

ToxCat ^{SPECIAL}



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A Beginners Guide to: *DIOXIN*

PART 1

“The worst thing caused by dioxin is chloracne, a nasty skin complaint.”

Dame Barbara Clayton





Communities Against Toxics (CATs) is a network of long suffering citizens and communities in Great Britain and Ireland living with incinerators, waste treatment plants, toxic waste landfills, chemical installations and other unsafe, polluting industrial facilities.

Founded in 1990, CATs operates as a non-profit making, non-party political organisation dedicated to increasing public and political awareness on environmental issues and whenever possible strengthening democracy at a local level.

To help communities protect the environment from industrial pollution and political apathy, CATs endeavours to provide information and expertise at reasonable cost and whenever possible free of charge to members of the poorer sections of society and groups in country's with transitional economies.

CATs survives on membership subscriptions and donations from sympathetic Foundations and receives no financial support from government sources or industry. CATs members newsletter *ToxCat* is published every two months.

Other publications available to members and subscribers include:

ToxCat 'Beginners Guide' to *Incinerator Emissions & their known impact on human health.*

ToxCat 'Beginners Guide' to *Epidemiological Studies Around Incinerators*

ToxCat 'Beginners Guide' to *Endocrine Disrupters*

ToxCat 'Do You Want a Boy or a Girl?'

In the pipeline:

ToxCat 'Living with Incinerators' - Community Case Studies

If you are interested in sponsoring any publication or helping CATs get their web site back on line please contact:

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Front cover cartoon taken from Billee Shoecraft's 'Sue the Bastards' artist unknown

Introduction

One of the main areas of concern to communities living with existing incinerator facilities or facing a proposal for an energy from waste incinerator is the production and release of dioxin.

There are other highly toxic pollutants released in far greater amounts, but for decades most community concern has centered around dioxin. Supporters of incineration (pyromaniacs), welcomed this attention because dioxin affected different animals species in different ways. By withholding data, losing records and not publishing studies of dioxin-related birth defects and its impact on the human reproductive system, they created a cloud of uncertainty that enabled industry, regulatory bodies and pyromaniacs to claim dioxin didn't affect humans with anything other than 'a nasty skin complaint.'

They backed up this claim with a number of now proven fraudulent [industry-sponsored] studies diluting the toxicity of dioxin and its impact on human health.

The United States Environmental Agency (U.S.EPA), which spent billions of dollars trying unsuccessfully to establish a 'safe' level for dioxin, used this data to establish regulations on it.

The industrial and political position was such they felt comfortable spinning lies like "*Dioxin is breathed in and out straight away*" - "*Forest fires are a major source of dioxin*" - "*the worst thing caused by dioxin is chloracne, a nasty skin disease.*"

When it was hypothesized that dioxin acted like a hormone and was capable of disrupting the body's natural balance, industry came up with the line "*the body produces hormones naturally, so adjust itself.*"

Another claim, often quoted by inspectors conducting inquiries on energy from waste incinerators applications in the United Kingdom is "*there is more dioxin emitted by the fireworks on 5th November than by incinerators in hundreds of years.*"

Alan Watson of Public Interest Consultants pointed out many times this was completely wrong, one reason being (basically) because the study in question had not taken into account the emissions passing over Britain from other countries. Eventually the EA had to agree with this, but retaliated with; "*bonfires (rather than fireworks) emit more dioxin than incinerators.*"

One disturbing theme running through any dioxin story is the appalling manipulation of data to detoxify it by scientists, regulatory/public health officials and academics. People and organisations citizens are told are there to protect public health. The reality is however, these people have stopped at nothing in their attempts to protect the guilty industries, and even today with so much research revealing the intricate mechanisms by which dioxin disturbs and damages human health and development, pyromaniacs have as recently as three years ago proclaimed "*the worst thing dioxin causes is chloracne, a nasty skin complaint.*"

'Spin' like this is not confined to the distant shores of the USA, Vietnam or in the far forgotten past. British citizens can look to:

*The dioxin incident at the Coalite Chemicals plant in 1990 when the UK government detoxified dioxin with the stroke of a pen lifting the [unproven] 'safe level' from 1 pg/kg/bw a day to 10 pg/kg/bw a day;

*the deliberate omission of children under 10 years of age in health impact assessments of incinerator ash contaminated with heavy metals and dioxin levels as high as 9,500ng spread on food producing areas in and around Newcastle upon Tyne, England;

*the failure by 'experts' to bring to the attention of a House of Lords inquiry several peer-reviewed published studies showing increased ill-health among communities impacted directly by dioxin.

Despite these people, the bravery of victims like Billee Shoecraft, Bob McCray, Marilyn Leistner, Lois Gibbs, Carol von Strum, and the work of scientists like Pat Constner, Peter Montague, Paul Connett, Tom Webster, Barry Commoner, Richard Clapp and EPA's Linda Birnbaum, citizens are far more knowledgeable on the dioxin issue than they were 20 years ago.

Thanks must also go to the realms of in-depth information published by community interest organisations like Peter Montague's *Rachel's Environment Health News*, the Centre for Health and Environmental Justice, *Environmental Health News*, *Synthesis /Regeneration*, and of course *ToxCat*.

Citizens are now aware that dioxin is a potent accumulative carcinogen, an endocrine disrupting compound that because of industry's irresponsible attitude and slack regulations, can be found in breast milk and the tissues of new-born babies.

We know the United Nations Environment Program has acknowledged incineration to be responsible for 69% of the world's dioxin contamination; and we know that even the most modern incinerator emits this and hundreds of other other health-damaging compounds daily.

I hope this '*Beginner's Guide*' will give you a useful insight into the deceit surrounding dioxin, whether it be in the herbicides sprayed in Kellner Canyon; in waste oil on the roads of Times Beach; in cooking oil in Yusho; emitted by incinerators, or found in animal feed in Belgium.

I have lifted '*Mylece*' by Carol von Strum straight from the pages of Don Fitz's *Synthesis/Regeneration, Dioxin: The Orange Resource Book* (1996). I included this because it is short, to the point, and had a powerful impact on me when I read it.

Other stories bring examples of the appalling indifference exhibited by politicians and regulatory officials towards people's suffering after being exposed to what epidemiologist Richard Clapp has described as the "*Darth Vader of chemicals.*"

Ralph Ryder, Coordinator, CATs.

Multinational companies, aided and abetted by governments and politicians with vested interests in them have poisoned the earth and its species for decades. Despite the work of Rachel Carson and her warnings in *Silent Spring* 46 years ago, these people have recklessly continued damaging the ecology of the world and the health of an untold number of animal species and their future generations.

These companies have almost unlimited access to the media and massive resources enabling them to get their PR message across on (for example) incineration and Genetically Modified crops and food almost unrestricted.

Independent scientists and citizens aware of the damage industry is doing to the planet and its inhabitants have little political support, no money, and poor access to the media. Governments are very happy with this situation for economic and in many cases, self-interest reasons.

It is time for what honest politicians they are in government to wake up to the reality that scientific experts who receive funding and grants from industry cannot honestly be expected to be independent, reliable advisors on public health and safety issues. The amount of fraudulent studies and manipulation of data surrounding dioxin, cigarettes, nuclear accidents, GMOs etc., has shown that corruption within the scientific community is widespread on many issues and having devastating consequences.

We have already witnessed the corporate run World Trade Organisation using its power to further industry interests before public health in Canada. While within the food biotechnology industry we have a poorly researched technology being forced upon us by profit-driven companies with appalling track records dictating what seeds we can grow and consume.

When we consider the global ecological crisis and the present ability of science / industry to develop technologies with potentially profound, global impacts (i.e., incineration / Persistent Organic Pollutants, GMOs) without thorough and impartial scrutiny is seriously threatening the health of homo sapiens and many other species to reproduce.

The present system of governments using ‘selected’ scientific experts often not working in the field concerned because their views are in accord with the politicians wishes, must cease. The current lack of proper scientific rigor and transparency must be replaced by a system that ensures genuine, independent and impartial research.

Carefully established facts and the implementation of the precautionary principle have to be the basis for decisions and not the personal wishes of industry, politicians and their selected scientists.

“... dioxin emissions from an energy to waste plant operating to the new pollution control standards will not pose a risk to people living near the plant, irrespective of the location and size of the plant, the profile of the people concerned (*such as nursing children*) or other activities in the surrounding area...” *British Government*

...Dioxin is unsafe at any dose. The public has been lied to by an industry propaganda campaign and a handful of unscrupulous industrial scientists who have carried the industry’s message to the highest levels of government. They have spread false information about new scientific evidence that dioxin is safe at low levels in an effort to allow industry to carry on with business as usual. The industry campaign is proof of an old maxim; if you repeat a lie enough, people will start believing it...”

Ted Weiss, Chairman, Human Resources and Intergovernmental Subcommittee. Hearing on Health Risks of Dioxin, June 10 1992.

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CONTENTS

Page 7. General Information (Vietnam, Monsanto, Belgium Food Scandal, Yusho, Yu-Cheng etc).
Page 20. Kellner Canyon
Page 25. Times Beach
Page 31. Immunological Studies on 16 Times Beach Children

This *ToxCat* 'Special' has been published in two parts to enable activists and interested citizens with slow connections to download them. Page numbers have continued as if it were one publication.

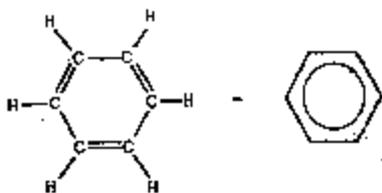
“There is no absolute knowledge. And those who claim it, whether they are scientists or dogmatists, open the door to tragedy. All information is imperfect. We have to treat it with humility”: J. Bronowski



What Are Dioxins?

Carbon exists both as an element (graphite and diamonds) and as a compound (bound with other elements). The study of compounds which include carbon abbreviated "C") is known as organic chemistry. Carbon binds with hydrogen (abbreviated "H") in thousands of ways, sometimes in long strings which form plastics. The 2.5 million carbon compounds are more than all other compounds combined.

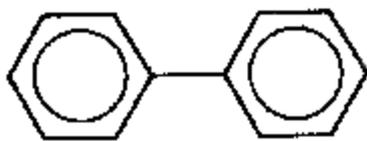
Compounds with carbon and hydrogen can also form rings. The most infamous carbon ring is benzene, which is a ring of six carbon atoms, each with a hydrogen atom on the outside. Benzene is so important to organic chemistry that it has its own symbol of a ring inside of a hexagon. In this drawing, single lines indicate a "bond" of atoms sharing an electron; double lines indicate the atoms share two electrons:



Benzene rings have two important properties:

1. Two or more benzene rings can themselves bind together; and,
2. Chlorine can replace hydrogen on the outside of the ring.

These principles explain the formation of the very toxic families of PCBs, furans and dioxins. A pair of benzene rings joined together forms biphenyl:

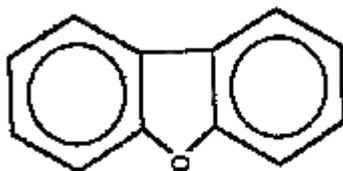


If chlorine is present when benzene is burned (and there is plenty of chlorine in plastics), hydrogen atoms can be released and chlorine

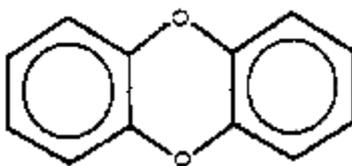
atoms can replace them. The result is poly-chlorinated biphenyls, known as PCBs. Their production was banned in the 1970's.

If oxygen (abbreviated "O") forms another link between the two benzene rings the result is furans.

If chlorine replaces hydrogen atoms, the furans are also very toxic:

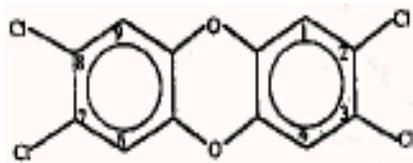


Sometimes benzene molecules bind together with two oxygen atoms with the resulting name of dioxin. Unlike furans, dioxin are symmetrical (the same at the top and bottom).



Since 2 oxygen atoms bind 2 benzene molecules, the chemical name is *dibenzo dioxin*. The abbreviation PCDD means polychlorinated dibenzo dioxin, which occurs when chlorine atoms replace hydrogen. Dioxins can have 1 to 8 chlorine atoms. The 75 different types of chlorinated dioxins result from the positions where chlorine atoms occur. This is so crucial in determining characteristics of the dioxin (such as how poisonous it is) that chemists use numbers to describe the positions of the chlorine atoms.

The most deadly form of dioxin has chlorine in the 2, 3, 7 and 8 positions:



Using the word tetra (for "four"), chemists named this molecule "2,3,7,8 tetra-chloro dibenzo dioxin," or 2,3,7,8 TCDD. The molecule is perfectly symmetrical.

The presence of chlorine makes dioxins extremely stable compounds. They do not break down as easily as enzymes do. The human body tends to store dioxin in adipose (fatty) tissue.

When people take in dioxin through food or air, it enters their cells where it fits into a protein called the Ah receptor.

Another protein (arnt protein) joins this combination and changes shape of the complex (dioxin + Ah receptor + arnt protein). This complex enters the nucleus and attaches to the DNA. It doesn't cause mutations, but it does switch on genes, resulting in the production of messenger RNAs, which then go to the ribosomes and produce new proteins in the cell.

In other words it functions like a fat soluble hormone.

