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April 8, 1999

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VIA FEDEX

Wells T. Watson, Esquire
Baggett, McCall, Burgess & Watson
3006 Country Club Road
Lake Charles, LA 70605

Re: *Ross, et al. v. Conoco, Inc. et al.*

Dear Wells:

As we indicated in our letter last week, and in conjunction with The Society of the Plastics Industry, Inc.'s ("SPI") December 23, 1998 response to your clients' December 3, 1998 document request, enclosed is SPI's privilege log for its company course of business documents Bates Nos. SPI-00001 to SPI-12592 that it has produced.

As also indicated in our earlier letters, some documents have been withheld based on the attorney-client privilege and others, mostly meeting minutes, have been redacted to the extent they contain attorney-client privileged information. All withheld documents and redactions are indicated on the privilege log.

In addition, we enclose some documents that should have been included with last week's production. They are Bates Nos. SPI-07690-07705, 12182-12204, 12225, 12226, 12227-12228, 12231-12239, 12240-12255, and 12256-12272. These documents were erroneously clipped together with a document being withheld based on privilege. We apologize in advance for any inconvenience this may have caused.

Please give me a call if you have any questions.

Sincerely,

Arthur S. Garrett III

c: Douglas J. Behr, Esq.

P 3/4 PLD

VIA FEDERAL EXPRESS

August 4, 1993

Michael N. Gray
ChemRisk
1685 Congress Street
Portland, ME 04102

Dear Mike:

Following are several general comments. Additionally, enclosed are several pages of the report (see listing at end of letter) on which I have made specific comments. As we discussed, after your team has had an opportunity to review these comments, please advise of the earliest possible delivery date for a final report.

1. The report would benefit from having an "Executive Summary" section or an expansion of the conclusion section. Several of the attached pages highlight some summary ideas. One reviewer suggested that perhaps a reorganization of the report would be helpful (see the "Suggestion for Reorganization" attached to this letter). I believe it would be considerably easier to prepare an Executive Summary and more useful to the Vinyl Institute.

2. Please review the use of italics to insure that they are used only for Greenpeace's claims (as defined on page 2 of the draft report. See the note on page 9 and 11 of the attached for example.

3. At the conclusion of the project, the Vinyl Institute would like copies of all cited references (Chapter 8 and Appendix A) as available. We anticipate that some of these documents may be used in other forums and it would be helpful to have copies of them.

4. As we discussed, I am aware of the fact that ChemRisk has received several additional references since the time that the draft was prepared and that these references are currently being translated for incorporation in the final report. Please clarify for me which of the references in Appendix A, page 3/4 you do not have or cannot obtain.

Similarly, do you have a resource/method for obtaining documents from Greenpeace (Appendix A, page 4) and what is the expected timeline for delivery.

5. You need to review the document carefully and be certain that references to EDC/VCM manufacturing and EDC/VCM/PVC are not used interchangeably with each other or used to make inferences to PVC only manufacturing. Behind the comments on page 9 I have included page 68 of the Norsk Hydro reference which you have ("PVC and the Environment"). This clearly notes what is produced at each of the Norsk Hydro facilities. We need to be careful to note that in the body of the comments, as I have done in the red-pen comments on page 9 and not fall into the Greenpeace trap of using information from one type of facility to draw conclusions applicable to another categoy of manufacturing.

I will be in my office the remainder of this week and Monday through Thursday of next week. I look forward to speaking with you.

Sincerely,

Meredith N. Scheck
Assistant Director

encl. Pages 1, 3, 4 (with attachment), 5, 6 7 9 (with attachment) 11, 13, 16, 17, 19

att.

