ToxCat SPECIAL

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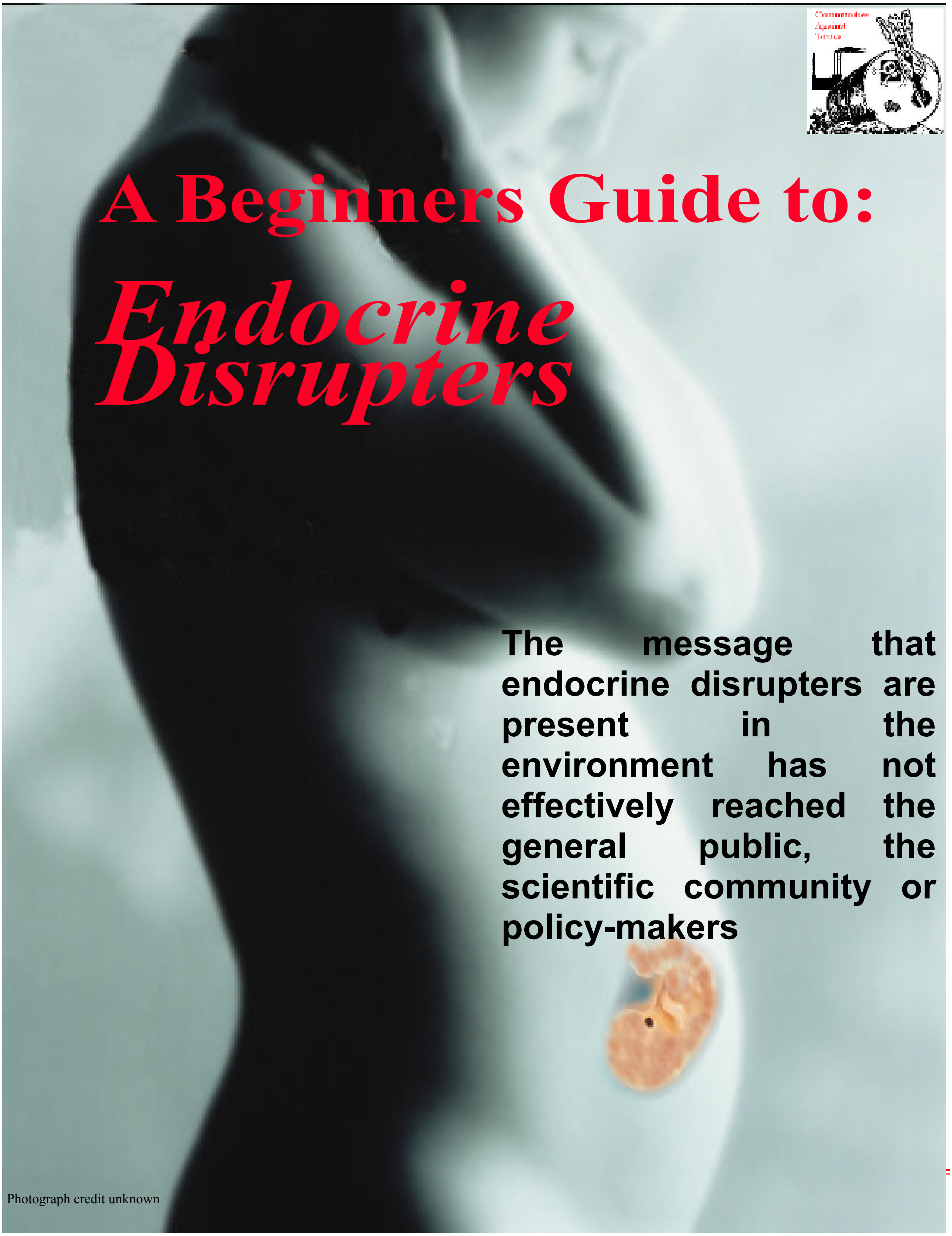

A Beginners Guide to:

Endocrine Disrupters

The message that endocrine disrupters are present in the environment has not effectively reached the general public, the scientific community or policy-makers

Photograph credit unknown

"Go out on a starry night and you realise how infinite is the number of stars that are visible. Suppose each star is an organic compound. Then suppose you were to go to any one of those stars and imagine the infinite number of new stars that would then become 'visible.' This in a way illustrates our conception of the possibilities of the multiplication of organic compounds." *German Chemist quoted in 'The Dow Story.'*

Communities Against Toxics (CATs) is a national network of the 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 strengthening democracy at a local level.
To help communities protect the environment from industrial pollution and political apathy and indifference, 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.
Despite helping 43 communities to resist planning applications for toxic, municipal, medical, crematorium and animal waste burners, CATs struggles to get financial support from grant giving Foundations relying on membership subscriptions and donations to survive. CATs receive 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 & some of the known impact on human health.*
ToxCat 'Beginners Guide' to *Dioxin*
ToxCat 'Beginners Guide' to *Epidemiological Studies Around Incinerators*
ToxCat 'Do You Want a Boy or a Girl?

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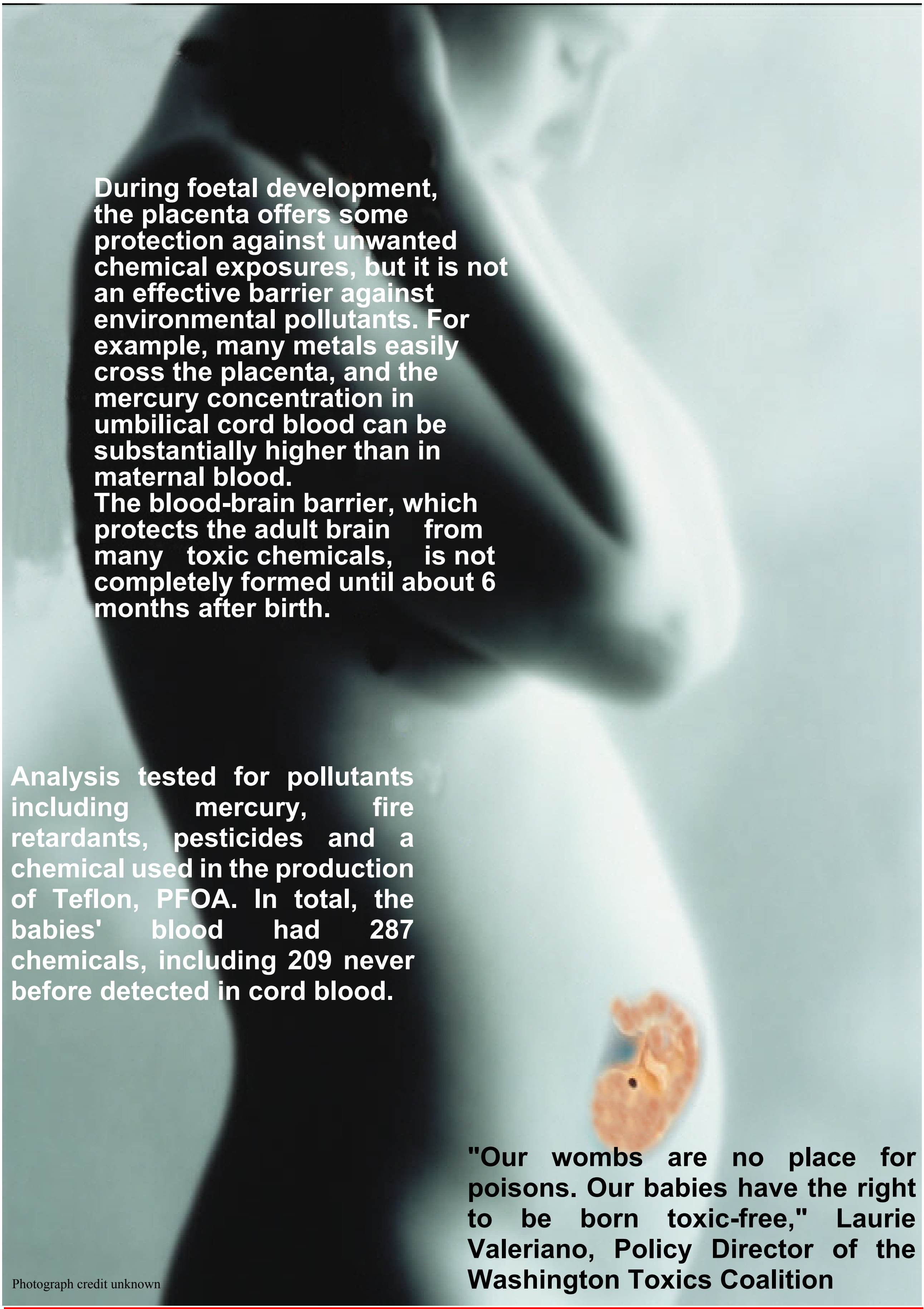


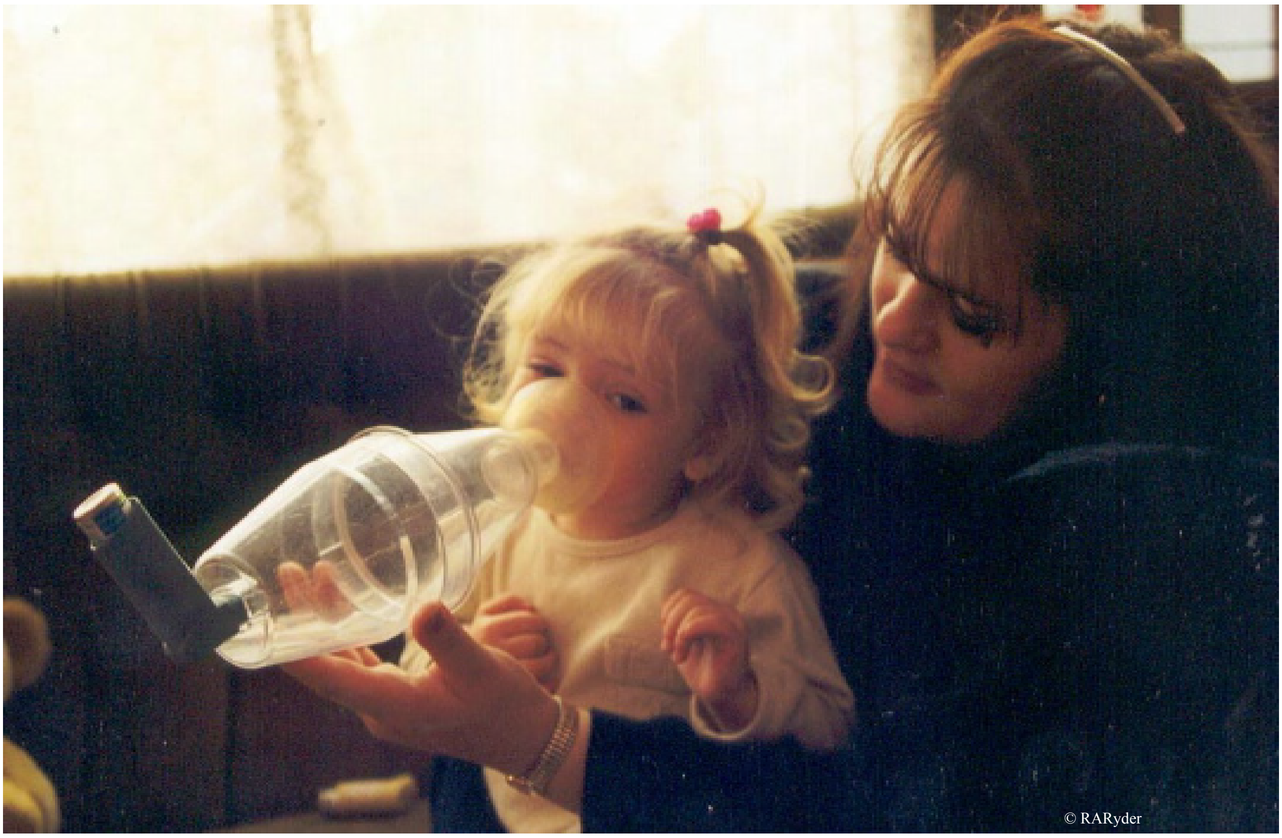
During foetal development, the placenta offers some protection against unwanted chemical exposures, but it is not an effective barrier against environmental pollutants. For example, many metals easily cross the placenta, and the mercury concentration in umbilical cord blood can be substantially higher than in maternal blood.

The blood-brain barrier, which protects the adult brain from many toxic chemicals, is not completely formed until about 6 months after birth.

Analysis tested for pollutants including mercury, fire retardants, pesticides and a chemical used in the production of Teflon, PFOA. In total, the babies' blood had 287 chemicals, including 209 never before detected in cord blood.

"Our wombs are no place for poisons. Our babies have the right to be born toxic-free," Laurie Valeriano, Policy Director of the Washington Toxics Coalition

Photograph credit unknown



About 17% of school-age children in the United States suffer from a disability that affects their behaviour, memory, or ability to learn, according to a study published in the March 1994 issue of *Paediatrics* by a team from the Centers for Disease Control and Prevention (CDC). The list of maladies includes attention deficit/hyperactivity disorder (ADHD), autistic spectrum disorders, epilepsy, Tourette syndrome, and less specific conditions such as mental retardation and cerebral palsy. All are believed to be the outcome of some abnormal process that unfolded as the brain was developing *in utero* or in the young child.

