III.
The Science on Pentachlorophenol

The EPA's Risk Assessment and Science Support Branch (RASSB)/Antimicrobial Division has produced a preliminary science chapter on pentachlorophenol for a Reregistration Eligibility Decision (RED) document, which finds excessive risk associated with penta use in utility poles. The EPA review was released to the wood treatment industry early Summer 1999 and disclosed to Beyond Pesticides/NCAMP in Fall 1999. The penta science chapter is a major step towards completion of the RED for penta, and represents the EPA's current scientific knowledge about the environmental fate, the health effects on humans, and the ecological effects of penta. All three of these subsections of the science chapter are important. This section of the report focuses on the unreasonable risks to human health caused by the continued use of penta. Of particular note, is the excessive risks that EPA has calculated for children's exposure.

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The Devastating Impact of Penta on Children

There are only two ways that children are normally going to come into contact with penta and the EPA has declared, in its preliminary science review, both of them hazardous and potentially deadly for children. These residential post-application exposure scenarios are the direct result of the widespread use of penta treated utility poles across the country. The EPA has determined that contact with soil contaminated with penta poses an unacceptable cancer risk to children as high as 2.2×10^{-4} (2.2 cancer cases in 10,000). Likewise, outdoor residential contact with industry pressure-treated wood products (e.g. utility poles, fencing, porches, shingles, steps and decks) leads to cancer in children with an unacceptable risk of 6.4×10^{-6} (6.4 cancer cases in one million).[1]

In its science chapter EPA finds that, "[R]esidues of pentachlorophenol in drinking water (when considered along with exposure from food and residential uses) pose an unacceptable chronic risk to children."[2]

The issue of protecting children from exposure to pesticides has received much attention in recent years. The landmark study, *Pesticides in the Diets of Infants and Children*, published by the National Research Council in 1993, finds that children are highly vulnerable to the negative health impacts of exposure to pesticides due to their small size, high proportional intake of air relative to body weight, and developing organ systems.[3] Because of these findings, Congress adopted legislation in 1996, the *Food Quality Protection Act*, which requires that special attention is given to the protection of children. Where data are not available to evaluate the nonthreshold affects (i.e., cancer) of pesticide exposure (dietary and nondietary) on children, EPA is required to adopt an additional 10-fold margin of safety (FQPA, Section 405, b(2)(B)iv). In its science chapter, despite the lack of data on the special vulerability of children to penta, EPA has neglected to apply the additional safety margin which would dramatically affect the acceptable exposure scenarios.

What Do the Numbers Mean?

EPA has historically said that one excess case of cancer per million population exposed is the threshold or range of acceptable risk; this is expressed numerically as 1×10^{-6}. Everyone is left hoping that their child is not the unfortunate one.

According to EPA's preliminary science review, the risk of cancer for children exposed to soil contaminated with penta is 220 times higher than levels deemed acceptable by the EPA. What does this mean for newborn children? The

National Center for Health Statistics calculated that there were 3,880,894 babies born in the U.S. in 1997.[4] This averages 10,633 children born every day. Applying the EPA's risk factor (2.2 in 10,000) to this new population results in over 2 child cancer victims a day just from this type of exposure to penta.

How many people are poisoned with penta?

Study after study have found 100% of the people tested have penta in their bodies. The following is a list of examples of penta contamination:

- A study in Arkansas found 100% of 197 randomly selected, 2-6 year old children tested had penta in their urine;[5]
- A study in Germany of human milk samples provided by nursing mothers found penta present in all of the milk samples; there was no special, identified sources of penta exposure of the donor mothers;[6] and,
- A study in Sakatchewan, Canada, found penta in 100% of randomly collected urine samples.[7]

What about those people that are exposed to penta on the job?

The penta science chapter finds that people with occupational exposure to penta are at excessive risk from short-term, intermediate-term and long-term exposure to penta. These people face extreme non-cancer risks to their health from exposure to penta from touching the chemical and breathing the chemical.[8] The cancer risks posed by penta to workers exposed on the job are off the charts.

The cancer risks that EPA has calculated for occupational exposure to penta are most telling: 13 of the 14 jobs had unacceptable cancer risks.[9] The following is a list of a few of the most shocking examples of the cancer risks calculated by the EPA from occupational exposure to penta:

- Applicators of grease formulation for groundline remediation of utility poles – 3.4 workers out of 1;
- Applicators of liquid penta at joinery mills with a low pressure handwand – 4.4 out of 10; and,
- Mixers and loaders of liquid penta at pressure treatment plants – 2 out of 1,000;
- Helpers and switchmen for applicators of liquid penta at pressure treatment plants – 1.5 out of 1,000.

