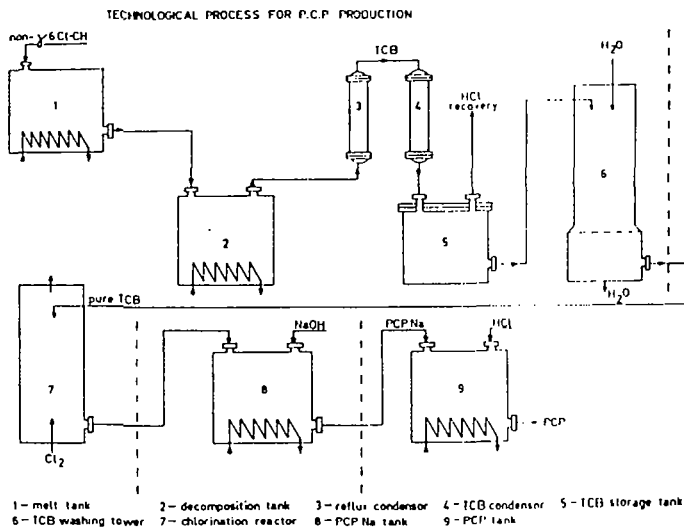


Fig. 2. Summary of production process shown in fig 1.

Non-gamma HEXACHLOROCYCLOHEXANE	
	----- HEATING
TRICHLOROBENZENE + HCL	
	----- CL2
HEXACHLOROBENZENE	
	----- NaOH
PENTACHLOROPHENATE-Na	
	----- Acid
PENTACHLOROPHENOL	

## RESULTS AND DISCUSSION

Out of the 118 workers 44 (34%) had clinical evidence of chloracne, as manifested by typical acneiform papules with comedones and cysts behind the ears, around the eyes and at the scrotum (see table 1). Histopathology of the biopsies supported the diagnosis. Affected workers also complained of itching. Most workers said that they had had this skin problem for more than 15 years, and that it started about 1 year after they began with their present job. Analysis of the blood and urine samples showed no abnormalities.

A breakdown according to work station showed that the majority of the affected workers were employed in building I, where non-gamma isomers of 6-Cl-Cyclohexane is melted and heated with recycled TCB to produce TCB (table 1).

Analysis of the product samples on the presence of TCDD and TCDF and their congeners is summarized in table 2, represented as ppb TCDD and ppb TCDF. The congeners are expressed as ppb toxicity equivalents in relation to TCDD. At this stage of our study it is unclear whether these amounts are sufficient to maintain or induce chloracne. The factory production process has not been changed over the past 10 years. Repeat samples are currently analyzed to compensate for sampling fluctuations. Chloracne can be very persistent in individuals. Analysis of fat tissue and serum of the affected workers may give further clues to their level of exposure.

Table 1. Distribution of chloracne cases among workshops

WORKSHOP	WORKERS	CHLORACNE CASES
TCB	40	40
HCB	28	0
PCP-Na	36	2
PCP	14	2

Table 2. Amounts of 2,3,7,8 TCDD and 2,3,7,8 TCDF (expressed in ppb) and their Pe,Hx,Hp,O- Cl congeners (expressed in ppb toxicity equivalents of TCDD) in product samples from each workshop.  
(f = failed)

PRODUCT	TCDD	TCDF	TCDD congeners	TCDF congeners
TCB	-	-	-	0.01
HCB	f	f	f	f
PCP-Na	5.4	0.5	71.8	15.7
PCP	6.3	0.8	104	10.1

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