ToxCat

SPECIAL

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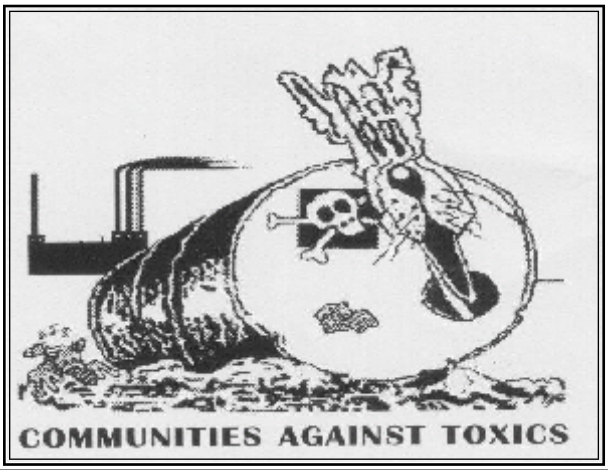
WHAT DO YOU WANT -A

OR

"Search for the truth is the noblest occupation of man; its publication is a duty.":
Anne Louise Germaine de Stael - (1766-1817)



Communities Against Toxics (CATs) is a network of long suffering citizens and communities in Great Britain and Ireland living with incinerators, waste treatment plants, toxic waste landfills, chemical installations and other unsafe, polluting industrial facilities.
Founded in 1990, CATs operates as a non-profit making, non-party political organisation dedicated to increasing public and political awareness on environmental issues and strengthening democracy at a local level.
To help communities protect the environment from industrial pollution and political apathy, CATs endeavours to provide information and expertise at reasonable cost and whenever possible free of charge to members of the poorer sections of society and groups in country's with transitional economies.
CATs survives on membership subscriptions and donations from a few sympathetic Foundations. It receives no financial support from government sources or industry.
CATs members newsletter ***ToxCat*** is published every two months and is available by becoming a member of CATs (£15 per annum subscription).
Other publications available to members include:
ToxCat 'Beginners Guide' to: *Incinerator Emissions & some of the known impact on human health*
ToxCat 'Beginners Guide' to: *Dioxin*
ToxCat 'Beginners Guide' to: *Endocrine Disrupters*
ToxCat 'Beginners Guide' to: *Epidemiological Studies Around Incinerators*

In the pipeline:
ToxCat Living with Incinerators - Community Case Studies

If you are interested in sponsoring any of the publications or CATs web page please contact:
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Special thanks to CATs member Janet Williams

"I DON'T CARE AS LONG AS IT'S HEALTHY"

In a 'Rapid Health Impact Assessment' produced by the Environmental Health Team of John Moores University (Liverpool) in relation to an application by Peel Holdings for a Resource Recovery Center at Ince near Ellesmere Port, Cheshire, the authors wrote; *'it is not true to say that the effects on the foetus or infant are not taken into account when setting safety limits. Information from reproductive/developmental studies are needed in order to set tolerable daily intakes (TDI)'.*

After the many hours of discussions with Dr's. Vyvyan Howard, Ted Schettler, Paul Connett, Gavin ten Tuss- cher and others over something like 18 years, and reading many reports on the sensitivity of the devel- oping embryo/foetus and growing child, I do not be- lieve that the technology or knowledge exists to enable anyone to make such an assessment.

How can you assess the 'tolerable' level of a carcinogenic chemical or endocrine disrupter of a embryo/foetus during the period we develop more rapidly than at any other time in our lives? It is simply impossible. Humans do not come of uniform stature, health or weight. No tests have ever been conducted on the very young, the very old, or on people already suffering chronic illnesses like cancer, leukaemia, asthma, cardiovascular problems or immunosuppression, never mind a developing foetus in the womb.

We do not know the toxicity and impact on human health of approximately 86% of the chemicals currently in use and 1000 new chemicals are produced each year on which there is also no data on long term toxicity.

I have attempted within this short document to give the reader a brief insight into our early development and how sensitive we are in the womb to chemical impact. It is of course impossible to cover every stage of development in this publication, so perhaps readers should write to: The Environmental Health Team, Center for Public Health, Liverpool John Moores University, North Street, Liverpool L3 2AY Tel: 0151 231 4510 and ask for more information and which studies they looked at/are available showing how they assessed the impact of thousands of chemicals and their combinations on the developing embryo and foetus.

Almost all health-related literature industry and health impact assessments will undoubtedly be directed towards exposure of adults, not children or those among us suffering ill health.
Therefore any safety information is highly unlikely to result in the effective protection of the most-at-risk sections of society.

The volatile organic chemicals emitted from a municipal waste incinerator include: pentane; trichlorofluoromethane; ace tonitrile; acetone; iodomethane; dichloromethane; 2-methyl-2-propanol; 2-methylpentane; chloroform; ethyl acetate; 2,2-dimethyl- 3-p xane; benzene; 2-methylhexane; 3-methylhexane; 1,3-dim limethylcyclopen hene; heptane; pentane; 2-h imethylcyclohexa yl acetate; 3-m ; octane; tetr ic acid ethyl este ethylcyclohexan dioxane; 2-f lorobenzene; met methylcyclohexan ; xylene; ace nyl; ethylmethylc ptanone; 2-buto benzene; pro yloctane; pentan ; propyl benze -2-furane carboxaldehyde; 1-ethyl-2-methylbenzen ethylbenzene; zonitrile; methylpropylcyclohexane; 2-chlorophenol; benzene; phenol; 1,3-dichlorobenzene; 1,4-dichlorobenzene; decane; hexanecarboxylic acid; 1-ethyl-4-methylben- zene; 2-methylisopropylbenzene; benzyl alcohol; trimethylbenzene; 1-methyl-3-propylbenzene; 2-ethyl-1,4-dimethy dehyde; 1-methyl-2-propylbenzene; methyl decane; 4-methylbenzaldehyde; 1-ethyl-3 yl- (1-propenyl)t ochlorobenzene; ic acid m thylphenol; ethyldi ne; undecane; hep chloromethyl nylbenzene; 1,2,3-t e; 4- methylbenzyl acid; ethyl b enol; 1,2,4-trichlor phthalene; cyclope methyl ace oxyethoxy); 4-chlor zothiazole; benzo ; 2-bromo-4 robenzene; dodeca lorophenol; 2,4- dichloron enzonitrile; tetrach methylbenzoic aci ydroxymethy aphthalene-1,2,3,4 ,4,6-trichlorophen 2,3,5-trichl acid; 2,3,4-trichlorophenol; 1,2,3,5-tetrachlorob (2-ethenyl lorophenol; chlorobenzoic acid; 2-hydroxy-3,5-dichlorobenzaldehyde; 2-methylbiphenyl ylbenzene); ecanecarboxylic acid; hy-droxymethoxybenzaldehyde; hydroxychloroacetopl ,6-dichloro-4-nitrophenol; sulphonic acid m.w. 192; 4-bromo-2,5-dichlorophenol; 2-ethylbiphenyl; bromodichlorophenol; 1(3H)-isobenzofuranone-5-methyl; dimethylphthalate; 2,6-di- tertiary-butyl-p-benzoquinone; 3,4,6-trichloro-1-methyl-phenol; 2-tertiary-butyl-4-methoxyphenol; 2,2'-dimethylbiphenyl; 2,3'- dimethylbiphenyl; pentachlorobenzene; bibenzyl; 2,4'-dimethylbiphenyl; 1-methyl-2-phenylmethylbenzene; benzoic acid phenyl ester; 2,3,4,6-tetrachlorophenol; tetrachlorobenzofurane; fluorene; phthalic ester; dodecanecarboxylic acid; 3,3'- dimethylbiphenyl;






WHAT 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."[1]

The same year I was told by a senior manager of ICI in Runcorn that "we all have to die sometime," when I inquired about that company's concern over the impact chemicals were having on children's health.

I was appalled by both of these responses. How can anyone be so indifferent to threats to the health of the unborn and young children? Yet years later 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 bit more will be more tolerable', with scant regards for the impact on the unfortunate souls living in the already polluted environment.

Perhaps this line of thought is commonplace among regulatory officials, politicians, industrialists and academics?

It would certainly explain the reason for Britain's increasing rate of birth defects and childhood cancers within heavily industrialised areas.

Perhaps this indifference is universal, which would go some way to explaining why the United States has 17% of its children suffering developmental disabilities and a massive increase in chronic respiratory conditions like asthma and chronic bronchitis (79%, 76% respectively from 1982 to 1993).[2] And why, out of 60 million children under the age of 15 in the U.S., more than 47,000 died from preventable diseases during 1994, the year I asked Mr. Wilson that revealing question?[3]

Of course American politicians can point to the 1997 White House issued Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," which called on federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure that their policies, programs, and standards address these risks.[4]

But for the reality I think we should look more to the recent report "Updating an Earlier Analysis," published in the January/February (2008) issue of the Journal Health Affairs showing the United States coming last out of 19 developed countries' for effectiveness at providing timely and effective healthcare. (The UK came second to last.)

Non-smoking cancers in the U.S. are occurring at proportionately higher rates. Since 1975, acute lymphocytic leukaemia has increased 68.7%, brain and nervous system cancers in children are up 56.5%, and testicular cancer is up 66% in adolescents.