These disorders have an enormous impact on families and society. According to the 1996 book *Learning Disabilities: Lifelong Issues*, children with these disorders have higher rates of mental illness and suicide, and are more likely to engage in substance abuse and to commit crimes as adults. The overall economic cost of neuro-developmental disorders in the United States is estimated to be $81.5-167 billion per year, according to a report published in the December 2001 issue of *EHP Supplements*.

...The human brain is often touted as the most complex structure in the known universe. The developmental process that produces this remarkable entity may also be among the most delicate in nature. As one scientist put it, “The brain doesn’t like to be jerked around.” That kind of fragility makes it difficult for scientists to untangle genetic influences from what often may be subtle environmental assaults. Even so, the catalogue of harmful environmental agents will undoubtedly continue to grow as scientists learn more about the interactions between the developing brain and its environment. The hope is that enough good minds will use that catalogue to create a future with healthier brains and more peace of mind for parents and society alike.

Michael Szpir

Environmental Health Perspectives Supplements Volume 109, Number S6, December 2001

Endocrine System Overview

The science related to measuring and demonstrating endocrine disruption is in its' infancy, so validated methods of testing that indicate specific effects of an endocrine disrupter are still being developed.

The endocrine system, also referred to as the hormone system, is found in all mammals, birds and fish. It is made up of glands located throughout the body.

Hormones (i.e., chemical messengers) that are made by the glands and released into the bloodstream or the fluid surrounding cells.

Receptors in various organs and tissues that recognize and respond to the hormones.

Hormones are released by glands and travel throughout the body searching for cells that contain matching receptors-proteins within the target cell or located on the surface of the target cell. The hormone binds with the receptor, much like a key would fit into a lock to unlock a door. The hormones, or keys, need to find compatible receptors, or locks, to work properly.

Although hormones reach all parts of the body, only target cells with compatible receptors are equipped to respond. Once a receptor and a hormone have bonded, the receptor carries out the hormone's instructions by either altering the cell's existing proteins or turning on genes that will build a new protein.

Both of these actions create reactions throughout the body. Researchers have identified more than 50 hormones in humans and other vertebrates.

The endocrine system regulates all biological processes from the conception of an organism through adulthood and into old age regulating many functions of a body, including metabolism, blood sugar levels, growth and function of the reproductive system, and the development of the brain and nervous system. The female ovaries, male testes, and pituitary, thyroid, and adrenal glands are all endocrine glands.

The EPA's Endocrine Disrupter Screening Program focuses on the oestrogen, androgen, and thyroid hormones. Estrogens, produced primarily by the ovaries and in small amounts by the adrenal glands, are the group of hormones responsible for female sexual development.

Androgens are substances responsible for male sex characteristics. Testosterone, the sex hormone produced by the testicles, is an androgen. The thyroid gland secretes two main hormones, thyroxine and triiodothyronine, into the bloodstream that stimulates all the cells in the body and control many biological processes such as growth, reproduction, development, and metabolism.

Endocrine glands are located throughout the human body: Hypothalamus - The hypothalamus links our endocrine and nervous systems together. The hypothalamus drives the endocrine system.

Pituitary gland - The pituitary gland receives signals from the hypothalamus.

This gland has two lobes, the posterior and anterior lobes. The posterior lobe secretes hormones that are made by the hypothalamus.

The anterior lobe produces its own hormones, several of which act on other endocrine glands.

Thyroid gland - The thyroid gland is critical to the healthy development and maturation of vertebrates and regulates metabolism.

Adrenal glands - The adrenal gland is made up of two glands: the cortex and medulla. These glands produce hormones in response to stress and regulate blood pressure, glucose metabolism, and the body's salt and water balance.

Pancreas - The pancreas is responsible for producing glucagon and insulin. Both hormones help regulate the concentration of glucose (sugar) in the blood.

Gonads - The male reproductive gonads, or testes, and female reproductive gonads, or ovaries, produce steroids that affect growth and development and also regulate reproductive cycles and behaviours.

The major categories of gonadal steroids are androgens, estrogens, and progestins, all of which are found in both males and females but at different levels.

Endocrine disrupters can mimic a natural hormone, fooling the body into over-responding to the stimulus (e.g., a growth hormone that results in increased muscle mass) or responding at inappropriate times (e.g., producing insulin when it is not needed).

Other endocrine disrupting chemicals can block the effects of a hormone from certain receptors.

Still others can directly stimulate or inhibit the endocrine system, causing overproduction or underproduction of hormones.

Certain drugs are used to intentionally cause some of these effects, such as birth control pills. In many situations involving environmental chemicals, an endocrine effect may not be desirable.

In recent years, some scientists have proposed that chemicals might inadvertently be disrupting the endocrine system of humans and wildlife. A variety of chemicals have been found to disrupt the endocrine systems of animals in laboratory studies, and compelling evidence shows that endocrine systems of certain fish and wildlife have been effected by chemical contaminants, resulting in developmental and reproductive problems.

However, the relationship of human diseases of the endocrine system and exposure to environmental contaminants is poorly understood and scientifically controversial.

You can find additional information about the endocrine system on the Internet by opening a search engine and searching on “endocrine”, or try the Tulane University Web site at http://e.hormone.tulane.edu/

The draft list of known endocrine disrupting chemicals contains 73 substances: 69 pesticides and four inerts used in pesticide formulations.
More than half of the compounds have known effects on the endocrine system or have proven anti-androgenic or estrogenic activity.

Source: Endocrine Primer | Endocrine Disruptor Screening Program, US EPA

“...we started looking at the effects of the materials that plastics are made out of in cell culture. We used human cells to see how responsive these cells were to these chemicals, and at what doses the chemicals could influence human cells to start growing and doing things differently. So, in other words, we're getting biological responses out of the cells and we were astonished at the incredibly small amounts of these chemicals that were actually able to alter human cell function.

So what we did in mice was based on the studies using human cells. We know that mouse cells are essentially identical to human cells in the way that they respond to these hormones. That's been known actually for quite a long time.

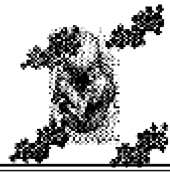
Now one of the surprising things is that when we started looking into the literature concerning the amounts of these chemicals that were being released into food from plastic containers, and we compared that to the doses active in our cell culture studies, they were the same doses. But they were also doses that the toxicological community was saying were absolutely safe.”

Fredrick vom Saal,
Professor of Biological Sciences,
University of Missouri.

Nearly half of all pregnancies in the U.S. today result in the loss of the baby or a child born with a birth defect or chronic health problem.

Source: National Research Council Sci-entific frontiers in developmental toxicology and risk assessment. National Academy Press; Washington DC, 2000.

ENDOCRINE DISRUPTERS



"Of all the pollutants released into the environment every year by human activity, POPs are the most dangerous. For decades these highly toxic chemicals have killed and injured people and wildlife by inducing cancer and damaging the nervous, reproductive and immune systems. They have also caused uncounted birth defects." UNEP Executive Klaus Toepfer.

Over the last 100 year's the chemical industry has showered the world with approximately 100,000 chemicals. Many of these are designed to have a biological effect and are capable of having a diverse range of devastating effects on the health of both wildlife and humans.

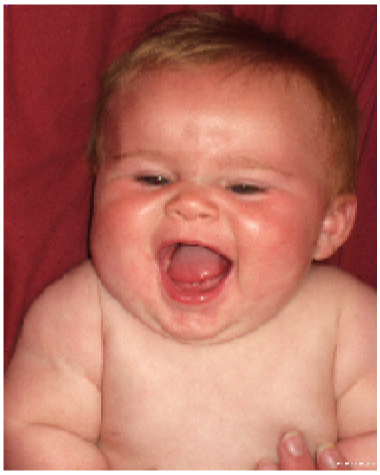
There is an ever-growing list of compounds capable of disrupting the human endocrine system. Dioxin is an acknowledged carcinogen and endocrine disrupter (EDC). Yet the British government is adamant: *"… dioxin emissions from an energy to waste plant operating to the new pollution control standards will not poise 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…" …Together, the available evidence demonstrates that there is no reason to be concerned about the dioxin emissions from the new generation of energy from waste incinerators…"*[1]

The reality is however there is very good reason to be concerned about the impact on health of the complex mixture of chemicals emitted and the amount of untested compounds in use throughout industry?

Although advisers to the government claim its possible estimate the 'tolerable' level of this chemical mixture of the developing embryo and foetus. The time spent in the womb is when we are at our most sensitive to chemical insult and given that scientists only have data on 14% of the chemicals in daily use, this claim is simply untrue.

A developing foetus does not come of uniform stature, health, age, weight or fitness. The same is true of adults, For example, some people are sensitive to commonly used chemicals in perfume and aftershave, while others drench themselves in these to (hopefully) make them more attractive to the opposite sex. Some asthmatics suffer a serious attack if they enter a smoky room, while others smoke heavily. Some suffer side effects from prescribed tablets, while others have no adverse effect at all.

Tests to acertain the health effects of a chemical are usually conducted on young fit men, marines, solders and the like. No tests have ever been conducted on the very young, the very old, on people already suffering chronic illnesses like cancer, leukaemia, asthma, cardiovascular problems or suffering immune system suppression. Never mind a developing fotus.



The reality is the British government made this statement to protect a industrial process that has contaminated each and every one of us, including the unborn;

*conceal the failings of regulatory bodies and the weak regulations in place to protect public health:

*protect a flawed system that allows industry to use and release daily thousands of tonnes of highly dangerous, and in many instances completely untested chemicals into the environment.

A draft list of known endocrine disrupting chemicals contains 73 substances: 69 pesticides and four inert's used in pesticide formulations. More than half of the compounds have known effects on the endocrine system or have proven anti-androgenic or estrogenic activity.

The endocrine system, comprising the hypothalamus, pituitary, testes, ovaries, thyroid, adrenals, and pancreas, and is one of the body's key communications networks. It regulates the function of specific tissues and organs by secreting hormones that act as precise chemical messengers.

Development and regulation of the reproductive system is one of the major functions of the endocrine system.

EDCs have the potential to disrupt critical endocrine pathways in a developing foetus with potential future effects on reproductive, neurologic, and immunologic systems.

EDCs (also called environmental hormones) are some man-made chemicals and unintentionally produced by-products that act like hormones, especially oestrogen's, interfering with the normal functions of the body's hormone system.

Because of this capability, EDCs pose a very real threat to the healthy development of the foetus and very young children.

Over the last 50 year's the chemical industry has showered the planet with approximately 100,000 chemicals. Many are designed to have a biological effect and are capable of having a diverse range of devastating effects on the health of both wildlife and humans.

In the early 1930's, researchers at the Northwestern University Medical School gave an extra dose of oestrogen to pregnant rats. At birth their young showed abnormalities stemming from disrupted sexual development.

The female pups suffered structural defects of the uterus, vagina and ovaries, while the males had stinted penises and other genital deformities.

These tests showed that adding oestrogen upset the natural hormone balance, scrambled the chemical messages, and derailed sexual development.[2]

In 1952, Burlington & Lideman suggested that some synthetic chemicals were indeed "hormonall" active.[3]

In Silent Spring (1962) Rachel Carson documented the damage which indiscriminate use of a new generation of pesticides and herbicides was doing to North American wildlife.[4]

Carson warned something more sinister than straightforward poisoning was occurring among animals noting "the actual destruction of the bird's ability to reproduce."

This resulted in the chemical industry accusing her of 'scare mongering' and being 'alarmist.' Industry's representatives and their political allies pilloried Carson at every opportunity. Industrialists and physicians claimed what was happening to wildlife was of no consequence because humans were 'different to other animals.'

Despite the increased evidence and knowledge we have available, some academics still argue with Carson's writings.

For decades medicine was dominated by the belief the placental barrier was some kind of wonderful impenetrable shield protecting the developing foetus from harm (from everything except radiation). Humans were considered a 'super' special species. Yet if scientists had looked closely they would have seen from the very beginning the warnings that increasing the body's natural balance of hormones were clear and ominous and not just something that happened to 'rodents.'

At the cellular level humans are essentially the same as other animals -- an amazing fact considering the years of evolution and differences in physical structure between animal species.

In many instances, the specific hormones involved in both animals and humans are chemically identicalFor instance, a hormone critical to sexual development and behaviour in humans is chemically identical in turtles.

"Human cells have cytoplasm, nuclei, mitochondria and so on, just as do, other mammals", said Dr. Arnold Schecter (University of New York Health Science).

"People love to think that we are different from other animals, and certainly different from insects. But at the cellular level, we are fundamentally the same," said Dr. Lou Guillette.

"There are so many apparent differences in these species," said researcher John McLachlan. *"Yet the strategy for sexual development is remarkably similar, and the effect of oestrogen is remarkably similar. That sounds simple, but to my thinking its profound."*

This profound similarity suggests that although there are few human studies, the endocrine-related effects first observed in animals can also be manifest in human populations.