SUGGESTED OUTLINE

From Section 2.0:

A. Introduction and Executive Summary

B. Process Definition

1. closed loop

2. Comparability

3. Environmental Regulation

4. Use of Waste Streams

C. Lack of Risk/Benefit Analysis

From Section 3.0 and Some of Section 4.0:

D. Technical Claims on Emissions, Fate and Analysis (of claims by Greenpeace that are misleading/unscientific)

From Section 4.0:

E. Inconsistencies between "Ubiquitous" and "No Safe Level" arguments (with the last paragraph on page 21 perhaps added here)

From Section 5.0:

F. Toxicological Arguments re cancer and non-cancer

From Section 6.0:

G. Unscientific Risk Allegations

1. Misrepresentation of the WHO-TDI applicability

2. Risk Model and Misrepresentation of same

3. Confusion between potential release to the environment and exposure

1.0 INTRODUCTION

ChemRisk®, A Division of McLaren/Hart Environmental Engineering was retained by the Vinyl Institute to critically evaluate the Greenpeace report entitled *Dioxin Factories: A study of the creation and discharge of dioxins and other organochlorines from the production of PVC*. The nineteen-page Greenpeace publication targets the polyvinyl chloride (PVC) manufacturing industry as a major source of environmental levels of organochlorine compounds including dioxins and furans. In its report, Greenpeace raised a number of claims concerning the PVC production industry, based on the assumption that the measured dioxin emissions from one facility were characteristic of industry-wide dioxin emissions on a global scale. Greenpeace also assessed the industry's contribution to environmental contamination (such as river sediments), toxicity of chemical byproducts of PVC production, and human exposures to byproducts, such as dioxins.

NORSK HYDRO ? HOW ABOUT AKZO & SOLVAY ?

Overall, the Greenpeace assessment of dioxin and organochlorines in PVC production contains factual errors and unsupported conclusions. A critical flaw in the Greenpeace report is that it discusses toxicity and distributions of dioxins and furans in certain media but does not identify differences among the congeners or isomers of concern. For example, Greenpeace cited Evers et al. (1989) in its allegation that $CuCl_2$, a catalyst used in the oxychlorination process, contained dioxins at the ng/kg (ppt) level. However, Greenpeace failed to mention that Evers et al. (1989) reported that $CuCl_2$ contained only octa- and heptachlorinated dioxins and furans, two of the least toxic congener groups (Heindl and Hutzinger, 1986). Other examples of factual errors and inaccurate reporting of study results are discussed in this report.

This report presents the results of ChemRisk's critical evaluation and review of Greenpeace's allegations and claims. Comments were organized into the following categories which encompass the majority of Greenpeace's allegations:

- PVC Production Process Issue
- Dioxins and Organochlorines as Byproducts of PVC Production
- Source Contribution of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/PCDFs)
- Toxicological Issues
- Exposure Issues

2.0 PVC PRODUCTION PROCESS

In general, Greenpeace has overlooked the widespread uses and benefits of PVC, which is heavily used in electronics, appliances, consumer goods, packaging, and medical products. The construction and automotive industries also rely on the versatility of PVC. Being exceptionally versatile and durable, PVC is the only plastic that can be modified to suit a variety of applications.

PVC is the second largest volume plastic produced in the world. In 1992, the U.S. alone produced over 4.5 million tonnes (Vinyl Institute, 1993) and worldwide consumption is estimated at 18 million tonnes annually (Norsk Hydro, 1992). Because the production of PVC is based on natural resources, such as sodium chloride, it is an economical plastic to produce. Furthermore, it is one of the most efficient construction materials available when analyzed on an energy-equivalent basis (Cowfer and Migistro, 1985).

The manufacture of PVC is essentially a closed production process (Vinyl Institute, 1993). Because of this closed system, production efficiencies are maximized, while environmental emissions and potential worker exposures are minimized. As individual plants improve environmental controls, solid waste generation and air and water emissions will continue to decrease.

Greenpeace : PVC industry has become "the sink for surplus chlorine" **SPI-07694**

According to the Greenpeace report, the PVC industry has become "the sink for surplus chlorine". Greenpeace neither quantified "surplus chlorine" nor provided a reference for the accompanying discussion that led to this conclusion. In fact, the entire chemical process industry consumes chlorine in order to create beneficial materials such as organic and inorganic chlorine compounds, refrigerants, pulp and paper, and fabrics (Windholtz, 1983; Parmeggiani, 1983). These materials, in turn, are used as the starting materials for products that are used worldwide on a daily basis.

could also cite the study completed by Charles River Associates, Boston, MA for the Chlorine Institute, April 1993 "Assessment of the Economic Benefits of Chlor-Alkali Chemicals to the United States and Canadian