What is causing this disturbing increase in paediatric cancer and why are we losing what numerous scientists suggest is a winnable war against cancer?

Like many other chronic children's diseases, science tells us that toxic chemicals used in our everyday environment are playing a significant role in the rise of childhood cancer. According to the International Agency for Research in Cancer, "... 80-90 per cent of human cancer is determined environmentally and thus theoretically avoidable."[5]

Perhaps the reluctance of the chemical industries to change processes and products because of the impact on their profit margins has had a big influence on the number of environmentally related illnesses?

Whatever the reasons, major birth defects remain the leading cause of infant mortality in the United

States, where a study published in 2002 revealed that nearly half of all pregnancies resulted in the loss of the baby or a child born with a birth defect or chronic health problem. A shocking statistic given the country's wealth.[6]

Genetic, nutritional, infectious, and other environmental factors, such as radiation, pharmaceuticals, and toxic chemicals, contribute to the total incidence of birth defects, but the percentage attributable to each is not known.

The leading birth defects associated with infant death are heart defects (31%), respiratory defects (15%), nervous system defects (13%), multiple abnormalities (13%), and musculoskeletal abnormalities (7%). Birth defects are also a major cause of miscarriages and foetal death.

Cost of birth defects

According to an analysis by the California Birth Defects Monitoring Program, the estimated lifetime costs for children born each year in the U.S. with one or more of 18 of the most significant major birth defects, including cerebral palsy, were approximately $8 billion (in 1992 dollars).[7] Costs related to other developmental disabilities add substantially to this amount.

Special education costs for a child with autism spectrum disorder, for example, are over $8000 annually, with care in residential schools reaching $100,000/year. *(It would be interesting to see a UK estimate for these cost.)*

Children with Attention Deficit Hyperactivity Disorder (ADHD) incur medical costs twice those of children without ADHD, and are more likely to have major injuries, asthma, and hospital inpatient and outpatient care.

In Europe the signs are governments, health authorities and organisations like the World Health Organisation (WHO) are ever-so-slowly waking up to the fact they have not been doing enough to protect children from industrial pollutants.

At a conference in June 2004 entitled 'The Future for Our Children', the delegates focused on the impact of environmental factors on children's health. This resulted in Ministers from 52 European countries adopting a declaration and action plan.

"The impact of the environment on children's health results in three million annual deaths in children under age five worldwide.

"…The number of child deaths is alarming. It paints a dismal picture of neglect. We must face reality and act now to work towards a sustainable and brighter future," Dr. Kerstin Leitner, Assistant Director-General WHO.[8]

Noble words and sentiment indeed, as are those written into the Millennium Declaration 2000. But it will take more than a few inspirational speeches to sort things out and what will be the outcome of this awaking and Ministers' pledge? A swift return to slumber-land I have no doubt as few officials will rock the industry financial interests boat.

The number of chemicals found in the body of every new-born child shows us that in today's materialistic world the welfare of the unborn and young children are well down the list of priorities to a great many sections of society.

The most obvious of these are politicians, regulatory officials, and the industrialists within the corporate dominated World Trade Organisation.

Past events have shown that all these groups consider the freedom to trade and profit levels of industry far more important than the health of the unborn, young children and susceptible members of society.

For the Doubting Thomases among you I would like to point out just a few examples to substantiate this statement:

*The UK's Environment Agency (EA) and Food Standards Agency (FSA) deliberately excluded children under ten years of age (one of the most susceptible sections to chemical insult) in scientific studies looking into the impact on public health of dioxin and heavy metals laded ash on spread on food producing land for approximately six years in and around Newcastle upon Tyne.

*The suing of the Canadian government by the Ethyl Corporation through the corporate dominated World Trade Organisation (WTO) over its refusal to allow methylcyclopentadienyl manganese tricarbonyl (MMT) to be manufactured in Canada because of fears over the dangers of manganese to [children's] health.

*The reaction of the U.S. chemical industry to the initially proposed European REACH legislation. Massive lobbying of leading European politician's resulted in a much weakened legislation allowing the continued use of many thousands of untested chemicals.

*The statement by former U.S. Secretary of State Madeline Albright who considers the deaths of 0.5 million Iraqi children (now something like 1.5 million) under five years of age since 1990) "as a price worth paying."[9]

While Albright's statement sends shivers down the spine of normal, caring people, if it's taken alongside the response of G.W. Bush's mother when asked about the war in Iraq and all the deaths there replied: "Why should we hear about body bags and deaths and how many, what day it's gonna happen? It's not

We recognize that, in addition to our separate responsibilities to our individual societies, we have a collective responsibility to uphold the principles of human dignity, equality, and equity at the global level. As leaders we have a duty therefore to all the world's people, especially the most vulnerable and, in particular, the children of the world, to whom the future belongs. UN Millennium Declaration (2000)

relevant. So why should I waste my beautiful mind on something like that?" we find this sickening indifference widespread among the wealthy section of society.

Changed Environment

The environment into which children are born today has changed dramatically to those today's senior citizens experienced. For 100 years industry has been releasing millions of tonnes of untested chemicals into the environment and nowhere is untouched by these.

Farmers have turned from traditional farming methods to the intensive use of pesticides which are known carcinogens or endocrine disrupters. There are more cars on the road, emitting health damaging particles, plane travel is common. Consumer products contain toxic chemicals, highly refined salt and additive laded processed foods; fat-laded fast foods and sugar-laded beverages. Plastics pollute the oceans and the land, the extinction of species is common place, and more emphasis is put on technology and computer use for children than on sport and healthy outdoor activities.

The irresponsible release of chemicals, dumping at sea and 'dilute and disperse' methods of waste disposal have contaminated ecosystems, the food chain and our bodies to such a degree that a child born today has more than 300 groups of man-made compounds in their tiny bodies. Many of these are known carcinogens, persistent and bio-accumulative in the human body, and capable of mimicking, blocking or otherwise disturbing the body's endocrine, immune, neurological and reproductive systems.

These are just a few of the more obvious changes in a child's environment from that of 50-80 years ago, so is it any coincidence that industrialised countries have seen massive increases in the cases of asthma, cancers, chronic bronchial problems, behavioural disorders like autism and attention deficit/hyperactivity, childhood brain cancers and birth defects such as cryptorchidism?

Joe Thornton, author of Pandora's Poison wrote of his concerns when awaiting the birth of their first child:

"There are some things I already know about the baby and his history, however, that I might prefer never to have learned. I know that my semen contains scores of pollutants that may have damaged the DNA I contributed to the baby. I know that Maggie, over the course of her life, has accumulated hundreds of industrial chemical compounds in her tissues, and these substances have crossed the placenta and entered the baby's bloodstream. I know that these chemicals are flushed out of the body by breast-feeding, so the baby will get even higher doses after being born. And I know of an emerging body of evidence that exposure to trace amounts of these compounds early in life can cause a range of subtle and severe problems, from cancer to reduced IQ, from infertility to a compromised immune system. Some kinds of damage may not become manifest until a child reaches adulthood. Our baby is no different in this way from any other in today's world."[10]

Joe Thornton is a highly respected scientist who understands the situation and the dangers facing the unborn child far better than any decision maker. Any damage to his sperm's DNA could have resulted in a variety of developmental problems from early embryo death, to foetal malformations, to subtle change in gene expression.

Indeed, the final stages of spermiogenesis may be relatively more vulnerable than earlier stages, since the DNA in condensed spermatids is incapable of being repaired.

Despite these dangers and the evidence that children are more vulnerable than adults to environmental agents, some scientists are arguing

Guardian, September 12, 2007. Twice as many girls as boys are being born in some Arctic villages because of high levels of man-made chemicals in the blood of pregnant women, according to scientists from the Arctic Monitoring and Assessment Programme (Amap). The scientists, who say the findings could explain the recent excess of girl babies across much of the northern hemisphere, are widening their investigation across the most acutely affected communities in Russia, Greenland and Canada to try to discover the size of the imbalance in Inuit communities of the far north. The scientists measured the man-made chemicals in women's blood that mimic human hormones and concluded that they were capable of triggering changes in the sex of unborn children in the first three weeks of gestation. The chemicals are carried in the mother's bloodstream through the placenta to the foetus, switching hormones to create girl children.

Lars-Otto Reierson, executive secretary for Amap, said: "We knew that the levels of man-made chemicals were accumulating in the food chain, and that seals, whales and particularly polar bears were getting a dose a million times higher than that existing in plankton, and that this could be toxic to humans who ate these higher animals. What was shocking was that they were also able to change the sex of children before birth."

Scientists believe a number of man-made chemicals used in electrical equipment from generators, televisions and computers that mimic human hormones are implicated. They are carried by winds and rivers to the Arctic where they accumulate in the food chain and in the blood streams of the largely meat- and fish-eating Inuit communities. Dr Reierson said the accumulation of DDT, PCBs, flame-retardants and other endocrine disrupters has been known for some time and young women had been advised to avoid eating some Arctic animals to avoid excess contamination and possible damage to their unborn children.

that 'susceptible genes' are responsible for the majority of increases in cancers among industrialised nations.

This of course could be seen as an attempt to 'blame the victim' and take any blame away from industry. But more information has recently come to light that possibly lays the blame firmly at industry's door step.