"For humans the estimates of the 1% increased cancer risk dose of dioxin point is between 6 and 161ng/kg with the middle values of all the ones looked at [for TCDD] being 40ng/kg. Animals were 14 to 1200ng/kg – with a median of 245ng/kg" Dr. Chris Portier told delegates at the 'The People's Dioxin Action Summit' at Berkeley, CA (2000): *"For TEQ, if you want to use that technique… is where the concern arises because the human cancer risk estimates have a range of human exposure that is extraordinary close to that of animals."*[5]

The studies on behavioural and reproductive differences related to hormone exposure in mice by Professor Frederick vom Saal, (University of Missouri), opened a window on the powerful role hormones have in the development of both sexes revealing the extreme sensitivity of developing mammals to just a slight shift in hormone levels in the womb.[6]

Researchers have discovered many synthetic chemicals capable of disrupting the endocrine system in one-way or another. Some of these chemicals are of the family of 'Persistent Organic Pollutants' (POPS) including the large family of 209 compounds classified as PCBs, the 75 dioxins and the 135 furans which have an abundance of documented disruptive effects.

Pesticides with the same disrupting capabilities include chlorinated organic chemicals such as DDT, toxaphene and kepone.

These are extremely persistent in the environment and human tissues/fats. They are not metabolised by bacteria or humans and are slow to degrade in the environment where the only major breakdown is due to, and only occurs, in the air or at the surface of water or soil under the right conditions. When these compounds bind tightly to organic matter in soil and sediments they will settle out and remain there for many years.[7]

They accumulate in the human body and can pass through the placenta. Some can alter sexual development, undermine intelligence and behaviour. Others damage the immune system leaving the victim open to a multitude of serious diseases.

Disturbingly all organic chemical compounds have the potential to disrupt, damage, and destroy the routine function of organic systems. Estradiol, the body's key estrogen hormone, operates at concentrations in the part per trillion ranges and as little as one-tenth of a part of a trillion of estrogen is capable of altering the course of development in the womb.

Interviewed by a 'Frontline' biologist, Frederick vom Saal said: *"The issue of the amount of hormone that actually causes effects is very difficult for scientists to talk to people about because we're dealing with numbers that are outside of the frame of reference that anybody is going to be thinking about. We see changes, profound changes, in the course of development of essentially the whole body of experimental animals, and we're working with mice and rats, and we see these changes at fifty femtograms of the hormone per milliliter of blood. That's 0.05 trillionths of a gram of this hormone in a milliliter of blood."*[8]

According to vom Saal this degree of sensitivity is *"...beyond peoples wildest imagination."*[9]

"It's like one drop of gin in a trainload of 660 tankers,"* said Theo Colborn, Senior Scientist with the World Wildlife Fund. (*A train with this many cars would be six miles long)

"...[T]hese concentrations are so low they can only be measured using the most sensitive analytical methods."[9]

John Sexton of UK's Thames Water Authority claimed chemicals that act like hormones posed no threat to health because *"the body produces the same hormones, so adjusts itself."*[10]

However, EDCs differ greatly in their potencies relative to natural hormones and in their affinity for target receptors.

"Man-made hormones [as produced by hormone mimicking chemicals] are different from natural hormones. They are persistent. Natural hormones are destroyed within the body in half an hour. Man-made hormones stay in the body for years and years switching on enzyme systems." said Dr. Vyvyan Howard.

"Hormones are incredibly potent at amounts as low as fractions of a millionth of a gram."[11]

Hormones are released by the brain, thyroid or other glands and carried through the bloodstream to "target" organs where they trigger a response. These responses direct and regulate critical functions of the body including behaviour, development, reproduction, body growth, organ development, metabolism, and regular body processes such as kidney function, body temperature and calcium regulation are generally controlled by the endocrine system. They are also responsible for maintaining blood pressure and reproductive cycling.[12]

Dr Chris Portier

If the hormone system works properly and the correct message is sent this is received by genes within the target cell. If something happens to damage the hormone system, then the wrong messages or no messages at all are sent to the cell. This is similar to a fault in the transmission system not connecting properly to the receiver even though the phone or radio is in good working order.

To exert their powerful effects in the body, hormones must first bind with specifically tailored cell proteins called *receptors.* There are hundreds of different kinds of receptors, each one designed for a particular chemical signal. Within one cell there are 10,000 or more of one type of receptor, although only a small number need to be activated to elicit a response.

The receptor and its hormone have an intricate and precise fit, like a lock and key and this hormone-receptor complex then binds to specific regions of DNA in the cell nucleus to activate specific genes. Endocrine disrupters can mimic the actions of the hormone taking its place and fitting badly into its receptor host.

"Although exposure took place in the womb, sometimes the effects don't appear until puberty or afterwards, sometimes even in the next generation."[12][13]

Diethylstilbestrol

If we look at Diethylstilbestrol (DES) a synthetic hormone, we can see how a chemical, even a prescribed one with endocrine disrupting capabilities can cause major problems that dont appear until years later in a developing foetus.

DES was first synthesized in 1936 by E.C.Dodds and approved for use in human medicine in 1941.

Taken by women during the first five months of pregnancy DES dosage levels varied widely ranging from 1.5 to 150mg/day to control bleeding during pregnancy.

Because of variations in the time during which DES was administered, total doses ranged from 135 to 18,200mg.

No consistent relationship between daily or total doses has been identified, other than that exposure must occur before the eighteenth week of gestation.[14]

There were reports between 1966-69 of eight young women aged between 15 & 22 being treated for vaginal adenocarcinoma (a clear-cell cancer of the vagina). This was developing in women whose mothers' who had taken DES during the first three months of pregnancy.

This was unusual as cancer of the reproductive tract is extremely rare in such young women, and clear-cell adenocarcinoma is rare even in women over 50, the age group in whom it is normally seen.[14]

These reports led to the setting up in the early 1970's of a group of researchers by John McLachlan at the National Institute of Environmental Health Sciences at Research Triangle Park, North Carolina, to investigate the effects of diethylstilbestrol (DES) on mice.

In 1975, McLachlan and his colleagues published their findings in the journal *'Science,'* detailing the damage done to male mice exposed to this synthetic oestrogen before birth. McLachlan kept in close touch with Dr. Arthur Haney who was studying the effects of DES on sons born to women who had taken the drug.

Repeatedly they would find something in a mouse and discover the same problem in humans as well.

McLachlan's team warned of the problem of undescended testicles three years before the same problem was reported in the sons of mother exposed to DES.[15]

The animal world was also reeling from the impact of endocrine disrupters.

The Wingspread Conference in July 1991, attended by 21 leading experts in various fields of wildlife research, issued a statement warning: '...Many compounds introduced into the environment were capable of disrupting the endocrine system of animals, including fish, wildlife and humans.,

They estimated with confidence that: 'Some of the developmental impairments reported in humans today are seen in adult offspring of parents exposed to synthetic hormone disrupters (agonists and antagonists) released in the environment.'[16]

A team of researchers determined that dioxin and similar toxic chemicals were high enough in lake Ontario to kill virtually every trout that hatched there from the late 1940's to the late 1980's.

Their report details results from a 15-year collaboration between a team of toxicologists, chemists, chemical and environmental engineers, and sediment dating experts.[17]

The mechanisms by which these compounds can interfere with or disrupt normal hormone activity can vary, but they share the general properties of mimicking the effects of natural hormones by recognizing their binding sites; antagonizing the effect of these hormones by blocking their interaction with their physiological binding sites; reacting directly and indirectly (triggering) with the hormone in question; by altering the natural pattern of synthesis of hormones; or altering hormone receptor levels.

Both exogenous (external source) and endogenous (internal source) androgens (male

In Utero Exposure to Dioxins and Polychlorinated Biphenyls and Its Relations to Thyroid Function and Growth Hormone in Newborns. Shu-Li Wang, Pen-Hua Su, Shiang-Bin Jong, Yueliang L. Guo, Wei-Ling Chou, and Olaf Päpke .*Environ Health Perspect* 113:1645-1650 (2005)

Abstract

The aim of this study is to examine the association between transplacental exposure to dioxins/polychlorinated biphenyls (PCBs) and thyroid and growth hormones in newborns. We recruited 118 pregnant women, between 25 and 34 years of age, at the obstetric clinic. Personal data collected included reproductive and medical histories and physical factors. Clinicians gathered placental and umbilical cord serum upon delivery and carefully scored the 118 newborns, making both structural and functional assessments. We analysed placentas for 17 polychlorinated dibenzo-p-dioxins and dibenzofurans and 12 dioxin-like PCB congeners with the World Health Organization-defined toxic equivalent factors, and six indicator PCBs by high-resolution gas chromatography and high-resolution mass spectrometry. We analysed thyroid and growth hormones from cord serum using radioimmunoassay. Insulin-like growth factor (IGF)-1, IGF-binding globulin-3, and thyroxine times symbol thyroid-stimulating hormone (T4 times symbol TSH) were significantly associated with increased placental weight and Quetelet index (in kilograms per square meter; correlation coefficient $r = 0.2\text{-}0.3$; $p < 0.05$). Multivariate analyses showed independently and significantly decreased free T4 (FT4) times symbol TSH with increasing non-ortho PCBs ($r = -0.2$; $p < 0.05$). We suggest that significant FT4 feedback alterations to the hypothalamus result from in utero exposure to non-ortho PCBs. Considering the vast existence of bioaccumulated dioxins and PCBs and the resultant body burden in modern society, we suggest routine screening of both thyroid hormone levels and thyroid function in newborns. Key words: dioxins, infant, placenta, prenatal exposure delayed effects, thyroid hormones.

hormones) and estrogens (female hormones) can alter the development of brain function.[18]

Mimics: are EDCs that act like normal hormones in the body. An excellent example of this type is the already mentioned synthetic therapeutic agent Diethylstilbestrol. “DES for ALL pregnancies,” said a drug advertisement in 1957 boasting it produced “bigger and stronger babies.”

DES was used for a variety of things; to suppress milk production after childbirth, to prevent spontaneous abortions, to treat acne, prostate cancer and venereal disease in children. It was even given to girls who had become ‘unfashionably’ tall.

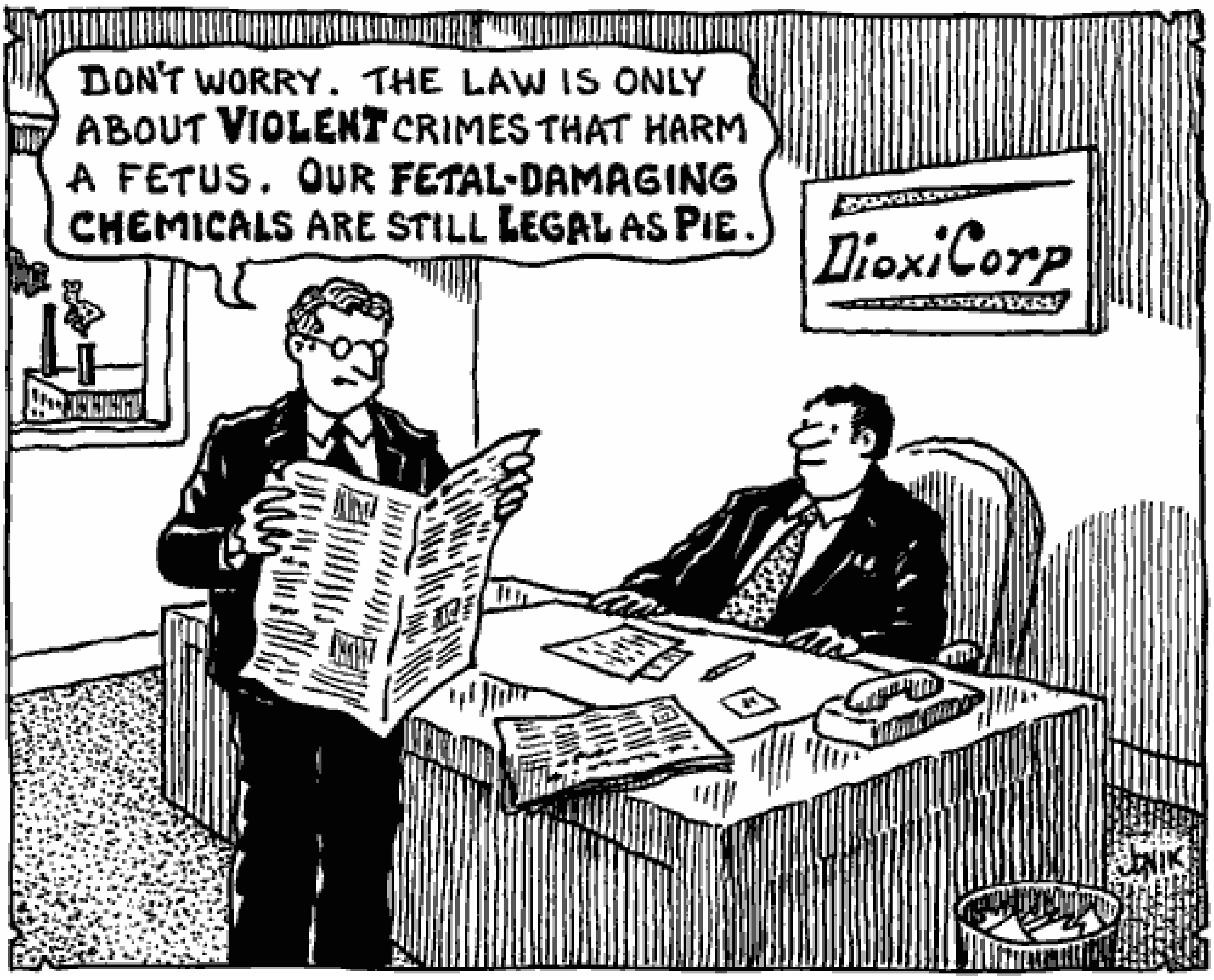
The effects of taking the drug were not apparent at the birth of a child, but came to light years later in the daughters of women who had taken the drug. The daughters also have an increased risk of endometriosis, while the sons have an increased frequency of undescended testes and higher risk of genital birth defects like hypospadias (a defect where the urethra that carries urine does not extend to the end of the penis) and a decreased adult sperm count.[19]

While there are no specific data, it is estimated that up to 10 million Americans (i.e., mothers, daughters and sons) could have been exposed between 1938 and 1971 to diethylstilbestrol during the mothers’ pregnancies.