NEED TO CLARIFY THAT EDC/VCM AND PVC CANNOT BE USED INTERCHANGEABLY

Greenpeace : There is a level of comparability among all PVC facility emissions

Throughout the Greenpeace report, site-specific data provided by Norsk Hydro (Norsk Hydro, 1992) were heavily relied upon and considered representative of ethylene dichloride and vinyl chloride monomer (EDC/VCM) facilities worldwide. However, Norsk Hydro explicitly stated that their data should not be assumed to be valid for all PVC production plants because regulatory and technology standards worldwide vary widely (Norsk Hydro, 1992).

For example, in the U.S., all air and water emissions resulting from the PVC production process are regulated by the USEPA (Vinyl Institute, 1993). Additionally, all U.S. manufacturers of PVC and/or VCM must report their compliance with USEPA standards. Prior to issuing permits in the United States, numerous site-specific factors are considered by the environmental agencies. For example, facilities located in areas that have relatively low population densities, stable atmospheric conditions, and advanced waste management practices have lower potentials for exposure and risk to human health. Thus, the USEPA takes these factors into consideration in issuing a permit so that allowable emission rates vary among facilities.

SEE ATTACHED *

Regulatory requirements also influence the types and efficiencies of air pollution control devices installed at EDC/VCM production facilities. Differences in facility designs, processes, and operating practices also contribute to the difficulty of extrapolating from one facility to another. The components of the feedstock, which depend on the grade of EDC or VCM desired, also directly effect the components and level of emissions from the process. Thus, because individual facilities specialize in specific grades of EDC or VCM, emissions from individual facilities will differ. Despite these factors, Greenpeace assumed that dioxin emission data, which were specific to a Norsk Hydro EDC/VCM plant in Norway, were representative of levels found at other EDC/VCM facilities. Because data do not exist to support this claim, such an extrapolation is inappropriate.

DROP. PLANT OPERATING DIFFERENCES ARE REAL BUT INDUSTRY DOES NOT CONTROL

Because this fundamental assumption has not been validated, the resulting conclusions made by Greenpeace, based on this assumption are unfounded. Greenpeace contended that chlorinated byproducts, formed during EDC/VCM production, are divided into heavy and light ends, or high molecular weight and low molecular weight compounds, respectively, which are created in approximately the same amounts. Greenpeace supported this by citing the percentage amounts of

Page 4, Paragraph 2:

The statement that all air and water emissions are regulated by USEPA should be least be amended to include comparable state environmental agencies. This paragraph also contains a statement that permits are based on population densities, atmospheric conditions, etc; while all facilities are regulated by federal regulations, some but not all states take some of these additional factors into account. One PVC producer suggested that a better way to look at this paragraph would be to note that USEPA does assessments, both risk and technology, to assess exposure levels to pollutants (such as Best Available Control Technology). The USEPA Vinyl Chloride standard could be cited.

NOTE THAT TO CLARIFY THIS IS THE EDC/VCM, NOT PVC PROCESS. HEAVY AND LIGHT ENDS DO NOT COME FROM PVC PROCESS

heavy and light ends resulting from a single German PVC production process. A description of the process, however, was not provided. Details, such as production rate, starting materials, reactor type, and reaction conditions are necessary to identify potential byproducts and, subsequently, to determine how the byproduct components will behave under separation. Because the amount and proportions of resultant byproduct components depend upon individual facility operating conditions, it appears that Greenpeace did not account for variabilities in process when stating that heavy and light ends are produced in almost equal proportions.

Greenpeace: Heavy and light ends are waste streams

Greenpeace referred to heavy and light ends as two types of waste streams. This is misleading because byproducts are often used as marketable and recyclable commodities. For example, heavy ends such as 1,1,2-trichloroethane and 1,1,2,2-tetrachloroethane are useful as feedstock for thermal chlorination processes, or they can be incinerated to generate energy or to produce high-quality muriatic acid (Norsk Hydro, 1992; McNaughton, 1983). Light ends, including ethyl chloride and *cis*-dichloroethylene, are also recoverable and sold as raw materials (Norsk Hydro, 1992; McNaughton, 1983). It is incorrect and misleading, therefore, to classify these materials as wastes.