New evidence about how genes interact with the environment suggests that many industrial chemicals may be more ominously dangerous than previously thought. It is increasingly clear that the effects of toxic exposure may be passed on through generations, in ways that are still not fully understood. Research suggests that, contrary to previous belief, our behaviour and our environmental conditions may program sections of our children's DNA."This introduces the concept of responsibility into genetics and inheritance," said Dr. Moshe Szyf, a researcher at McGill University in Montreal, "This may revolutionize medicine.

You aren't eating and exercising just for yourself, but for your lineage."

The new field of genetic research, called epigenetic's, involves what scientists are referring to as a "second genetic code" which influences how genes act in the body.

If DNA is the hardware of inheritance, the epigenetic system is the software determining which genes get turned "off" or "on" and how much of a certain protein they produce.

It is this switching system that allows the genetic material in each cell to influence the creation of proteins—which ones are manufactured, in what sequence, and how many. Proteins are the building blocks of our bodies. The chemicals and hormones in our bodies are proteins and determine, in large part, how we look, how we feel, and even how we act.[11]

Now, it seems that this chemical switching system may also act in reverse. In most cases, epigenetic changes (changes to DNA from current environmental conditions) are not passed from parents to their offspring. Scientists are still not sure how— but genes seem to be "wiped clean" after a sperm fertilizes an egg.

Based on the recent data, however, researchers are intrigued by the notion that some of the genetic changes influenced by our diet, our behaviours, or our environment, may be passed on from generation to generation.

Basically this story tells us that environmental influences (like our mother's diet and her exposure to toxic chemicals) are far more important to us than anyone suspected just a decade ago.

It turns out that environmental influences shape us from the moment of conception onward, and the earliest months and years of life are the most important ones. It is called "foetal programming" and it means our first environment (the womb) can determine what sorts of diseases will afflict us later in life. Furthermore, some of these early influences can be inherited by our offspring and even by their offspring. So your personal pattern of disease may have been set by your grandmother's diet, or by her exposure to toxicants.

These findings imply that keeping toxic industrial chemicals out of the environment is far more urgent than anyone has previously thought. With more than 1,000 chemicals presently entering commercial channels each year with almost no health or safety testing this is not welcome news. In May 2007, a group of scientists from five continents issued strongly worded consensus statement (the "Faroes Statement") saying that early exposure to common chemicals leaves babies more likely to develop serious diseases later in life, including diabetes, attention deficits, certain cancers, thyroid disorders, and obesity, among others.

Notably, the scientists urged governments not to wait for more scientific certainty but to take precautionary action now to protect foetuses and children from toxic exposures.

Most of the mainstream press continued to tiptoe around this story, with a few important exceptions until May 2007 when the Faroes Statement blew the story open. Now that it is out in the open, we will have to see if the mainstream press has what it takes to explain the far-reaching ramifications of these findings.[12]

Asthma

Dust mite dropping, central heating and even over-enthusiastic hygiene by mothers have all been named in connection with the world wide increase in asthma. Chemicals are never mentioned, despite asthma being a symptom of a damaged immune system and many chemicals are known to damage/suppress this system.

There are also several well conducted studies showing reduced lung capacity in children living in areas with high levels of air pollution[13][14] which we never hear mentioned by 'experts'

27 July 2007. The World Health Organization (WHO) released its first ever report highlighting children's special susceptibility to harmful chemical exposures at different periods of their growth. This new volume of the Environmental Health Criteria series, *Principles for Evaluating Health Risks in Children Associated with Expo- sure to Chemicals,* is the most comprehensive work yet undertaken on the scientific principles to be considered in assessing health risks in children. It highlights the fact that in children, the stage in their development when exposure occurs may be just as important as the magnitude of the exposure.

'suggesting'[perhaps recommending?] the placement of incinerators in heavily polluted areas.

Others studies have demonstrated a clear association between low blood lead levels in children and reduced intelligence and greater aggressiveness.[15][16]

When one considers the quantity of bio-accumulative, persistent organic pollutants (POPs),and the products of incomplete combustion (PICs) and heavy metals etc., emitted by waste incinerators over the last five or six decades, I think we can safely say that incineration has been, and indeed continues to be, a major contributor to the levels of man-made compounds in human tissues and increases in cancers, cardiovascular diseases and malformations in children born within communities hostage to such facilities.

Industrialists and pyromaniacs claim the quantity of chemical's emitted by modern facilities are "insignificant." But when we consider their carcinogenic properties, persistence and bio-accumulative nature, along with their capability to mimic, block or otherwise disturb so many vital human systems, they are not as 'insignificant' as these people would have you believe.

Common sense tells us that to allow a process that emits these compounds daily, even hourly, to operate for 35 years is simply asking for health problems on a massive scale.

Despite pyromaniacs claims that the process poses only a minor threat to health, there are numerous epidemiological studies showing significantly increased ill-health in communities living around incinerator facilities. Although, because of the complexity of the science and numerous confounding factors, the authors have been unable to prove 100% proof of causation, they express grave concerns and recommend the importance of more studies.

However, when asked *"what sort of monitoring for the benefit of the environment or human health would you recommend around incinerators burning waste specifically?"* Dame Barbara Clayton, past President of The UKs National Society for Clean Air and Environmental Protection (NSCAEP) and a strong supporter of incineration replied *"If they are modern ones, I would have thought there is no point in monitoring individuals living around it."*[17]

This is a somewhat different view to that of the committee conducting the inquiry who concluded: *".. we think that it would be wrong to discount public concern about the health implications of incineration products (especially dioxins) on the grounds that it is derived from the experience of an older generation of municipal incinerators which the 1989 Directives have essentially done away with. Although considerable progress has been made in understanding the toxicology and exposure effects of many of the key pollutants, continued epidemiological work will be needed. We consider there are well established grounds for caution, justifying the general approach of the draft Directive. We feel that the collection and study of data on the potential health risks, from combustion products should continue to be a priority..."*

Professor T Holgate (Committee on the Medical Effects of Air Pollutants (COMEAP) giving evidence to the same inquiry was of the opinion that: *"... some thought needs to be given as to where air pollutants monitors [are] sited in relation to those most at risk. We know that cardiovascular and respiratory illness is a risk factor from the adverse health effects of particles in the elderly in urban conurbations."*

Chemicals are beneficial to many aspects of daily life, but some chemicals are also harmful to human health—especially the health and development of children. The World Health Organization estimates that unintentional poisonings annually account for the deaths of more than 35,000 children under age 151. Many more children suffer from illness and disability related to chemical poisonings or chronic exposure to chemical pollutants in their environment.

The social and economic cost of children's harmful exposure to chemicals can be high. In addition to direct medical expenses, there are sick days that keep children away from school and their parents away from work, and the emotional toll that childhood illness, disability and death takes on families and communities.

Poor children are the most vulnerable and may suffer the most harm, as they tend to be undernourished, live in more polluted environments, and lack access to health care and education. Moreover, persistent poor health of children can contribute to a cycle of poverty, negatively impacting the long-term productivity of communities and entire nations.

Intergovernmental Forum on Chemical Safety (IFCS) Children and Chemical Safety Working Group.

Despite the concerns of Professor Holgate and the reservations of epidemiologists and scientists around the world along with the ever increasing number of disturbing findings of epidemiological studies, the British government make the astonishing claim against all the evidence that:

"…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."[17a] and are pursuing a Waste Strategy requiring the building of over 150 EfW incinerators throughout the UK.

After a recent vote by the European Parliament to call energy from waste incineration a 'recovery operation' rather than 'disposal', the European Union is also ignoring the evidence of increased ill-health and is looking to build an estimated 1000 EfW facilities throughout Europe using its citizens money to subsidies their construction.

The reality is the ever-increasing mountain of [epidemiological] evidence gives us many reasons to be concerned over these plans. This evidence and the communities experience does not allow any responsible government to disregard several very important points including:

*implementation of the precautionary principle:

*the findings and advice of epidemiologists

*the findings of scientists working in the field of dioxin research;

*that not only is dioxin (of which a minuscule amount is capable of disrupting several natural human development systems) released daily by incinerators, but so are an assortment of products of incomplete combustion and persistent heavy metals.

Dioxin has been described as "the most potent, synthetic compound known to man" and the "Darth Vadar of chemicals" by eminent scientists working in the field. But a report produced by Enviros/DEFRA in 2004 [18] concluded incinerators pose only a 'minor threat to health'.

This desk top evaluation of carefully 'selected studies' is seen by some inspectors conducting public inquiries into planning applications for Energy from Waste incinerators as the 'Holy Grail' of scientific certainty. Indeed, many are refusing to take health impact into consideration believing 'there will not be any.'

One such planning inquiry saw a document submitted for Sussex County Council claiming: ...that 'emissions from a modern incinerator cause only a very small increment upon pre-existing concentrations [of pollutants] which, insofar as they would have any effects upon local residents, represent no significant threat to health'.

But surely, if subtle effects are happening at present day body burden levels, as believed by the scientist of the World Health Organisation, then any increment, however small, could have devastating consequences for public health, and children in particular?

