Breast cancer:

"We know how pesticides, industrial pollutants, radiation and other factors are linked – part of the social context of breast cancer. Yet, neither government agencies nor societies responsible for dealing with breast cancer acknowledge this context. WHY?"

Professor Ross Hume Hall 'Female Biology, Toxic Chemicals and Preventing Breast Cancer: A Path Not Taken'

an environmental disease

the case for primary prevention

It is our intention that 'Breast cancer: an environmental disease' will:

– challenge a number of prevailing views and attitudes about breast cancer
– establish a 'novel' view of breast cancer as a 'preventable' rather than 'inevitable' disease
– address the under-acknowledged and non-lifestyle factors associated with breast cancer
– provide a right-to-know document, presenting essential information to the general public
– challenge the government to prioritise the primary prevention of breast cancer.

'Breast cancer: an environmental disease' has been produced by the UK Working Group on the Primary Prevention of Breast Cancer as a:

- public interest document – focusing on risk factors for breast cancer which are yet to be acknowledged and made part of the UK's cancer prevention agenda
- UK-oriented document which can be readily adapted for use in other countries
- general resource document – for individuals and groups planning or developing primary prevention campaign work
- general reference document for anyone concerned about breast cancer prevention in particular, or disease prevention in general.

Contents

Some of the causes of breast cancer ... can only be controlled by political and social action aimed at reducing the production, use, transport and disposal of agents that directly or indirectly affect breast cancer risks.

D Davis D Axelrod L Bailey M Gaynor A Sasco 'Rethinking Breast Cancer Risk and the Environment: The Case for the Precautionary Principle' p528 Environmental Health Perspectives 106 (9) September 1998

Endorsements

Taking action to the European level

The European Public Health Alliance Environment Network (EEN) has welcomed the opportunity to support the campaign publication, 'Breast cancer: an environmental disease'. As a first step in putting the spotlight on what is known about the environmental causes of breast cancer, this publication will help women and other health advocates to build scientifically based arguments that they can present to citizens and to their governments.

To help achieve European policy change, EEN intends to work with Women's Environmental Network and Breast Cancer UK to inspire groups in different countries to undertake national campaign work. By sharing information on the links between cancer and environmental causes, EEN aims to bring the arguments for the primary prevention of breast cancer to the European political agenda.

Diana Smith and **Génon Jensen,**
European Public Health Alliance
Environment Network
www.env-health.org

UNISON is proud to be associated with 'Breast cancer: an environmental disease'. Its origins lie in the Ban Lindane Campaign, which started in the UNISON East Midlands Region in 1994 and resulted in the banning of the pesticide Lindane in the UK by 2000. This campaign brought UNISON together with organisations including Pesticide Action Network *(UK)*, Friends of the Earth, Women's Environmental Network, the Soil Association, Green Network and Breast UK.

The Case argued here is one of which we need to make politicians, media and the public in general much more aware. The increasing incidence of breast cancer is unacceptable and we need a deeper understanding of why this has happened. As human beings with finely balanced hormonal systems, we cannot be separated from the environment around us. If we know that environment to be contaminated, then surely we are right to assume that this has consequences for the human body itself. Especially the female body.

More than one million UNISON's members are women. The rise in the rate of breast cancer is an important issue for them, their families and their communities. We hope that this Case will stimulate debate and lead us towards effective prevention of this disease.

Financial support has been provided by the European Commission through EPHA Environment Network

Part-funded by UNISON's General Political Fund

The CO-OPERATIVE BANK
Customer led, ethically guided

The Co-operative Bank refuses "to invest in any business whose core activity contributes to the manufacture of chemicals which are persistent in the environment and linked to long-term health concerns". This investment decision is supported by 88% of customers, and so we are pleased to have been able to support 'Breast cancer: an environmental disease'.

Man-made chemical contamination of our bodies is a fact of modern life. Up to 300 man-made chemicals have been found in humans but no one knows the long-term impact of these and the risks they may pose.

As advocates of the 'precautionary principle', the Bank welcomes the Case presented here and the valuable contribution it will make to the debate. It is an important first step in developing a truly preventative approach to breast cancer – one that is less reliant on early detection and instead demands that stronger safeguards to human health are immediately put in place.

Kate Daley
Campaigns Manager
The Co-operative Bank

The Scottish Breast Cancer Campaign welcomes this much-needed Case, which draws together the many studies linking environmental pollution with the incidence of breast cancer.