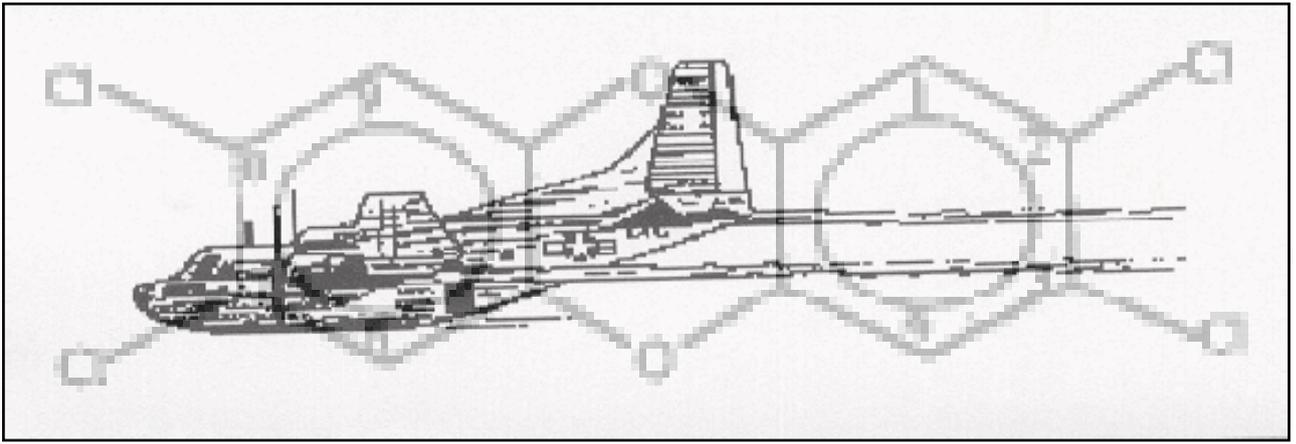
Dioxins produce different proteins, including enzymes and growth factors. Dioxins are known to disrupt at least six different hormonal systems: male and female sex hormones; thyroid hormones; insulin; gastrin and glucocorticoid.

Other dioxins and furans have many of the same effects as 2,3,7,8 TCDD, but are less deadly because they are less symmetrical and do not fit the Ah receptor as well.

The toxic equivalency (TE or TEQ) of an organochlorine is a measure of how toxic it is relative to 2,3,7,8 TCDD. An organochlorine with a TEQ of .05 is 5% as poisonous as 2,3,7,8 TCDD.

Sources: Dioxin the Orange Resource Book. Synthesis/Regeneration 7/8 summer 1995

Dr Paul Connett, Professor Emeritus of Chemistry, presentation, Haifa University, March, 2007



In 1959 Friedrich Hoffman, a chemicals warfare specialist and chief of the U.S. Chemicals Corp's Agent Research Branch at Edgewood Arsenal was sent to Europe to scout for potential warfare agents. In his report of the trip Dr. Hoffman noted that he had received "startling information about the toxicity of dioxin," including the fact that it had been linked to "severe and sometimes fatal liver damage."

Dr. Hoffman reportedly told the army that "dioxin was too deadly to be used for chemical warfare purposes."

Although the first recorded military use of herbicides took place in Malaysia in the 1950's with the British using 2-4-5-T to clear communication routes. The herbicides 2,4-D and 2,4,5-T were originally developed by E. J. Kraus of Chicago University, as part of the US military plan.

AGENT ORANGE (contaminated with Dioxin) and Agent White was authorized for use in Vietnam in November 1961, to improve road and waterway visibility and clear camp perimeters.

Later, Agent Blue was authorized to destroy crops and clear areas suspected of harboring enemy base camps or supply routes. The U.S. Air Force created the 309th Air Commando Squadron to conduct the spraying which was originally known as 'Hades,' but later became 'Operation Ranch Hand.'

In the spring of 1962 the South Vietnamese military conducted large-scale tests of herbicides along 70 miles of Highway 15. In the summer, further tests were conducted using 2-4-D at 1.5 gallons/acre and 2-4-5-T at 3.3 gallons/acre. The herbicides used were applied mostly by twin engine C-123 Provider Transports (Fairchild Hiller) equipped with an internal defoliant dispenser (Hayes International) with 36 high-pressure nozzles distributed on three booms.

Normal spray time was two minutes, but a full load could be dumped in just 30 seconds. Spraying missions usually consisted of three to five aircraft flying in a

staggered lateral formation. (Single plane runs were known as sorties.)

Helicopters, UH-1 Huey (Bell Aerospace), trucks, boats and hand spraying equipment was also used to dispense the herbicides.

Targets were selected by U.S. or Vietnamese officers, approved by provincial chiefs, the Vietnamese Army general staff, the U.S. Military Assistance Command, and the American Ambassador.

During this time, Air America also sprayed defoliants for the CIA in combat operations against Thai insurgents on the Isthmus of Kra.

The drift of herbicides involved in these operations was estimated at an average of 20%.

Agent Orange, the main herbicide dispensed in this period, was applied at up to 25 times the rate of use in the U.S. Entire tank loads were also jettisoned over one area.[1]

Adverse effects of the chemical 2-4-5-T and its chemical precursors on the workers engaged in their production had been observed as early as 1949.

At that time a Monsanto-owned plant manufacturing 2-4-5-T in Nitro, West Virginia, had an explosion. Two hundred and twenty eight workers developed chloracne.

Chloracne symptoms include skin eruptions on the face, neck, and back, shortness of breath, intolerance to cold, palpable and tender liver, a loss of sensation in the extremities, damage to peripheral nerves, fatigue, nervousness, irritability, insomnia, loss of libido and verti-

***The term "dioxin" is used to connote the group of 210 similar substances - polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-furans.**

Photo credits unknown



Chloracne is not a simple 'skin disease' or 'rash' as advocates of incineration and industrialists claim. It is a disfiguring, systemic disease that can last for decades and even recur more than twenty years after exposure. It is not necessarily caused by exposure to high amounts of dioxin as some sufferers simply handled or brushed against workers overalls contaminated with 'trace' quantities

go. Chloracne was also found in 1953 among the male workers and many of their wives, children and pets at a BASF (Badischer Anilin & Soda Fabrik)-owned 2-4-5-T plant at Ludwigshafen am Rhein in Germany.

The factory experienced an explosion months after the appearance of chloracne among the workers. In medical examinations following the explosion, some workers were found to have severely damaged internal organs including the liver. Heightened blood pressure, myocardial degeneration, severe depression, memory and concentration disturbances were also observed. Fifteen years later some of these workers were still suffering from chloracne and its symptoms despite treatment and no subsequent exposure. One death from intestinal sarcoma was attributed to the explosion.

In 1963 an explosion occurred in a 2-4-5-T factory owned by Philips Duphar in Amsterdam, Holland. Fifty workers developed chloracne and suffered internal damage and serious psychological disturbances as a result. The factory was closed.

In 1973 the plant was still so contaminated with dioxin that it had to be dismantled, embedded in concrete and buried at sea.

Dow Chemical, the largest producer of Agent Orange in the U.S. experienced an outbreak of chloracne among its workers in 1964 in one of their 2-4-5-T manufacturing plants. Over 70 workers were affected, 12 of them severely. Dow's director of its Midland Division, Dr. Benjamin Holder, described the symptoms as fatigue, lassitude, depression, blackheads (prevalent on the face, neck, and back), and weight loss.

"Heavy exposure," Dr. Holder said, "could lead to internal organ damage and nervous system disorders."

In 1970, Julius F. Johnson, Director of Research and Development, appearing before the Hart Sub-Committee of the U.S. Congress, described chloracne as "a skin disorder mostly prevalent of the face, neck, and back. It is

similar in experience to severe acne of the kind suffered by teenagers".

Dow ran its own study of the effects of Orange using 220 workers and 4,600 controls. The range of exposure to 2-4-0 was 30-40/mg/do. Ten of the men were karyotyped, and no rearrangement of genetic material was reported.

The 220 men were exposed to 2-8/mg/do of 2-4-5-T. Fifty two men were karyotyped negatively. No difference between the study group and the control group was reported.

Dow's testing indicated that a contaminant of 2-4-5-T (Dioxin) was responsible for the chloracne and illness experienced by its workers.

They conducted tests utilizing animals on 2-4-5-T with varying amounts of 2-3-7-8-Tetrachlorodibenzo-p-dioxin.

The chemical was shown to be toxic and fatal to the animals. Cleft palates were observed in further tests. The results were not repeated with 2-4-5-T without the contaminant.

Dioxin was found to be one of the most toxic substances known, a fatal dose being 0.022-0.045 in rats and 0.0006 in guinea pigs, LD-50 as milligrams per body weight.

Between 1965 and 1969 a 2-4-5-T production plant near Prague, Czech Republic, developed leaks in its processing area. Workers developed chloracne and exhibited weight loss, libido diminution and insomnia.

Maximum symptoms were observed about one to two years after the initial exposure, but lasted over eight years in some of the exposed workers.

Several workers died of severe liver damage, and workers' families also became sick. Contaminated equipment was buried in a mine shaft.

Other studies of workers exposed to 2-4-D and 2-4-5-T conducted showed exposed workers exhibiting symptoms including fatigue, headaches, loss of appetite, stomach and kidney pain, upper respiratory distress, decreased



hearing, smell and neurological responses, high serum albumin values, skin and eye irritations and concentrated TCDD (dioxin) levels in body fat and liver tissue. Festisov (1966) Long (1969) Poland (1971) Sundell (1972) Piper

Sordid History

The extent the industry has gone to cover-up the toxicity of dioxin is a truly sordid affair involving industrialists, scientists, academics and high ranking health, regulatory and government officials.

As early as 1964, while the spraying was increasing in Vietnam, reports circulated of increased miscarriages, stillbirths, and birth defects among exposed Vietnamese women and animals. Because of the war conditions collecting data to corroborate this was difficult.

Records from 1970 for Saigon's leading maternity hospital showed a monthly average of 140 miscarriages and 150 premature births in 2,800 pregnancies, but the hospital would not disclose whether or not this was an increase.

In 1966 the U.S. government started studies on the teratogenic effects of 2-4-5-T. These studies were conducted by Bionetics Research Laboratories of Bethesda, Maryland, for the National Cancer Institute.

The findings were released in 1969. Rats and mice used in the study were given 21.5 mg/kg doses of 2-4-5-T during early gestation. Almost all the offspring were born dead or with cleft palates, no eyes, cystic kidneys and enlarged livers. At 4.6 mg/kg, 39% of the offspring were born deformed. Based on these findings Dr. Lee Du Bridge, Presidential Advisor, said that the use of the chemical in populated areas and on food crops should be restricted.[1]

Dow objected to the findings saying the sample of the 2-4-5-T was used unrepresentatively because of an abnormally high amount of TCDD (Dioxin).

Dr. Jackie Verett (FDA Toxicology Lab, Washington, D.C.,) Dr. Matthew Meselson (Harvard, the National Institute) used a .50 parts per million (ppm) dioxin solution obtained from chemicals used in Vietnam in chicks. She found resultant cysts, necrotic livers, slipped tendons, cleft palates and beak deformities. She then used a .25 parts per trillion solution and observed the same effects.

Further tests of 2-4-D and 2-4-5-T without dioxin still produced dead and deformed offspring.

English tests had demonstrated Agent Orange contained as many as 17 or more contaminants and autopsies of 600 reindeer in northern Sweden which had consumed foliage sprayed with Agent Orange showed a significant residue of the herbicide in the kidneys and liver of the deceased animals.

The Piper Study in 1973 showed dioxin concentration in the liver and body fat of exposed workers up to ten times the normal concentration.

In 1973 Matthew Meselson and Dr. Robert Boughman refined an analytical system for detecting the presence of dioxin in parts per trillion instead of pp billion. Using their system, they found

(1973). [1]

Further tests showed TCDD to be an extremely toxic agent with a slow effect rate and diverse symptomatology including edema, necrotic changes of the liver, gastric hyperplasia and ulceration, hemorrhage of gastrointestinal tract and other organs, atrophy of the kidneys, thymus and other lymphoid organs and tissues. Later, symptoms appear to lead to decreased immune responses.

Dioxin is thought to be at least partially responsible for a multitude of health problems. These include the current increase of male reproductive tract disorders such as testicular cancer, cryptorchidism, and hypospadias.

Researchers say dioxins can cause harm, even at low levels. But debate continues over exactly what concentration in the body causes problems.

We know that dioxin is considered so toxic that when they were measured in the soil at Times Beach, Mo., in the early 1980's, the federal government spent \$30 million relocating the towns 2,000 plus residents.

"They are so dangerous," said Dr. Nachman Brautbar, a medical toxicologist at the University of Southern California's School of Medicine.

There is however an army of industrialists and incinerator supporters (pyromaniacs) who have been claiming for decades that the worst thing caused by dioxin is "a nasty skin complaint..." and "this is only after high exposure."

In reality this claim is nothing more than an outrageous industry scripted line to protect its profit margins and allow 'business as usual.'

The liver is a target organ as it breaks down chemical contaminants in the blood. Anything you eat or inhale goes through the liver and if a chemical is going to be metabolised it will probably be in the liver.

dioxin residues in Vietnamese crustaceans, indicating that dioxin had entered the food chain as a result of earlier 2-4-5-T use.

Dow's scientists continued to maintain that 2-4-5-T, when used as directed, presented inconsequential hazards to the environment, animals and man.

While chloracne is widely accepted as the most obvious external symptom of high dioxin exposure, many scientists believed this has been over-emphasised to the exclusion of other, more serious conditions. When pyromaniacs claim "no-one ever died from dioxin" and the worst thing it causes is "chloracne, a nasty skin complaint" they should be asked if this was really true why did the U.S. government buy out all the homes at Times Beach, and why did so many countries take drastic action when polychlorinated biphenyl (PCBs) and dioxins were found in food products in Belgium in 1999.

The Belgium scandal occurred after 500 tonnes of animal feed was contaminated with approximately 50 kg of polychlorinated biphenyls and 1 gram of dioxins. The feed was then distributed to animal farms in Belgium and to a lesser extent the Netherlands, France and Germany.

The discovery of the contamination resulted in a number of European countries, along with Russia, Hong Kong and Israel, imposing restrictions on the farm produce of Belgium.

The USA went even further banning all farm produce from the whole of the European Union.

The trouble began when a company that collects oil from fast-food chains (which it pays a fee for) and recycles it into animal feed, decided to collect some oil it didn't have to pay for.

The problem was that about 8 liters of this oil had been taken from an electric transformer containing polychlorobiphenyls (PCBs, most likely Arochlor 1260) and dioxins. This was then put into a 80,000 kg batch of animal fat which was mixed with 1.4 million kg of animal feed, a common 'recovery' practice in the United States and Europe.