The effects seen in ‘in utero’ DES-exposed humans parallel those found in contaminated '…The concentrations of a number of synthetic sex hormone agonists and antagonists measured in the U.S. human population today are well within the range and dosages at which effects are seen in wildlife populations. In fact, experimental results are being seen at the low end of current environmental concentrations.

'Unless the environmental load of synthetic hormone disrupters is abated and controlled, large scale dysfunction at the population level is possible. The scope and potential hazard to wildlife and humans are great because of the probability of repeated and/or constant exposure to numerous synthetic chemicals that are known to be endocrine disrupters.'[20]

Blockers: are EDCs that interfere with the function of naturally occurring hormones. They often bind to the



same protein receptors as the real hormone. They do not stimulate any action but just sit in the way of the natural hormone (like testosterone) preventing it doing the job nature intended.

If it does this on the 56th day of development inthe male (for example) major problems in the reproductive development can occur.*"Day 56 the day sexual differentiation sets in, a crucial day in all our lives. Yet as children we are still vulnerable for many years as the development of our secondary sexual organs are not complete until puberty, especially in the male."*[21]

EDCs include a spectrum of substances that can be loosely classified according to their known or suspected activity in relation to sex hormone receptors and pathways. The most-studied and best known are the environmental estrogens, which mimic estradiol and bind to estrogen receptors (ERs). ER agonists include the pesticide methoxychlor, certain polychlorinated biphenyls (PCBs), bisphenol A (BPA; a high production volume chemical used to make polycarbonate plastic), pharmaceutical estrogens such as diethylstilbestrol (DES) and ethinyl estradiol, and phytoestrogens, which occur naturally in many plants, most notably in soybeans in the form of genistein and related substances.

There are a few known ER antagonists, or antiestrogens. Antiandrogens, or androgen receptor (AR) antagonists, include the fungicide vinclozolin, the DDT metabolite p,p´-DDE, certain phthalates (a group of chemicals used to soften polyvinyl chloride plastics), and certain other PCBs.

There are other types of EDCs that affect particular endocrine targets.

The various EDCs differ greatly in their potencies relative to natural hormones, and in their affinity for target receptors. Some have been shown to act via non-receptor-mediated mechanisms, for example by interfering with hormone synthesis. [22]

Triggers: include chemicals that interfere with natural hormones by attaching to protein receptors and triggering an abnormal action. The abnormal action may be growth at the wrong time (perhaps the cause of children as young as four developing breasts and pubic hair?), an alteration of metabolism, or the synthesis of a different product.

The best known of this "trigger" type of disrupter is dioxin and dioxin-like chemicals. Dioxin acts through the hormone-like process, but neither mimics nor blocks natural hormones but initiates entirely new responses.[22]

The endocrine system, comprising the hypothalamus, pituitary, testes, ovaries, thyroid, adrenals, and pancreas, is one of the body's key communications networks. It regulates the function of specific tissues and organs by secreting hormones that act as precise chemical messengers. Development and regulation of the reproductive system is one of the major functions of the endocrine system.

Sex determination and development begin early in gestation, with the differentiation of the embryonic gonad into either testes or ovaries. If the Sry gene is present on the Y chromosome, it will, when activated, trigger a complex cascade of hormonal events that ultimately results in the birth of a baby boy with all the requisite male equipment in place and functioning properly. In the absence of the Sry gene, the end product of the process will be a baby girl. The female phenotype is considered to be the "default" pathway for mammalian reproductive development.[23]

Persistent Organic Pollutants (POPs) are the ultimate in persistence. Sons of Taiwanese women accidentally contaminated by PCBs have developmental delays, symptoms suggesting attention deficit disorder, and shortened penises at puberty although the mothers' exposures took place at least *six years* before the pregnancy. These, the DES results, and the effects of the drug thalidomide on children of women who took perhaps only two or three tablets at five to eight weeks into their pregnancy, (the critical time for the development of arms and legs), tell us that it is not the dose of the drug (or chemical), but the *timing of exposure* that is crucial. The fact that the guilty chemicals are produced and emitted in what the industry claim is 'small,' even 'insignificant amounts', is therefore meaningless.

EDCs include a spectrum of substances that can be loosely classified according to their known or suspected activity in relation to sex hormone receptors and pathways. The most-studied and best known are the environmental estrogens, which mimic estradiol and bind to estrogen receptors (ERs). ER agonists include the pesticide methoxychlor, certain polychlorinated biphenyls (PCBs), bisphenol A (BPA; a high production volume chemical used to make polycarbonate plastic), pharmaceutical estrogens such as diethylstilbestrol (DES) and ethinyl estradiol, and phytoestrogens, which occur naturally in many plants, most notably in soybeans in the form of genistein and related substances. There are a few known ER antagonists, or antiestrogens. Antiandrogens, or androgen receptor (AR) antagonists, include the fungicide vinclozolin, the DDT metabolite *p,p´*-DDE, certain phthalates (a group of chemicals used to soften polyvinyl chloride plastics), and certain other PCBs. And there are other types of EDCs that affect particular endocrine targets. The various EDCs differ greatly in their potencies relative to natural hormones, and in their affinity for target receptors. Some have been shown to act via non-receptor-mediated mechanisms, for example by interfering with hormone synthesis. Are EDCs Blurring Issues of Gender? *Environmental Health Perspectives* Vol 113 No 10 October 2005

“Foetal development is the stage of life where chemical messengers have the most impact at the lowest level. Adults can be completely unaffected by regular exposure to an endocrine disrupter, but the developing foetus can have its future completely changed.[24][25] posing even more questions about the UK governments claim that *'… dioxin emissions from an energy to waste plant operating to the new pollution control standards will not poise a risk to people living near the plant etc...'*

One meeting of scientists underscored the exquisite sensitivity of the developing nervous system to chemical disruption with the participants estimating "with confidence that *“…there may not be definable thresholds for responses to endocrine disrupters. In addition, for naturally occurring hormones, too much can be as severe as problem as too little…*

They agreed, *“…Even weak endocrine disrupters may exert potent effects because they can by-pass the natural protection of blood bonding proteins for endogenous hormones.”*

And: *“…Also compounds that are not toxic in the mother may be toxic to her developing embryo, foetus or newborn. The exquisite vulnerability of the foetal brain to methyl mercury and lead are prime example of this principle.”*

They admitted there are many uncertainties in our understanding [of endocrine disrupters] because: *“…Relatively few of the man-made chemicals found in human tissue have been identified. Lack of funding has seriously constrained testing these chemicals for their potential to disrupt natural systems.*

'…In addition, alternation of other systems can produce subsequent cognitive, behavioural, and neurological dysfunction: i.e., diseases of other organ systems that influence the brain: non-CNS drugs: other foreign substances such as air pollutants: and immune system involvement that alter behaviour.

They also believe:

“…The message that endocrine disrupters are present in the environment has not effectively reached the general public, the scientific community, or policymakers.”

As for the effects of these chemicals on certain sections of society i.e., the unborn, children and those already ill the conference stated:

“…The magnitude of the problem can be better determined by knowing the distribution of responses to endocrine disrupters by individuals within the subsets of the population most at risk, such as pregnant women, developing embryos, foetuses, and newborns, teens,theaged, the ill or those with pre-existing endocrine disorders.” [26]

Given the extremely low levels of natural hormones produced by the endocrine system to induce appropriate changes within the body, more scientists are joining the school of thought that no level of dioxin or any other hormone-mimicking/disrupting chemical is safe.

“…to set policy which will guarantee to protect the most sensitive group in the population with an ample margin of safety [from air pollution] in not good science.'

"Some extremely sensitive individuals will display a physiological reaction at an extremely low concentration. Probably it is not feasible to rid the air of pollutants to the point that the most sensitive individuals will not react at all.”[27]

Dr. Barry Commoner (Center for the Biology of Natural Systems, New York) believes that *“dioxin and dioxin like substances represent the most perilous chemical threat to the health and biological integrity of human beings and the environment… …[Which] present in only minuscule amounts can powerfully alter the natural bio-chemical process.”*[28]

Yet we are told by Prof Jim Bridges, adviser to the UK government and the EU that scientists can estimate the 'tolerable' level of chemicals in the foetus and embryo. Presumably this claim includes EDCs? Can we really know what level of a particular chemical causes a specific problem in a developing fembryo/oetushemical?

The reality is that if we took the 1,000 commonest chemicals in daily use in unique combinations of three for testing, this would require at least 166 million

POSSIBLE RISK OF PROSTATE CANCER ASSOCIATED WITH ADIPOSE TISSUE CONCENTRATIONS OF PERSISTENT ORGANIC POLLUTANTS

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Prostate cancer is the most common malignancy in Western society. The etiology of prostate cancer is poorly understood. It has been found that the risk of developing prostate cancer in men with high concentrations of moderately chlorinated PCBs or PCBs with phenobarbital-like activities is over two times higher, compared to men with low concentrations. Several POPs are endocrine disruptors with estrogenic potency causing adverse effects on male reproduction. Since they have these endocrine disrupting characteristics it is reasonable to investigate an association with prostate cancer and human exposure of these POPs. An increased concentration of certain POPs in mothers of men with testicular cancer has been found, supporting current hypothesis that testicular cancer is of foetal origin.

Source: *Organhalongen Compounds* Volume 67 CD-Rom of Proceedings of Dioxin 2005 and ISPAC-20 experiments, and this is ignoring the need to study varying doses. Even if each experiment took just one hour to complete, with 100 laboratories working round the clock seven days a week, testing all possible unique three - way combinations, it would take over 180 years to complete.[38][39]

To confound the problems of synergistic effects even more research has shown that many chemicals considered harmless as individual compounds can act as a catalyst and magnify the hormone disrupting powers of other chemicals. Combinations of two or three pesticides can become 160 to 1,600 times more toxic than in their individual form.

Given this I believe the British public are once again being misled to protect industry's interests.

It is not only while in the womb that children are at risk from endocrine disrupters. In just six month's a breast fed baby in Europe and the United States get the maximum recommended lifetime dose of dioxin. Its average daily intake is at least ten times higher than the average daily intake for an adult. The same baby gets five times the allowable daily level of PCBs set by the international health standards for a 150 pound adult.[28] Worrying news indeed when you consider that in the 1996 video Hormone Copycats' scientist Theo Colburn told us:

"It was only recently that scientists discovered we need thyroid in the human embryo from the moment of conception and during the first 12 weeks of development. They did not believe it was necessary until then because the amounts in the body were so low they could not detect them.

It is now known that if the thyroid is interfered with it can affect the way the brain is wired and the intelligence and behaviour of the child."[30]

Breast Feeding

Doctors agree breast-feeding is the most natural and best food for a baby. It strengthens the mother-baby bond and provides the baby with important immune protection and substances that enhance development. Unfortunately at the same time it exposes the child to a number of carconogenic chemical contaminates including known EDCs.

When asked "Given the contaminates in breast milk should a woman breast feed or not?"

Tom Webster, one of the scientist involved in the initial review of the United States Environmental

A precious gift - a healthy baby. But every child born today carries as many as 300 groups of chemicals in their tiny body. Many are carcinogenic and in minuscule amounts capable of disrupting and damaging development not only in the womb, but up to puberty and beyond.

Protection Agency's Reassessment of 2,3,7,8-TCDD in 1994, replied,

"Surely the fact that we may have to decide that or not tells us we have gone way too far?"[31]

Dr. Paul Connett (St. Lawrence University) also believes we are in real trouble. *"When you tell a woman to limit breast feeding you are looking at the beginning of the end of mankind."*[32]

"Nursing is highly desirable in general, and yet we are unhappy with the high levels of dioxin, furans and PCBs found in nursing mothers' breasts milk" said Dr Arnold Schecter.[33]

Abnormalities

Could the human population already be suffering major health problems because of synthetic chemical contamination of the embryo/foetus in the womb and breast fed child when nursing?

