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# Human Poisoning with Pentachlorophenol and Its Treatment[1]

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A case of intentional intoxication with pentachlorophenol has been described. Salient features observed included pyrexia, diaphoresis, hyperkinesis, muscle twitching, tremors, epigastric tenderness, leg pain, tachypnea, and tachycardia. The patient's restlessness and agitation were controlled with phenytoin and phenobarbital. Forced diuresis with furosemide and mannitol resulted in a large increase in urinary excretion of pentachlorophenol. It is suggested that such therapy may be life saving in such intoxications.

Infants have been poisoned by pentachlorophenol-impregnated diapers and there were two deaths in the 20 cases (Robson *et al.*, 1969; Armstrong *et al.*, 1969). The quantity of pentachlorophenol in their blood serum varied from 0 to 0.018 ppm (Barthel *et al.*, 1969). Determination of the chemical in human urine showed concentrations of 0.0022–0.018 ppm in one study (Crammer and Freal, 1970) and 0.040–0.044 ppm in another (Benvenue *et al.*, 1967). Recently, a case of suicide from pentachlorophenol revealed the following tissue concentrations: blood, 173 μg/ml; urine, 75 μg/ml; liver, 225 μg/g; kidney, 116 μg/g; and stomach, 750 mg (Cretney, 1976). I would like to report on a case of intentional ingestion of pentachlorophenol, with survival through the use of forced diuresis to increase its excretion.

## CASE REPORT

At 2:30 PM, K.S., a 71-year-old Japanese male, intentionally ingested an estimated 4–8 oz of weed killer containing: 12% pentachlorophenol, 1.5% other chlorinated phenols, 82% aromatic petroleums (AR55), and 4.5% inert ingredients. Within the next hour, the patient was treated in a local emergency room with gastric aspiration returning a large amount of solvent-smelling, cloudy-brown fluid. This was followed by thorough gastric lavage with saline plus sodium bicarbonate. The patient received 5% dextrose in Ringer's lactate and, when his condition stabilized, he was transferred to the intensive care unit of a second local hospital.

Upon admission at 4:30 PM, his vital signs were: pulse, 94; respiration, 16; and blood pressure, 130/80; and the patient was responsive, restless, talkative, and diaphoresing. Urinalysis: albumin, +1; sugar, −2; leukocytes, 1–5; and erythrocytes, 5–15. Hematology: hemoglobin, 14.4 g; erythrocytes, 4.53 million; leukocytes, 9900, with 85% segmented, 1% stabs, 10% lymphocytes, 3% monocytes, and 1% eosinophils.

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TABLE 1

RESULTS OF LABORATORY ANALYSES ON SAMPLES COLLECTED FROM K. S. AFTER INGESTION OF PENTACHLOROPHENOL

| Sample description | | Day | Hours | Level of PCP (ppm) |
|---|---|---|---|---|
| Gastric lavage: initial wash at second hospital | | 1 | 6:30– 7:30 PM | 40 |
| Final return at second hospital | | | | 13 |
| Serum | | 1 | 7:30 PM | 150 |
| | | 1 | 9:30 PM | 153 |
| | | 1 | 11:15 PM | 155 |
| | | 2 | 7:30 AM | 155 |
| | | 2 | 7:30 PM | 144 |
| | | 3 | 7:20 AM | 136 |
| | | 3 | 10:30 PM | 119 |
| | | 4 | 7:00 AM | 96 |
| | | 4 | 10:30 AM | 122 |
| | | 4 | 1:00 PM | 91 |
| | | 4 | 5:00 PM | 116 |
| | | 4 | 7:30 PM | 105 |
| | | 5 | 7:00 AM | 93 |
| | | 5 | 7:00 PM | 62 |
| | | 6 | 7:45 AM | 74 |
| | | 7 | ? | 85 |
| | | 8 | 4:05 AM | 77 |
| | | 9 | ? | 70 |
| | | 16 | 11:30 AM | 28 |
| | | 37 | ? | 12 |
| Urine | Total volume (ml) | | | |
| | 780 | 1 | 5:00 PM– 9:55 PM | 2.3 |
| | 485 | 1–2 | 11:00 PM– 5:00 AM | 3.1 |
| | 190 | 2 | 5:00 AM–11:00 AM | 5.7 |
| | 240 | 2 | 11:00 AM– 5:00 PM | 7.1 |
| | 200 | 2 | 5:00 PM | 8.6 |
| | 290 | 2–3 | 11:00 PM | 7.7 |
| | 395 | 3 | 5:00 AM–11:00 AM | 5.8 |
| | 465 | 3 | 11:00 AM– 5:00 PM | 5.4 |
| | 260 | 3 | 6:00 PM– 9:30 PM | 4.1 |
| | 720 | 3 | 9:30 PM–10:30 PM | 0.4 |
| | 350 | 3 | 10:30 PM–11:00 PM | 0.2 |
| | 450 | 3–4 | 11:00 PM–12:00 AM | 0.3 |
| | 410 | 4 | 12:00 AM– 2:00 AM | 1.8 |
| | 280 | 4 | 2:00 AM– 4:00 AM | 2.3 |
| | 340 | 4 | 4:00 AM– 6:00 AM | 1.6 |
| | 355 | 4 | 6:00 AM– 8:00 AM | 1.4 |
| | 200 | 4 | 8:00 AM–10:00 AM | 1.9 |
| | 80 | 4 | 11:00 AM–12:00 PM | 2.5 |
| | 270 | 4 | 12:00 PM– 1:00 PM | 1.2 |
| | 300 | 4 | 1:00 PM– 2:00 PM | 1.8 |