The PCBs had been heated to a high temperature converting 50 to 80 mg to dioxins and furans. An estimated 2 billion picograms of dioxin toxic equivalents (TEQ) entered the food chain through chicken, dairy and pig farms.[2]

European Commission investigators described the levels found at the first farm they visited as 'astronomical', and that 'the chickens were practically eating pure dioxin.'

Test data revealed 958 parts per trillion (ppt) of dioxin (TEQ) in the fat of one chicken, and 775 ppt in the fat of another. The allowable limit for dioxin in chicken in Belgium is 5 ppt (TEQ)

Over 17% of the Belgian beef farms were affected and nearly half of the country's chicken farms. Products with excessive levels were destroyed, including some chickens.

At the Dutch State Institute for Quality Control of Agricultural Products where tests were carried out, spokesman Wim Traag said the number of people affected depends on how many animals ate the poison and passed it on in meat or eggs.

"Either a few people got a large dose or many people got a small dose" he said.

It was estimated that between 10 and 15 kg of PCBs and from 200 to 300 mg dioxins were ingested to maximally 10 million Belgians.[2]

As has been the case on numerous occasions with dioxin, deceit and a cover-up by officials and politicians played a large part in the spread of the contamination throughout the European Union (EU) member states.

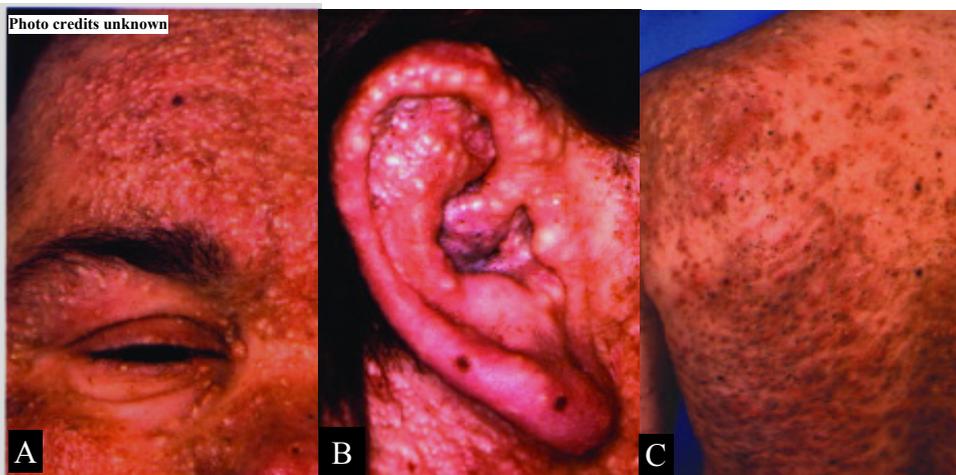
It was discovered the Belgian chickens were showing signs of illness as early as January (1999) but it was April before the Belgian government admitted it was aware of the problem and put restrictions on some farms.

Even then, it waited until the end of May before issuing a public statement, a delay that allowed large quantities of meat and other dairy produce to be exported to other member states. The duration of the exposure to the population can be estimated as 4 months (February to May).

Unfortunately, as most of the contaminated produce were perishable, it's almost certain the bulk of it had already been consumed by the time the Belgian authorities condescended to tell the rest of the world of the problem.

Dioxin Chemistry

It was during the 1930's and 40's that chemists discovered that by attaching



Lackmann, G.-M., Schaller, K.-H., Angerer, J., 2004. **Organochlorine compounds in breast-fed vs. bottle-fed infants: preliminary results at six weeks of age.** *Science Total Environ.*

Abstract - Background:

Polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), and 1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane (DDT) are ubiquitous compounds with carcinogenic and teratogenic properties. They are chemically very stable and lipophilic and, therefore, accumulate in our food-chain. They are prenatally transmitted from mother to foetus, and mother's milk due to its high lipid content is an elimination pathway of special importance. Therefore, breast-feeding has been held responsible for elevated concentrations of these organochlorine compounds as well as for harmful effects in children later in life. Methods: Blood samples (2..5 ml) were taken from each 10 breast-fed and bottle-fed infants at 6 weeks of age. Blood specimens were immediately centrifuged, and serum was stored in glass tubes at -20 oC until analysis. Three higher chlorinated PCB congeners (IUPAC nos.138, 153 and 180), HCB, and the organic metabolite of DDT, p,p'-DDE, were analysed with capillary gas chromatography with electron capture detection. Reliability was tested with gas chromatography-mass spectrometry. Results: There were no differences between the study groups of breast-fed and bottle-fed infants with regard to sex distribution, gestational age, birth weight, age of the mothers, and smoking behaviour of the parents. In contrast, serum concentrations of all organochlorine compounds were significantly higher (P<0.0001) in breast-fed than in bottle-fed infants (mean): PCB 138, 0.38 vs. 0.10 mg/l; PCB 153, 0.49 vs. 0.1 mg/l; PCB 180, 0.31 vs. 0.04 mg/l; SPCB, 1.19 vs. 0.29 mg/l; HCB, 0.13 vs. 0.04 mg/l; p,p'-DDE, 1.05 vs. 0.18 mg/l. Conclusions: Breast-feeding significantly increases the pollution of our infants with different organochlorine compounds as early as at 6 weeks of age. The progress of the present study will show whether this pollution will further increase with longer duration of breast-feeding, and whether breast-feeding bears any health risks for our offspring.

“The actual mean daily exposure of a breast fed infant can be estimated to 131 pg WHO-TEq/kg body weight.” [This can be compared to the World Health Organization's recommended tolerable daily intake of 1-4 pg TEQ/kg body weight per day.] “As indicated in other studies, previously observed continuous decrease of human PCDD/F and PCB levels might now have stopped.”

Wittsiepe *et al.*, 2007. PCDD/F and dioxin-like PCB in human blood and milk from German mothers. *Chemosphere*. In Press. doi:10.1016/j.chemosphere.2006.05.118

Abstract

Blood samples of pregnant women aged between 19 and 42 years at the time they gave birth and milk samples from the same women following delivery were collected between September 2000 and January 2003 from 169 participants living in an industrialized area of Germany (Duisburg birth cohort study). All samples were analyzed for their content of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F) as well as dioxin-like and indicator polychlorinated biphenyls (PCB).

Levels of WHO-TEQ were in the range of 4.34-97.3 pg/glipid base (median: 26.37, arithmetic mean: 28.36) for blood, or 3.01-78.7 pg/glipid base (median: 26.40, arithmetic mean: 27.27) for milk, respectively. The four congeners 12378-PeCDD, 23478-PeCDF, 3304405-PeCB (# 126) and 23304405-HxCB (# 156) contribute the main share to total WHO-TEQ. The contribution of PCDD/F in relation to PCB to total WHO-TEQ was 60:40% in blood and 52:48% in milk. Good correlations of the contaminant levels in lipid base between both matrices were found. The distribution between blood and milk depends on the molecular weight of the substances. Higher chlorinated PCDD/F- and PCB-congeners were found in 2-4-fold higher concentrations in blood in relation to milk and the concentrations of lower chlorinated PCB-congeners were up to 2-fold higher in milk in relation to blood. The body burden of PCDD/F and PCB increases with age and decreases over the total nursing period. Women who had lived outside highly industrialized countries showed lower concentrations of PCDD/F and PCB. In some cases, elevated levels of PCB were observed when the women had previously lived in Eastern Europe for a long time. In comparison with recent data, the decline in human PCDD/F and PCB levels observed during the nineties seems to have stopped. The individual exposures of the infants due to breastfeeding within the first 18 months were calculated to be from 4.4 to 318 ng WHO-TEq (median: 106, arithmetic mean: 118).

The actual mean daily exposure of a breastfed infant can be estimated to 131 pg WHO-TEq/kg body weight.

....[from general text]

... As indicated in other studies, previously observed continuous decrease of human PCDD/F and PCB levels might now have stopped.

The still high PCDD/F and PCB exposure of newborn children via human milk and the now observed steady state in human levels indicate that efforts to reduce human exposure to PCDD/F and PCB should be continued.



chlorine atoms onto petroleum hydrocarbons they produced a vast array of 'chlorinated hydrocarbons.' These gave rise to many of today's pesticides, solvents, plastics etc.

Research has shown dioxin to be a very potent carcinogen that in just minuscule amounts poses a threat to the human immune, thyroid, and reproductive systems. Especially those of the developing foetus and breast fed child.

Yusho

There have been two previous dioxin contamination incidents similar to that which occurred in Belgium. One in Yusho, Japan, (1968) saw a serious mass intoxication of 1,700 people after they had consumed rice contaminated with PCBs from a leaking oil coil. Heating (in this case by cooking) of the contaminated oil produced high levels of dioxin and 20 people died as a result. Symptoms included chloracne, melanosis, edema of the eyes, swelling and stiffening of the limbs, headaches and hearing difficulties.[3]

Children subsequently born to exposed parents had malformations of various kinds. Some were born with abnormal fingernails, were undersized with small heads and brown, hyperpigmented skin and mucous membranes (dubbed "cola babies").

They had abnormal shaped tooth roots and altered eruption of permanent teeth. They grew and developed slowly, had learning difficulties, speech problems and emotional and pulmonary (lung) problems.

Long-term studies identified a high incident of malignant neoplasms (primary liver as well as lung, trachea and bronchus) and significantly increased liver and lung cancer. They also revealed a slight increase in diabetes, heart disease, chronic liver disease and cirrhosis.[4][5][6]

Yu-Cheng

The second incident occurred in 1979 in Yu-Cheng, Taiwan. This was a repeat of the Yusho PCB-rice oil disaster with more than 2,000 identified victims.

Children exposed in the womb developed slowly and are still retarded. When they were first born they were reported to have what was called ectodermal dysplasia syndrome, which included all sort of pigmentation problems. They had brown skin, chloracne, teeth and pulmonary problems and extensive stimulation of P450s.[4][6][7]

They also have elevated incidences of respiratory

infections and otitis, ear infections, and a very decreased rate of 'take' of vaccinations. All of which would be at least compatible with the effects on the immune system.

Asked in 1993 if there was any indication that dioxins were implicated in neurobehavioural effects in the Yu-Cheng study Dr. Linda Birnbaum, Director of the Environmental Toxicology Division of the United States Environmental Protection Agency (U.S.EPA) replied:

"Yes there is, we know for certain PCBs, like some of the non-dioxin-like PCBs, are developmentally neurotoxicity. Clearly, the sexual behaviour effects are neurotoxic effects, but they were induced developmentally."

Dr. Birnbaum also said: "...[the children] were small in stature. When they did development milestones, these kids were developmentally delayed. They have continued to follow these kids. Their IQ is shifted about five points down from the rest of the population, and this has been maintained as they have grown up. It is not something they have outgrown. The children continue to be shorter in stature than matched controls and as the boys approach puberty, and some of them are now between the ages of 8-13, the ones who are 10, 11, 12 and 13 are apparently having problems with their genitalia. This is very new data, ...but it is very compatible with the data that we are seeing in the experiments."[8]

An increase in foetal mortality was recorded among women who were pregnant at the time of eating the rice.[9]

Despite the fact that:

*children born to women who were pregnant at the time of the poisoning incident demonstrated Intrauterine Growth Retardation (IUGR);



Photo credit unknown

*monitoring by various intelligence tests each year from 18 months to 7 years of age, showed their scores during these tests were consistently and significantly lower at each age level compared with an unexposed group of children (with their performances on standardised intelligence tests averaging an IQ of about 70);

*the contaminated mothers were still giving rise to affected babies six years after ingestion of the affected oil.

*pyromaniacs are still saying that a 'nasty skin disease is the worst thing caused by dioxin.' Disturbingly and despite the mountain of epidemiological evidence to the contrary, some journalists and politicians are carrying this message forward as fact.

Lies

One would assume, given the publicity and headlines dioxin has been given since the Vietnam War politicians, academics and those pushing for the expansion of incineration must be fully aware that the 'chloracne, a nasty skin disease' claim stems from fraudulent, industry conducted studies of incidents involving chemical workers?

As is often the case when a regulatory body liaisons with industry, the officials of the U.S.EPA took this data, (now proven to be fraudulent), and used it to assess the affects of dioxin on human health.

Re-examination of the studies by independent scientists, sometimes working on behalf of workers compensation claims, found a number had been falsified with non-exposed personnel being included in exposed groups in order to reduce the number of increases in diseases like cancer among the exposed workers. [10][11][12]

Dermatitis

As I wrote earlier, the history of dioxin and its impact on human health is really sordid. So let us go back to the year 1936 when several hundred lumber workers in Mississippi began developing severe 'skin rashes.'

Dr. Karl O. Stingily a physician, treated the first of three or four hundred cases of this new 'industrial chemical dermatitis' and wrote in the *Southern Medical Journal* in 1940 describing the 'peculiar type of pustular and ulcerative lesions' that affected the predominately Negro lumber workers.

In the same journal there was also a report from an Alabama physician of a worker with acne and blackheads covering his face. The man had brought along to the surgery his two children, a girl of five and a three year old boy who also had blackheads [the chloracne trademark] "all over their faces."

The worker explained that when he came home from work his children would grab him around the legs hugging him and he'd take them up onto his lap. It was through this loving action they came into contact with the traces of chemicals on his overalls. [13]

The same year two Atlanta physicians published a case history in the Archives of Dermatology and Syphology, about a Monsanto worker described simply as: "O. D., a Negro aged 26."

They reported that the patient had a severe case of chloracne and observed that as early as December 1933, O. D.. had "complained of lassitude, loss of appetite and loss of libido."