DELETE

DELETE - CONFUSING. NEED TO BE CAREFUL NOT TO USE EDC/VCM and PVC INTERCHANGEABLY.

3.0 DIOXIN AND ORGANOCHLORINES AS BY-PRODUCTS OF PVC PRODUCTION

Greenpeace: *"There is also reason to believe that other organochlorines are discharged in at least the same percentage as for dioxin type compounds."*

No supporting documentation was provided to substantiate this claim. It is unclear whether Greenpeace is asserting that each organochlorine is discharged in an equal and fixed proportion relative to dioxin or that total organochlorine discharges represent a proportion of the waste stream equal to that of dioxin. In any case, given the variety of facility designs, feedstocks, operating procedures, and physicochemical behaviors of organochlorines, it is highly unlikely that discharges would be as uniform as Greenpeace states. In fact, Table 1 of the Greenpeace report, which lists the proportions of several chlorinated hydrocarbons produced during VCM manufacture, rebuts this claim. In this table it is shown that other organochlorines discharged range from <0.0001% to 0.8%, while the discharge of dioxin-type compounds from this facility was not reported.

Greenpeace: *"...if dioxins follow the EDC streams, and the percentage levels of dioxin to EDC in the gas streams is the same as those found in the discharge to water, the level of dioxin discharged to air would be: 74.52 grams TCDD-equivalents/year for this factory."*

The incorrect assumption inherent in this calculation is that dioxin partitions equally between gas and liquid phases. The physical properties of dioxin have been described by various investigators and are readily available in the literature. The use of these data would allow a better and more accurate calculation to be provided.

citation(s)?

BELIEVE THIS SHOULD BE EDC/VC

Greenpeace assumed that laboratory experimentation replicates industrial manufacture of PVC

In Case Study B, Greenpeace cited a laboratory analysis of the oxychlorination of ethylene and concluded, from a comparison of the PCDD and PCDF congeners from the experiment, that the oxychlorination process is responsible for the PCDD and PCDF present in sediment at the investigated site. This allegation is based on the assumption that the laboratory was able to replicate actual conditions. To directly extrapolate from laboratory data to the actual byproducts created during manufacturing is oversimplified and does not take into consideration the differences in impurity production due to varying reactor volumes.

GOOD POINT

Greenpeace: [PVC production results in] "...5 - 10 grams of dioxin TCDD equivalents per 100,000 tons.."

EDC/VCM

Many of the studies cited by Greenpeace do not support the contention that PVC manufacturing produces TCDD equivalents at the rate of 5 to 10 grams per 100,000 tonnes. In fact, Norsk Hydro (1992) data indicate that emissions of TCDD equivalents is lower by two orders of magnitude.

Greenpeace: Components can be quantified by the AOX method

Greenpeace is incorrect in asserting that the molecular weight of constituents can be determined by an AOX analysis. The compounds present cannot be identified by this methodology and most AOX analyses do not adequately separate inorganic from organic fractions. Greenpeace has attempted to use total AOX results to quantify the components. This is conjecture, not science, and the ratio of inorganic constituents to organic constituents cannot be determined with the results presented.

Greenpeace: Bench-scale prototypes are capable of replicating VCM production

Research by Evers (1989) is an attempt to use a bench-scale prototype to emulate manufacturing facilities. Although this research is valuable from the perspective of optimizing conditions for VCM production, it is always questionable as to how the trace impurities production will compare

check for appropriate use of Italics (see page 2)

4.0 POTENTIAL SOURCES OF PCDD/PCDF IN THE ENVIRONMENT

Greenpeace : *Greenpeace disregarded multiple sources of PCDD/PCDF in the environment*

