US study establishes link between dioxin and cancer

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A recent study published in the journal of the US National Cancer institute provided conclusive evidence of the direct relationship between industry and the cancer-causing effects of the chemical dioxin. Generally ignored by the mainstream press, the study revealed that many thousands of workers in the US chemical industry died of all types of cancer-related illness as a result of exposure to the dioxin known as 2,3,7,8-tetrachorodibenzo-p-dioxin (TCDD).

Pooling data from more than 5,000 workers from 12 different factories across the United States, it found that workers with the highest dioxin exposure had a 60 percent higher risk of dying from cancer than the US national average.

Scientists also provided evidence demonstrating that TCDD's effects are magnified by the presence of other potentially harmful herbicide chemicals. Describing this process, one of the researchers said: “It is possible that other chemicals acted as confounders (exacerbating agents) and were responsible for the increases in cancer rates in this cohort (study group), given that workers in chemical plants can be exposed to a wide range of toxic substances.”

Conducted by the National Institute for Occupational Safety and Health (NIOSH), the study gathered data from 5,172 male workers from all 12 US plants that produced TCDD-contaminated products, including factories that made the wartime chemical Agent Orange, which was originally used as a herbicide. The presence of other chemicals contaminates the production process of phenoxy-acid herbicides such as Agent Orange, producing toxic by-products like TCDD. Workers are exposed to the harmful dioxin either directly or indirectly in the production process, or by industrial accidents.

Scientists were only able to gather usable records of exposure from 3,500 workers out of the 5,172. The team calculated the exposure of each worker to the chemical using a “job-exposure matrix”. This system assigns a quantitative exposure score to the individual, based on (1) the TCDD levels present in the particular process materials, (2) how long the worker worked on the specific process, and (3) an estimate made of how much TCDD was absorbed into the worker's skin.

NIOSH mentions that the aim of the study, originally laid out in 1978, was to identify exposed workers at all US chemical companies that had made TCDD-contaminated products between 1942 and 1984. Actual figures, collected over some six years, however, only began from the 1960s through to 1983. The cancer's effect is not immediately manifested so scientists assigned an approximate figure of 15 years to take into consideration the actual physical onset of cancer.

Using these parameters, workers were considered on the basis of those who had worked in any of the factories for periods of between six months to 20 years.

The men were divided into seven groups depending on their level of dioxin exposure. The findings showed that those in the highest dioxin exposure, the sixth and seventh group, had a 34 and 60 percent increased risk of dying of cancer, respectively. Workers in the highest bracket with a 60 percent higher mortality rate had exposure levels 100 to 1,000 times higher than the general public. The same men were also shown to be at an increased risk of dying from cardiovascular problems like heart disease.

It was also found that workers in the first five groups, the lower end of dioxin exposure level, whilst having a significantly lower risk of cancer mortality, was still higher than the rest of the US population. Furthermore, the figure across the seven exposure groups was an overall 13 percent higher risk of cancer mortality compared with the general public.

The study is the first to conclusively prove that TCDD exposure can cause all forms of cancer, and that the higher the level, the greater the risk of cancer. Furthermore, it used substantial data over a long period of time, and developed a method of correlating exposure level with cancer incidence.

It has long been argued that there is no direct evidence for this link. Epidemiological studies either lacked data or were inconclusive in terms of which specific cancers were caused. Previous studies seemed to suggest a relationship between

cancer death and TCDD exposure, but their findings were not as conclusive.

Prior to the US study, one of the most prominent TCDD investigations was into the 1976 industrial accident at Seveso near Milan in Italy. The accident found the highest concentrations of TCDD ever recorded in man. The ICMESA plant had an output of 143,000 kg per year at the time of the accident and was owned by the multinational company, Hoffman-La Roche, which made $18 billion last year. It manufactured the chemical 2,4,5-trichlorophenol, a byproduct of which is TCDD. The accident produced a visible chemical cloud, which deposited its toxic contents over several square kilometers of populated countryside. Many of the subsequent scientific investigations involved studying the considerable damage to the flora and fauna, as dioxin contamination in humans often takes place through the food chain.

In a 10-year mortality follow-up study into the Seveso incident, published in 1989, the results were not unlike those found in the current US investigation. Significantly, it also found that those in closest proximity to the accident had the highest contamination of TCDD. The vital statistics of over 30,000 people were studied, finding that there was an increased rate of death from cardiovascular causes, several cancers like biliary (liver-type amongst females), brain as well as lymphatic cancers (including leukaemias, Hodgkin's Disease and other blood diseases).

In another study in Hamburg, Germany, a herbicide-producing company, Boehringer Ingelheim, produced herbicide by-products like TCDD and other cancer-causing chemicals such as poly-chlorinated dioxins and furans. Mortality records were gathered from 1,189 workers who had worked at the plant for at least three months between 1952 and 1984. While some important findings were made of the relationship between cancer and exposure levels, scientists nonetheless concluded there was a need for further investigation.

Scientists confront significant complexities in conducting epidemiological-type studies, particularly those concerned with the link between chemicals and cancer-incidence. Scientists need to construct an effective method of analysing data, have large enough numbers for a proper study, as well as have access to consistent data. Technological and scientific advances have assisted recent scientific studies. But there are definite commercial and political pressures against conducting such studies or making any definitive findings.

A great deal is at stake for corporations involved in the manufacture of these chemicals. If a definitive scientific link is established between cancer and other diseases and exposure to TCDD, then major and costly modifications may be required to manufacturing practices and safety procedures, which will eat into profits. In addition, companies face the possibility of expensive compensation.

For instance, following a factory accident involving 247 BASF workers exposed to dioxin in 1952, most of the scientific studies were conducted by a team headed by the medical expert employed by BASF itself. The study predictably concluded that no proof existed of a relationship between dioxin exposure and cancer—thus exonerating BASF.

Robert N. Hoover, a representative from the National Cancer Institute, in an editorial on the latest findings, pointed to the continuing dispute over TCDD, saying: “Few chemicals have engendered as much public/political controversy as the dioxins, particularly 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).”

Hoover sought to downplay the significance of the study's results. He described the study as “a critical piece of evidence” showing that dioxin, at its present levels in the environment, appears to present no significant threat to general public health. “The good news is that the low levels of exposure (now in the environment) are not likely to contribute much disease.” Similar remarks were made by the study's co-author, Kyle Steenland, who said: “The finding is reassuring from a public health standpoint”.

In fact, the findings demonstrate that even at low exposures, there is an increased risk of cancer. In terms of a public risk, the evidence has neither proven nor refuted whether long-term low level exposure could have an effect on the public. The major finding is that chemical companies for at least 40 years have exposed thousands of workers to dangerous chemicals without adequate safety precautions.

All of the companies targetted by the study insisted that their names be kept out of the report. Nonetheless, a listing in the US Weed Science website gives an indication of which US plants were possibly involved. It includes the major international companies that have produced herbicide, and possibly TCDD, for at least 40 years. These are, with profits in billions for 1998 in brackets: Bayer (former Miles) (DM 54.9), Dow ($18), DuPont ($24.8), FMC ($4.4), Monsanto ($8), Novartis (FF 31.7), Rhone-Poulenc (FF 4.2), Rohm and Haas ($3.7) and Uniroyal ($1).