Some sense of the authors' ability to appreciate the significance of these symptoms, (later to be characteristic of dioxin poisoning,) can be gained from their additional comment:

Dioxin in breast milk	Year: Country: WHO TEQ mean (pg/g fat)	2002 Spain 13.5	2002 Australia 5.6
1992 Belgium 40.7	1987 Yugoslavia 13.3	2002 Italy 12.4	1992 Albania 4.8 *
2002 Egypt 26.4	2002 Germany 12.1	2002 Austria 12.0 *	2002 Brazil 4.1
1993 United Kingdom 26.3	1992 Romania 9.7	2002 Sweden 9.6	1994 China 3.1
1986 Poland 25.8	2002 Ukraine 9.5	2002 Finland 9.4	* TEQ: I-TEF Dioxin
1990 France 23.4	2002 Russia 9.4	2002 Slovak 8.9	Sources:
1996 Kazakhstan 22.6	2002 Czech Republic 8.6	2002 Norway 7.3	All 2002 information comes from
1995 Japan 21.8	2002 Ireland 7.2	2002 India 7.2	"Results of The Third Round of
1988 USSR 20.0	2002 Hungary 6.8	2002 New Zealand 6.6	The WHO-Coordinated Exposure Study On
2002 Netherlands 18.9	2002 Croatia 6.4	2002 Thailand 6.2	The Levels Of PCBs, PCDDs And PCDFs In
1990 United States 18.8	2002 Bulgaria 6.1		Human Milk" by FX Rolaf van Leeuwen
1991 Vietnam 18.1			and Rainer Malisch.
1990 Pakistan 17.7			Information for all other dates is taken from -
1990 South Africa 15.5			Infant Exposure to Chemicals in Breast
1992 Denmark 15.2 *			Milk in the United States: What We Need to
1993 Lithuania 15.1			Learn From a Breast Milk Monitoring Program
1992 Canada 14.6 *			by Judy S. LaKind, Cheston M. Berlin, and
			Daniel Q. Naiman. Published in
			<i>Environmental Health Perspectives</i>
			VOLUME 109 - NUMBER 1- January 2001.

“His complaint of lassitude was not borne out by anything more than the usual temperament of the Negro toward work.”^[14]

Lesions

In 1937 twenty one workers who had handled powdered chlorophenol products at Dow’s Midland plant developed “acne like eruptions.” Some of the blackheads were so severe they produced a black discoloration beginning behind the ears and spreading over the whole face and the back of the neck. Some men had lesions on the arms, buttocks, abdomen, thighs, penis and scrotum. Fifteen months later not one had completely recovered and many had severe scarring, weight loss, and complained of being easily fatigued.

Starve the Enemy

During the 2nd World War the American military began working on ideas to starve the enemy into surrender. After testing nearly 1,100 substances they knew that a strong dose of the phenoxy compounds 2,4-dichlorophenoxyacetic (2,4-D) and 2,4,5-trichlorophenoxyacetic (2,4,5-T) was effective in killing rice indoors. (A 50/50 mixture of these chemicals was later named Agent Orange.)

They began testing chemicals in the field and calculated that 20,000 tons of 2,4-D could destroy the entire Japanese rice crop. They were planning an attack on the Japanese mainland when the war ended.

In West Germany within five months of starting experiments with 2,4,5-trichlorophenol 17 workers developed chloracne. Eleven developed bronchitis, five suffered damage to the muscular layer of the heart

Agent Blue: Acute poisoning by cacodylic acid can cause headaches, vomiting, diarrhoea, dizziness, convulsions, general paralysis, and death. Symptoms can be brought on by an ounce of cacodylic acid.

wall, two had liver cirrhosis (one fatal) and nine had symptoms of neuritis, most of them involving severe pains in the lower limbs. Seven suffered various complaints including constant fatigue, depression, lack of vitality, nervousness, slight headaches, disturbed sleep and decreased libido and potency.

This provided even more evidence that chloracne is not simply a “nasty skin complaint”, but a serious disfiguring, systemic disease that can last for four decades and even recur more than 20 years after exposure.

U.S.A.

In the United States an accident at Monsanto’s Nitro plant in West Virginia in 1949 left 228 workers, laboratory, medical staff and several of the workers wives who had never visited the plant, with chloracne.

One worker, a white man, developed chloracne so severely he gave up all social and athletic functions remaining in his house for months on end.

Several times he was mistaken for a Negro and was forced to conform to the racial segregation customs of the area.^[15]

Manipulated Studies

Zack and Gaffey, two Monsanto employees, published a mortality study purporting to compare the cancer death rate amongst the Nitro workers who were exposed to dioxin in the 1949 explosion, with the cancer death rate of unexposed workers.

The published study concluded that the death rate of the exposed worker was exactly the same as the death rate as the unexposed group.

This was a result of Zack and Gaffey deliberately and knowingly omitting five deaths from the exposed group and

The Fifteen Herbicides Used in Vietnam

PURPLE: A formulation of 2,4,-D and 2,4,5,-T used between 1962 and 1964.

GREEN: Contained 2,4,5-T and was used 1962- 1964.

PINK: Contained 2,4,5-T and was used 1962- 1964.

ORANGE: A formulation of 2,4,-D and 2,4,5-T used between 1965 and 1970.

WHITE: A formulation of Picloram and 2,4,-D.

BLUE: Contained cacodylic acid.

ORANGE II: A formulation of 2,4,-D and 2,4,5-T used in 1968 and 1969 (also sometimes referred to as “Super Orange”)

DINOXOL: A formulation of 2,4,-D and 2,4,,5-T. Small quantities were tested in Vietnam between 1962 and 1964.

TRINOXOL: Contained 2,4,5-T. Small quantities tested in Vietnam 1962-1964.

BROMACIL

DIQUAT:

TANDEX:

MONURON:

DIURON:

DALAPON:

Small quantities of all of the above were tested in Vietnam, 1962-1964.

Agent Orange was a mixture of fifty fifty 2,4-D and 2,4,5-T containing up to 30 mg/kg or more of 2,3,7,8-Tetrachlorodibenzo-para-dioxin (TCDD) an inevitable by-product of the manufacturing process. This was sprayed undiluted using 3 gallons per acre in lines about 240 feet wide. Roughly 17.7 million gallons of herbicides were used between 1960 and 1971 with 12.8 million gallons being Agent Orange which Dow sold to the government at \$7 a gallon.

taking four 'exposed' workers and putting these in the 'unexposed' group.

This decreased the death rate in the exposed group and increased that in the unexposed group. The exposed group had in fact 18 cancer deaths instead of the reported 9 (P 1. Ex. 1464), with the result that the death rate in the exposed group was 65% higher than expected.^[16]

BASF

At the Badischer Anilin & SodaFabrik (BASF) West German plant, a chamber containing 2,4,5-trichlorophenol was overheating for months. As a result 60 workers developed chloracne, as did some of their wives, children and even their household pets.

When the chamber eventually exploded it caused a wide range of illnesses including swelling of the skin, excessive hair growth, pulmonary emphysema, kidney damage, muscular disturbances and breaks in memory and concentration.

The Germans would not provide exact figures, but reported:

- * Several workers died as a result of liver damage and one from intestinal cancer.

- * Two men had persistent chloracne 23 years after the accident.

- * One had paralysis of the left leg,

- * Another was permanently deaf.

In 1982 Alistair Hay (Leeds University) published an account of the accident and recorded that 17 workers had died, six from cancer, "four of which involved the gastrointestinal tract."

In 1958 a worker was assigned work on or near the reactor that was involved in the 1953 explosion. The reactor had not been used since the explosion, and the worker used protective clothing which included a face mask. He removed the mask several times during the work. Four days later he was suffering from headaches and had developed hearing loss and chloracne. Within six months he developed pancreatitis and a painful upper abdominal tumor. He died three months later.

A post-mortem revealed intestinal ulceration and degeneration of liver and fatty tissue.

Another worker at the same plant spent two hours working on the reactor wall in 1958. He developed a severe case of chloracne. One year later a large x-ray opaque area appeared on one of his lungs. Five years after the initial exposure, the worker suffered acute psychosis and committed suicide.

Rabbit Testing

Tests on rabbits by German scientists in 1953 revealed a single feeding of 0.1 milligram of dioxin per kilogram of the rabbit's weight killed it.

Chemists discovered that any animal put into cages that had housed animals treated with dioxin (and conse-

quently developed liver problems) also developed liver damage, as did any animal living in the cages next to those housing the dioxin treated animals.

Around this time workers in CH Boehringer Sohn trichlorophenol plants in Ingelheim and Hamburg developed chloracne.

The scientist who had worked on the rabbits, Dr. Schulz, examined the workers who complained of headaches, giddiness, a loss of appetite, and having lost all interest in sex.

Most of these workers had abdominal trouble. Biopsies revealed three had liver damage. All suffered distinctive mental and behavioural changes during the years after being exposed. Most experienced sleep disturbances, reduced memory and perception. Psychological tests showed a decrease in mental capacity.

In 1963 an explosion occurred in a 2-4-5-T factory owned by Philips Duphar in Amsterdam, Holland. Fifty workers developed chloracne and suffered internal damage and serious psychological disturbances as a result.

When workers tried to decontaminate the plant six months later all but one wore deep-sea diving suits and industrial face masks. Nine men contracted chloracne, and three of them died within the next two years. The worker who was not as well protected was still being treated in thirteen years later for severe effects and was unable to work.

In 1973 the plant was still so contaminated with dioxin that it had to be dismantled, embedded in concrete, and buried at sea.

Between 1965 and 1969 a 2-4-5-T production plant near Prague, Czech Republic, developed leaks in its processing area. Workers developed Chloracne and exhibited weight loss, libido diminution and insomnia. Maximum symptoms were observed about one to two years after the initial exposure, but lasted over eight years in some of the exposed workers. Several workers died of severe liver damage, and workers' families also became sick.

Contaminated equipment was buried in a mine shaft.

Other studies of workers exposed to 2-4-D and 2-4-5-T were conducted by Festisov (1966), Long (1969), Poland (1971), Sundell (1972) and Piper (1973). These studies showed exposed workers exhibiting symptoms including fatigue, headaches, loss of appetite, stomach and kidney pain, upper respiratory distress, decreased hearing, smell and neurological responses, high serum albumin values, skin and eye irritations and concentrated TCDD levels in body fat and liver tissue... Further tests showed dioxin to be an extremely toxic agent with a slow effect rate and diverse symptomatology including edema, necrotic changes of the liver, gastric hyperplasia and ulceration, hemorrhagous of gastrointestinal tract and other organs, atrophy of the kidneys, thymus and other lymphoid organs and tissues. Symptoms appeared to lead to decreased immune responses.^[1]

Persistent

The toxicity and persistence of dioxin can be better appreciated when you consider: *the children from Alabama who developed chloracne from the traces of chemicals on their father's overalls;

*The BASF mechanic wearing full protective gear, entering a chamber where trichlorophenol had been prepared five years earlier. Within days he developed chloracne, headaches, loss of hearing, was hospitalised a month later with angina, then acute pancreatitis and a tumour in the upper abdomen;

*Three years after an explosion at the Coalite Chemicals factory in Derbyshire, two outside contractors working on a tank that had been repeatedly cleaned using high pressure steam jets and tested clean, developed chloracne. One contaminated his son (who developed chloracne), while the other contaminated his wife who developed the disease nine months later.

As pointed out earlier, we are led to believe chloracne is a symptom of high dioxin exposure. Yet the sixty BASF workers were only exposed to vapours from the overheating tank; the mechanic in Germany and the two workers in Derbyshire, were all only exposed to *traces* of dioxin; the families of the BASF workers, the two children in Alabama, the women and child in England, were all only exposed to *traces* on the workers clothes / overalls. [17]

Prison Tests

In 1965 Dow Chemicals began a series of experiments on prisoners at the Holmsberg Prison, PA. A \$10,000 study under the direction of Mr. V. K Rowe of Dow, was conducted by Dr. Albert Kligman.

During his experiments Dr. Kligman put specific amounts of pure dioxin onto the backs of the human guinea pigs but, without Dow's knowledge, he increased the dosage dramatically at one point.

After being released several prisoners went to the U.S.EPA for assistance because they were very ill. The officials refused to have anything to do with them and informed them their files had somehow been 'lost.'

Information about these experiments came to light in 1980 during U.S.EPA hearings when V. K. Rowe testified about them. He refused to follow up on the state of the prisoner's health and the matter was dropped and quickly forgotten by both company and EPA officials. Refusing to follow up on the prisoner's health enabled Dow to continue claiming: "Beyond a case of chloracne there is nothing wrong with anyone exposed to Agent Orange."

Vietnam

It was through its use in Vietnam that Agent Orange and the contaminate 'dioxin' first hit the world's headlines. Trials at Fort Drum, New York had shown that 2,4-D and 2,4,5-T were active in killing most the species

of plants encountered in Vietnam.

January 1962 saw the beginning of herbicide spraying between Saigon and the coast in an effort to clear strips and reveal Vietcong movements. Despite knowing of the problems and the workers ill-health. The major herbicide companies assured the military that "none of the workers in their factories had shown any ill effects as a result of working with these chemicals." [17]

Veterans

After returning home U.S. Vietnam Veterans exposed to the chemicals began to suffer a multitude of health complaints including: cancer, numbness and tingling in the extremities, skin rashes, liver dysfunction, loss of sex drive, infertility, miscarriages, radical mood changes, weakness and birth defects in their children [18] chloracne, soft tissue sarcoma, non-Hodgkin's lymphoma and Hodgkin's disease, Porphyria cutanea tarda, (PCT) a disease characterized by liver dysfunction and light sensitive lesions, with pigment changes in the skin.

Consequent studies found 'sufficient evidence of a statistical association with exposure to herbicides or dioxin.' [19]

A team of scientists representing the American Association for the Advancement of Science (AAAS) made a detailed examination of birth records in Tay Ninh, a province that had been heavily sprayed. They found that in 1968-69 over twice the national average of still-birth had occurred at the Tay Ninh Provincial Hospital, 64 per thousands compared to the national average of 31.2. The AAAS team also discovered that there had been a 'disproportionate rise' in two birth defects, pure cleft palate and spina bifida, at the Saigon children's Hospital during 1967 and 1968. They were neither able to confirm nor deny that these effects resulted from defoliation campaigns. [20]

The Yale embryologist Clement L. Markert believed the use of 2,4,5-T and 2,4,-D posed an 'unacceptable risk' to the people of Vietnam and added that even if the compounds were not causing obvious malformations to Vietnamese children, they could lead to hidden damage such as a lessening of the brain capacity. [21]

Vietnam says that something like 3 million of its 80 million population have birth defects or other health problems related to dioxin. The legacy of this chemical warfare can even be inflicted on the unborn, with Agent Orange birth deformities now being passed on to a third generation.