SBCC is confident that this publication will open up the debate on the primary prevention of breast cancer and will lobby government agencies to ensure that it is given the consideration it warrants.

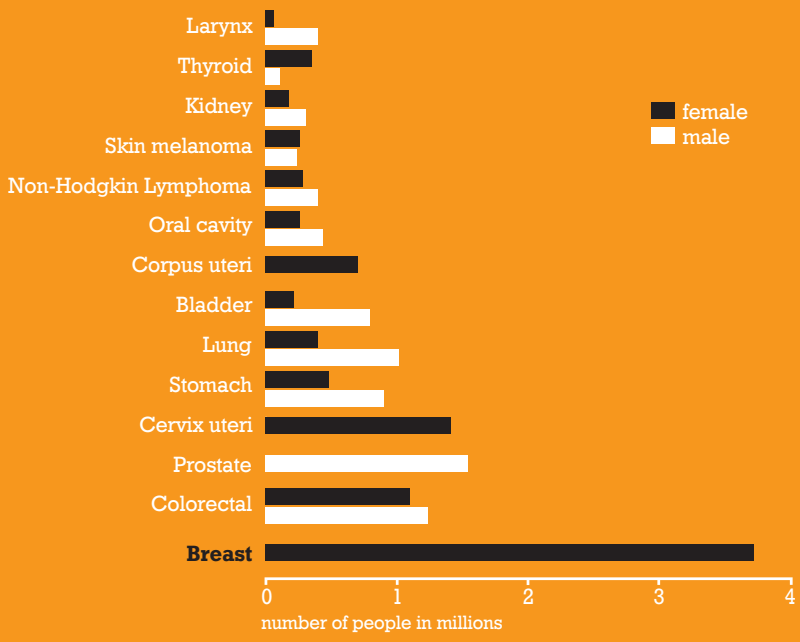
Moira Adams
Director
The Scottish Breast Cancer Campaign

Financially supported by The Co-operative Bank

Financially supported by Scottish Breast Cancer Campaign

Cancer worldwide 2000

This graph shows the total number of people worldwide who have been diagnosed with the 14 most common cancers during the previous five years, and still living with cancer in the year 2000.
V



Note: the figures on the bottom line of this graph have been simplified for the purposes of clarity.
(Source: the World Health Organization (WHO) International Agency for Research on Cancer: World Cancer Report 2003)

Probably between two-thirds and three-quarters of all cancers are preventable. In theory, we could prevent 80,000 of the 120,000 people dying of cancer just by using current knowledge. We have discussed all the usual suspects and it is clear that the avoidance of carcinogens is one of the main issues in balancing choice with legislation ... Although the link between poor diet, obesity and lack of exercise and cancer had not been confirmed in 2003, there was sufficient circumstantial evidence to suggest that strong associations would be found.