This view is shared by a panel who, in 2004 reported on their review of data published since 1994 showing a causal link between air pollution and respiratory deaths in infants. The panel found a 1% increase in children's risk of mortality due to respiratory causes attributed to air pollution exposure.

Because exposure is so common, this small increase places large numbers of children at risk and according to the authors is the "tip of an iceberg hiding a far bigger problem", related to aggravated asthma episodes, increased incidence of cough and bronchitis, greater susceptibility in adulthood to the effects of aging and infection, tobacco smoke and occupational contaminants.[19]

Almost all health-related literature industry has is directed towards exposure of adults, not children, the elderly or those among us suffering ill health. Therefore any safety information is highly unlikely to result in the effective protection of the most-at-risk sections of society.

Citizens involved in the battle to protect public health from polluting incinerators are well aware that the statement "dioxins pose no threat to the health of all sections of society" is simply 'spin' to protect the interests of the waste industry and enable the government to implement its plans to build Energy from Waste incinerators throughout the United Kingdom. Ministers are repeatedly claiming their

The Role of Thyroid Hormones in Prenatal and Neonatal Neurological Development-SP Porterfield and CE Hendrich. 1993. *Current Perspectives Endocrine Reviews 14(1): 94-106* SP Porterfield and SA Stein. 1994. **Thyroid Hormones and Neurological Development: Update 1994** *Endocrine Reviews* 3(1):357-363 These comprehensive reviews by Susan P. Porterfield examine the role of thyroid hormones on normal brain development, and the impact of thyroid hormone abnormalities on the fetal brain. The critical period for thyroid hormones in brain development occurs in humans in late gestation to 1-2 years of age (in rats this period is equivalent to 18 days of gestation to 21 days neonatal). Thyroid deficiency (hypothyroidism) at birth has several implications on the brain and middle ear development. Too much or too little of these hormones can result in the decrease of cells in the mature brain, can impair neurological development and can alter middle ear development. Untreated congenital hypothyroidism will result in severe mental retardation and hearing loss. Subtle effects of treated congenital hypothyroidism include learning disabilities, speech and memory problems, and poor coordi- nation and balance. Similar behavioural and neurological problems emerge in children whose mothers had thyroid hormone deficiency or hyothyroxinemia during pregnancy. *Source :*http://www.ourstolenfuture.org

Strategy is not based on incineration, but on 'recycling.'

Their response to the subsequent public outcry at this blatant disregard towards public health saw the government looking to experts whose views were concordant with their policies. They used these to counter-attack the findings and interpretations of genuine epidemiological evidence using 'selected' studies and conducting a 'desk job' evaluation of them mention earlier.[20]

To strengthen the governments argument the Environment Agency's Chief Executive Baroness Young made the amazing claim that, *"composting is more dangerous than incineration"* [21] showing how far the 'spin' for EfW incineration in the UK has reached.

However, despite the government and pyromaniacs claims the Royal Society warned of serious flaws in the Enviros/DEFRA study stating:

'*In view of the large uncertainties associated with some of the data examined, particularly in the epidemiological studies, it would have been more appropriate to adopt a cautious approach, rather than use inadequate data in a quantitative framework. The latter may give a misleading impression of the robustness of the results.*

Caveats associated with the uncertainties in the results are not presented adequately, particularly in the quantification of the health effects, which could mislead the reader. The report's relevance to waste management decision-making by Local Authorities is limited, as several important issues are not addressed.

These include the effect of local environmental and health sensitivity to pollutants and the impact on emissions of specific waste management activities operating under non-standard conditions.

Bias in the availability of good quality information means the report concentrates mainly on the effects of air pollution. Consideration of the potential effects of exposure to pollutants through other pathways is not consistent throughout the report and therefore prevents adequate comparison of the options'.

The Royal Society's evaluation and criticism of the report is never admitted or mentioned at planning inquiries. When it is mentioned by a concerned citizen it is downgraded to nothing more than a simple, almost irrelevant statement.

Cheshire

One consultancy advising Cheshire County Council that a EfW incinerator of over 500,000 tpa is necessary in the county of Cheshire, claims 'the UK is forecast to be the biggest market for in Europe.'[22] Indeed the Merseyside Basin / north west Cheshire has been targeted as the major UK dumping ground with planning permission having been granted for the building of a 800,000 tonne per annum EfW burner at Runcorn/Halton. Concerned residents also await the outcome of a planning inquiry into an application for a 600,000 tpa EfW burner just four miles away. There are also applications for three other EfW incinerators as well as anaerobic digesters and composting facilities, some within the Mersey Basin area. If permission is granted for all these the total amount of waste that could be handled each year in Cheshire will be almost 2 million tonnes. (FYI Cheshire now produces just 400,000 tpa of waste.)

With all these facilities in the pipeline what does the future hold for the forthcoming generations of Merseyside / North West Cheshire children and the UK in general?

With the towns of Halton and Ellesmere Port acknowledged as two of the hot spots of cancers, early child deaths and poverty by a number of reports, the residents are justifiably concerned for their children's future.

Independent scientists and an ever-increasing numbers of the medical profession throughout Europe are speaking out against incineration. But Government advisers and industry scientists say "no problem" refusing to accept that although our bodies

Brucker-Davis, F. 1998. **Effects of environmental synthetic chemicals on thyroid function**. *Thyroid* 8:827-855.

In this definitive review, Francoiçe Brucker-Davis assembles literature up to 1997 from laboratory experiments, wildlife observations and human epidemiology on possible thyroid disruption by a diversity of chemicals, including DDT, amitrole, thiocarbamates, polyhalogenated hydrocarbons (e.g., PCBs), phenol derivatives and phthalates. She begins her review by observing that it is vitally important to distinguish between potential impacts on fully-grown individuals *vs.* impacts via exposure *in utero*. This is because the thyroid gland in adults is able, within reason, to compensate for mild or moderate disruption (e.g., caused by hyperplasia or goiter). In contrast, the fetus in the womb is highly sensitive to alterations in thyroid hormones, especially its developing brain.

A table compiled by Brucker-Davis summarizes data on over 90 chemicals known to be thyroid disruptors (from laboratory experiments in animals *in vitro*). It turns out that **only a tiny fraction of the 70,000+ chemicals in commercial use have been tested for thyroid activity, even fewer for transgenerational effects examining the consequences of exposure in the womb.**

She classifies the main mechanisms of action by which thryoid disruption occurs into four specific categories--thryoid hormone synthesis, transport, metabolism, and tumor--and a catch-all "other." Most of the main synthetic chemicals influence the thyroid system via multiple mechanisms. *Source:* http://www.ourstolenfuture.org

and those of our new born are burdened with more than 300 groups of chemicals, these chemicals pose any threat to health. Indeed, according to chemicals expert, Prof Roy Harrison, (Birmingham University) our bodies can seemingly 'tolerate' an even heavier body burden and he suggested to a House of Lords Inquiry that building incinerators in areas already polluted might be the best thing because 'a small increment'[of pollutants] will be more tolerable". (Authors comment: 'to those citizen already being poisoned, or to the people enjoying healthier lifestyles in cleaner environments or to Prof Harrison personally?')

What I find extremely dubious is that after reading on the scant data available on the impact of chemicals, especially on the developing embryo/foetus and growing child, we are now being told the effects on these are taken into account when setting safety limits for chemicals. It is claimed they look to information from reproductive / developmental toxicity studies in order to set a 'tolerable daily intakes.'[23]

Given what we know about the extreme sensitivity of the embryo/foetus and growing child to chemical insult, how the hell can anyone work out a 'tolerable daily intake' for such a tiny body changing and developing faster than it ever will again?

Why do these people continuously insult the intelligence of everyday people with claims like this?

In order for the layperson to form a reasonable 'common sense' opinion whether incineration and these chemical burdens pose a serious threat to public health, and in particular to the developing embryo/foetus and growing child. We should consider:

1) the toxicity,
2) the persistence
3) the bio-accumulative nature of the chemicals and the by-products emitted by incinerators;
4) the evidence of genuine independently conducted epidemiological studies;
5) the extreme sensitivity of the developing foetus and growing child to chemical impact;
6) the considerable time available during the vulnerable 'windows of development' between the formation of sperm, conception and the ultimate end of development beyond puberty.;
7) that assessments are conducted with healthy adults in mind.
8) that children are not simply 'small' adults.

The following section will give you just a fleeting glimpse into the complex world of a developing foetus/child and hopefully help you understand why any claims that the health of the unborn and growing children are fully understood is either wishful thinking, or (in most cases) deliberate lies to protect industries interests.

Chemicals

There are between 80,000 to 100,000 chemicals in use. Something like 30,000 in daily use. Of those produced in large volumes there is sufficient public data available on only 14% to allow the minimal assessment of their risks for exposure to one substance at a time. There is no data on the complex combinations of substances emitted to which we are all exposed on a daily basis. Industry certainly does not know the effect of these on something as sensitive as already damaged tissues, organs or the immune system of sick or elderly persons, lung function, nervous system function, reproductive system, immune or endocrine system function, the development pattern of a foetus, a nursing infant, or a growing child.

A developing foetus today, especially that in the womb of a woman living in close proximity to an incinerator or other chemical releasing facility, is faced with completely different risks to a foetus of two or three decades ago.