Vernon Houk

In 1983 a study to determine if veterans were suffering health problem from exposure to Agent Orange was placed under the direction of the U.S. Centers for Disease Control (CDC) and headed by Dr. Vernon Houk of the Center for Environmental Health and Injury Control.

In June 1986 the CDC cancelled the study saying it was impossible to identify who had been sprayed and who hadn't. Prior to this they had asked the National Academy of Science (NAS) to provide an independent assessment of whether the study could in fact be completed. The NAS said there was more than sufficient evidence to enable them to do a creditable epidemiological study. CDC ignored them.

During an inquiry into how \$63 million of government money could be spent on this and other studies with conflicting results, the Committee on Government Operations concluded the CDC studies were "flawed and perhaps designed to fail," and that the government had "effectively used the CDC study to stifle any attempts to link Agent Orange to health effects."^[20]

It was during these hearings that Dennis Smith, a CDC staff scientist said: "the administrators of CDC had changed the design and variables of the study so frequently the results were essentially meaningless."

He also said researchers had manufactured data to fill gaps in records. When asked whether he thought it was impossible to link soldiers to exposure as claimed by Vernon Houk Smith said: "that was completely false."^[22]

Speaking of the CDC study at the First Citizens' Conference on Dioxin (Chapel Hill North Carolina, Sept 21 1991) Marc Smolonsky, an investigator working for the House Committee on Human Resources and Inter Governmental Relations (Washington D. C.) said.

"...It begins in Vietnam when eleven million gallons of the stuff was sprayed from helicopters, backpacks, aero planes. and accidental dumpings... dioxin was a big component of Agent Orange... Congress ordered this study in 1979. They ordered the Veterans Administration to do this study... three years later, the study had not begun ... and then one day appears a man named Dr. Vernon Houk. before a congressional committee. He said, give me that money. I'll do the study. I'll do it better and quicker than the Veterans Administration could do it. [Houk is] one of the most influential health

officials in the federal government. He's an assistant surgeon general; He's the director of one of the Centres of Disease Control. As the study proceeded we found that Dr. Houk decided to: *exclude the people who had the most terms of service in Vietnam. who would have received the most exposure:

*exclude the people in the areas where Agent Orange was sprayed the most - and he did a lot of other things to narrow it down to the people who, in my view - and in the view of our committee - were the people who probably would have been least likely to be exposed. And then Dr. Houk said we can't do this study because we can't identify who was sprayed with eleven million gallons of herbicide. He said the study was impossible to do, and with the approval of the White House and the Office of Management and Budget (OMB), the study was cancelled in 1987...we subpoenaed documents of the White House. They had an organisation called the 'Agent Orange Working Group,' and the lawyers that worked with this group and with the OMB, in writing, in memoranda that we have copies of, concluded that it would be dangerous to compensate Vietnam Veterans for Agent Orange because of the liability to the government, not only at the military end, but also the civilian end, and also the liability to chemical companies ..."^[23]

It was with the publication of the *Bionetics* report in 1969 that news of health and ecological damage from the use of herbicides began filtering out of Vietnam. With the doubts about the safety of the herbicides being in the public domain, both scientific and public outrage saw the use of Agent Orange by the military banned in 1970.

Ignoring the evidence from Vietnam and warnings from the U.S. Surgeon General that dioxin-laced herbicides may present an imminent hazard to women of child bearing age. The U.S. government allowed its domestic use to continue and even expand throughout the United States over the next decade.

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The U.S. Government's Veterans Administration officially recognizes 13 medical conditions linked to Agent Orange and provides free medical treatment to U.S. soldiers who can prove their exposure to the herbicide.

Types of Cancer with no time requirements for manifestation

Cancer of the bronchus
Cancer of the larynx
Lung Cancer
Prostate cancer
Cancer of the trachea
Hodgkin's disease
Multiple myeloma
Non-Hodgkin's lymphoma
Chronic lymphocytic leukemia

Types of Soft Tissue Sarcoma with no time requirements for manifestation

Adult Fibrosarcoma
Alveolar Soft Part Sarcoma
Angiosarcoma
Clear Cell Sarcoma of Aponeuroses
Clear Cell Sarcoma of Tendons and Aponeuroses
Congenital Fibrosarcoma
Dermatofibrosarcoma Protuberans
Ectomesenchymoma
Epithelioid Malignant Leiomyosarcoma
Epithelioid and Glandular Malignant Schwannomas
Epithelioid Sarcoma
Extraskeletal Ewing's Sarcoma
Hemangiosarcoma

Infantile Fibrosarcoma
 Leiomyosarcoma
 Liposarcoma
 Lymphangiosarcoma
 Malignant Fibrous Histiocytoma
 Malignant Giant Cell Tumor of the Tendon Sheath
 Malignant Glandular Schwannoma
 Malignant Glomus Tumor
 Malignant Hemangiopericytoma
 Malignant Mesenchymoma
 Malignant Ganglioneuroma
 Malignant Granular Cell Tumor
 Malignant Leiomyoblastoma
 Malignant Synovioma
 Malignant Schwannoma with Rhabdomyoblastic Differentiation
 Proliferating (systemic)
 Angiendotheriomatosis
 Rhabdomyosarcoma
 Synovial Sarcoma



Diseases other than Cancer with various time requirements

Type 2 Diabetes (Also known as Diabetes Mellitus)
 Periphera neuropathy (acute or subacute)
 Chloracne
 Porphyrria Cutanea Tarda

Disabilities in Children of Vietnam Veterans

Spina Bifida
 Certain Birth Defects in Children of VN Veterans

GLOSSARY

Acute Peripheral Neuropathy. A temporary dysfunction involving the nervous system.
 Adult Fibrosarcoma. A tumor formed as an adult derived from connective tissue.
 Alveolar Soft Part Sarcoma. A sarcoma found in the alveolus, the sac-like ducts in the lung.
 Angiosarcoma. A tumor occurring in the breast and skin, and believed to originate from blood vessels.
 Birth Defects. An abnormal structure, function, or metabolism of the fetus, whether genetically determined or as the result of an environmental influence during embryonic or fetal life.
 Cancer of the Bronchus. A malignant tumor found in a bronchus, an extension of the trachea (windpipe) connecting to the lungs.
 Cancer of the Larynx. A malignant tumor found in the larynx (voice box).
 Cancer of the Lung. A malignant tumor found in the lung.
 Cancer of the Prostate. A malignant tumor found in the prostate gland.
 Cancer of the Trachea. A malignant tumor found in the trachea (windpipe).
 Chloracne. An acne-like eruption due to prolonged contact with certain chlorinated compounds.

Clear Cell Sarcoma of Aponeuroses. A sarcoma found at the end of a muscle where it becomes a tendon.
 Clear Cell Sarcoma of Tendons. A sarcoma found in the tendons.
 Congenital Fibrosarcoma. A malignant tumor formed before birth and derived from connective tissue.
 Dermatofibrosarcoma. A relatively slow growing benign skin tumor consisting of one or more firm nodules.
 Ectomesenchymoma. A tumor found in a certain part of the skin.
 Epithelioid Malignant Leiomyosarcoma. A malignant tumor derived from smooth muscle found in the layer covering the muscle.
 Epithelioid Malignant Schwannoma. A moderately firm, benign, tumor found in the layers of membrane covering surfaces inside the body, caused by too many Schwann cells growing in a disorderly manner.
 Epithelioid Sarcoma. A tumor found in the membrane covering surfaces inside the body.
 Extraskelatal Ewing's Sarcoma. A tumor outside the bone consisting of small, rounded cells.
 Hemangiosarcoma. A tumor derived from blood vessels and lining blood filled spaces.
 Hodgkins Disease. A tumor in the lymph nodes characterized by the increasing enlargement of the lymph nodes, liver, and spleen, and by progressive anemia.
 Infantile Fibrosarcoma. A tumor formed as a child derived from fibrous connective tissue.
 Leiomyosarcoma. A tumor derived from smooth muscle.
 Liposarcoma. A tumor that may occur in any site in the body consisting of irregular fat cells.
 Lymphangiosarcoma. A tumor derived from blood vessels.
 Lymphoma. A malignant tumor of lymph nodes.
 Malignant Fibrous Histiocytoma. A type of tumor present in connective tissue.
 Malignant Giant Cell Tumor of the Tendon Sheath. A tumor found in the membrane of the tendon.
 Malignant Glandular Schwannoma. A moderately firm, malignant tumor in the glands caused by too many Schwann cells growing in a disorderly pattern.
 Malignant Glomus Tumor. A tumor found in the glomus, the tiny nodes found in the nailbed, pads of fingers and toes, ears, hands, feet and many other organs of the body.
 Malignant Hemangiopericytoma. A tumor characterized by rapidly growing fat cells formed in blood vessels and lining blood filled spaces.
 Malignant Mesenchymoma. A malignant tumor in the embryonic tissue or fluid.
 Malignant Schwannoma with Rhabdomyoblastic. A moderately firm, malignant tumor found in skeletal muscle resulting from the rapid growth of Schwann cells in a disorderly pattern.
 Multiple Myeloma. Cancer of specific bone marrow cells characterized by bone marrow tumors in various bones of the body.
 Non Hodgkins Lymphoma. Malignant tumors of the lymph nodes, distinguished from Hodgkins disease by the absence of the giant Reed-Sternberg cells.

Peripheral Neuropathy. A dysfunction involving either the somatic nerves or the autonomic system. See also acute peripheral neuropathy and subacute peripheral neuropathy. Porphyria Cutanea Tarda. A disease characterized by liver dysfunction and light sensitive lesions, with pigment changes in the skin.

Proliferating (systemic) Angiendotheliomatosis. A growing number of 20 benign tumors formed in blood vessels. Often causes skin discoloration.

Rhabdomyosarcoma. A tumor derived from skeletal muscle.

Sarcoma. A tumor arising in connective tissue, bone, cartilage, or muscle.

Soft Tissue Sarcoma. A diverse group of sarcomas arising in the soft tissues that are found in and around organs.

Spina Bifida. A disability characterized by the defective closure of the spinal cord, through which the cord is exposed and may protrude.

Subacute Peripheral Neuropathy. A dysfunction involving either nervous system with a course between acute (temporary) and chronic (long duration)

Synovial Sarcoma. A tumor found in the lubricating fluid surrounding joints and tendons.

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March 2008



Cartoon taken from Billee Shoecraft's 'Sue the Bastards'

Kellner Canyon

One area in the United States sprayed with herbicide to destroy unwanted bushes during this period was Kellner Canyon near Globe, Arizona.

It was here that Bob McCray, standing 6ft 4" and every Englishman's idea of what an American 'cowboy' should be was sprayed with herbicides contaminated with dioxin.

I met Bob during the '2nd Citizens Conference on Dioxin' in St. Louis, Missouri in July 1994. We establish a good friendship and roomed together during the '3rd Citizens Conference on Dioxin and other Synthetic Hormone Disrupters' in Baton Rouge, Louisiana, in March 1996. It was there Bob told me the full story of the chemical spraying of Kellner Canyon.

In June 1969, Bob, a fit young man, was just one of a number of

men building a home for their families in the Globe area. Bob's wife, Rosalie, and their five month old son Paul, made up a small, but happy McCray family. The plot they had chosen for their home was inside the



timberlands of Kellner Canyon, one of 4 canyons, Russell, Kellner, Ice-house and Six-shooter, that lie about three miles south of Globe, Arizona.

The house at that time was just a skeleton with a tarpaulin sheet stretched across the rafters as a makeshift roof to shield them from the hot June sun. Settling down to a family picnic, Bob heard the throbbing rhythm of helicopter blades. Peering into the clear blue sky he saw a snub-nosed - two seater U.S. Forest Service helicopter passing overhead just above the tree tops. Seconds later a ghostly, foul smelling spray cloud enveloped them as it drifted like a thick chiffon curtain along the floor of the canyon, over the partly built house and into the McCray's lungs, and their lives.

Suddenly, from a happy family enjoying the sunshine and its warmth, the McCray's found them-

selves sopping wet with some strange witches brew burning their eyes and skin. Absolutely furious, Bob McCray bundled his frightened family into their pickup and drove to the U.S. Forest Services helicopter pad near-by to find out who was responsible and get some answers as to what was going on.

When they arrived at the heli-pad the McCray's encountered a line of interested spectators watching the helicopter filling up with more chemical spray. Bursting through the line of onlookers and shouting defiance at the pilot Bob McCray made for the helicopter. Seeing him approach, the pilot simply revved up, lifted off, and flew over dowsing him with the foul smelling vapour again.

Also enjoying the sun on that fateful day in Kellner Canyon was Bob McKusick and his family. They were looking at the clay deposits McKusick, in his trade as a potter, had secured through negotiations with the Forest Service. Then came the throbbing blades and the pungent curtain of mist...

Pat Medlin, a young woman living in Kellner Canyon was also keen to take advantage of the beautiful sunshine. She was stretched out soaking up the sun in her garden when, seeing the good looking young woman in a

closer for a better look, not bothering to stop the chemical spray as he swooped in low over her home...

Another resident, Billie Shoecraft, had been woken up earlier in the day by the same throb of helicopter blades. Stepping onto her front porch she was met by a curtain of mist that lingered in the early morning air...

The canyon residents later discovered that the pungent, curtain of mist was in fact a cloud of Silvex, the brand name of Dow Chemical's mixture of 2,4,5-T and 2,4-D. American servicemen in Vietnam knew it better as 'Agent Orange.'

Virtually everyone who was caught directly by the spray developed health problems of one kind or another. Pat Medlin lost mobility within a few days and never walked again without the aid of a walking frame. She died of cancer.

Paul McCray, Bob's son, went into convulsions on the afternoon of the spraying and was later diagnosed as grand mal epilepsy. These convulsions continued daily - with as many as 36 terrifying attacks per day until he was five years old.