Many scientists believe so! Laboratory experiments, wildlife studies, the DES experience, and a great number of paediatricians from the U.S. and Europe, are pointing to the increasing frequency of genital abnormalities in children such as undescended testicles, extremely small penises, hypospadias, and the reduction in sperm count as being caused by hormone disrupting chemicals.[33]

Sharpe and Skakkebaek suggest that decreased male reproductive capacity may be related to exposure to endocrine disrupters.[34]

While hypospasias and cryptorchidism (a condition in which one or both testicles have not descended, and hypospadias occurs when the urethral opening is displaced) have both been observed in male offspring of rodents exposed in utero to estrogenic and antiandrogenic compounds.[35][36]

Dr. Linda Birnbaum (U.S.EPA) a leading authority on dioxin and dioxin like compounds stated: *"We know that in animals in prenatal exposure, or should I say perinatal exposure actually, both prior to birth and shortly after birth in animals, leads to permanent suppression of the immune system and this never goes away. We have followed the animal up to 18 months of age and their immune system still doesn't function properly."*[37]

However, none of these disturbing facts deter industry from continuing to release millions of tonnes of untested chemicals into the environment.

Man-made compounds can now found in the sediments of the deepest sea bed, to the top of uninhabited mountain peaks - in the tissues of wildlife in regions as remote as Antarctica and the Sahara Desert. Each chemical compound is theoretically

Thyroid-Hormone-Disrupting Chemicals: Evidence for Dose-Dependent Additivity or Synergism
Kevin M. Crofton, Elena S. Craft, Joan M. Hedge, Chris Gennings, Jane E. Simmons, Richard A. Carchman, W. Hans Carter Jr., and Michael J. DeVito. *Environ Health Perspect* 113:1549-1554 (2005)

Abstract

Endocrine disruption from environmental contaminants has been linked to a broad spectrum of adverse outcomes. One concern about endocrine-disrupting xenobiotics is the potential for additive or synergistic (i.e., greater-than-additive) effects of mixtures. A short-term dosing model to examine the effects of environmental mixtures on thyroid homeostasis has been developed. Prototypic thyroid-disrupting chemicals (TDCs) such as dioxins, polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers have been shown to alter thyroid hormone homeostasis in this model primarily by up-regulating hepatic catabolism of thyroid hormones via at least two mechanisms. Our present effort tested the hypothesis that a mixture of TDCs will affect serum total thyroxine (T4) concentrations in a dose-additive manner. Young female Long-Evans rats were dosed via gavage with 18 different polyyhalogenated aromatic hydrocarbons [2 dioxins, 4 dibenzofurans, and 12 PCBs, including dioxin-like and non-dioxin-like PCBs] for 4 consecutive days. Serum total T4 was measured via radioimmunoassay in samples collected 24 hr after the last dose. Extensive dose-response functions (based on seven to nine doses per chemical) were determined for individual chemicals. A mixture was custom synthesized with the ratio of chemicals based on environmental concentrations. Serial dilutions of this mixture ranged from approximately background levels to 100-fold greater than background human daily intakes. Six serial dilutions of the mixture were tested in the same 4-day assay. Doses of individual chemicals that were associated with a 30% TH decrease from control (ED30), as well as predicted mixture outcomes were calculated using a flexible single-chemical-required method applicable to chemicals with differing dose thresholds and maximum-effect asymptotes.

The single-chemical data were modelled without and with the mixture data to determine, respectively, the expected mixture response (the additivity model) and the experimentally observed mixture response (the empirical model). A likelihood-ratio test revealed statistically significant departure from dose additivity. There was no deviation from additivity at the lowest doses of the mixture, but there was a greater-than-additive effect at the three highest mixtures doses. At high doses the additivity model underpredicted the empirical effects by 2- to 3-fold. These are the first results to suggest dose-dependent additivity and synergism in TDCs that may act via different mechanisms in a complex mixture. The results imply that cumulative risk approaches be considered when assessing the risk of exposure to chemical mixtures that contain TDCs. Key words: additivity, cumulative risk, polyhalogenated aromatic hydrocarbons, synergism, thyroid hormone disruptors.

capable of affecting living creatures in very unpredictable, devastating ways, either as individual chemicals, or when combined with others.

The proliferation of synthetic chemicals and their organic link with living creatures mean that every plant, insect, fish, animal and human being, is swimming blindfolded in a sea of chemicals with frightening consequences.[38]

Today *Silent Spring* is acknowledged as being one of the most important books of the twentieth century. It is credited as being the start of modern environmentalism. But one thingis certain. It made the public aware of the recklessness of the chemical industry that, in its rush for increase profits, produced and released thousands of untested chemicals into the environment, a practice it continues almost unhindered today.

Dr. Linda Birnbaum (U.S.EPA) answers questions from delegates at the 'People's Dioxin Action Summit' at Berkeley, CA (2000) with Stephen Leister and Tom Webster (seated) looking on.

One would think given the evidence which, like many of the chemicals in question, has accumulated over the years. Governments and industry would be working hard to take the guilty chemicals off the market and ensure no more are introduced.

But no! Industry is resisting change with all its might.

Aided and abetted by the political hierarchy of the United Kingdom, France and Germany. They lobbied the European Commission to water down the Registration, Evaluation and Authorization of Chemicals (REACH) legislation.

As a result of this intense lobbying industry will continue using approximately 30,000 untested chemicals threatening the health of future generations and raising concern among environmental organisations over the true agenda of the politicians in question.

Will we ever know what specific chemical and in what dose cause what problems?

The reality is that if we took the 1,000 commonest chemicals in daily use in unique combinations of three for testing, this would require at least 166 million experiments, and this is ignoring the need to study varying doses. Even if each experiment took just one hour to complete, with 100 laboratories working round the clock seven days a week, testing all possible unique three - way combinations, it would take over 180 years to complete.[39] [40]

When one considers Denmark's Environment Ministry calculated the socio-economic benefits to that country alone of carrying out the REACH EU chemicals policy reform at somewhere between DKr675m and DKr5,260m (€90 - €707m) over 30 years, one wonders just where the priorities and interests of these politicians and members of the European Commission lie?

The Danes estimated covered "savings associated with direct costs such as expenditure on doctors, hospitals and medicines", with particular emphasis on occupational cancers and contact allergies, and "indirect costs in the form of lost production and individual well-being."[41]

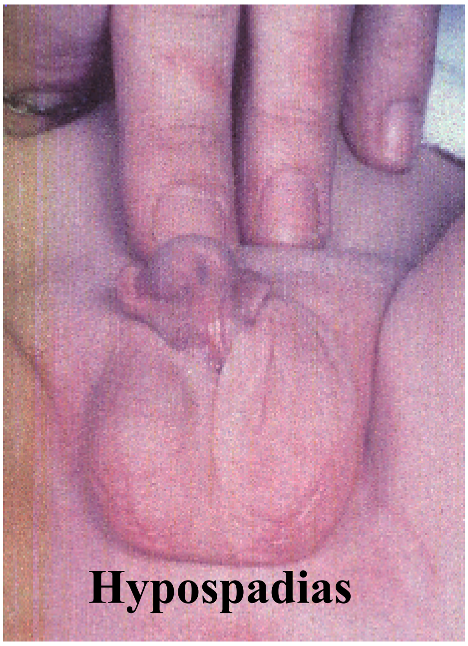
Public health activists and other concerned organisations realised how much watering down had occurred when politicians and industrialists who screamed like banshees when they saw the 1st draft, were signing its praises at the time of its adoption.

The headlines of the media reports gave little notice of how public health was being sacrificed for industrial profit.

European Parliament OKs Rules on Chemical Safety. 'The regulation would force industries worldwide to test their chemicals for effects on human health and the environment' wrote the *Los Angeles Times*.[42]

EU Parliament Tries to Strike Chemical Balance. 'The Parliament advanced major new rules that could lead to the removal of some industrial chemicals from

..marine mammals tested in the 1960's were found to contain five organochlorine pollutants and mercury in their tissues. Today some 265 organic chemical contaminants and 50 inorganic pollutants can be found in those same species.



Mean Prevalence of Hypospadias per 10,000 births

Finland 4.7
France (CE) 8.4
Northern 10.7
Denmark 11.5
Paris 12.2
Ireland 12.4
Norway 12.9
England 15.3
Spain 17.6
Italy (IMER) 19.1
Hungary 19.4
Sweden 19.7
Czech Republic 21.0
Italy (IPIMC) 24.3

Average Prevalence of all countries 14.0

Between 1962 and 1981 there doubling of the frequency of undescended testicles in England and Wales. The rate of hypospadias, an abnormality of the penis, doubled in the United States during the 1970s and 1980s.

the European market. But industry won significant concessions.' Reported the *Wall Street Journal.*[43]

If any politician needed more proof of the failings of the regulations to protect public health and the environment, they need look no further than the report 'Cause for Concern' published by the WWF.[44]

This shows that the warnings given and the evidence collected since the publication of *Silent Spring* nearly 50 years ago, are still being ignored to safeguard industrial economic interests.

The report concentrates on more recent additions to the chemical cannon and the emerging hazards these newer compounds represent.

Like many other toxins before them, these substances are proving to be ubiquitous in both consumer products and the environment.

They include perfluorinated compounds like those used in food packaging and non-stick cookware; brominated flame retardants found in everything from furniture to electronics; phthalates, which are found in PVC and soft, flexible plastics; and phenolic compounds like bisphenol-A from things like food cans, plastic bottles, and computer shells.

'Cause for Concern' documents countless instances in which these and other relatively new chemicals have been found in wildlife tissues samples. Bisphenol-A, (for example) has been discovered in the broad-snouted caiman, a South American relative of the alligator. Perfluorinated compounds have been identified in dolphins, whales and cormorants in the Mediterranean, seals and eagles in Europe's Baltic region, and polar bears. Brominated flame retardants have been discovered in sperm whales, arctic seals, peregrine falcon eggs, and in many other creatures as well.

WWF makes it clear that such contamination is widespread in the general environment and that the pollutants causing it are easily able to reach creatures and ecosystems found thousands of miles away from the nearest potential source.

Equally alarming is the fact that wildlife exposure to toxins is increasing over time. According to its researchers, who examined a wealth of current scientific studies to produce their findings, marine mammals tested in the 1960's were found to contain five organochlorine pollutants and mercury in their tissues. Today some 265 organic chemical contaminants and 50 inorganic pollutants can be found in those same species.

Obviously the 'strict regulations' imposed by governments to safeguard human health and the environment from industrial pollution have failed dismally. But industry and politicians refuse to accept the full implications / consequences of this contamination.

While further study is needed to ascertain the precise health effects of exposure to these chemicals in individual species, existing evidence indicates that the results are likely to be similar to those experienced by human beings. These include cancer, immune system damage, behavioural changes, hormonal disruption, and reproductive and developmental disorders.

The authors note that older compounds long since removed from production continue to cause trouble demonstrating just how problematic persistent chemicals can be once they are let loose in the environment.[44]

They also serve as a strong precautionary lesson as to why it's important to prevent generations of new and future chemicals from gaining a similar foothold in ecosystems throughout the world.

World Trade Organisation

The WWF, along with other groups working on the issue of endocrine disrupters face the phenomenal power of the corporate-dominated industrial lobby group 'The World Trade Organisation' (WTO).

Of the world's richest economies, 51 are multinational corporations and because of this wealth the WTO has gained a great deal of power within the international political and economics arena. It has used its lawyers to give itself amazing powers and now dictates trading laws to democratically elected governments. Its hierarchy is blinded by profit, and believes nothing is as important as the freedom of its members to trade, irrespective of the impact their processes and products might have on human health.

Their shameful disregard for human well-being was brought strikingly into the public eye during the 'investment protection' battle between the Ethyl Corporation and Health Canadian.[45]

Health Canadian refused to allow the sale of the neuro-toxin petrol additive methylcyclopentadienyl manganese tricarbonyl (MMT). One of its major concerns was the possible impact on children's health as MMT is known to be extremely toxic at high doses, whereas the impact of low doses are essentially unstudied and therefore unknown causing real concern in that it might have subtle adverse neurological effects, particularly in children.

The Ethyl Corporation claimed this refusal lost them 'expropriation of its property' (i.e., its anticipated profits) and how the Canadian government had damaged its 'good reputation' by simply discussing the problem in Parliament.

The WTO agreed that these factors took precedence over the [justifiable] concerns of the Canadian government and Health officials that the manganese in MMT posed a real threat, especially to children's health. Given the situation there is good reason to think we may be witnessing a development similar to the original addition of lead to petrol in the 1920.

Any citizen unfamiliar with the workings of the WTO might assume that all national governments have a right to regulate industrial processes and products to protect human health and the environment within their countries boundaries. This is not the case. The WTO 'Free Trade Agreement' undermines the rights and ability of any government to regulate. "Under the new rules, corporations will be able to challenge local laws before an international tribunal (whose records are not disclosed and whose decisions cannot be appealed), but governments and their citizens will have no corresponding right to take action against offending corporations. For instance, they will have no right to conserve their environment or protect people against the harmful effects of foreign investment."[46]

This 'freedom to trade above all else' mentality, together with the decisions of politicians more concerned with industry's economics than public health is undoubtedly resulting in increasing numbers of children being born with serious developmental defects through chemical insult.