Scientists understand that chemicals in the environment can cause a wide range of problems. The effects of such exposures are determined in part by chemical toxicity, dose, timing and duration of exposure.

We know that because of a variety of factors children have a greater potential for adverse health effects from the impact of chemicals than adults. They are still developing in many ways and less able to rid themselves of chemicals due to immature mechanisms for detoxification. Because of differences in metabolism and behaviour, they may reach higher levels of exposure within the same environment as adults.

While there has been some increase in research into children's health and chemical impact little attention has been given to the consequences of developmental exposures that occurred in either foetal development, during breast feeding, or in childhood up to puberty and into maturity.

To identify and understand the relationship between exposures and the developmental outcomes, scientists must look towards the identification of key times and periods during foetal development where chemical impact can result in specific outcomes. Epidemiologist are now aware after the experiences of DES and Thalidomide, (a tragedy that didn't affect the United States because of Frances Kelsey), that it is not simply the dose of a toxin that causes damage to a developing foetus, but at what stage of development the foetus is at when exposed.

Thalidomide created an epidemic of 15,000 babies world wide with missing limbs. But it also caused other developmental disabilities including mental retardation and autism.

It is very likely that had it not been for the visible anatomic malformations phocomelia (limb shortening) it would have been many decades (perhaps never)

before the blame for the sub-clinical deficits and neurobehavioral development problems would have been laid at door of the manufacturers of thalidomide. This is just one factor that makes the claim that "*no more health studies are necessary among communities living with incinerators"* irresponsible and revealing a disgraceful indifference not only to the communities hostage to incinerators today but to the well-being of future generation.

The most vulnerable time of our life is when we are developing in the womb. The human body is composed of roughly 50 trillion individual cells that all cooperate and communicate with each other. Any damage that might occur to any cells will be carried by us for the rest of our lives.

Cell Multiplication

Dividing cells are more susceptible to injury from chemical and physical insults, the DNA is uncoiled and there is a higher probability of interlocation defects. Damage to the dividing cells of a developing organ may cause severe deformity, while in the adult it will lead to scarring at the site of the injury.

*Immaturity: Enzyme systems are immature and of low capacity and hence the foetus can only detoxify toxic substances at a low rate and is exposed to high levels for a longer time.

*Infection defence systems are immature.

*Foetal cell surface proteins are often different to hose expressed in the adult and therefore responses to toxins can be very different.

*Foetal kidneys cannot concentrate urine as well as adults.

*The blood brain barrier is not fully formed.

The foetus has a higher metabolic rate and therefore less (or no) cells are in a resting state - therefore any perturbation in this has a bigger effect eg., the build up of intermediate toxic metabolites for a given body weight will be greater in a neonate.

There is little body fat in the foetus and therefore no protective reservoir for fat soluble toxins such as organochlorines, as in adults. This leads automatically o higher circulating levels of toxic substances than in adults.

*The free radical scavenging system is immature.

*Intrauterine Existence: Toxin excretion in the adult is largely in the bile and faeces, a route not available to the foetus.

*Urine excretion is not appreciable in the first 2 trimesters.

Therefore the two most common routes for toxin excretion in the adult are not an option for the foetus.[24]

Whereas researchers have considered the importance of exposure timing and how this affects the outcomes, none has systematically compiled:

*Preconception,

*Prenatal,

*Postnatal developmental exposures and

*the subsequent outcomes from impact at these different stages.

Efforts have been undertaken to examine the information available and to evaluate the implications for risk assessment for several areas:

a) respiratory and immune systems,
b) reproductive system,
c) nervous system,
d) cardiovascular system, endocrine system, and general growth, and
e) cancer

but the research is still in its infancy.

Development

A developing baby is called an embryo from the time the bilaminar germ layer appears during the second week after fertilisation, to approximately the eighth week of gestation, by which time most major organ and tissue development has occurred.

By the eighth week, tissues and organ systems have developed and the major features of the external body form have developed.

The period of development between the fourth and the eighth week, when all the major tissue and organ systems begin to develop in the human embryo, is referred to as organogenesis.

The foetal period extends from the ninth week until birth. During the foetal period, the foetus grows in weight from approximately 8g to approximately 3,400g. Weight is gained mainly in the third trimester, but the foetus increases in length mainly during the second trimester.

Many organ systems, including the brain, peripheral nervous system, sensory systems, and the reproductive system, are not mature at birth.

There are windows of vulnerability for structural alterations; whereas the beginning of the period of vulnerability is often poorly defined, the end is usually well defined.

The principal reason for uncertainty about the initiation of the vulnerable period is that cascades of gene action and development exist, but their sequences and timing are not fully known. The closer scientists look, the more evident it is that often there is not a uniform response within a given 'window.' There may be peaks and valleys, or various slopes of sensitivity, within the period of vulnerability.

Although there is increased recognition of the role of regulatory genes and gene cascades, it's also evident that the same gene has different roles and timing in different tissues.

The Respiratory System and Pollution

The respiratory system is a complex organ system composed of multiple cell types involved in a variety of functions. An understanding of critical windows of exposure of the respiratory system on children's health requires consideration that lung development

is a multi-step process and cannot be based on studies in adults.

The system undergoes several dynamic changes and development occurs from embryogenesis to adult life. It passes through several distinct stages of maturationand growth involving branching morphogenesis and cellular differentiation of the respiratory system, as well as the postnatal development of xenobiotic metabolising systems within the lungs.

Exposure of the respiratory system to a wide range of chemicals and environmental toxicants during perinatal life has the potential to affect significantly the maturation, growth, and function of this organ system.

Although the potential targets for exposure to toxic factors are currently not known, they are likely to affect critical molecular signals expressed during distinct stages of lung development.

The effects of exposure to environmental tobacco smoke during critical windows of perinatal growth can be provided as an example leading to altered cellular and physiological function of the lungs. An understanding of critical windows of exposure of the respiratory system on children's health requires consideration that lung development is a multi-step process and cannot be based on studies in adults.[25]

Zanobetti, Schwartz, and Gold found that the ai rpollution associated increase in hospital admissions for cardiovascular diseases was almost doubled in subjects with concurrent respiratory infections. The risk was also increased by a previous admission for conduction disorders.

For Chronic Obstructive Pulmonary disorders (COPD) and pneumonia admissions, diagnosis of conduction disorders or dysrhythmias increased the risk of particulate matter <10 µm in aerodynamic diameter (PM10)-associated admissions. Persons with asthma had twice the risk of a PM10-associated pneumonia admission and persons with heart failure had twice the risk of PM10-induced COPD admissions.

The PM10 effect did not vary by sex, age, and race.

These results suggest that patients with acute respiratory infections or defects in the electrical control of the heart are a risk group for particulate matter effects.[26]

Asthma

Over the last few decades, asthma has increased throughout Europe with an average of over 10% of children suffering from asthmatic symptoms.

In western Europe, symptoms are up to ten times more frequent than in eastern countries. In 1995/1996, the International Study of Asthma and Allergies in Childhood (ISAAC) found an average annual prevalence of self-reported asthma symptoms in children aged 13-14 years in Europe of 11.5%, ranging from 2.6-4.4% in Albania, Romania, Georgia, Greece and the Russian Federation, to 29.1% in Ireland and 32.2% in the United Kingdom.

Main allergic disorders

Atopy (allergy) in general refers to a condition or disease associated to the presence of allergen-specific immunoglobulin E (IgE) antibodies. It includes allergic rhinitis, atopic eczema or dermatitis, and asthma.

Allergic rhinitis is an allergen-dependent inflammation of the lining of the nose associated with conjunctivitis.

It may be chronic, recurrent or seasonal. For example, seasonal rhinitis usually results from an allergic reaction to inhaled grass pollen (hence the name 'hay fever'). The prevalence of hay fever has increased considerably since the beginning of the 20th century, from about 1% to a current overall level in the general population around 15-20%. Recently, urban air pollution has been increasingly incriminated as one of the potential causative or precipitating agents. Other suggested causal factors in the increasing prevalence of hay fever include ethnic sensitivity, social class, family size and maternal smoking.

Atopic eczema is an inflammatory skin disorder characterized by severe itching, a chronic or chronically relapsing course, and a particular distribution of lesions that changes with age. The cumulative incidence of atopic dermatitis before age seven has increased dramatically in recent decades, and 10-20% of children with this disease develop asthma. A major review encompassing 25,000 children in five European countries revealed prevalence as high as 24% in some places. Children with atopic eczema have a risk of around 40-60% of developing respiratory symptoms in later years.

Asthma is a chronic inflammatory disorder of the airways affected by many factors. In susceptible individuals, inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and cough, particularly at night and/or in early morning.

These symptoms are usually associated with widespread but variable airflow limitation that is at least partially reversible, either spontaneously or with treatment.

Inflammation also causes an associated increase in airway responsiveness to a variety of stimuli. Two thirds of affected children become asymptomatic before school age, but there is subsequently a tendency towards increasing prevalence with growth into adulthood. In general, the male-female prevalence ratio is 2:1 in early childhood, gradually equalizing with advancing age.[27]

Kidneys

In 1999 an ongoing population-based Swedish study, Women's Health in the Lund Area, was expanded to include low-level cadmium exposure. Analysis of the data collected now reveals a small but significant kidney response to low level cadmium exposure suggesting that low-level cadmium exposure may pose a significant public health risk.