Symptoms reported by the victims of the spraying were chloracne, pancreatitis, fibrosarcoma cancer, muscular and skeletal problems, elevations of liver enzymes and high cholesterol. Research on dioxin ex-

posure had indicated that it can cause these symptoms.

Dr. Susan Daum, an environmental medicine specialist who examined the Globe plaintiffs concluded "the symptoms and clinical abnormalities observed in this population were, "with a reasonable medical probability, as a result of toxicity from exposure to the chemical dioxin."

Billee Shoecraft developed cancer and until her death in 1976 led a fierce battle to get the process of chemical spraying stopped. The government and industry experts tried to play-down the whole thing and pacify the residents of Globe.

Shoecraft's feelings and outrage at what had been done is reflected in the title of the book she wrote about the shameful affair: "*Sue the Bastards.*" (Phoneix: Franklin Press 1971).

In February 1970 McCray met with investigators from the United States Department of Agriculture and United States Forest Service whose eventual report concluded the "herbicide caused little damage in the Arizona area.

According to McCray, "it was more important to those doctors whether their scotch had soda or water than how we were affected."

He concluded the whole investigation was a farce; "How can you

How Toxic is Dioxin?

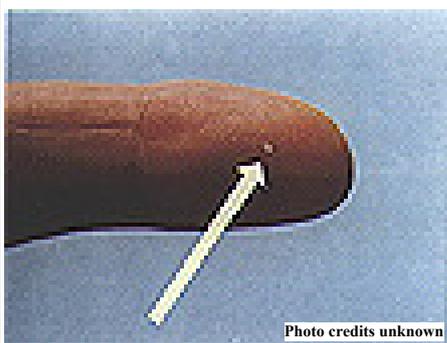


Photo credits unknown

This amount of dioxin was calculated to represent the allowable lifetime dose (70 years) for 25,000 people.* That was before the announcement that dioxin was 10 times more toxic than originally thought.

*US EPA figures

When giving evidence to a House of Lords Inquiry into 'Waste Incineration' (March 1999) Dame Barbara Clayton made the statement: "the public look on dioxins as the very severe chemical..." and "...there is no reason to have that view but it is very much the public perception..."

It is worth emphasizing that the effective dose of dioxin is very small: 10 nanograms of dioxin per kilogram of bodyweight (10ng/kg) harms the mouse immune system enough to increase the death rate from influenza virus. To get 10 ng/kg into perspective, consider that a single 5-grain aspirin tablet taken by a 150-pound adult is a dose of 4.7 MILLION nanograms of aspirin per kilogram of bodyweight (4,761,936 ng/kg). For an adult human to get a dose of aspirin equivalent to the dose of dioxin that harms the mouse immune system, you would have to divide a single aspirin tablet into 470,000 pieces and eat only one piece.*

Surely reason enough to think dioxin is a *very* severe chemical?

*Ref: Rachel's Environment Health Weekly #414

have a bank robber investigate his own crime?"

McCray kept samples in the freezer of deformed chickens and rabbits born after the spraying. One day in the spring of 1970 when the family was out of town, the plug was mysteriously pulled from the freezer and the evidence was destroyed.[1]

The members of several other families in the area caught directly in the spray developed cancer as the years passed, including Bob who developed fibrosarcoma, a soft-tissue cancer.

"Every morning you look in the mirror to see if there is any new lumps. I've found 14 at different times" he told me. [2]

Dow settled out of court with five families for an undisclosed amount and had the court documents sealed.

"I wanted to get it all out in public in a court suit" said Bob. "But emotionally we'd gone as far as we could."

Surprisingly, in the land of the big pay-outs, the compensation of \$1.1 million between all the plaintiffs barely covered their medical bills.

During the years after the spraying, as well as suffering continual, declining health, Bob McCray kept a



One of McKusicks goats born with reproductive organs backwards

watchful eye on the situation in the Kellner Canyon/Globe area with regards to people's health which he noted seemed to be following a downward curve.

In September 1993, after hearing a lot of rumours about increasing ill-health around Globe, McCray advertised on the local radio and in the local newspapers to see if they were any elevated levels of cancers. "I expected to get a few replies, but not an avalanche," he told me. "I got six hundred letters in the first month.

found in people living around the canyons that were sprayed," Bob said.

According to the National Institute of Health, the Globe-Miami area should experience one case of Soft Tissue Sarcoma every two years; one case of Hodgkin's disease and 3 cases of Non-Hodgkin's disease every year.

The only other group in the United States afflicted with high rates of these cancers are the Vietnam veterans who were exposed to Agent Orange.

Bob McCray unearthed so many cases of cancer that even the U.S. Environmental Protection Agency and the Arizona State Health Department were interested. Dr. Linda Birnbaum, (Environmental Toxicology Division U.S.EPA) said: "I talked to McCray and I think his numbers are very interesting..."

In 1986 the EPA tested Kellner Canyon as part of the National Dioxin Study. They found the highest dioxin concentration anywhere in America on the helipad site above Globe. Warning signs placed on the helipad were removed shortly after McCray and McKusick visited the sight and took photographs.

Although the residents of Kellner Canyon and others received very little in terms of compensation from Dow. Their battle served as a prece-

They were coming in so fast there was no way I could keep up with them."

Compiling the volumes of information he received, he began to note a definite connection between specific types of cancers: 30 cases of Soft Tissue Sarcoma - a cancer affecting tendons and ligaments (suffered predominately by forestry workers using pesticides); 40 cases of Hodgkin's Disease and 40 cases of Non-Hodgkin's Lymphoma - a cancer of the lymph nodes. "All these odd-

For My Son's Guinea Pigs

I'll close your eyes now that they are swollen ...
I'll close your eyes now that your dead...
I'll wrap you gently - hold you softly...
And wipe the sweat that's on your head...

The blackened skin spots will not matter...
No one will see them any more...
Whatever pain you knew is over,
Just like the ones that died before...
'Cyclops' with his little 'one-eye'...
'Rusty' that we loved so much...
'Spilt' and 'Sam; and furry 'Lady'...
All so soft - and fun to touch!

I don't know why, I give no reason...
I don't know what the experts said
Who wouldn't see - or hear - or listen...
I only know now they're dead.

Billee Shoecraft

dent for a Vietnam veterans' class-action suit worth \$180 million against chemical companies like Dow and Hercules. Again, the Corporations settled out of court without admitting liability.

Bob McCray is dead. A victim of a callous chemical industry and officialdom. I have no idea of what happened to his files. At the time of spraying little was known by the general public about the dangers from the chemicals used. It was assumed that the only danger to health came from "between the nozzle and the ground." Through the efforts of a few responsible scientists publications like *Rachel's Environmental Health Weekly* and community based groups organisation's like the Centre for Environmental Health and Justice, and outspoken victims Billee Shoecraft, Bob McCray and activist/author Carol Van Strum, the public is thankfully a lot better informed about the compounds used in herbicides and pesticides. Many are now known to be persistent and health damaging years after being released into the environment.

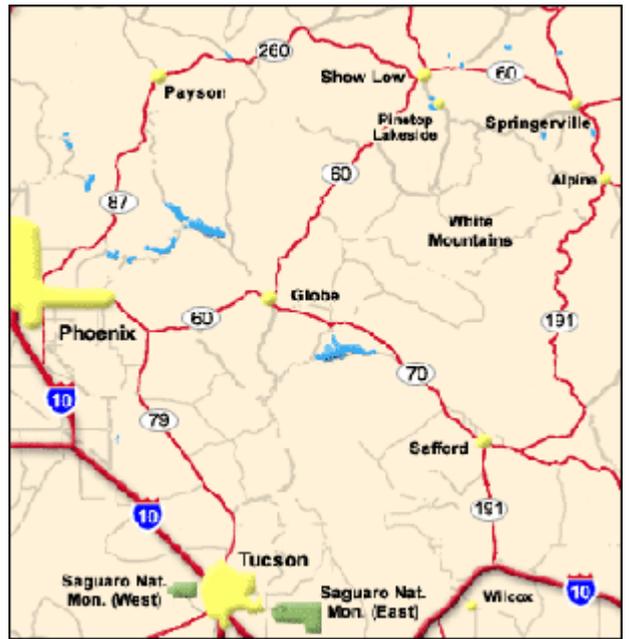
Alsea Study

A number of horrific domestic spraying incidents had already taken place in the U.S. prior to the banning of spraying in Vietnam of which Kellner Canyon was just one.

In 1977, after aerial defoliation had taken place in a 1,600-square mile area of Oregon. A group of residents disturbed by birth defects, miscarriages and illness in their families, livestock and local wildlife, filed a lawsuit that forced the EPA's suppressed studies into the open.

This resulted in *'The Alsea Study,'* an attempt to correlate human miscarriages with the time, amount and location of aerial spraying.

A preliminary report published in 1979 showed an overwhelming surge of miscarriages in the two months



following herbicide applications. On the basis of this report the EPA issued an emergency suspension of forestry and right-of-way uses of 2,4,5-T and Silvex, a slower acting herbicide that toxicology studies had shown to be relatively non-toxic to animals in acute or brief exposure. There was no data on its use in the field or from prolonged exposure.



Photo credits unknown

The idea was to kill desert scrub impeding water run-off so rainfall would roll cleanly over the sand into the creeks, empty into the Salt river, thus swelling the river and making Salt River Project turbines spin faster.

No-Safe Level

Based on the preliminary *Alsea Study* and a Dow study showing the effects of dioxin on three generations of rats, U.S.EPA concluded that 'no safe level or no-effect level' of dioxin exposure could be demonstrated' and that its reproductive toxicity presented an imminent hazard to exposed populations at any level.

The problem was that at that time the EPA were promoting waste-to-energy incinerators (WtE) and these were pumping out dioxin at far greater amounts than was to be found in 2,4,5-T.

Also, other significant sources of dioxin included the manufacture of plastics, pulp, paper, and wood preservative etc. A 'no-safe' level would cause serious problems for industry and create liability for the government against the claims of the Vietnam Veterans exposed to Agent

Orange. Consequently, the EPA concealed the data and the *Alsea Study* was never completed or the data made public.

However, a leak of its analyst in 1983 saw the EPA and Dow finally cancel the registrations of 2,4,5-T and along with its registration went the 'no-safe level' and 'reproductive harm at any dose.'

"The demise of 2,4,5-T allowed EPA quietly and without public notice or comment, to replace its 'no-safe level' of dioxin policy with an exciting new technique in the field of numerology, 'risk assessment.'" [3]

Manual

The EPA did have information on the effects of herbicides at that time that they didn't want to share with the public. They had provided a manual in 1978 to personnel aboard the Vulcanus, an incinerator ship destroying 'Herbicide Orange' at 1,000°C. That stated:

The principal Herbicide Orange constituent of concern, TCDD, has been found to be highly embryotoxic, teratogenic (tending to cause developmental malfunctions and monstrosities,) and acnegenic and is lethal in the microgram-per-kilogram of body weight range.

It also gave a list of observed effects as follows:

Chloracne (moderate to severe) Skin irritation, with swelling, hardening, blackheads, pustules and pimples; hyperpigmentation (Skin discoloration); muscular pain; decreased libido, fatigue, nervous irritability, intolerance to cold, destruction of nerve fibres and nerve sheaths.

In addition, effects on exposed test animals "may be considered



possible effects on the human system, especially, when the metabolism of the animal is similar to that of man. These effects included toxicity to embryos, birth defects, possible carcinogenicity and even death. It should also be noted that the greatest hazard is to pregnant females and their foetuses, especially in the first third of the pregnancy."

The manual also told of: "entry of TCDD into the body: through the mouth - ingestion; through the skin - percutaneous; the lungs and eyes."

The list had been compiled by the EPA with the assistance of a certain Mr. V. K. Rowe of Dow Chemical. The same V, K. Rowe had been the company's main spokesman telling customers there were no problems with Dow's herbicides, while at the same time secretly writing to all Dow managers that "TCDD is the most toxic material we've ever studied." [4]

While Bob was compiling his data he was threatened many times by citizens who thought his campaign for

the truth was damaging the tourist trade around Globe.

Bob McCray passed away in December 2000. He was a good, honest man with a fighting spirit all too rare these days. It was a privilege and an honour to have known him and call him my friend.

Ralph Ryder

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"Why are so many scientists as apathetic as the general public in their reaction to many of the alarming facts regarding what is really happening to man. The majority of them leave the burden of informing those who should be doing something about it to a handful of their more courageous members. Why must the few always fight the battles for the many?" Billee Shoecraft



The scene of another spraying with dioxin, but of a different nature from that in Vietnam and Kellner Canyon, was the spraying of the Missouri town of Times Beach.

Times Beach was a small suburban town of slightly over 2,000 residents situated about 17 miles from St. Louis, Missouri. The town covered 480 acres and was built alongside the I-44 highway and along the banks of the Meramec River.

In 1925 the old *St. Louis Star-Times* newspaper initiated a sales promotion program to increase the circulation of the paper. The purchase of a 20 x 100 lot in Times Beach at a cost of \$67.50 entitled one to a newspaper subscription for a period of six months. In order to utilize the property and build a house, another lot had to be bought.

The site was originally a flood plain used for farming and consequently many of the houses had been built on stilts. As these were primarily for summer use they were not of the highest standard construction wise, but were very similar to summer beach houses.

Upgraded

During the depression of the 1930's people moved into these summer homes and the post-war

shortage of housing saw many becoming permanent homes.

The 1950's saw an upward trend in the development of the town and as a result the summer houses were improved and Times Beach became a town in the true sense of the word.

As the flooding seemed to have abated the use of stilts was considered unnecessary and 'The Beach,' as it was called by the locals, had blossomed from a low income community to a middle class community.

Dusty Roads

The local authorities were unable to afford road surfacing of the town's 16.3 miles of dusty roads and they were simply covered with gravel. It was thought spraying with oil was the best method to control the dust.

During the long hot summers of 1972-73 these were sprayed with waste oil by haulage contractor Russell Bliss of 'Bliss Waste Oil.' Costing only 6 cents a gallon, the oil was considered a bargain and came from a plant belonging to the Northeastern Pharmaceutical and Chemical Company (NEPACCO) in Springfield, Missouri.

