

REV
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ENVIRONMENTAL HEALTH REPORT

February 3, 1978

PERSONNEL BLOOD SAMPLES

INTRODUCTION

Blood samples collected from two employees at the Solvents Plant and from a plant visitor (Carl Kesler) were analyzed for chlorinated hydrocarbons. The chemicals were extracted from the blood with nanograde hexane using an ultrasonic technique. Analysis of the hexane extract was performed by electron capture gas chromatography. The chemicals analyzed include vinylidene chloride (V_2), chloroform ($CHCl_3$), carbon tetrachloride (CCl_4), 1,1,2-trichloroethane (B-tri), perchloroethylene (Per), trans 1,2,3-trichloropropene (trans TCP), cis 1,2,3-trichloropropene (cis TCP), hexachloroethane (HCE), hexachlorobutadiene (HCBd), and hexachlorobenzene (HCBZ).

A linearity study of the analytical method was also conducted and found to be within acceptable limits.

EXPERIMENTAL

Standard Preparation:

A stock solution of the 10 compounds was prepared by injecting 30 microliters of each organic into a 16 X 150 mm culture tube containing 10 ml. of nanograde hexane. Thirty (30) microliters of this stock was then transferred to another culture tube containing 10 ml. of hexane to give a second stock which contained between 10 - 14 ug (depending on the density) of chlorinated hydrocarbon per milliliter of solution. Working standards of 25, 75, and 150 mg. per ml. were then prepared by injecting sufficient quantities of the second stock into three culture tubes containing 10 ml. of hexane each. These standards were analyzed to check the linearity of the detector.

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Analytical Parameters:

A Hewlett-Packard, Model 5700 A, gas chromatograph equipped with a N163 electron capture detector was used for the analyses. Chromatograph conditions follow:

Column: 10 X $\frac{1}{4}$ " glass column, 15% Dexsil 300 on 80/100 MESH
50/50 Gas Chrom Z - Gas Chrom W-(AW) DMCS treated

Temperature: Oven, run # 1 80 C
Oven, run # 2 140 C
Oven, run # 3 250 C

Injector 200 C
Detector 250 C

Carrier Gas: 5% CH₄/95% Ar at 40 cc/minute

Sample Size: 7 microliters

Elution Times: 250 C

Hexachloroethane	2.0 minutes
Hexachlorobutadiene	2.4 minutes
Hexachlorobenzene	10.8 minutes

140 C

1,1,2-trichloroethane	2.9 minutes
Perchloroethylene	3.3 minutes
Trans 1,2,3-trichloropropene	4.3 minutes
Cis 1,2,3-trichloropropene	5.4 minutes

80 C

Vinylidene Chloride	2.3 minutes
Chloroform	3.6 minutes
Carbon tetrachloride	4.6 minutes

PROCEDURE

Sample Collection:

Each blood sample was drawn into a 5 ml. green top heparinized tube in order to prevent clotting. All samples were then frozen until analyses could be performed.

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Sample Preparation:

After the blood samples had thawed to room temperature, four milliliters of each sample were pipetted into 16 X 150 mm culture tubes containing 5 ml. of 2% Na₂SO₄, and agitated for 20 minutes on a wrist action shaker. Four (4) ml. of hexane were then pipetted into each culture tube and the resulting mixture agitated again for 20 minutes. The culture tube was then placed into an ultrasonic bath for 60 minutes, agitated for 20 minutes, and finally centrifuged for 45 minutes. The hexane layer was pipetted from the culture tube and transferred to another culture tube containing 2-3 grams of anhydrous Na₂SO₄ (drying agent). Analysis of the hexane extract was performed by electron capture detection gas chromatography and the peak height of the resulting trace measured.

Calculations:

Nanograms per ml. of hexane extract of each chlorinated hydrocarbon was calculated from the chromatogram with the following equation:

$$\text{ng/ml (chromatogram)} = \left(\frac{\text{peak height of}}{\text{compound in sample}} \right) (\text{attenuation}) (\text{standard response factor})$$

The parts per billion by weight of chlorinated hydrocarbon in whole blood was then determined as follows:

$$\text{ppb(w)} = (A - B) \frac{4}{C}$$

where:

A = nanograms of chlorinated hydrocarbon per ml. of hexane extract obtained from the whole blood sample.

B = nanograms of chlorinated hydrocarbon per ml. of hexane extract obtained from the blank.

C = grams of whole blood

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RESULTS AND DISCUSSION

The results of blood samples are shown in Table I. The concentrations of all chemicals detected are expressed in parts per billion by weight. Hexachlorobenzene was the predominant contaminant in all samples.

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TABLE I

PERSONNEL BLOOD SAMPLES - ppb (w)

<u>NAME OF EMPLOYEE</u>	<u>DATE SAMPLED</u>	<u>TIME</u>	<u>V₂</u>	<u>CHCl₃</u>	<u>CCl₄</u>	<u>B-TRI</u>	<u>PER</u>	<u>TRANS TCP</u>	<u>CIS TCP</u>	<u>HCE</u>	<u>HCBD</u>	<u>HCBB</u>
Cy Barrios	9/22/77	2 PM	N/D	12.7	7.4	7.3	13.4	0.8	0.6	7.0	3.0	197
Art Bourg	9/22/77	2 PM	N/D	16.0	9.2	6.9	16.0	1.1	0.9	12.1	4.1	713
Art Bourg	9/27/77	9:30 A	N/D	22.6	14.5	17.3	7.7	0.7	0.6	5.1	2.5	643
Cy Barrios	10/3/77	8 AM	N/D	17.1	4.3	18.0	12.7	1.5	1.5	5.3	3.0	185
Art Bourg	10/5/77	7 AM	N/D	18.7	9.9	3.3	7.3	0.4	0.7	9.7	2.7	654
Art Bourg	10/7/77	9:30 A	N/D	21.6	12.9	5.3	23.6	2.7	1.1	12.0	4.3	810
Carl Kesler	1/27/78	2 PM	N/D	28.2	22.3	21.3	27.0	4.3	4.0	10.8	6.0	123

N/D = Not Detected

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