Owing to extremely slow excretion, cadmium accumulates in the body, especially in the kidneys.

Kidney damage is the primary consequence, but most toxicity data are from exposures in occupational settings or severely polluted areas. The effects of low level exposure are less certain.

Some of the pollutants emitted by incinerators have been associated with intrauterine growth retardation (IUGR).

There is now incontrovertible evidence that IUGR is associated with Sudden Death Syndrome (SIDs) and a reduced adult life expectancy among those who survive infancy.

Research has shown that IUGR in human infants is associated with a highly significant reduction in the number of nephrons the basic filtration unit in the kidneys.

While normal infants and adults will possess in the order of 1,000,000 nephorns per kidney, the IUGR cases studied demonstrate a nephron population of 300,000 and 600,000. A study in 1992 shown similar findings in 70% of the cases of SIDs examined.

The foetus starts making the building blocks of the kidneys at the age of 16 weeks and finishes at 36 weeks, normally about four weeks before birth.

A primary function of the kidney is to filter excess water and metabolic by-products from the blood for urinary excretion. This filtration occurs in more than 1 million nephrons, each of which contains a blood capillary (the glomerulus) intertwined with a urine collecting tubule. In the current study, researchers assessed glomerular and tubular fitness by measuring kidney function markers in blood and urine, respectively.

Blood testing also revealed ongoing cadmium exposure, and urinalysis indicated cadmium body burden.[28]

The nephron is the basic functional unit of the kidneys. Nephrons form from a special layer on the outside of the kidney which is only found in the foetus. Once that layer disappears at 36 weeks it is then impossible for that individual to ever make nephrons again in their lifetime; it has to be achieved in the womb.[29]

Neurological

To address critical windows of exposure that impact neurological function, it is important to recognise the importance of several factors.

These windows (of vulnerability) are influenced by:

*the mechanism of action of the agent,

*the target tissue dose of the agent,

*the developmental time table of the target tissue,

Yanagawa, T., Kobayashi, Y., Nagayama, J., 2003. **Assessing the joint effects of chlorinated dioxins, some pesticides and polychlorinated biphenyls on thyroid hormone status in Japanese breast-fed infants.** *Environmetrics* 14: 121-128.

Summary

Joint effects of dioxin related chemicals (DXNs), hexachlorocyclohexanes (HCHs), DDT, dieldrin, heptachlore- poxide (HCE), chlordane and polychlorinated biphenyls (PCB) on the levels of triirodothyronine (T3), thyroxine (T4), thyroid stimulating hormones (TSH) and thyroid binding globulin (TBG) in the peripheral blood of 101 breast-fed infants are studied. The statistical issue involved is how to estimate the effects based on data from volunteer subjects with possible measurement errors. A chain independent graph is applied for modeling the associations among factors, and dicotomizations of selected factors are performed for estimating the effects. Use of non parametric methods with careful consideration of over- adjustment is suggested. It is shown that the estimated odds ratios of DXNs[DDT, the first principal component of DXNs and DDT, relative to TSH are 3.02 (p-value=0.03) and 7.15 (p-value=0.02), respectively, when PCB is not adjusted and adjusted for respectively.

[from text]

It has been reported that perinatal exposure to PCBs or 2,3,7,8-TCDD significantly decreases plasma thyroid hormone levels in neonatal rats (Morse et al., 1993; Seo et al., 1995; Morse et al., 1996). It has also been reported that concentrations of T4 in the brain of female weaning rats were significantly decreased after maternal exposure to PCB during days 10 to 16 of gestation (Morse et al., 1996). It is known biologically that a decrease in T3 or T4 increases TSH, whereas the present study shows that PCB decreases the levels of TSH. It is speculated that this difference might be caused by the difference between ‘acute’ and ‘chronic’ exposures. More precisely, PCB might be metabolised to be a chemical that is similar to T3 and T4 in the chronic exposure.

In conclusion, the present study shows that the elevated exposure to chlorinated dioxins and DDT altered the levels of thyroid hormones significantly...

*the outcome
*and the age
and the manner in which that outcome is evaluated.

Different functions are mediated by different neural substrates, and the timing of developmental events vary with neural substrate. Thus, vulnerability associated with specific time periods of exposure varies with the agent of exposure and the end point of interest.

It is also important to recognise the protracted period of development of the nervous system. Empirical evidence substantiates multiple periods of vulnerability to toxic insult in the developing nervous system spanning from early gestation to adolescence in humans and experimental animal models.[30][31]

Toxic insults during this protracted period can result in diverse outcomes ranging from structural abnormalities emergent during early embryogenesis that may be incompatible with pre- or postnatal survival, to ultrastructural or molecular abnormalities potentially emergent at any developmental point and associated with functional deficits. The architecture and physiology of the brain develops throughout gestation and continues postnatally through adolescent development.

Insult by a chemical compound at any point during this period may result in aberrant neural structure or function. '..[M]any (perhaps most) environmental developmental toxicants that influence behavioural, hormonal, or growth outcomes do so in the absence of malformation induction at higher doses where maternal toxicity and/or foetal death may occur [e.g., lead, mercury, polychlorinated biphenyls (PCBs), amphetamine, and cocaine].

Thus, in the context of screening, behavioural alteration may sometimes be the only marker for risk assessment. Research has clearly linked behavioural dysfunction with ultrastructural or molecular abnormalities in brain development...'[32]

Early exposure to PCBs is frequently associated with decrease in IQ. Research by Joseph and Sandra Jacobson of Wayne State University, in Detroit, Michigan revealed that PCB exposure in utero correlated with decreases in children's ability to comprehend words as well as whole bodies of reading material.

Specifically the children with the highest exposure lagged more than seven months behind the norm for children of the same age in word comprehension.[33]

Thyroid

"It was only recently scientists discovered we need thyroid in the human embryo from the moment of conception and during the first twelve weeks of development. They did not believe it was necessary until then because the amounts in the body was 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," said Theo Colborn' Senior Scientist with the World Wildlife Foundation in 1996.[34]

The thyroid's two principal products are thyroxine (T4) and triiodithyronine (T3). These are generally known as 'Thyroid hormones.'

It is now established that many environmental contaminants can disrupt thyroid hormone (TH) homeostasis, which is vital during foetal development and for a variety of physiological processes in adults.

Among known TH disrupters are polychlorinated biphenyls (PCBs), dioxins, and dibenzofurans, all members of the polyhalogenated aromatic hydrocarbon (PHAH) chemical family. Little is known, however, about how mixtures of such chemicals at typical environmental exposure levels may disrupt TH functions.

Nor is it clear whether effects are additive, synergistic, or antagonistic--that is, whether there is interaction between constituent chemicals, whether their cumulative influence is more than the sum of its parts, or whether they cancel each other out.

With respect to risk assessment, the U.S. Environmental Protection Agency's default assumption is that the effects of chemicals in mixtures are additive. Now a team of researchers has tested the additivity assumption and found that it is relatively robust at exposure levels typical for humans.

Significantly, the study also showed that the mixture exerted an effect on T4 even though concentrations of its constituent chemicals were at least an order of magnitude below their known effective doses.

Potent Competitive Interactions of Some Brominated Flame Retardants and Related Compounds with Human Transthyretin in Vitro. Ilonka A, TM Meerts, JJ van Zanden, EAC Luijks, I van Leeuwen-Bol, G Marsh, E Jakobsson , Å Bergman and A Brouwer. 2000. *Toxicological Sciences* 56: 95-104.
Brominated flame retardants are commonly used in a wide variety of products and processes, including plastics, paints, electronic parts and fabrics. Research is now revealing that contamination by several types of these compounds is extraordinarily widespread. Ilonka et al. observe that the chemical structures of some flame retardants is quite similar to the structure of thyroxine (T4), a human thyroid hormone. They conduct competitive binding experiments to measure the potency of brominated flame retardants to interfere with thyroid hormone function. Their results "indicate that brominated flame retardants, especially the brominated phenols and tetrabro- mobisphenol A, are very potent competitors for T4 binding to human transthyretin in vitro and may have effects on thyroid hormone homeostasis in vivo comparable to the thyroid-disrupting effects of PCBs."

This indicates that considering individual chemicals in isolation may not predict their effects in mixtures because, even though chemicals may not be potent enough by themselves to cause effects, the cumulative effects of low doses of many chemicals may be enough to do so.

The multiple functions of TH, such as its role in foetal development and its regulation of metabolism and heart rate, make it vulnerable at many points. The research team estimates that there could be as many as five distinct mechanisms by which chemicals exert antithyroid effects for which a reduction in circulating T4 is the common end point.[35]

Thyroid-disrupting chemicals (TDCs) are xenobiotics that alter the structure or function of the thyroid gland, alter regulatory enzymes associated with thyroid hormone (TH) homeostasis, or change circulating or tissue concentrations of THs. TDCs include a wide range of chemical structures. Chemicals such as perchlorate inhibit the uptake of iodide into the thyroid gland, with subsequent decrease in iodine-based TH synthesis.[36]

Thyroid hormones are markedly different from reproductive hormones in several respects, and these differences have made it difficult to transfer the reproductive hormone model of chemical endocrine disruption to the thyroid system.

