Environmental and Human Health Impacts of Agent Orange Manufacturing on the Tittabawassee, Saginaw, and Kanawha Rivers in Eastern United States

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Introduction

A lesser-told story was the environmental and human health impacts on the communities and chemical plant workers who manufactured Agent Orange that was contaminated with dioxin TCDD in the manufacturing processes at two primary locations, Nitro, West Virginia and Midland, Michigan.

In the early 1960s utilizing the War Powers Act of 1950, President Kennedy and his administration decided to require 11 American chemical companies to manufacture, using a pre-determined formulation, tactical herbicides containing 2,4,5-T for the Vietnam War.



Figure 1. The North American locations of the eight Agent Orange chemical manufacturing plants, the primary Agent Blue chemical manufacturing site and the two Ports on the Gulf of Mexico where tactical herbicides were loaded on ocean-going ships.

Diamond Chemical Case Study outcome

Many of the 52,000 Vietnam Veterans were dissatisfied with the amount of the settlement ($3800.00/veteran or the family). The judge ruled the out-of-court settlement was fair. The funds were distributed by 1997.

The Agent Orange Product Liability Litigation (1979-1984) records retained by the New Jersey State Council, Vietnam Veterans of America, Inc were transferred in 1,000 legal boxes to the Vietnam Center and Archive (VNCA) at Texas Tech University (personal communication from Executive Director Stephen Maxner).

After the settlement, the US Government established an Endocrine Disruptor Screening Program to test industrial and agricultural chemicals for endocrine effects prior to marketing and use.

The goal was to prevent future unanticipated consequences of the use of new chemical or herbicide weapons.

These records are of immense importance to further understanding of how tactical herbicides, with dioxin TCDD and arsenic (Agent Blue), were manufactured and sprayed during the Vietnam War.

This specific collection is unique, as it represents the years of document and material collection in preparation for the landmark, “Agent Orange” legal action regarding its contaminant dioxin.

The primary objective of this article is:

The objective of this study is to document the environmental and human consequences of the manufacture of herbicides with dioxin TCDD on the chemical plant workers. These workers were exposed to dioxin TCDD during the chemical manufacturing process.

Case Study 1: Dow Chemical Plant at Midland, Michigan

The Dow Chemical 770 ha facility adjacent to the Tittabawassee River in Midland, Michigan began operating in 1897.

Dow Chemical Plant at Midland, Michigan

Past waste disposal practices at the Midland Chemical Plant have resulted in both on- and off-site contamination. Contamination has been exacerbated by flood events when contaminated sediment settled on the floodplains and created natural levees along some riverbanks.


Lake Michigan
Lake Huron
Saginaw Bay
Tittabawassee
Chippewa
Midland
Saginaw
Bay City
Saginaw
Pine
Cass
Flint
Flint
Shiawassee
Detroit



At least 21 residential properties along the Tittabawassee River floodplain have more than 250 ppt of dioxin in their soils.

Dow faced extensive lawsuits, including a case already settled for $77 million for natural resources restoration of areas contaminated by the Dow Chemical Plant.





Dow Chemical Plant at Midland, Michigan

Elevated dioxin levels downstream, in and along the river, have been primarily attributed to particles in liquid wastes that were historically discharged into the river from the Dow Chemical facility during the manufacturing of chlorine-based products in early 1900s. Dioxin attaches to eroded soil particles and sediment and was transported over 80 km downriver.



Case Study 2. Monsanto Chemical Plant at Nitro, West Virginia

Monsanto, one of the largest chemical manufacturers of Agent Orange, and other Chemical Companies, including Dow Chemical, discovered ways to manufacture Agent Orange faster and cheaper by raising the temperature 9 degrees F.
These Chemical Companies delayed telling the US Government and DOD about the manufacturing process modification and increased dioxin TCDD levels at the higher temperature.

Agent Orange Product Liability Litigation

The US military exposed thousands of US Vietnam veterans and millions of Vietnamese citizens to dioxin while both Monsanto and Dr. Kelly knew about the dangerous consequences of exposure to dioxin.

Monsanto's legal team claimed that Monsanto made improvements at the Nitro Chemical plant (in the 1950s) that reduced worker's exposure to explosion residues. However, the workers kept reporting health problems for the next 30 years and long after the 1949 Nitro explosion and subsequent cleanup.



Agent Orange Product Liability Litigation

In 1965, Dr. R. Emmet Kelly, a Monsanto medical doctor based in St. Louis, Missouri wrote that dioxin was “a potential contaminant” and very likely a potential carcinogen that could cause another epidemic. Four years later, the US State Department terminated its contracts with Monsanto’s Nitro Chemical Plant.

However, once the military officers were eventually told by the chemical companies about the “manufacturing process contamination problem”, the military was asked to decide which manufacturing process should be used in the future.

The US Military officers opted for the faster and cheaper manufactured product with higher levels of dioxin TCDD contamination.

The chemical plant workers and their families are continuing to live with the consequences of the early 1960s US government and military decision to use tactical herbicides during the Vietnam War. These workers were exposed to dioxin TCDD during the chemical manufacturing process.


MERCURY

By 1955, if not sooner, there is evidence that the United States government, military, chemical companies, including Monsanto and Dow Chemical, and their company medical doctors likely knew that tactical herbicides with 2,4,5-T were contaminated with unknown amounts of dioxin TCDD a known carcinogen.


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NO TRESPASSING
STOP

Historical supporting evidence includes 1949 Monsanto chemical plant explosion in Nitro, West Virginia which occurred while producing 2,4,5-T with unknown amounts of dioxin TCDD.

Unfortunately, Monsanto and their company doctors did not share their medical information and findings with their chemical plant workers, the media or the public.


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When a similar explosion occurred in 1953 at the BASF chemical plant in Europe, while producing 2,4,5-T, the company and their medical doctors, with the assistance of Dow Chemical were able to determine the cause of chemical plant workers chloracne and cancers as exposure to dioxin TCDD. By 1955, BASF made their finding available to their chemical plant workers, the media and the public.

Unfortunately, eight years later, in 1961. US government (President Kennedy and Johnson) and military ignored the findings that 2,4,5-T with unknown amounts of dioxin TCDD was a carcinogen.