(Hayes *et al*. 2002). The mechanism appears to involve enhancement of aromatase conversion of testosterone to estrogen during development.

Elegant theoretical and empirical work suggests that for activated signalling systems, there may be no threshold beneath which no effect occurs (Sheehan et al. 1999).

Another key shift is the acknowledgement that the assumption that "the dose makes the poison" can be misleadingly simplistic, if it is used to imply that only high dose exposures induce effects. In fact, low exposure levels sometimes cause effects not seen at higher levels (e.g., vom Saal et al. 1997, National Toxicology Program 2001, Cavieres et al. 2002). Researchers are now intensely pursuing these "non-monotonic dose response curves" and the uncertainty about their underlying mechanisms, which likely vary from case to case. One plausible hypothesis is that at low, "physiological" levels, the contaminant interferes with developmental signalling, but does not activate biochemical defences against impacts that would be caused by higher exposures. At somewhat higher levels, these defences are activated and the contaminant is successfully detoxified.

At even higher levels, the defense mechanisms are overwhelmed by the toxicant and more traditional toxicological effects are induced.

As scientific research has focused on mechanisms of message disruption, it has implicated a wide array of chemicals. This expansion has involved both ongoing identification of compounds capable of interfering with oestrogen, which was the initial focus, as well as research broadening the range of message systems studied.

Some of the most troubling discoveries about "new actors" is that they involve compounds in widespread use in consumer products, including plastic additives like phthalates and plastic monomers like bisphenol A, which leaches from polycarbonate prod- ucts (e.g., Gray et al. 2000, Masuno et al. 2002).

Source: *Silent Spring to Scientific Revolution,* John Peterson Myers, Ph.D. (an essay first published in *San Francisco Medicine,* November 2002).

We know things must be really bad when the extremely conservative World Health Organisation released the following statement at a pre-'the Future of Our Children' Budapest meeting: *"the vested interests of industry and free trade have worked against this [precautionary principal] approach so far... For too long, policy-makers have retrospectively pleaded, 'If only we had known earlier what we know now.'*

They also said: "While effective prevention is the key to addressing known health threats, the precautionary principle needs to be applied when facing uncertain risks... If applied earlier, it could have saved millions of lives, but convincing proof of harm was awaited before action was taken." [47]

Traditional toxicology focuses on damage, such as cell death, mutations or genotoxicity that occurs typically when cellular biochemical defense mechanisms are overwhelmed. At high exposure levels many chemicals implicated in message disruption are toxic in these traditional ways. At lower levels of exposure, however, their impacts instead involve, in essence, hijacking control of development, adding or subtracting to the body's own control signals at remarkably low levels of exposure. A vivid recent example is the discovery that a widely used herbicide, atrazine, causes tadpoles to develop into hermaphroditic adults at a level of exposure approximately 30,000 times lower than traditional toxicological work had identified as toxic to frogs .

We are aware many chemicals pose threat to public health and especially the developing foetus and growing child. Now we know that even our ability to reproduce is threatened immediate action is called for, not more compromising with industry, political waffling and governments dithering.

Over the years the political representatives of the citizens of Europe and the lawyers they employed have failed to adequately safeguard the interests of its citizens. What politicians there are within the corridors of power of the European Union with *genuine* concerns for the wishes of the people, find themselves with embarrassingly ineffective legal power to resist the actions of the industrialists of the WTO.

This is no doubt that the majority of politicians elected to safeguard the well being and future of the citizens of Europe have been so wrapped up in securing a cozy future for themselves they have failed dismally and allowed industry to manipulate international law to suit themselves.

The citizens of Europe, and indeed the rest of the world and its future generations, are paying a high price to keep the arrogant industrialists of the chemical industry, the WTO, and high ranking politicians with vested interest in their success wealthy and happy.

Cao *et al.,* **Environmental exposure to dioxins and polychlorinated biphenyls reduce levels of gonadal hormones in newborns: Results from the Duisburg cohort study.** *International Journal of Hygiene and Environmental Health.*

Abstract

Background: Endocrine dysfunction related to the hypothalamic–pituitary–thyroid (HPT) and/or the hypothalamic–pituitary–gonadal axis (HPG) is being discussed as underlying developmental adversity of polychlorinated dibenzo- p -dioxins and dibenzofurans (PCDD/Fs) and polychlorinated biphenyls (PCBs). This study was done to evaluate effects related to the HPG axis.

Methods: A birth-cohort study was initiated in the year 2000. Healthy mother–infant pairs were recruited in the industrialized city of Duisburg, Germany. Dioxins, dioxin-like PCBs and six indicator PCBs were measured in maternal blood during pregnancy and in maternal milk. Testosterone and estradiol levels were measured in maternal and cord serum of 104 mother–infant pairs representing a subsample with a complete data set of the total basic sample of 232 participants. Linear regression analysis was used to describe the association of PCDD/Fs or PCB in maternal blood or milk with sex steroid concentrations after adjustment for confounding.

Results: Median concentrations for PCDD/Fs in maternal blood fat and milk fat in terms of WHO-TEq were 15.3 and 13.1 pg WHO-TEq/g, respectively, and for the sum of the indicator PCBs (#28, #52, #101, #138, #153, #180) 149 and 177 ng/g. The adjusted ratio of geometric means when doubling the concentration of PCDD/Fs in maternal blood fat was 0.86, 95% confidence interval (95% CI): 0.72–1.03 for testosterone and 0.73 (0.61–0.87) for estradiol in cord serum. Typically, testosterone reduction was more pronounced in cord serum of female and estradiol reduction in that of male babies. Reduction of hormone levels was generally more pronounced for dioxins than for indicator PCBs.

Conclusions: The hypothalamic–pituitary–gonadal axis of newborn babies is influenced by prenatal exposure to PCDD/Fs and PCBs in a manner suggestive of AhR-mediation. The clinical relevance of this finding remains to be established, however.

Barr, D., Bishop, A., Needham, L., 2007. **Concentrations of xenobiotic chemicals in the maternal-fetal unit.** *Reproductive Toxicology* 23: 260–266

Abstract

Exposure to a variety of toxic chemicals has been associated with adverse health outcomes. Presumably, the most vulnerable population for these adverse health outcomes are fetuses that are exposed to toxicants *in utero* . Fetuses have immature organ systems and often their detoxification enzymes or enzymatic processes are not fully developed when exposures occur.

Many xenobiotic chemicals have been shown to pass through the placental barrier and into the fetal blood stream. These exposures have been associated with adverse birth outcomes, neurocognitive delays and adult onset disease.

Exposures associated with interuterine growth retardation have been linked to a variety of adult onset diseases such as coronary artery disease and diabetes.

In this article, we review a variety of chemicals that have been known to enter the fetal environment and their potential to affect both early childhood and subsequently adult health. We restrict our review to chemicals shown to be present in umbilical cord blood, amniotic fluid, or meconium, thus unequivocally demonstrating the chemicals have entered the fetal environment. In some instances where known health outcomes have occurred from these exposures, we note these and any caveats associated with the exposures.

[from body of text]

Conclusions

The fetal unit can be exposed to a variety of toxicants that are capable of producing adverse outcomes in the fetus or developing infant. Evaluating fetal exposures is a complex process that is largely dependent upon the chemical being studied. Obviously, the most practical approach is to assess exposure during critical time stages; however, these critical periods are often unknown. Better mechanisms for assessing fetal exposure, including modeling and chemical disposition, must be developed to fully evaluate fetal exposures and their subsequent impact on adult disease. Special precautions should be taken to reduce the degree of exposure to chemicals, as much as they can be controlled, to ensure that the fetus has the best environment for fully developing thus giving it a better advantage to develop normally after birth.

[Note this study includes a list of substances and/or class of substances that have been detected in meconium, cord blood and amniotic fluid.]

McKinlay *et al.,* 2007. **Endocrine disrupting pesticides: Implications for risk assessment.** *Environment International.* Article in Press. doi:10.1016/j.envint.2007.07.013

Abstract

Endocrine disrupting (ED) chemicals are compounds that alter the normal functioning of the endocrine system, potentially causing disease or deformity in organisms and their offspring. Pesticides are used widely to kill unwanted organisms in crops, public areas, homes and gardens and medicinally to kill parasites. Many are proven or suspected to be EDs.

Ancient physiological similarities between different vertebrate groups suggest that disorders observed in wildlife may indicate risks to humans. This makes accurate risk assessment and effective legislation difficult.

In this paper, the hazardous properties of pesticides which are known to have ED properties are reviewed in order to assess the implications for risk assessment. As well as data on sources of exposure in the United Kingdom (UK) an assessment of the evidence on the health effects of ED pesticides is also included.

In total, 127 have been identified from the literature and their effects and modes of action are listed in this paper. Using the UK as a case study, the types and quantities of pesticides used, and their methods of application are assessed, along with their potential pathways to humans.

In the UK reliable data are available only for agricultural use, so non- agricultural routes of pesticide exposure have been poorly quantified. The exposure of people resident in or visiting rural areas could also have been grossly under- estimated. Material links between ED pesticide use and specific illnesses or deformities are complicated by the multifactorial nature of disease, which can be affected by factors such as diet. Despite these difficulties, a large body of evidence has accumulated linking specific conditions to ED pesticides in wildlife and humans. A more precautionary approach to the use of ED pesticides, especially for non-essential purposes is proposed.

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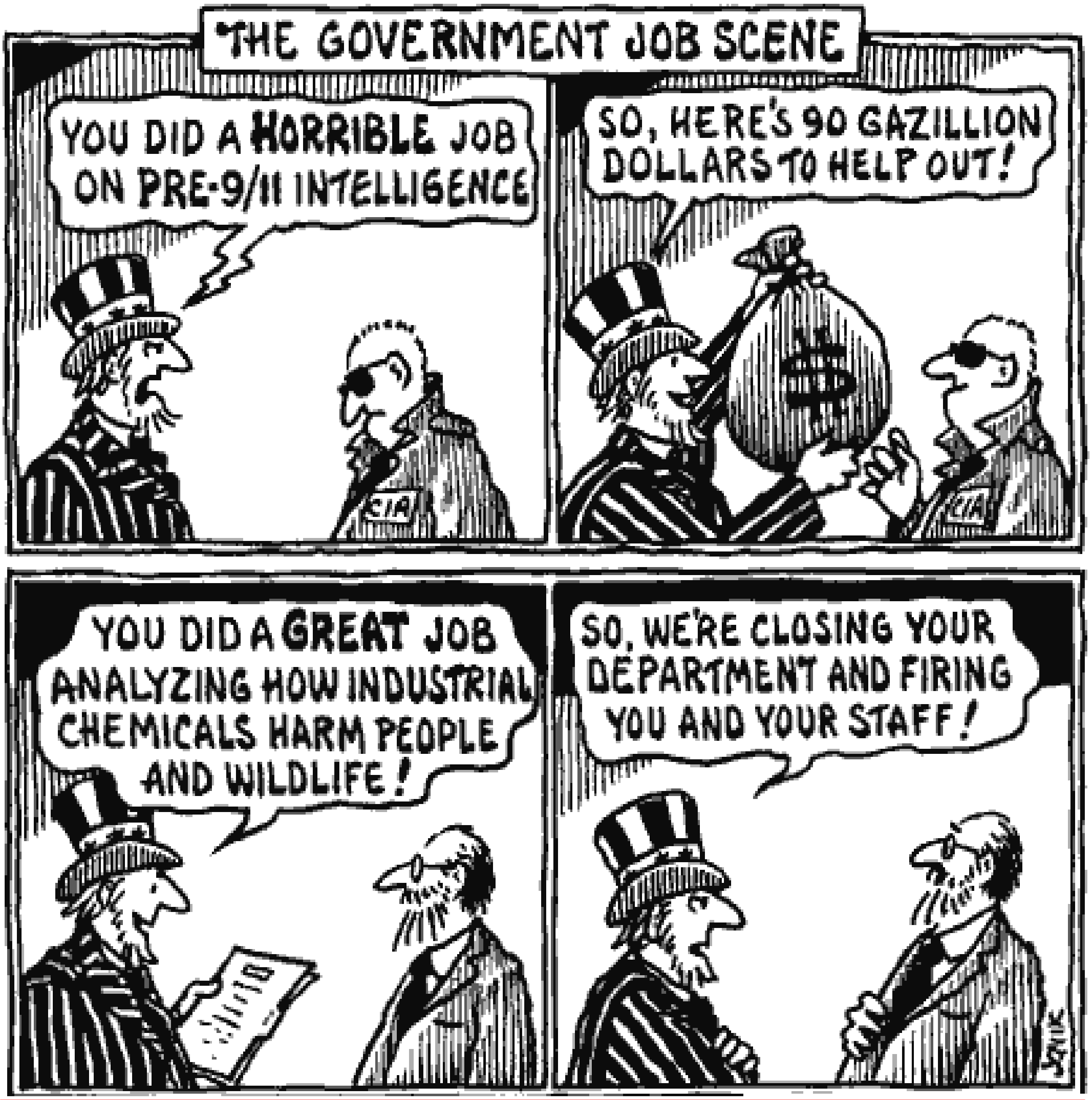


This may be a useful timeline when it is claimed that Health professionals, regulatory bodies etc., have only been aware of endocrine disruption for a few years and it is too early to take regulatory action:
http://www.thepestprofessionals.com/studies/2007/01/10/timeline-of-endocrine -disruption/

The following timeline is based on a PBS feature aired in February of 1998 and featuring interviews with Theo Colborn, author of *Our Stolen Future,* Lois J. Guillette, PhD, and Fredrick Vom Saal.