The developing foetus depends upon maternal thyroid hormones until around the beginning of the second trimester and at no time is thyroid hormones more crucial than during brain development. Thus, it is in foetal and childhood development that environmental factors may have their greatest impact.

Basic foetal brain development is underway in humans within the first few weeks of gestation. Spinal cord and hindbrain components grow at this point, and cerebral cortex structures begin to take shape about halfway through gestation. Neural synapses begin forming as early as the second month of gestation, peaking in the child's first year of life and many parts of the brain continue to develop postnatally and even into adulthood. Thyroid hormone is essential for neuron formation, synapse development, formation of myelin (the sheath surrounding neurons that enhances nerve impulse transmission) and migration of neurons to their proper places in the brain.[37]

Even small changes in thyroid hormone availability during critical periods of brain development can have troubling results. Children born to mothers with hypothyroxinemia or low circulating levels of T4, may have difficulty with motor coordination, balance and other psyhomotor problems, attention deficit / hyperactivity disorder. One study found a 5-to 6- point IQ deficit in children of mothers with hypothyroxinemia.

Answering the questions regarding foetal brain development involving thyroid would be far easier if there were only one or two mechanisms by which the thyroid function can be disrupted. But most of the main synthetic chemicals influence the thyroid system via multiple mechanisms.[38]

In fact nearly 90 separate compounds having thyroid-disrupting properties have been identified and 12 separate types of interference in thyroid mechanism.

Fluoride, an element common in U.S. drinking water and a compound the British government plan to add to that country's water supplies, is known to depress thyroid hormone, although the mechanisms by which it does this is unknown. However, as the thyroid affects nearly every bodily system, and given its vital and wide ranging role in foetal development, its protection from chemical impact/disruption is absolutely imperative.[39]

Neural Tube Defects

Some studies show that chemicals are associated with Neural Tube Defects (NTD) These are serious birth defects that involve incomplete development of the brain, spinal cord and /or the protective covering of these organs. There are three types of NTDs, anencephaly (underdeveloped brains and incomplete skulls), encephalocele (a hole in the skull allowing brain tissue to protrude) and spina bifida (an opening in the spine that may allow parts of the spinal cord to protrude).

Other developmental problems that are sometimes considered related to birth defects include premature birth and low birth weight. They increase the risk of

infant mortality and developmental disabilities, like cerebral palsy and mental retardation.

Approximately 20% of children with cerebral palsy and 50% of children with mental retardation also have structural birth defects, showing that these conditions often overlap.

Reproduction System

The sperm count of our species is in serious decline. In 61% of infertile couples there is a problem with the man and scientists studying the impact of man-made chemicals on human health claim males will be infertile by the middle of the next century if present industrial trends are maintained.

We have been exposed over the past 75 years to the effects of industrial chemicals. They are found in our food, water and the air we breathe.

We have all been exposed occupationally, environmentally or through food and scientists have tried to determine the impact on our health. There has been a frequent, persistent argument, significantly from industry, that there is a safe level for all chemicals, and as long as we take no more than "the threshold level" into our bodies we will not come to any harm.

The problem is after decades of research some of these chemicals show no signs of having a threshold (i.e dioxin which is 100 times more toxic to a male child before and just after birth than to an adult.

In 1979 a group of mothers in Taiwan unwittingly consumed PCB contaminated rice oil over a period of ten months. It has now been found that boys born to these women have matured with reduced penises - thus providing the first direct evidence that polychlorinated biphenyls (PCBs) are teratogenic (birth-defect producing) in humans.

The scientists who studied the 115 "Yucheng" (oildisease) children believe the children were exposed to the chemical before and after birth via their mothers' blood through the placenta while they were still in the womb, and as young babies via their mothers' milk.[40]

The simple easy-to-understand fact that 115 Taiwanese teenage boys have smaller penis's than normal was the first confirmation that humans, as well as wildlife, are being similarly affected by exposure to endocrine disrupting chemicals such as DDT, PCBs, dioxin and other man-made chemicals.

It seems that the reproductive system of the male is more prone to damage from these chemicals. But the effects of these hormone mimicking chemicals doesn't stop at reducing the size of the penis. The Taiwanese teenagers had a variety of physical defects at birth ranging from; dark coloured heads, faces and genitals, to abnormal nails that were often dark and ridged, split or folded.

This issue - as to whether chemicals are affecting fertility - is not quite as new as most people believe. As long ago as 1978 scientists working for the Thames Water Authority discovered that 40% of the male roach fish in the River Lee, Hertforshire were hermaphroditic (that is having both male and female sex organs) and were sterile. It was believed that chemicals, notably oestrogen - probably contained in contraceptive pills, in the effluent from the Mill Green sewage works which treats industrial and domestic waste was to blame.

Unfortunately the findings of this research was deliberately kept under wraps by the company.

Defending this secrecy, John Sexton, the Director of Environment and Science at Thames Water Utilities Ltd, said, "the first findings were of very little consequence and the whole works should be completed by government departments."

This view was not shared by scientist Paul Johnson of Exeter University who said, "Science and the pursuit of science are all about evaluating problems and expanding the knowledge base. If the results of works are not published it's impossible to make progress".[41]

John Sexton maintained the amount of hormone found in the drinking water supplied by the Thames Water Authority posed no danger to health because "the body produces the same hormones, so adjusts itself".[41]

"Man made hormones [as produced by hormone mimicking chemicals] are different from natural hormones," said Dr. Vyvyan Howard [then] of the Department of Fetal and Infant Pathology Unit at the University of Liverpool.

"They are persistent. Natural hormones will be destroyed within the body in half an hour. Man-made hormones stay in the body for years switching on enzyme systems."

Hormones are incredibly potent at amounts as low as fractions of a millionth of a gram. "If it affects those fish, then it's affecting us," he added.

One source of exposure to estrogenic chemicals via food was discovered when Spanish scientists found that bisphenol-A leaches from the inner lining of food cans into the contents. Disturbingly this chemical also leaches out of plastic babies bottles. [42]

None of this is 'new' news. Dr. Richard Sharpe of the Medical Council's Reproductive Biology unit in Edinburgh announced as long ago as July 1995 that he had experimental evidence that prolonged exposure to low levels of phthalates, comparable to those found in human diets, could cause a reduction in testis size in developing rats. Any reduction in testis size would be expected to reduce sperm production.[43]

But regulatory action against phthalates has been almost non-existent despite the studies showing the sperm count in men has declined precipitously over the past 20 years.[44]

A report in the *British Medical Journal* fourteen years ago (August 1994) compared the fertility of men of similar ages but born years apart. They found sperm count in 3729 Scottish men had declined 41% among those born in 1969 compared to those born in 1941.

The *New England Journal of Medicine* reported in February 1995 that sperm count has declined 33% during the past 20 years among a study-population of 1,351 healthy, fertile men in Paris, France.

Researchers at the North London Royal Free Hospital, measuring the pregnancy rate between 1977 and 1989, found, despite improved techniques, that the number of pregnancies had fallen. Jean Ginsburgh, Consultant Endocrinologist at the hospital, said: "When checking we found men were producing 96 million [sperm per cubic centimetre] which is a decent sperm count, but we found we had a higher proportion of poor or no motility and the quantity and quality had declined."

Alan Bennett, a male infertility specialist in Albany, New York State, where men are suffering major reproductive problems said in the mid 1990s: "It's rare in my practice to find a man with a sperm count of 100 million cc. I see a lot of men who are 'normal' with a sperm count of 30 to 40 million. In the US we now have a normal count of 20 million, whereas when I was training it was 60 million, so in the twenty five years I've been practicing it's gone from 60 million to 20 million, that says something."[45]

The fact is that the number of morphological normal sperm [sperm with a normal shape] produced by the average man has dropped below the level of those of a hamster, which has testicles a fraction the size of a man.

Various hypothesis have been suggested as to the cause of the decline, but the one getting the most attention is that hormone mimicking chemicals in the mothers blood is affecting the male child before it is born. This hypothesis suggests that the male child is being born with fewer Sertoli cells. These are the cells that cause the production of sperm after puberty.

Reduced numbers of Sertoli cells (and reduced sperm count) have been observed in the male offspring of oestrogen-exposed pregnant rats.[46]

Researchers studied a group of 1,351 healthy men in Paris who had donated sperm to a sperm bank maintained by a hospital, starting in 1973. Each of the men had fathered at least one child. One percent of the men were farmers and 16% were manual labourers; 40% were classified as "technicians" and 38 % as "executives." From 1973 to 1992 their average (mean) sperm count declined at the rate of 2.1% each year from 89 million per cubic centimetre (cc) to 60 million per cc.

During the same period the proportion of motile sperm (that is sperm able to swim) declined at a rate of 0.6% per year, and the proportion of "normal" sperm (compared to misshapen sperm) declined at the rate of 0.5%. In sum, the quantity and quality of sperm declined simultaneously.