TABLE 1—*Continued*

| Sample description | Day | Hours | Level of PCP (ppm) |
|---|---|---|---|
| 435 | 4 | 2:00 PM– 3:00 PM | 1.1 |
| 525 | 4 | 3:00 PM– 4:00 PM | 1.1 |
| 730 | 4 | 4:00 PM– 6:00 PM | 1.1 |
| 960 | 4 | 6:00 PM– 8:00 PM | 1.2 |
| 440 | 4 | 8:00 PM–10:00 PM | 1.6 |
| 1665 | 4–5 | 10:00 AM– 4:00 AM | 0.9 |
| 1600 | 5 | 4:00 AM–10:00 AM | 1.9 |
| 85 | 5 | 10:00 AM–11:00 AM | 6.1 |
| 90 | 5 | 11:00 AM–12:00 PM | 5.8 |
| 130 | 5 | 12:00 PM– 1:00 PM | 11.8 |
| 50 | 5 | 1:00 PM– 2:00 PM | 17.1 |
| 480 | 5 | 2:00 PM– 6:00 PM | 7.9 |
| 690 | 5 | 6:00 PM–10:00 PM | 9.0 |
| 1820 | 5–6 | 10:00 PM– 7:00 AM | 4.6 |
| 620 | 6 | 7:00 AM– 1:00 PM | 7.4 |
| 860 | 6 | 1:00 PM–10:30 PM | 7.2 |
| 2380 | 6–7 | 10:30 PM–10:30 PM | 5.2 |
| 2220 | 7–8 | 10:30 PM–10:30 PM | 3.5 |
| 3370 | 9–10 | 11:30 AM–11:30 AM | 3.0 |
| 1640 | 13–14 | 10:30 PM–10:30 PM | 8.6 |
| 1030 | 14–15 | 10:30 PM–10:30 PM | 2.1 |
| 1700 | 15–16 | 10:30 PM–10:30 PM | 2.0 |

Lavage was continued because the patient's mouth and gastric drainage continued to have the odor of the weed killer. When seen at 7:00 PM, his vital signs were: pulse, 100; respiration, 20; blood pressure, 160/100; and axillary temperature, 99°F. The patient was in no acute distress but was diaphoresing profusely and was very restless and agitated, being hyperkinetic in his movements with some jerking of the extremities and random muscle twitching, especially of the face; having a fine tremor of the hands and coarser tremor of the head and tongue plus incessant talking in completely unintelligible Japanese. The patient was known to have slurred speech. Cranial nerves were grossly intact, pupils reactive, CTR's 4+; and there was some epigastric tenderness. Otherwise, the physical examination revealed mild pulmonary emphysema and his generalized arteriosclerosis. There was good body preservation for his age, and generally good health had been enjoyed except for arteriosclerosis for several years and the slurred, indistinct speech.

A neurological consultant thought that the patient probably had some degree of cerebral excitation so the following regime was instituted: phenytoin, 200 mg intramuscularly every 8 h × 3 doses, then 200 mg intramuscularly every 12 h × 4 doses, followed by 100 mg orally every 6 h; and dexamethasone, 2 mg intramuscularly every 6 h × 5 doses, then 2 mg intramuscularly every 12 h × 4 doses. Following the initial doses, the patient became quiet with clearing of the muscle twitching and tremors.

Gastric lavage was continued until 9:30 PM, when the return was finally free of odor and 4 liters of saline had been used. Besides being restless, talkative, diaphoretic, and complaining of abdominal and leg pain, the patient had an uneventful night; and the following day, he was able to take fluids and a soft diet. A low serum potassium was

treated with 20–40 mequiv of KCl in continuous intravenous infusion. Initially, the abdominal pain responded to an aluminum–magnesium–silicate antacid but, later, it was ineffective.

The serum level of pentachlorophenol (Table 1) was 150 ppm, 5 h postingestion and remained at this level until the morning of the third day. Serum and urinary levels were measured by the method of Bevenue *et al.* (1967). On the evening of the third day, the patient received 20 mg of furosemide intravenously and, on the fourth and fifth days, 20 ml of 20% mannitol was administered every other hour to promote diuresis. Three intravenous doses of 500 ml of albumin were also given. When the patient became agitated on the fourth day, he was given 60 mg of phenobarbital intramuscularly at 12:30 AM, 2:00 AM, 5:00 AM, and 2:00 PM.

Table 1 shows the serum and urine concentrations throughout the period of pentachlorophenol intoxication and the serum concentration 2 weeks after discharge. It can be seen that the pentachlorophenol levels steadily decreased in serum and maintained a fairly steady state in urine until forced diuresis caused a doubling of the output of pentachlorophenol on Days 4, 5 and 6.

## DISCUSSION

Pentachlorophenol intoxication has been described in farmers, handler of preserved wood, and industrial workers handling the chemical (Truhaut *et al.*, 1952; Bergner *et al.*, 1965; Gordon, 1956; Chapman and Robson, 1965; Menon, 1958; Nomura, 1954), and the signs and symptoms always included pyrexia with profuse diaphoresis, hyperkinesis, abdominal pain, tachypnea, and tachycardia. The present case confirms these observations.

Although exchange transfusions were life saving in infants (Armstrong *et al.*, 1969), the large volume of blood required in adult therapy precluded its use in the present case. On the other hand, the use of forced diuresis with a subsequent major increase in urinary excretion of pentachlorophenol indicates that this type of therapy might prevent death in such poisonings.

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