NEPACCO had been manufacturing hexachlorophene at the plant for two years and 2,3,7,8-tetrachlorodibenzo-para-

dioxin, TCDD (dioxin) was derived by distilling TCP, needed in its pure form for the production of hexachlorophene.

This process spawned concentrated batches of dioxin called 'still bottoms,' and this was what Bliss was contracted by the Independent Petrochemical Company (IPC) of St. Louis, to collect and dispose of.

Gregory Browne, a district manager of IPC, said Bliss was notified that the loads comprised of hazardous waste.

Bliss made six trips to the NEPACCO's hexachlorophene plant in early 1971 collecting a total of 18,500 gallons on the first five trips: February 16, 3,500 gallons; May 20, 3,000 gallons; May 25, 3,000; July 30, 6,000 gallons; October 4, 3,000 gallons.

On the fifth trip Bliss learned that that IPC was earning \$.25 per gallon for removing the waste from NEPACO while he was only getting about five cents a gallon. He spoke with a plant foreman at NEPACCO and walked away with a deal to haul directly by-passing IPC for \$500 per trip. He only made one trip.

Shenandoah Stables

The first place to experience trouble after the spraying was the Shenandoah stables horse arena. This was treated with 2,000 gal-

lons of oil on May 26 1971. Three days later the area was littered with dead wild birds. "There were literally bushel baskets full of those dead wild birds" said Dr. Patrick E. Phillips a veterinarian with the Missouri Division of Health.

These were followed by eleven cats, four dogs, farm animals and sixty two horses. A six year old daughter of one of the owners was admitted to St Louis children's Hospital with a severe kidney disorder and inflammation to the bladder. According to Robert Koehler of the Centre Disease Control (CDC), the levels of dioxin in the arena were between 31,800 part per billion (ppb) and 33,000ppb.

In preparation for a lawsuit the arena's owners Judy Piatt, mother of the girl hospitalised, and Frank Hampel started tracking the drivers of Bliss Waste Oil to determine the source of the waste and observe and make notes of their dumping procedures.

They saw Bliss Waste Oil drivers opening their spigots to spew the waste into ditches, creeks, rivers, roadsides and fields. They followed one truck and witnessed the driver dumping oil into a run-off ditch near the Mississippi River. They followed another truck to Times Beach where the driver dumped the waste onto a field.

They called the CDC and they did tests on the dirt in their arena and found dioxin.

They then checked the records of Russell Bliss and found his record of the spraying of Times Beach. This started a full-scale operation to determine if the town was contaminated.

Although in the aftermath that followed Bliss always maintained he did not know the waste oil was hazardous (despite Gregory Browne's accusations to the contrary) and one can reasonably assume he must have been aware of the problems at the arena after the spraying - he continued spraying the oil in other areas of the State.

One of these was the Pacific Intermountain Express truck terminal in St. Louis where Alvin Overmann* worked.

More than 20 dioxin contaminated sites have been found in Missouri.

Testing was Delayed

In November 1982 a local reporter told the St. Louis City clerk that it was possible that Times Beach had been sprayed along with other sites in the area with waste oil

contaminated with dioxin. Environmental Protection Agency officials confirmed the information given by the reporter was indeed correct and that Times Beach was

Warning signs on the road to Times Beach



Photo credit unknown

high on the list of sites they suspected was contaminated.

Some residents recalled a terrible stench from the oil and the roads turning purple after the spraying. They also remembered that birds and dogs had died, as had newborn animals shortly after birth.

One man remembered a dog found in one of the contaminated ditches. They thought it had rabies and called the police to shoot it.

Another man recalled finding a great many dead birds and calling the St. Louis Health Department

Alvin Overmann worked for more than twenty years at the Pacific Intermountain Express truck terminal in St Louis, Missouri. Russell Bliss' practice of spraying waste oil to control the dust had become commonplace in the three trucking terminals which employed about 600 personnel. Overmann died on July 10, 1991 and his family were awarded \$1.5 million after a 3 month jury trial in St. Louis Circuit court in Missouri. The court ruled that Overmann's death was due to dioxin exposure. He was diagnosed with soft-tissue sarcoma, chloracne and porphyria tarda. The court ruled further that Syntex Agribusiness, Independent Petroleum Chemical and Northeastern Pharmaceutical were liable.



who recommended he kept the birds in a freezer saying they would collect them later. They never did.

Bliss dumped the remainder of the oil in an underdeveloped area of the city that was to be used as a playing field by the local children. Tests revealed the soil contained ten priority pollutants.

When the community of Times Beach were told it could be as long as nine months before any soil testing could be done all hell broke loose.

Private Testing

The Beach community had no knowledge of the chemicals used or their effects on human health. As information on these came in from all over the U.S. the EPA announced they would commence testing immediately given the amount of people exposed in the area.

Residents believe this sudden change of heart came about as a result of their taking things into their own hands, having a collection, and raising the necessary cash to employ a local laboratory to do private test-

ing. Hearing about this the EPA then speeded up their own operations.

Floods

While the residents were waiting for the results of the tests on December 5 1982, the floods came back with a vengeance. Times Beach suffered the worst flood in its history with water reaching 42.88 feet carrying the dioxin contaminated oil into the homes, fittings, furniture and deeper into the lives of the residents.

As the townsfolk were cleaning up their water damaged homes the results of both the private and EPA testing were made public. They confirmed their worst fears, dioxin was present in the soil. No-one was sure of the quantities of chemicals, but residents were told, "If you are in town it is advisable for you to leave and if you are out of town do not go back."

A great many did just that, they never went back. Those who did stay were left in limbo as to what the future had in store for them. Should they continue the clean-up of their homes, given that to disturb the contamination might expose them to even greater amounts of dioxin?

There was talk of a buy-out by the government, but residents had heard of no definite plan of action and stress had reached a high point with people beginning to become ill. Personal relationships suffered and many people became deeply depressed. Frightened children learnt from television that the dirt they had played in for years killed laboratory animals when it was fed to them. Headlines like *EPA Spokesman Says "Dioxin The Most Toxic Chemical Known To Man"* did nothing to alleviate anyone's concern.

In the midst of all this unrest and upheaval, it came to light that some of the government were aware of the possible contamination of Times Beach as long ago as 1972.

At this time the EPA was being closely scrutinised by five congressional committees over allegations of having too 'cozy' a relationship with the chemical companies it was supposed to be monitoring. One memo went so far as to identify the business community as "the principal constituents of this administration" EPA's Administrator Anne Gorsuch-Burford, was accused of

Spina bifida is the most common of the three types of neural tube defects (NTD). Every child with this serious defect (e.g acranium monstrosity) has been stillborn. Potential mechanisms could underline a paternal relationship to spina bifida in the offspring as follows: from paternal exposure (mutagen), maternal health and chance or unproven association [1].

The environmental pollution is a serious problem and has been examined by many scientists. The results from many studies have shown that defects of the neural tube may be caused by many factors following: heavy metals (Sever, 1995)^[2], social stress, folic acid (Czeizel & Dudas, 1992; Berry *et al.*, 1999)^[3] multivitamin use (Wasserman *et al.* 1998)^[4] and specifically-Polychlorinated Aromatic Compounds POPs (Erickson, 1984; CDC Vietnam Experience Study, 1988)^[5]. These, factors caused neural tube defects of acranium monster at the rate of 1/1000 in USA. Another study (Australia, IOM) on Spina bifida showed that this kind of defects may be related to Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) which was used by U.S forces during the Vietnam war (Ranch Hand 1961-1971). In 1998 Spina bifida was considered a suggestive evidence of an association between exposure to herbicides and the health outcomes (IOM, Veterans and Agent Orange)^[6].

[1] Report of the Expert Committee into the possible connections between exposure to Herbicides in Vietnam and Spina Bifida in children of Vietnam Veterans 1996.

[2] Sever LE (1995) 'Looking for causes of neural tube defects: Where does the environment fit in?' *Environmental Health Perspectives*, 103 (Suppl 6): 165-171.

[3] Czeizel AE & Dudas I (1992) 'Prevention of the first occurrence of neural tube defects by periconceptional vitamin supplementation'. *The New England Journal of Medicine*, 327: 1832-1835.

[4] Wasserman CR, Shaw GM, Selvin S, Gould JB & Syme SL (1998) 'Socio-economic status, neighbourhood social conditions, and neural tube defects'. *American Journal of Public Health*, 88:1674-1680.

[5] Erickson JD, Mulinare J, McClain PW, Fitch TG, James LM, McClearn AB & Adams Jr MJ (1984) 'Vietnam Veterans' risks for fathering babies with birth defects'. *Journal of the American Medical Association*, 252(7): 903- 912.

[6] Veterans and Agent Orange, update 2000, 6-7

putting industry's interest before the environment.

Illness

Over the years since the spraying the residents of Times Beach developed illnesses similar to those suffered by the Vietnam Veterans i.e. soft tissue sarcoma, chloracne, peripheral neuropathy, at least three cases of PCT (both illnesses now shown to be service-connected to Agent Orange exposure); hearing loss affected all ages, allergies, liver, kidney, bladder problems, thyroid disorders and bone tumours were rife. Many women had miscarriages and a high proportion in their 20's and 30's had to have hysterectomies, including Marilyn Leistner the last Mayor of Times Beach and a fierce campaigner for justice for the community.

Hyperactive children with an array of developmental problems were common and some babies were diagnosed with hydrocephalus, others with Spina Bifida. Two children in one home were born with cleft palates, one dying before it was a year old. A number of people suffered gastroesophageal reflux and there was a theory that dioxin harms the sphincter muscle between the stomach and the esophagus.

Marilyn Leistner's family suffered a variety of disturbing illnesses. Her first husband was one of the town's three cases of porphyria cutane tarda. A daughter has giant hives all over her body and rashes and severe acne. Another is sterile and has a hyper thyroid condition. The third suf-



Marilyn Leistner, the town's last Mayor photographed on the dusty roads of Times Beach. Beach residents developed illnesses similar to those suffered by Vietnam Veterans i.e. soft tissue sarcoma, chloracne, peripheral neuropathy, hearing loss, allergies, liver, kidney, bladder problems, thyroid disorders and bone tumours.

fers a rare seizure disorder while Marilyn herself has no feeling in her left hand and has been diagnosed as having severe peripheral neuropathy.

Phoniest Study

As with numerous other studies on dioxin, the true facts of its health effects were 'diluted' by the authorities. A study using only 66 people, (out of a population of over 2,000) was conducted with many elderly residents whose health problems could be attributed to dioxin being deliberately left out. People with serious health problems did not participate because they were represented by their attorneys who were wary of what the government was going to do. People who did not live long-term at the Beach were

included as were delivery men, telephone engineers and even incidental visitors to the town which served to dilute the figures even more.

Dr. Vernon Houk, the scientist responsible for the cancelled CDC study on the Vietnam Veterans, announced the results at the hospital that conducted the Times Beach study. Marilyn Leistner called it the "Phoniest study in the whole world and the people of Times Beach were very angry with Vernon Houk."

Buy Out

Tests done in 1982 showed dioxin levels of more than 100 ppb in the soil of Times Beach. On February 23, 1983, the EPA announced its plans to buy out the entire town of 800 houses and thirty business.

Spina bifida occult among the adult's children of the people living in herbicides contaminated areas during wartime was revealed by lumbar vertebra X-rays.

Tran Hung1, Dang Duc Nhu1 110-80 Division Of Ministry Of Health

The rate of spina bifida (SB) occult in the exposed group of children whose parents lived in areas sprayed by herbicides during wartime was approximately two-fold higher than the rates of SB in the unexposed group. This research revealed the possible relationship between herbicides exposed and the occurrence of Spina bifida on adult's children of families living in sprayed areas. We do not deny that other reasons many exist for spina bifida, but this research suggested that AO/Dioxin can be the main cause for the increase in the rate of spina bifida of children...

Once again things were not made easy for the Beach residents. The first offers from the government for their homes were ridiculously low and the residents were so disgusted by this exploitation of their position they sprayed the prices offered to them on the outside of their homes in front of the television cameras to let the nation see what they had been offered. This had the desired effect and the government increased the money offered to a total \$36.7 million. They demolished every building.

The announcement of the buy-out was one of the last official acts of Mrs Burford who resigned in March as EPA's Administrator.

Contamination Levels

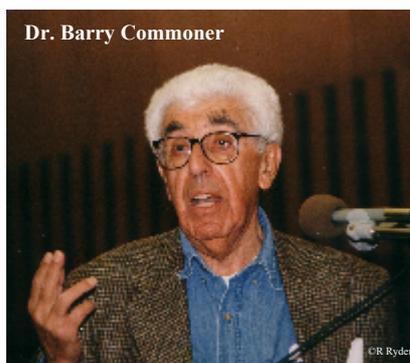
At the time of the health study it was known that dioxin concentrations were under 400 parts per billion. Months after its completion levels of 1,200 ppb were found. Dr. Ayres who preformed the study for the state and federal government said that the higher dioxin levels would impact the study because they only looked at "problems that could be caused by lower levels."

People Turned

Whereas initially people throughout the United States had been sympathetic and responsive to the plight of The Beach community. As information came through on the toxicity of dioxin, children from uncontaminated areas were told by their parents not to associate with the children of The Beach. Almost daily more people were turning against the victims of the dioxin contamination.

Hearing of the buy-out, some people resented the community receiving the money saying: "there's nothing wrong with dioxin. It's the flood that's causing the buy-out."

Marilyn Leistner explained to these patiently, "You don't buy



homes in a flood plain with 'Superfund' dollars."

The problems of being a resident of Times Beach will live with the community for the rest of their lives, both mentally and physically. The children seem to have been affected in different ways from the adults and suicides among the generation born during the 1970's is well above the national average.

A study examined 402 births to mother affected by the dioxin. It found that compared to unexposed mothers, increased foetal deaths, infant deaths low birth weight babies and birth defects.[1] Other research into the effects on children revealed a number of other disturbing facts.

Dr. David Cantor (Director of Neuropsychology, Scottish Rite Children's Medical Centre, Atlanta) told delegates at the '2nd Citizens' Conference on Dioxin' held in St Louis, Missouri, home of the chemical giant Monsanto, of his research on seventeen of the children of Times Beach who had been exposed prenatally to dioxin.