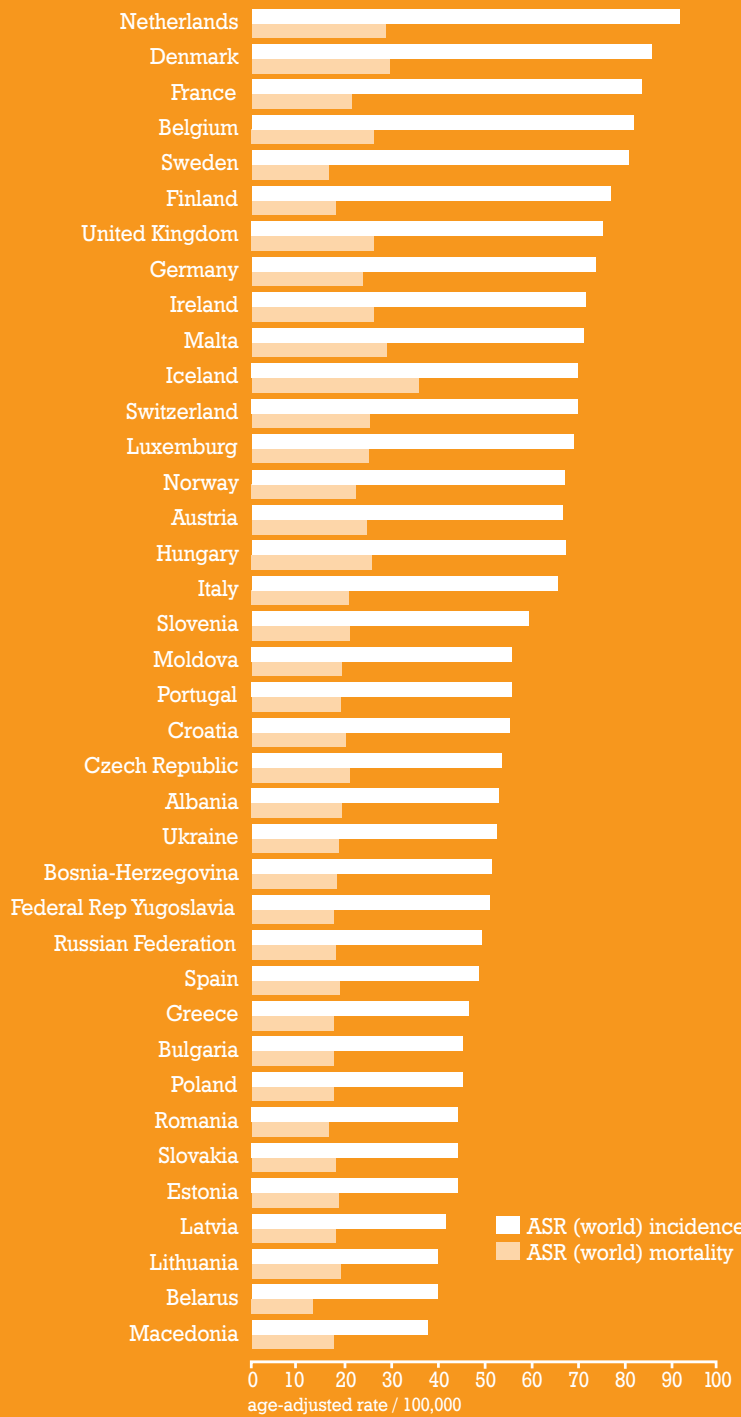
Angus Dalgleish Mike Richards Karol Sikora 'Prevention' Chapter 3 pp19-21 'Cancer 2025: the future of cancer care' Ed Karol Sikora Future Drugs Ltd June 2004

For more than two centuries, scientists have acknowledged the critical role of hormones in breast cancer. In the eighteenth century, Bernardo Ramazzini, the founder of environmental medicine, noted that nuns had higher rates of breast cancer. He then hypothesized that this might be due to the fact that they did not have children. A century later, well before estrogen was discovered, the insightful Scottish surgeon, George Thomas Beatson, noted that breast cancer did not occur in women who had their ovaries removed.

D Davis D Axelrod HL Bradlow M Osborne N Telang E Sittner 'Avoidable Causes of Breast Cancer: The Known, Unknown and Suspected' Annals of the New York Academy of Sciences Vol 833 1997 p113

Breast cancer Europe 2000

This graph shows the estimated incidence and mortality rates per 100,000 of the population using age-standardised rates (ASRs). ASR allows the comparison of rates in populations that have different age structures and over different periods of time.



(Source: European Network of Cancer Registries fact sheet, December 2002)

Within the European Union, every 2.5 minutes a woman is diagnosed with breast cancer. Every 7.5 minutes a woman dies from the disease.

Stella Kyriakides, President of Europa Donna, the European Breast Cancer Coalition. Sue Claridge, in 'The Beacon' (Breast Cancer Network Australia's magazine) Issue 29, Summer 2004 p10

Much cancer today reflects events and exposures in the 1950s and 1960s. The production, use and disposal of synthetic organic* and other industrial carcinogens was then miniscule in terms of volume when compared with current levels, which will determine future cancer rates for younger populations now exposed. There is every reason to expect that even today's high cancer rates will be exceeded in the next few decades.

Professor Sam Epstein 'Losing the War Against Cancer: Who's to Blame and What to Do About It' p56 International Journal of Health Services Vol 20 no1 1990

We have strong scientific evidence about toxic chemicals in the environment that mimic female sex hormones and overload a woman's hormonal system, a known cause of breast cancer. We know how pesticides, industrial pollutants, radiation and other factors are linked – part of the social context of breast cancer. Yet, neither government agencies nor societies responsible for dealing with breast cancer acknowledge this context. WHY?

Professor Ross Hume Hall 'Female Biology, Toxic Chemicals and Preventing Breast Cancer: A Path Not Taken' International Conference on Breast Cancer and the Environment Ontario Canada November 1995

*'Organic' is the scientific and industry term to describe all chemicals produced from a carbon base.