The Greenpeace report has assumed that dioxins present in sediments of Sweden and the Netherlands were entirely attributable to EDC/VCM production. Other known or potential sources of contamination were not considered in spite of the fact that the areas of most concern to Greenpeace, i.e. along the Rhine River in Germany and the Netherlands, and the Bohus Coast in Norway and Sweden are heavily industrialized. The southeastern coast of Norway, in the vicinity of Norsk Hydro's PVC facility in Rafnes, houses several metals processing and pulp and paper manufacturing facilities (P. Balerin, personal communication, 1993). The western coast of Sweden, in the vicinity of another Norsk Hydro PVC facility in Stenungsund, is well known for its automobile production facilities, petrochemical and pulp and paper plants, shipyards, and smelters which process specialty steels (G. Couey, personal communication, 1993). In Germany and the Netherlands, the proximity of the river Rhine encouraged many chemical companies to establish operations in the region. These companies were attracted to the Rhine's water supply and transport facilities. Production facilities along the Rhine include manufacturers of organic and inorganic industrial chemicals, organic intermediates, fertilizers, pigments, plastics, and synthetic rubbers (Chemische Industrie, 1991).

Several studies indicate that PCDDs and PCDFs are widely distributed in industrialized and heavily populated environments (Hutzinger and Blumich, 1985; Sheffield, 1985; Czuczwa and Hites, 1986; Rappe et al. 1987a; 1987b; Rappe and Kjeller, 1987; 1988; Southerland et al., 1987; Tieman et al., 1989; Smith et al., 1990). A growing number of processes which can potentially lead to TCDD and PCDF emissions to the environment have been identified. These include large and small combustion engines, chemical manufacturing, production of pulp and paper, the chlorination of sewage, smelting, incineration, heating systems and forest fires. Although the variety of sources of PCDD and PCDF in the environment have been well established in the scientific literature (Langhorst and Shadoff, 1980; Czuczwa et al., 1985; Sheffield, 1985; Ballschmiter et al., 1986; Hagenmaier et al., 1986; Jones and Konheim, 1986; Konheim 1986; Patterson et al., 1986; Stanley et al., 1986; Clement et al., 1985, 1987; Marklund et al., 1987; Rappe et al., 1987c,

THIS IS A CHLORINE/EDC/VCM - SEE ATTACHED

EDC/VCM/PVC

SEE PAGE 68 OF THE NORSK HYDRO REFERENCE WHICH YOU HAVE WHICH IS ATTACHED. TAKE CARE IN REFERENCING

DROP. EXPANDS THE CONTROVERSY.

PCDDs and PCDFs in the flue gas and part per million levels in the fly ash, depending on the technology employed at a given facility (Tong et al., 1989)

In addition to controlled incineration, accidental fires are another potential PCDD/PCDF combustion source. It is well documented that fires involving a number of man-made materials result in the formation of dioxins, furans and a number of their precursors. Deutsch and Goldfarb (1988) reported that the soot from a flue in a university lecture hall contained PCDDs and PCDFs. The materials which burned contained sources of chlorine and hydrocarbon.

Greenpeace: *The Greenpeace report contained misleading statements and misinterpretations of the literature*

CHECK ITALICS

In their report, Greenpeace made misleading inferences and misinterpreted the scientific literature. A clear example is Case Study A in which Greenpeace cited a study conducted by Evers et al. (1988), who determined PCDF isomer distributions from sediments in the Rhine at river km 660. Although Greenpeace contributed the presence of PCDF to VCM production, the VCM facility to which Evers et al. referred was nine river kilometers downstream of river km 660. However, it is generally expected (except in the case of tidal mixing) that the source of chemical contamination occurs upstream from a "hot spot." In addition, Greenpeace alleged that the location of Akzo's Rotterdam VCM plant is at river km 669 and that this plant contributed to PCDF levels in sediment. This contradicts Evers et al. (1988), who stated that Rotterdam is at river km 1000, over 330 river kilometers downstream from river km 669, which further disputes the possibility that the Rotterdam VCM facility is responsible for those levels. Finally, although a figure provided by Evers et al. (1988) displays the heavily industrialized area of the river Rhine from the 159 river km mark to the 1000 km river mark, Greenpeace does not acknowledge the density of the industrialization.