Among the Paris group, a subgroup of 382 men in a narrow age range (28 to 37 years) was chosen for special analysis; they had all reported a similar period of abstinence (3 to 4 days). Among this group, there was a clear decline in sperm count from 1973 to 1992; from 101 million per cc to 50 million per cc, a reduction by half. The average 30-year-old born in 1945 would have a count of 102 million per cc; the

Potent Competitive Interactions of Some Brominated Flame Retardants and Related Compounds with Human Transthyretin in Vitro. Ilonka A, TM Meerts, JJ van Zanden, EAC Luijks, I van Leeuwen-Bol, G Marsh, E Jakobsson , Å Bergman and A Brouwer. 2000. *Toxicological Sciences* 56: 95-104.

Brominated flame retardants are commonly used in a wide variety of products and processes, including plastics, paints, electronic parts and fabrics. Research is now revealing that contamination by several types of these compounds is extraordinarily widespread. Ilonka *et al*. observe that the chemical structures of some flame retardants is quite similar to the structure of thyroxine (T4), a human thyroid hormone. They conduct competitive binding experiments to measure the potency of brominated flame retardants to interfere with thyroid hormone function. Their results "*indicate that brominated flame retardants, especially the brominated phenols and tetrabromobisphenol A, are very potent competitors for T4 binding to human transthyretin in vitro and may have effects on thyroid hormone homeostasis in vivo comparable to the thyroid-disrupting effects of PCBs."*

average 30-year-old born in 1962 would have a count of 51 million.

"We conclude," the French researchers said, "that there has been a true decline in the quality of semen during the past 20 years, since the characteristics of semen from a fertile man of a given age in 1992 were significantly poorer than those of a fertile man of the same age in 1973."

The Scottish researchers completed their study in response to criticism of another study by Elisabeth Carlsen's [47] (1992) analysis of 62 sperm-count studies showing a 50% reduction in 50 years. They had records for 3,729 semen donors born between 1940 and 1969. They examined these by statistical techniques chosen to avoid the (controversial) criticisms that had been levelled at Carlsen's work. They found an apparent decline in sperm count from 128 million per cc (in men born in the 1940s) to 75 million in men born in the late 1960s, a 41% loss in a single generation.

Richard Sharpe concurred the decline in sperm is linked to some event that affects the endocrine system which governs the body's hormones.

"This must happen," he said, either in the womb or shortly after birth. "I have absolutely no doubt this is the most important time in your life, certainly if you're a male," he said. "This is when your sperm producing capacity as an adult is settled once and for all."[48] [12,pg48]

Phthalates

Phthalates are used as plasticisers in PVC plastics. As the phthalate plasticisers are not chemically bound to PVC, they can leach, migrate or evaporate into indoor air and atmosphere, foodstuff, other materials, etc.

Consumer products containing phthalates can result in human exposure through direct contact and use, indirectly through leaching into other products, or general environmental contamination. Humans are exposed through ingestion, inhalation, and dermal exposure during their whole lifetime. Some phthalates are reproductive and developmental toxicants in animals and suspected endocrine disrupters in humans.

Exposure assessment via modeling ambient data give hints that the exposure of children to phthalates exceeds that in adults. Human bio-monitoring data proves that the tolerable intake of children is exceeded to a considerable degree, in some instances up to 20-fold.

Very high exposures to phthalates can occur via medical treatment, i.e., via use of medical devices containing DEHP or medicaments containing DBP phthalate in their coating.

Because of their chemical properties exposure to phthalates does not result in bio-accumulation. However, health concern is raised regarding the developmental and/or reproductive toxicity of phthalates, even in environmental concentrations.[49]

Thirty-eight of the world's leading scientific experts on bisphenol A have warned policymakers of potential adverse health effects of exposure to the widespread plastic. The consensus statement, published in August 2007, emerged from a work- shop sponsored by the National Institute of Environmental Health Sciences, held in Chapel Hill, NC, in November 2006.

They conclude that average levels in people are above those that cause harm to animals in laboratory experiments.

And they calculate that average serum levels in people can only be explained by assuming that exposures today are above the level that EPA considers safe (the reference dose).[50]

Carcinogens

When considering the possible impact of chemicals on children's development we should not overlook the fact there is no adequate evidence of a safe level of exposure for endocrine disrupting compounds and carcinogens. Scientists have not yet developed a way to measure a person's individual risk or scientifically estimate the impact of mental. Exposure to a low level of a carcinogen has to be considered a risk for everyone and endocrine disrupting chemical a serious risk for the unborn and developing child.

In the human population, large numbers of people are exposed to low doses of chemicals, but the total impact may not be small at all. For example "...a carcinogen might cause one tumour in every 10,000 people exposed to it, which might not seem great. But exposure to 230 million Americans would result in 230,000 cancers -- a public health disaster."[51]

We only have to look at the report *'Late lessons from early warnings: the precautionary principle 1896-2000,'* [52] to see the folly of relying too much on the opinion of so-called experts where chemical impact on health and the environment is concerned.

This report shows several examples where the hazards of chemicals were not known until it was too late to stop irreversible damage occurring.

In the Preface the authors write: *"Misplaced 'certainty' about the absence of harm played a key role in delaying preventive actions in most of the case studies.*

However, there is clearly nothing scientific about the pretence of knowledge. Such 'certainty' does little to reduce ignorance, which requires more scientific research and long-term monitoring in order to identify the unintended impacts of human activities. "Why were not only the early warnings but also the 'loud and late' warnings often ignored for so long?

This question we will largely leave to the reader, while noting that the absence of political will to take action to reduce hazards in the face of conflicting costs and benefits, seems to be an even more important factor in these histories than is the availability of trusted information."

What we already know of the possible damage to health from the chemicals in every-day products like

textiles, computers and food containers (e.g. tin cans) or emitted by incinerators, waste facilities, steel works, power stations and chemical manufacturing sites should be enough to justify immediate action. (Please don't mention the 'politically' watered down REACH legislation.)

The ever-increasing number of damaged babies being born around incinerators should be taken as a strong warning that the 'experts' and their friendly politicians are deliberately playing down overwhelming evidence of serious harm to suit industry's financial interests, and, as it has been shown many times before, in many cases, their own.[53][54]

Authors Footnote:
I hope this short insight will help you understand better the complexity of our early development and the sensitivity of the developing foetus throughout its many windows of development. I trust you are now more enlightened as to just how dubious is the claim that scientists known enough about these development stages to be able to estimate the damage / danger from all the chemicals, mixtures and by-products emitted hourly by incinerators in any Health Impact Assessments (HIA).
What makes this claim even more incredible/outrageous is the fact that along with the scant knowledge we have on the early development in the womb, we have only reliable toxicity data on approximately 14% of the chemicals in use and more than 1,000 new chemical compounds are added each year of which the toxicity and impact on human health etc., are unknown.
Wishing you and your loved ones good health.

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[53] Too Close to Business, a report on MEPs corporation links and potential conflicts of interest. Andy Rowell, Spinwatch, July 2008.
[54] After his death it was revealed that Sir Richard Doll, one of the most respected scientists of all time, had received huge amounts of money from the chemical giant Monsanto, producer of Agent Orange. In 1985, Doll wrote to the judge of an Australian Royal Commission, investigating claims of veterans who had developed cancer following exposure to the herbicide Agent Orange in Vietnam, in strong support of the defence claims of its major manufacturer, Monsanto. He stated that, "TCDD (dioxin), which has been postulated to be a dangerous contaminant of the herbicide, is at the most, only weakly and inconsistently carcinogenic in animal experiments". In fact, dioxin is the most potent known tested carcinogen, apart from

confirmatory epidemiological evidence. Doll's defence, resulting in denial of the veterans' claims, was publicized by Monsanto in full-page advertisements in worldwide major newspapers.
In 1987, Doll dismissed evidence of childhood leukaemia clusters near 15 U.K. nuclear power plants. Faced with evidence of a 21% excess of lymphoid leukaemia in children and young adults living within ten miles of these plants, Doll advanced the novel hypothesis that "over clean" homes of nuclear workers rendered their children susceptible to unidentified leukaemia viruses. In a 1988 review, on behalf of the U.S. Chemical Manufacturer's Association, Doll claimed that there was no significant evidence relating occupational exposure to vinyl chloride and brain cancer. However, this claim was based on an aggregation of several studies, in some of which the evidence for such association was statistically significant.

For more on Doll see: Stop Cancer Before It Starts: How to Win the War On Cancer by Samuel S. Epstein, Ph.D. 2003.


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"Once harm has been done, even a fool understands it."
Homer, The Iliad Book XVII 1.32

Suggested reading:
Our Stolen Future, Theo Colborn, John Peterson Myers, Dianne Dumanoski. Little Brown and Company. ISBN 0 316 87546 5. 1996.
Generations At Risk, Ted Schettler M.D., Gina Solomon M.D. Maria Valenti, Annette Huddle, MIT Press, ISBN 0-262-19413-9 (hardcover) 0 -262-69247-3 (pb.). 1999.
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Pandora's Poison, Joe Thornton, MIT Press, ISBN 0-262-20124-0. 2000.

Sites to subscribe to:
Rachel's Democracy and Health News. www.rachel.org
www.EnvironmentalHealthNews.org

Detailed background information about protecting children from harmful chemical exposures, including common chemicals of concern for children's health can be found at:
http://www.who.int/ifcs/forums/forum4/meet_docs/en/index.html and
http://www.who.int/ifcs/documents/forum/forum/en/11inf_en.pdf

"Real knowledge is to know the extent of one's ignorance."
Confucius