1923 First oestrogen bioassay is developed. The test detects estrogenic activity in biological extracts and determines relative potencies of compounds and mixed natural materials.

1929 Commercial production of PCBs begins in the United States in response to the electrical industry's need for a safer cooling and insulating fluid for industrial transformers and capacitors.

1938 British scientist and physician Edward Charles Dodds announces the synthesis of a chemical that acted in the body like a natural oestrogen.
Called Diethylstilbestrol (DES), it is hailed by leading researchers and gynaecologists as a wonder drug with a host of potential uses. (Dodds was later knighted for his scientific achievement.) Soon after Dodds invents DES, researchers in the United States begin giving the synthetic hormone to women with problem pregnancies. The massive experiment would eventually involve an estimated 4.8 million pregnant women worldwide.

1948 Paul Muller is awarded a Nobel Prize in medicine for discovering the insect-killing properties of DDT.

1950 DDT is shown to disrupt sexual development in roosters possibly by acting as a hormone. Scientists V.F. Lindeman and Howard Burlington find that young roosters treated with DDT fail to develop normal male sex character- istics, such as combs and wattles. The pesticide also stunted the growth of the animals' testes. These scientists noted a similarity between DDT and DES, a synthetic oestrogen given to women for problem pregnancies. DDT, they observe, "may exert an oestrogen-like action" on the animal in question.

1952 By this date, four separate scientific studies show women treated with DES to prevent miscarriage did no better than those treated with alternatives such as bed rest or sedatives. Further analysis will show that DES actually increases the number of miscarriages, premature births and deaths among infants.

1962 *Silent Spring* is published. Rachel Carson's book describes health problems observed in wildlife such as eggshell thinning, deformities and population declines. Carson links these adverse effects to exposure to pesticides and other synthetic chemicals.

1963 Study shows that newborn mice receiving oestrogen injections developed tissue pathologies such as cysts, cancers and lesions. Results indicate that exposure to naturally occurring hormones early in life can produce harmful health effects and point to possible early-life causes of cancer in adult human populations.

1968 DDT is shown to be estrogenic in mammals and birds.

1971 DES is linked to vaginal cancer in daughters whose mothers had taken the drug during the first three months of pregnancy. By this date, millions of pregnant women had received prescriptions from physicians for DES. The US Food and Drug Administration directs doctors not to prescribe DES to pregnant women and bans the drug for animal use.

1972 DDT use is restricted in agriculture by the US Environmental Protection Agency.

1973 International Joint Commission (IJC) for the US and Canada singles out first 'Areas of Concern' in the Great Lakes region, noting extensive pollution and threats to wild- life.

1976 DES is shown to cause developmental abnormalities in male mice and reproductive problems in humans.

1977 Use and manufacture of PCBs restricted by the U.S. Environmental Protection Agency. PCBs continue to be manufactured and sold overseas .

1978 Great Lakes Water Quality Agreement between US and Canada calls for virtual elimination of persistent toxic substances from Great Lakes basin.

1979 National Institute of Environmental Health Sciences holds conference entitled: Estrogens in the Environment I. Presented papers identify and evaluate both advertent and inadvertent hormone mimics. Manufacture of PCBs banned in the US, but not their use or storage.

1982 DES is shown to cause developmental abnormalities and vaginal cancer in female mice.

1983 Responding to public concern over dioxin contamination at Times Beach, Love Canal, Jacksonville and other sites, the US Congress directs the EPA to conduct a National Dioxin Study to determine the extent of contamination na- tionwide.

1985 National Institute of Environmental Health Sciences hold a conference called Estrogens in the Environment II: Influences on Development. Presentations address the effects of environmental estrogens on puberty in young chil-

dren. Also noted is the ubiquitous nature of the potency and their potential impact on public and environmental health.
EPA's Dioxin Risk Assessment classifies dioxin as a known animal and probable human carcinogen, setting the lowest "safe exposure level" on record.

1985 Eight Great Lakes states develop remedial action plans to address environmental damage seen in IJC-targeted 'Areas of Concern.'

1986 Documents are leaked to Greenpeace showing EPA agreed to demands from the paper industry to keep results of National Dioxin Survey secret. Under threat of lawsuit, EPA releases National Dioxin Survey. The study finds dioxin is present in discharge from paper mills and in finished paper products (due to chlorine bleaching of white paper).

1986 Paper industry pressures EPA to reconsider its 1985 Dioxin Risk Assessment in hopes of obtaining a less damaging judgment on dioxin's health effects.

1988 EPA begins its first reassessment of dioxin.

1990 The EPA and the Chlorine Institute (an industry group) co-sponsor the Banbury Conference on Dioxin, which takes place on Long Island, New York.
Conference attendees reach a consensus on dioxin's probable mechanism of action. Theo Colborn co-authors *'Great Lakes, Great Legacy?,'* detailing developmental, reproductive, metabolic and behavioural damage to wildlife from persistent chemical pollutants.

1990 Fifth Biennial report of IJC puts threat in plain language, saying that the principal danger of persistent organochlorine chemicals is to the foetus.

1990 Environmental groups around the Great Lakes form the Zero Discharge Alliance to oppose production of bioaccumulative toxic substances.

1991 Theo Colborn helps organise a conference called *'Chemically Induced Alterations in Sexual Development: The Wildlife-Human Connection'* and held at Wingspread in Racine, Wisconsin. For the first time, scientists from many disciplines are brought together to discuss concerns about endocrine-disrupting chemicals in the environment. Participants present evidence that compounds may have deleterious effects on sexual development in a variety of wildlife species. Possible impacts includer eproductive system abnormalities, reduced fertility, behavioural abnormalities, and population declines particularly in top predators. Researchers Ana Soto and Carlos Sonnenschein report that some plastic compounds widely used in a variety of consumer products are estrogenic in laboratory research.

1991 The Chlorine Institute (an industry group) prematurely issues a press release stating that below a certain threshold of exposure, dioxin has no adverse effects. Group makes false claim that this was the consensus of the Banbury Conference.

1991 EPA administrator Bill Reilly states publicly that dioxin seems less dangerous than previously thought. He initiates a second EPA reassessment of dioxin.

1991 Greenpeace tours 40 Great Lakes cities by boat in preparation for upcoming IJC meeting in Traverse City, Michigan. The publicity campaign focuses on the goal of zero dioxin discharge by the paper industry.
Greenpeace distributes a report entitled: '*The Product is the Poison: The Case for a Chlorine Phase-Out.'*

1992 Sixth Biennial Report of the IJC calls for a phase-out of chlorine as an industrial feedstock. Drinking water and pharmaceutical uses are exempted. Environmental groups and industry are surprised by this wide-reaching recommendation.

1992 Physician Niels Skakkebaek publishes a paper demonstrating that human sperm counts may have declined 50 percent over the last 50 years.

1993 Referring to the perceived decrease in human sperm counts, scientist Lou Guillette tells the US Congress, "Every man sitting in this room today is half the man his grandfather was, and the question is, are our children going to be half the men we are?"
A link between environmental estrogens and male reproductive problems is hypothesised in scientific papers.

1993 Chemical Manufacturers' Association forms the Chlorine Chemistry Council (CCC) to promote the industry's agenda in the debate over chlorine chemistry. CCC launches a public relations campaign, including television advertisements asserting the need for chlorine.

1994 EPA releases a Public Review Draft of its Dioxin Reassessment. It covers dioxin, dioxin-like PCBs and furans. The report concludes that these chemicals cause harm at levels similar to those seen in the general public. In addition to cancer, potential damage is seen to the immune, nervous and reproductive systems.

1995 The National Academy of Sciences and National Research Council sponsor a panel study called 'Hormone Related Toxicants in the Environment.' The EPA's Science Advisory Board reviews draft of Dioxin Reassessment.

1996 The topic of endocrine disrupters is popularised with the publication of *Our Stolen Future,* which is co-authored by Theo Colborn and includes an introduction by U.S Vice President Al Gore.

1996 President Clinton signs the Food Quality Protection Act and amendments to the Safe Drinking Water Act, Testing Advisory Committee (EDSTAC). EDSTAC is a unique advisory committee of 40 members from industry, academia, government and environmental groups. It is charged by Congress to develop a chemical screening program for endocrine disruptors by 1998, and to implement the program by August, 1999.

1996 Scientist Lou Guillette publishes his finding that male alligators in Florida's Lake Apopka have strikingly low levels of testosterone and abnormally small phallus size. Pesticide residues in this contaminated lake appear to have 'feminised' the alligators there.

1996 Psychologists Sandra and Joe Jacobson report that children exposed to high levels of PCBs before birth have as much as a 6.2 point IQ deficit later in life.

1996 Dr. Harry Fisch publishes a study refuting any decline in US sperm counts. He found, instead, striking geographical variation in sperm counts across the U.S. While sperm counts remained constant in a given region between 1970 and 1994, New York had higher counts than Minnesota, which had higher counts than California. Fisch thinks that the geographical variation may have confused other research that, in 1992, showed a worldwide decline in human sperm counts.

1997 Work by researcher Dr. Fredrick vom Saal shows that bisphenol-A, a component of polycarbonate plastic, can alter the reproductive development of lab mice at extremely low doses. Bisphenol-A mimics the natural sex hormone oestrogen. Male mice exposed to this plastic during foetal development have permanently enlarged prostates and lower sperm counts. The effects occur at doses near those that humans are exposed to each day from sources like food packaging and dental sealants.

1997 A study by the Centers for Disease Control and Prevention shows that hypospadias, a hormone-dependent genital defect, is on the rise in baby boys.

1997 The National Institute of Environmental Health Sciences (HHS) holds its fourth major conference on estrogens in the environment in Arlington VA.
Numerous scientific papers and reports are presented on toxicology, risk assessment and research for this emerging health concern.

1997 Tulane University scientists retract an environmental oestrogen study published in a June 1996 issue of *Science.* The report had claimed that combinations of pesticides were as much as 1,600 times more potent as environmental estrogens than the individual pesticides. The research results couldn't be replicated and the study was retracted.

1998 The National Academy of Sciences Institute of Medicine is expected to issue its report on hormone-related toxicants in the environment. The NAS panel will critically review the literature, identify known and suspected impacts on fish, wildlife and humans, and recommend research, monitoring and testing priorities, among other activities. By August, the EPA committee EDSTAC is mandated to develop recom- mendations on how to screen and test chemicals for their potential to disrupt hormone function in humans and wild- life. EDSTAC's final plenary session is set for June 17-18 in Washington, D.C.

1998 A research paper published in the *Journal of the American Medical Association* reports that the proportion of males to females born has been declining in the US and Canada since the 1970s and in Denmark and the Netherlands between 1950 and 1994. The study's authors suggest that endocrine disruptors may play a role, pointing to increased numbers of male reproductive disorders. When the study is reported in the popular press, some scientists downplay the significance of the reported trend.

1998 Vice President Al Gore urges the chemical industry to release voluntarily vital health information about thousands of commonly used chemicals. He says such a move would "empower citizens with new knowledge" to safeguard their neighbourhoods against potential chemical hazards.

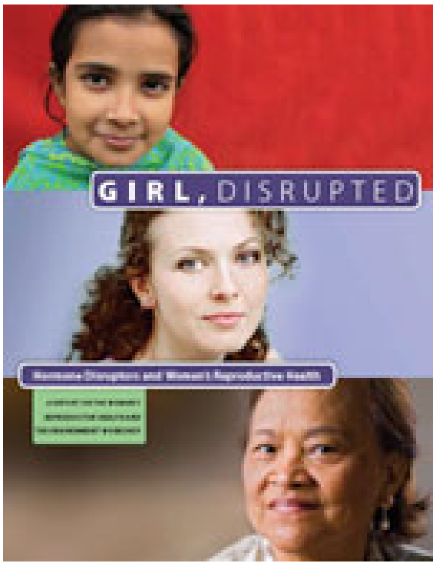
1998 The United Nations Environment Programme meets in Montreal to expand throughout the world an agreement to ban, phase out or limit the production of Persistent Organic Pollutants (POPs). POPs are chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects on human health and the environment.
Persistent Organic Pollutants include: aldrin, dieldrin, endrin, chlordane, DDT, heptachlor, hexachlorobenzene, mirex, toxaphene, PCBs, dioxins, and furans.

1998 On Earth Day, the Chemical Manufacturers' Association announces it will urge its members to increase voluntarily their health effects testing program of industrial chemicals to 100 chemicals a year by 2003.