Dr. Cantor studied the frequency of the firing of cells in different parts of the brain and noted a significant decrease in firings in the frontal lobe area compared to a control group.

The pre-frontal cortex is the part of the human brain where consciousness resides. That is where the 'true' person that is 'you' resides. The frontal lobes contain the cores of human self-

knowledge, damage it, and what is left may be able to live, function, see and breathe, and outwardly look quite normal to others - but it will no longer be the conscious, thinking, free-willed person that was before.

"At first these children showed only slight signs of difficulties when dealing with elementary learning," said Dr. Cantor. "But as they got older they experienced extreme difficulty in getting to grips with more complicated problems, problems the average child solves quite easily" he continued.

It was obvious the children studied would never reach their true potential, either in intelligence or as a person. Certainly something much worse than the "nasty skin condition" pyromaniacs talk about..

Other eminent speakers at this conference included:

Dr. Barry Commoner (Director of the Center for the Biology of Natural System, Queens College, USA) told delegates: "Dioxin is now known to interfere with the most delicate balanced biological process in our bodies, they are man-made chemicals that present in only minuscule amounts can alter the natural biochemical process that determine how people develop, grow, and behave."

Dr. Peter McConnachie, Director Immunotransplant Laboratory, Memorial Medical Center, Springfield, Illinois). His field of expertise is the immune system and its reaction to drugs as used on patients undergoing transplant surgery. He spoke of his research into the immunological problems experienced by some of the children exposed to dioxin prenatally at Times Beach.

He performed immunological tests on a group of sixteen children from Times Beach exposed in utero or prenatally to dioxin. Analysis revealed multiple immunological

anomalies nine to fourteen years after exposure.

Dr. McConnachie's talk was fascinating and he spoke of one disturbing moment during his research:

"...when I took blood samples from the children not one child cried, flinched, or moved away from the needle. They were so passive it was unnatural" he said.

Dr. Janna Koppa (Holland) investigating 38 healthy breast-fed infants in relation to dioxin content of breast milk told of the significant collation between the levels of dioxin in mothers breast milk and the activity of a thyroid gland in newborn infants.

"We concluded that exposure to increase concentrations of dioxin via breast milk seems to modulate the hypothalamus pituitary thyroid regulatory system in newborn babies. Stillborn babies showed 6.9 p to 11.9

parts per trillion TEQ of dioxin in their bodies."

Dr. Paul Connett (St. Lawrence University) told delegates:

"Hormonal changes, birth defects, cancers, sexual dysfunction, infertility, learning disorders, immune system suppression, are all caused by dioxin. It's like throwing a hand-grenade into the centre of human biology."

Marilyn Leistner said: "I cringe when someone says, 'Dioxin never hurt anybody.' Dioxin has harmed everyone who has come into contact with it. For us, it has meant loss of property values, community, neighbours, friends, identity and security, and most of all, loss of our health.

Source:

Various Waste Not Fact sheets, personal interviews and observations

by Ralph Ryder during the 2nd Citizens Conference on Dioxin. St. Louis, Missouri, July 29-31 1994.

The Times Beach Story, by Marilyn Leistner published in, *Dioxin: the Orange Resource Book*, Synthesis/Regeneration 7/8.

1995. 2nd Citizens Conference on Dioxin. St Louis, Missouri, July 29-31, 1994.

As part of this conference over 250 former residents of Times Beach gathered for a reunion at the Eureka Community Center.

[1] Stockbauer, J.W., Hoffmann, R.E., Schramm, W.F., Edmonds, L.D. (1988) "Reproductive outcomes of mother with potential exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin." *American Journal of Epidemiology* 128:410-19. Quoted in 'Dying From Dioxin.' Lois Marie Gibbs South End Press, ISBN 0-89608-525-2 (1995)

As long ago as 1980, the year of the very first Dioxin Symposium, several critical elements of the dioxin story were already known. [1] Poland and co-workers had described the isolation of the aryl hydrocarbon receptor (AhR) from mouse hepatic cytosol.[2] Structure-binding and structure-activity relationships among the polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), biphenyls (PCBs), and other Halongenation as had been determined.[3] Moreover, studies in genetically inbred strains of mice and in other species had clearly defined differences in Ah-responsiveness between species that may be related, in part, to differences in the AhR.

However, since 1980, thousands of papers on the toxicology/molecular biology/mechanism of action of TCDD, and related compounds have been published and selection of the important advances would vary with the individual scientist'. Some of the key mechanistic/molecular biology discoveries include: (i) cloning of the AhR gene [4][5] (ii) cloning of the AhR nuclear translocator (Arnt) gene [6], (iii) generation of the AhR knockout mouse[7] and (iv) development of the molecular mechanisms of action of the nuclear AhR complex using the CYP1A1 gene as a model.[8] One of the important toxicological studies was the report that in utero exposure of pregnant female rats to exceedingly low doses of TCDD resulted in gene reprogramming which affected physiological function in the offspring.[9] This study also formed an underpinning for the endocrine disruptor hypothesis. Mechanism-based risk assessment and development of toxic equivalency factors (TEFs) and toxic equivalents (TEQs) was derived from early and later structure-activity studies of PCDDs and PCDFs. Earlier research contributing to this concept included the identification of mono- and diortho-substituted PCBs as AhR agonists[10] and subsequently as antagonists.

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Immunological Studies on 16 Times Beach Children

By P.R. McConnachie,¹ A.C. Zahalsky,² G.H. Smoger³

We were asked because of our interest in the effects of halogenated aromatic hydrocarbons (HAH) on the human immune system, to perform immunological testing on a group of 16 children who were exposed to dioxin in utero or perinatally, as their mothers lived or visited frequently in Times Beach between 1977 and 1983 while pregnant.

One of the 16 was exposed only after birth for the first year of her life. The studies were performed at the Memorial Medical Centre Springfield, Illinois between February 11 and March 5 1992.

Analysis revealed multiple immunological anomalies 9 to 14 years after the exposure. The testing included lymphocyte phenotype frequency measurements, functional testing of natural killer (NK) ability and responses to mitogens, serum immunoglobulin levels, autoantibody detection and measurement of viral antibody titers.

Cytotoxic T cells (CD8), Interleukin 2-receptor bearing T cells and Natural Killer (NK) cells (CD3-/CD16,56) were present in higher frequency in the children than in controls. There was also an increased frequency of early B cells (CD19) and paradoxically, a significant decrease in the frequency of light bearing B cells in the children.

The helper induced T cell subpopulation (CD29/CD4) was very significantly reduced in the children.

The particular finding was previously reported in TCDD exposed monkeys by Neubert.

Female NK function was increased compared to controls in the children. The mitogenic responses to

human lymphocytes was significantly elevated in the children.

Auto-antibodies (anti-smooth muscle) were detected in 75% of the children's sera. Two were deficient in serum IgA, but overall, the children demonstrated above normal levels of serum IgC and IgM.

IgG anti-viral antibodies were detected to HSV-1 (Herpes) (31% incidence), HSV-2 (25%) CMV (Cytomegalovirus) (19%) and EBV (Epstein Barr) (75%).

The deficiency in the helper inducer T cell subset and the surprising incidence of anti-viral antibody are evidence of immune system dysregulation. This is further supported by the hypergammaglobulinemia, the evidence of T cell activation, the increased responses to mitogens and in NK cell function in girls.

Similar, but not identical, characteristics of immune dysregulation have been noted in children and adults, exposed to pentachlorophenol in the home environment, in children exposed to chlordane/heptachlor in a school environment and in adults liv-

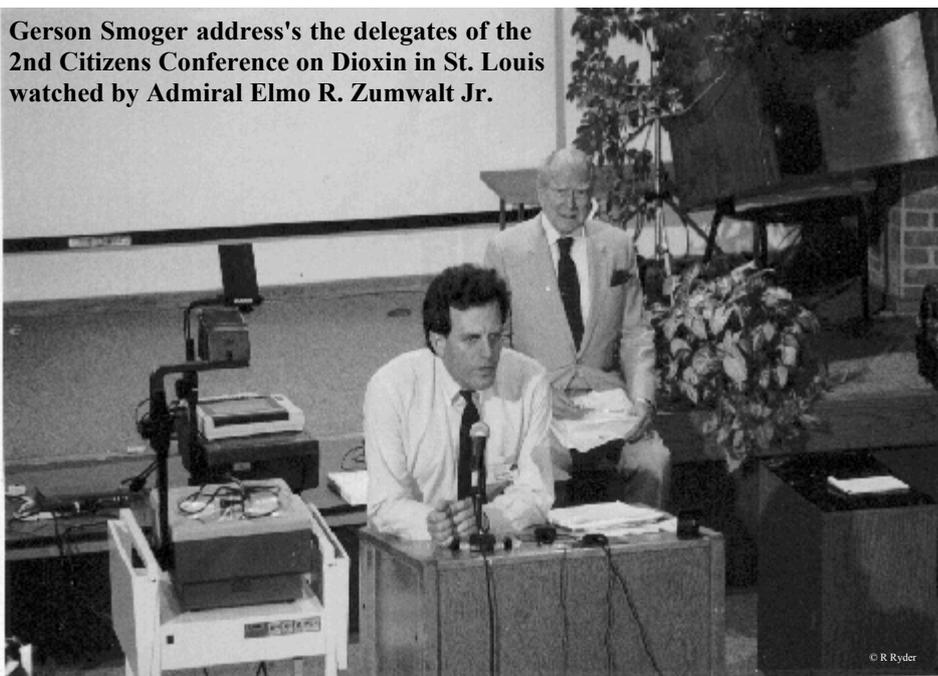
ing in a highly industrial chemically contaminated environment.

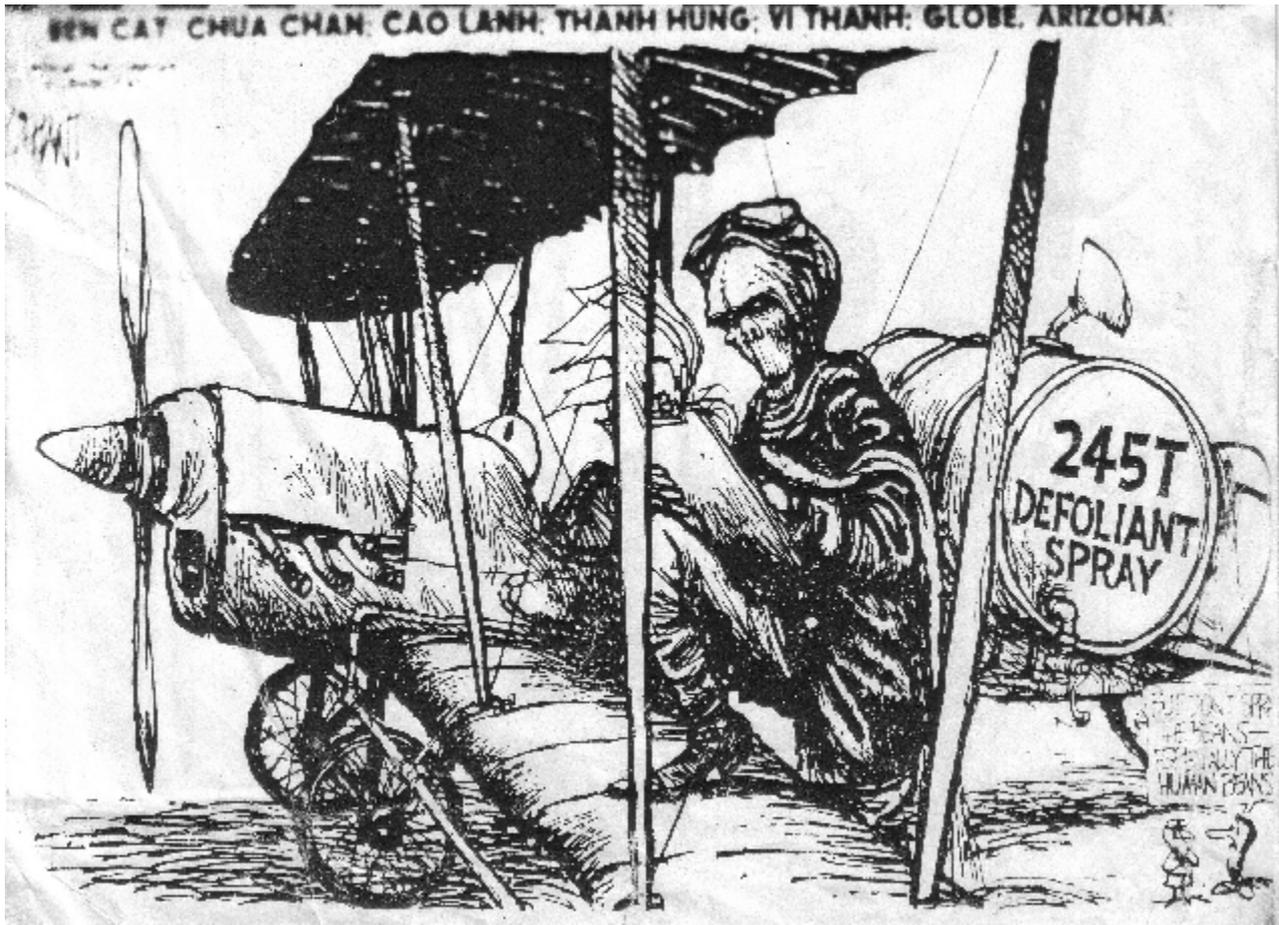
Organochlorine exposure, in general, can lead to dysregulation of the human immune system including one or more, or all of the following immunodeficiency, inappropriate T cell activation, autoimmunity, and hypo or hypergammaglobulinemia.

The mechanism of this remains undescribed.

1. Memorial Medical Center, Southern Illinois University School of Medicine
2. Immunox Research, Edwardville IL.
3. Smoger and Associates, Walnut Valley, CA

Gerson Smoger address's the delegates of the 2nd Citizens Conference on Dioxin in St. Louis watched by Admiral Elmo R. Zumwalt Jr.





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