In addition, Greenpeace incorrectly reported the scientific literature in the following statement:

> "The researchers (Evers et al., 1988) looked at the available scientific evidence, and found that the compounds found in the sediments were also produced during VCM production (Greenpeace reference 17 (Erickson et al., 1988)) and during synthesis

5.0 TOXICOLOGICAL ISSUES

Greenpeace: TCDD is a Human Carcinogen

Greenpeace cited Fingerhut et al. (1991a,b), Manz et al. (1991), and Jenkins (1991) as the sources of their allegations that "recent research confirms carcinogenicity in humans." A review of these studies indicates that they do not support this conclusion. The Jenkins (1991) report is simply a compilation of scientific data and anecdotal information, some of which is dioxin-related and some that is not. A second evaluation of causation is absent from the Jenkins affidavit. Fingerhut et al. (1991a,b) and Manz et al. (1991) report only simple associations between exposure (defined as length of employment) and increased mortality. Neither group of researchers evaluated causation. Moreover, neither group directly correlated 'dioxin exposure' to health effects. Fingerhut et al. (1991a,b) correlated serum TCDD levels with length of employment, and separately evaluated the relationship between length of employment and increased mortality. Manz et al. (1991) measured adipose TCDD levels in a small group of workers for the purpose of confirming exposure categories. However, those individuals sampled were not members of the study cohort and adipose TCDD levels were not directly used to evaluate mortality. Although Fingerhut et al. (1991a,b) found a correlation between length of employment and serum TCDD levels of chemical workers, the association is a simple correlation, not a causal association. Because these chemical workers were exposed to many different persistent chemicals, it is likely that such a correlation would exist for any number of chemicals.

2,3,7,8—Tetra... dioxin

Although there is sufficient evidence to suggest that TCDD, and possibly other dioxin and furan isomers, are carcinogenic in laboratory animals (Kociba et al., 1978; NTP, 1982; USEPA, 1985), there is no conclusive evidence that TCDD is a human carcinogen (Zober et al., 1990; Fingerhut et al., 1991a,b; Kimbrough, 1991; Manz et al., 1991; Saracci et al., 1991; Tollefson et al., 1991). In fact, the evidence obtained from dozens of epidemiologic studies of herbicide sprayers, chemical workers, American servicemen exposed to Agent Orange in Vietnam, and the residents of Seveso, Italy (who received the highest doses of any population studied), indicates that TCDD is unlikely to be carcinogenic in humans at the very low doses currently found in the environment.

incurred by Yusho and Yu-Cheng subjects are at all relevant to the levels typical of environmental exposures.

Greenpeace: *TCDD Causes Noncancer Effects In Humans Other Than Chloracne*

Greenpeace stated that, "...noncancer toxicity [of TCDD] in humans includes effects on the central nervous system, disruption of metabolism and suppression of immune system". No reference to the scientific literature is given for this allegation. Numerous epidemiologic studies have evaluated noncancer effects in human populations exposed to dioxin-contaminated chemicals (Suskind and Hertzberg, 1984; Moses et al., 1984; Lathrop et al., 1984, 1987; Sweeney et al., 1990; Wolfe et al., 1991). The populations studied by these researchers are generally the same populations that have been evaluated for cancer mortality. Reported noncancer effects include chloracne, porphyria, hepatomegaly, changes in liver enzyme levels and lipid metabolism, diabetes, and cardiovascular disease. However, there has not been one condition or series of long-term health effects that has been consistently demonstrated among every exposed population (USEPA, 1992). Furthermore, these studies all suffer from the same shortcomings as the cancer epidemiologic studies; that is, it is not possible to separate out the effects of TCDD from the effects caused by the other chemical exposures.

Greenpeace: *The Toxicity of Chemicals Used In Production Are Relevant to Environmental Exposures*

Greenpeace lists 29 different chemicals used by Norsk Hydro's Stenungsund facility (Figure 1 of the Greenpeace report) **{To Be Expanded}**

Will need to review.

6.0 EXPOSURE ISSUES

Greenpeace: The WHO TDI of 10 pg/kg-day is fundamentally flawed because it is based on the assumption that dioxins do not cause cancer

REVIEW FOR CONSISTENCY WITH "NON CANCER EFFECTS."