DOH URGED TO PREVENT WOMEN'S EXPOSURE TO HORMONE DISRUPTORS

Quezon City (Philippines) -- An environmental alliance working on chemical safety policy reforms today called on Health Secretary Duque to initiate measures that will prevent women's exposure to hormone-mimicking chemicals.

The EcoWaste Coalition aired this request for action as it releasesthe report ***"Girl, Disrupted: Hormone Disruptors and Women's Reproductive Health"*** published by the US-based Collaborative onHealth and the Environment (CHE).



"Girl, Disrupted," based on cutting-edge research and reviewed by top scientists in the field, sheds light on what hormone disruptors are and how these chemicals harm women's reproductive systems, particularly at critical stages of development.

The new report says that manmade, hormone-like chemicals in the environment harm women's reproductive systems, particularly when exposure occurs during prenatal and early life development, stressing that more focused research is needed to fully understand how.

"I continue to be surprised by the number of doctors that come up to me at conferences and comment on what they are seeing in their patients that they have never seen before," said Dr. Tracey Woodruff, Director of the Program on Reproductive Health and the Environment (PRHE) at the University of California, San Francisco, reviewer of the report.

"Girls entering puberty at extremely young ages, young women suffering from the inability to get pregnant and conditions normally associated with older ages such as very painful fibroids, endometriosis and breast cancer," she said.

In a letter faxed to the Department of Health, the EcoWaste Coalition expressed concern over the effects of industrial chemicals as cited in the report that have been linked to serious health problems for women such as early puberty, infertility, endometriosis, uterine fibroids, breast cancer and others.

"These industrial chemicals known as endocrine or hormone disruptors can disturb hormonal balances that are critical for the good health and development at all phases of a woman's life," Elsie Brandes-De Veyra of the EcoWaste Coalition's Steering Committee said.

"We therefore urge Secretary Duque to initiate policy solutions, applying the precautionary principle, that will adequately safeguard our girls and women from early- life exposures to these harmful chemicals that can cause later-life health issues and even multi-generational harm," De Veyra added.

Hormone disruptors, the "Girl, Disrupted" explains, can get into the human bodies when we breathe, eat, drink and have skin contact with these harmful chemicals that can be found in household products as well as in cigarette smoke, industrial pollutants and some pesticides.

Some of these hormone disruptors include bisphenol A, which is commonly used in baby feeding bottles, sports bottles and in the linings of infant formula and canned foods, and phthalates, which are used in children's products, cosmetics, medical devices and as plasticizer in polyvinyl chloride.

Other known hormone disruptors include chemicals in first and second-hand cigarette smoke, the dioxin byproducts from industrial and burning processes, polychlorinated biphenyls (PCBs) in transformer oils and polybrominated biphenyls (PBBs) used as flame retardant in electrical appliances, textiles, plastic foams and other products.

Studies show that the health impacts of these chemicals to hormonal functions depend on the potency and dose of the chemical, the timing of the exposure and the individual's overall health, which can be shaped, among other factors, by the person's genetic makeup, diet, physical habits, sexually transmitted diseases and access to healthcare.

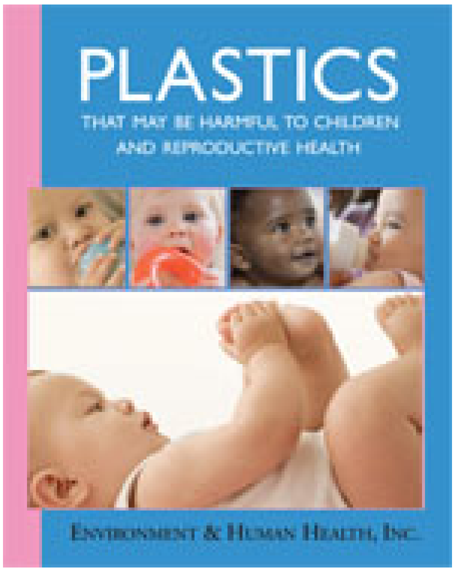
In calling for action versus hormone disruptors, the EcoWaste Coalition asked Secretary Duque to support local research on endocrine disrupting chemicals and their effects on women's health, and for him to support policies that will identify and phase out harmful chemicals in products and to require the use of safer substitutes.

The EcoWaste Coalition specifically asked the Department of Health, as the principal public health and safety agency, to lead the process of listing non-environmentally acceptable products and packaging to be targeted for phase out under Republic Act 9003 or the Ecological Solid Waste Management Act.

As for the consuming public, the EcoWaste Coalition encourages consumers to insist on toxics-free goods as a fundamental right, and to have access to chemical information, including a product's chemical ingredients, health effects and eco-disposal, to facilitate informed choices.

"Girl, Disrupted" is available for free download at ecowastecoalition@yahoo.com

Also at: Healthy Child, Healthy World, http//healthychild.org/issues/media/girl_disrupted/ Where there are a number of free interesting publications including:



CHE is a nonprofit, nonpartisan global network of more than 3,000 individuals and organizations focused on the science of environmental health:
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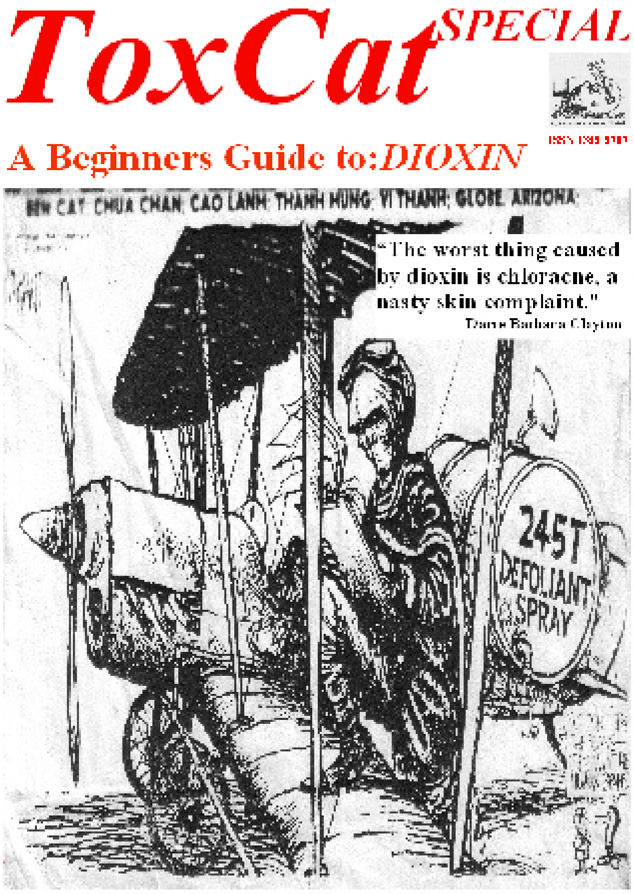
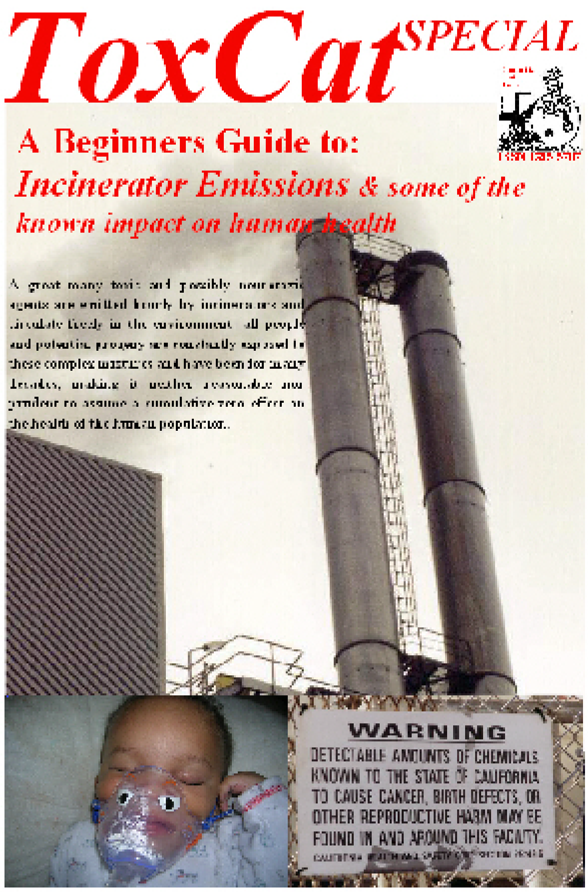




ToxCat SPECIAL

WHAT DO YOU WANT -A

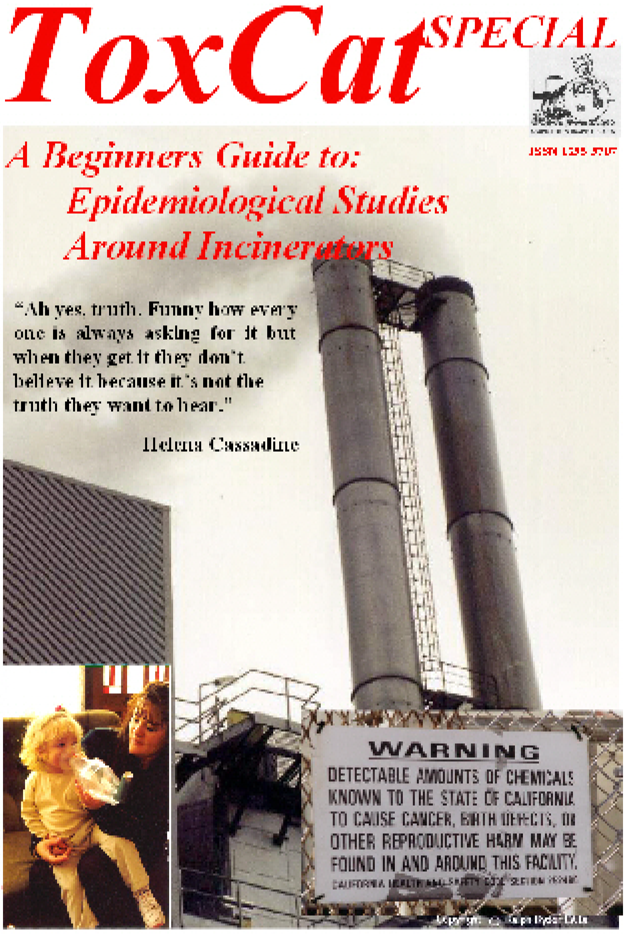
Many of the chemical particles emitted by the most modern incinerator are persistent and bioaccumulative in the environment and human tissues. They are capable of damaging human health in ways never considered until approximately 20 years ago. Dozens of epidemilogical studies provide overwhelming evidence that communities hostage to incinerators are suffering increased levels of birth defects, asthma, heart disease and cancers. To protect industrial interests successive British governement have used selected experts to look through carefully chosen epidemiological studies to downgrade the very real danger posed to human health, especially to the developing foetus.

Read for yourself some abstracts of eipdemilogical studies finding elevated levels of serious illnesses and see what you think!

"Do you want a boy or a girl?" Ask this question of any expectant parent and the response will usually be "We/I don't care as long as it's healthy."

Children are without doubt our most precious gift. Yet when I asked Mr. Stuart Wilson of 'Her Majesty's Inspectorate of Pollution' (now the Environment Agency (EA) in 1994 about that organisation's "concerns over the impact of incinerator emissions on the developing foetus" he replied, "It is not in our remit to include future generations." The same year I was told by a senior manager of ICI in Runcorn that "we all have to die sometime." Professor Roy Harrison told a House of Lords Select Committee that perhaps 'the best place to build incinerators was in area's already suffering a heavily polluted environment, as a small increment [in pollution] will be more tolerable', with scant regards for the impact on the unfortunate souls living in the already [heavily] polluted environment.

How can anyone be so indifferent to threats to the health of the unborn and young children?



A new Scientific Consensus Statement on Environmental Agents Associated with Neurodevelopmental Disorders, released this week, summarizes the latest science about environmental contaminants associated with neurodevelopmental disorders, such as learning disabilities, autism spectrum disorder, attention deficit hyperactivity disorder (ADHD), intellectual disabilities and developmental delays.

The statement was published by the Collaborative on Health and the Environment's Learning and Developmental Disabilities Initiative.

The statement, which summarizes over 200 studies, was drafted and reviewed by a prestigious committee of scientists and health professionals based in North America. They concluded:

“The scientific evidence reviewed in this statement indicates environmental contaminants are an important cause of learning and developmental disabilities (LDDs)....

Much research addresses the potential benefits and adverse impacts of fluoride ingestion. Yet, many data gaps remain. We know that:

*Tooth decay is an infectious process and its origins are multifactorial. General dietary practices, nutrition, oral hygiene, socioeconomic status, and access to dental care play direct and indirect roles. The relative contribution of each depends on the context.

*To the extent that fluoride helps to prevent tooth decay or slow its progression, the predominant advan- tage is from topical application rather than through ingestion. Topical ap- plication includes fluoride in tooth- paste, drops, mouth rinses, and fluoride treatments in a dental office, as well as from drinking fluoride containing beverages.

*There is little disagreement that ingested fluoride has adverse effects as exposures increase beyond some amount. The question is, at what level of exposure do adverse effects begin and when do they begin to outweigh any potential benefits?