EPA has determined that cancer risks that are greater than 1 worker in 100,000 is unacceptable.[10]

EPA does not have any data to estimate human exposure risks for a number of post-application exposure scenarios including: pressure treatment retort maintenance; pressure treatment facility storage yard worker; and, operators of equipment at pressure treatment plants.[11] Given the high risk of cancer associated with workers exposed to penta one could and should reasonably expect that these individuals face a particularly high risk of cancer.

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Data Gaps Plague EPA's Analysis, Suggesting the Hazards Are Even Worse Than Calculated

The penta science chapter is riddled with such data gaps; pieces of important scientific information that the EPA acknowledges it does not have. For example, a question that remains unanswered in the penta science chapter "is to what extent PCP [penta] and its microcontaminants are depleted from treated wood poles and the levels of exposure to soil, water and air in the vicinity of treated poles. Studies were not conducted to measure the levels of PCP and its microcontaminants in treated utility poles at specified times intervals including when they were placed in service."[12]

The lack of an analysis of the human and environmental health risks posed by the contaminants of penta is the single most important data gap.[13] Penta is contaminated with some of the most toxic substances known including polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and hexachlorobenzene

(HCB).[14] The hazards associated with this alphabet soup of poisons is well established.[15]

Dioxins, furans, and hexachlorobenzene are recognized as endocrine disruptors.[16] Endocrine disruptors act like hormones in the body during critical times, adversely affecting fetal and sexual development, reproductive capacity, and causing diseases like breast and prostate cancer later in life.[17] What makes these effects different from others is that they defy classical toxicology models that adopt the notion that the "dose makes the poison." With endocrine disruptors, like penta and its contaminants, it is the *timing* of exposure that is important. The relevant dose of such a toxic material may be thousands or even millions of times lower than the range where acute or chronic toxic effects are noted.[18] Dioxins, furans and HCB are also extremely toxic in the classical sense.

The signs and symptoms of poisoning for chemicals contaminated with dioxin include a spectrum of toxic effects. Dioxin exposures in humans are associated with increased risk of severe skin lesions such as chloracne and hyperpigmentation, altered liver function and lipid metabolism, general weakness associated with drastic weight loss, changes in activities of various liver enzymes, depression of the immune system, and endocrine- and nervous-system abnormalities. It is a potent teratogenic, fetotoxic, and carcinogenic chemical.[19]

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HCB has been shown to be a potent teratogenic, fetotoxic, and carcinogenic chemical. Chronic exposure to HCB causes damage to the liver, spleen and nervous system.[20]

How Much Dioxin Is In Penta Treated Poles

In its report on the meeting to peer review "The Inventory of Dioxin in the United States" (1998), EPA found that,

> A significant finding of the current inventory . . . is that very large quantities of dioxin can enter the environment in products. For example, EPA estimated that 25,000 grams TEQ[21] of dioxin may be found in pentachlorophenol (PCP) used for wood treatment. This amount of dioxins is over eight times greater than EPA's central estimate of total releases of dioxin to air, land, and water in 1995. Although the fate of dioxins on treated wood and in other products in not fully understood, the reviewers noted that **dioxins on treated wood appears to be the largest flow of dioxins that were quantified**, thus making treated wood a large reservoir of dioxins in the environment.[22] (emphasis added).

Calculating the Real Risk of Penta

There can be no doubt that any recalculation of risk to include the effects of exposure to dioxins, furans, and HCB will raise the risks of exposure to penta higher than the risks currently established in EPA's preliminary science chapter.

In addition to the cancer risks caused by penta, the penta science chapter contains a wealth of information addressing the impacts of the use of penta. Beyond Pesticides/NCAMP has included a listing by page of the numerous data gaps and the scientific data in the penta science chapter, establishing the risks to human and environmental health caused by penta (see Table III). The table focuses on two of the three substantive sections of the penta science chapter: the human risk assessment. and the environmental fate of penta.

Similar to adopting a 10-fold additional margin of safety for children where data on the impact on children is not available, it is critical that the agency assign values (best guess estimates) or an additional margin of safety to exposure scenarios for which the agency has incomplete or inadequate data. If the agency is to move forward with an analysis that is even minimally protective of public health and the environment, it should not assume zero risk associated with the data gap exposures listed in Table III and move ahead with an RED document that allows continued use.