This statement is incorrect. The World Health Organization (WHO) Tolerable Daily Intake (TDI) value of 10 pg/kg-day is based on general toxicological effects, including carcinogenicity, reproductive effects, and immunotoxicity in various laboratory animals (WHO, 1990). WHO analyzed tissue levels and health effects data from animal studies and, from these data, identified a No-Observed-Adverse-Effect-Level (NOAEL) of 1000 pg/kg-day for 2,3,7,8-TCDD. Based on this NOAEL, WHO calculated a TDI by applying a safety factor of 10 to extrapolate from animal to humans and an uncertainty factor of 10 to account for uncertainty in reproductive effects (WHO, 1990). Based on its analysis, WHO (1990) concluded that TCDD is carcinogenic in animals, but the evidence regarding the carcinogenicity of TCDD in humans is inconclusive.

The TDI of 10 pg/kg-day is consistent with the allowable daily intakes (ADIs) developed by Canada, the Netherlands, West Germany, and the United Kingdom (Ontario, 1985; van der Heijden et al., 1982; NCASI, 1987; U.K., 1989; Tollefson, 1991). These countries have historically used a safety factor approach to estimate ADIs for TCDD based on the NOAEL of 1,000 pg/kg-day, reported in the Kociba et al. (1978) cancer bioassay, and a safety factor of 100. The Kociba et al. (1978) study has been used by nearly all regulatory agencies for setting standards for TCDD.

Based on the evidence that TCDD is nongenotoxic and acts as a promoter of carcinogenesis in laboratory animals (Lucier et al., 1991) it is appropriate to conclude that there is an exposure level at which no carcinogenic response will occur. Therefore, use of a threshold model like that used by WHO to develop a dose for TCDD that is protective of general toxicological health effects of TCDD, including cancer, is consistent with the scientific evidence regarding the carcinogenic potential of this compound.

THIS CITATION SHOULD BE ADDRESSED IN "INTRO" OR "NONCANCER EFFECTS" page 15-16. IS IT?

Collectively, use of these conservative assumptions in estimating risks is likely to overestimate actual risks by orders of magnitude. As such, Greenpeace's interpretation of risk estimates is flawed and the allegation is unjustifiable.

Greenpeace: *The WHO TDI of 10 pg/kg-day and the risk-specific dose of 0.006 pg/kg-day (which is based on 10-6 risk level and the EPA cancer slope factor of 156,000 mg/kg-day-1 for 2,3,7,8-TCDD) do not address the "...most obvious noncancer effects that are thought to occur at levels that are 1/100th of those at which cancer occurs; neither addresses the impacts to the unborn, through exposure via transplacental transfer, or the newborn, through exposure via breast milk..."*

This allegation is misleading and unsubstantiated. The only noncancer effect in humans that has been causally associated with TCDD is chloracne (Kimbrough, 1990; Tollefson, 1991). Associations between exposures to high concentrations of chemicals containing TCDD and other noncancer effects have not been established. Although there is evidence suggesting transplacental transfer of TCDD to human fetuses (Schecter et al., 1990), there is no evidence of adverse effects at the observed fetal TCDD levels.

Experimental studies have evaluated noncarcinogenic endpoints for TCDD including reproductive, immunotoxic, fetotoxic, and teratogenic effects (USEPA, 1985). Low-effect levels and no-effect levels for these endpoints based on animal studies range from 130 pg/kg-day for reproductive effects in monkeys (Bowman et al., 1989) to 6,000 pg/kg-day based on immunologic changes in guinea pigs (Vos et al., 1973). Applying a conservative safety factor of 100 to these effect levels results in estimated ADIs for noncarcinogenic effects of TCDD ranging from 1.3 pg/kg-day to 60 pg/kg-day. Even assuming a conservative 100-fold safety factor, these values are 3-4 orders of magnitude greater than the USEPA's risk-specific dose of 0.006 pg/kg-day. Thus, the statement by Greenpeace that noncarcinogenic effects occur at levels 100 times lower than cancerous effects, and that the WHO TDI and U.S. risk-specific doses are not adequately protective of human health, appears to be scientifically unjustified.

MAKE INTO PLAIN ENGLISH (!)
AND ALSO HIGHLIGHT IN EXECUTIVE SUMMARY