Summary

'Breast cancer: an environmental disease' sets out to:

- **challenge a number of prevailing views and attitudes about breast cancer**
- **establish a new view of breast cancer as a 'preventable' rather than 'inevitable' disease**
- **address the under-acknowledged and non-lifestyle factors associated with breast cancer**
- **inform and encourage new ways of thinking about this disease and the many possibilities for its prevention**
- **challenge the government to prioritise the primary prevention of breast cancer.**

Breast cancer is the major cancer affecting women and the most common cancer in the UK. It kills more than 1,000 women every month. With a steady rise in new cases year on year – from 21,446 in 1979 to 41,000 in 2001 – the chance of a woman contracting the disease in her lifetime rose from 1 in 12 to 1 in 9 in the five-year period 1996-2001. Earlier and improved detection accounts for only a limited number of cases in this rising trend. **Breast cancer is the most commonly diagnosed cancer in women under 35. Over 1,400 women between the ages of 35-39 are diagnosed each year. The highest rate of incidence occurs in women in the 50-74 age group. In any one year, breast cancer can affect almost a quarter of a million women in the UK. For example, in 2001 there were 41,000 new diagnoses, 15,000 deaths and 172,000 women living with diagnoses made in the previous ten-year period.**
Sources: Cancer Research UK & Office of National Statistics (ONS) 2003

The social, psychological, and economic impact on women, their families, friends and colleagues is incalculable, as are the healthcare and support costs borne by society.

Fewer than 50% of breast cancer cases can be attributed to officially recognised, 'established' and 'probable' risk factors which are understood to increase a woman's susceptibility to breast cancer e.g. late onset of menopause, body weight, diet, late-age pregnancy. Only two risk factors – ionising radiation and inherited genetic damage – are known to directly cause the disease.

A vast number of animal, human, laboratory and field studies, dating from the 1930s, continue to provide incontrovertible evidence for the role of man-made environmental agents in human diseases such as breast cancer – agents that can be reduced, modified or eliminated. While the public remains largely unaware of the sound, scientific evidence linking breast cancer and environmental agents, many in government, industry, environment, science, commerce, health and higher education have been aware of this evidence – and its significance for breast and other cancers – for many decades.

'Breast cancer: an environmental disease' draws upon the words, work and expertise of many of the best thinkers, writers, scientists, activists, researchers and medical practitioners on the subjects of breast cancer and public, occupational and environmental health, as well as more general subjects such as ethics, which have a bearing on the Case.

It focuses on exposures to environmental agents that are known or suspected of being implicated in breast cancer, and reveals the significance of low-level, long-term and early-life exposures to mixtures of such agents in the complex process that can lead to breast cancer.

It brings to public attention scientifically based information routinely overlooked or dismissed by government, industry and the cancer establishment.

It provides both evidence for and explanation of the escalation in numbers of women affected, and of the more than 50% of cases which are officially held to be 'inexplicable'.

The main propositions in 'Breast cancer: an environmental disease' are:

- **breast cancer is a preventable disease**
- **cancer can be caused by exposure to numerous and varied cancer-causing and cancer-promoting environmental agents – large-scale prevention could be achieved by eliminating such exposures**
- **in the light of expanding knowledge about specific environmental factors known or suspected of implication in its incidence, the primary prevention of breast cancer is an attainable goal**
- **the ultimate responsibility for primary prevention lies with government**
- **science and industry share responsibilities with government for human and environmental health**
- **based on current knowledge, the failure to act to prevent breast cancer is to be complicit in causing death and disease for this and future generations.**

Primary prevention: the vital role of citizens

Official disregard for evidence supporting primary prevention makes it clear that the only hope of seeing 'primary prevention' enacted into law and implemented as policy lies with citizens. From a strong basis of knowledge we can:

- demand an end to the production and use of toxic agents associated with breast cancer
- demand safe alternatives for those toxic substances proven to be essential e.g. food preservatives
- insist that government, industry and science demonstrate their joint responsibilities for delivering primary prevention.

As a matter of urgency

- **we need to apply our knowledge to the task**
- **we need to act now to reduce production, release and use of toxic substances**
- **we need to act now to reduce our dependence on toxic substances**
- **we need to prioritise primary prevention.**

Notes: The UK includes England, Scotland, Northern Ireland and Wales. These four countries are represented throughout the document. The content also applies in general to other countries, for example, the Republic of Ireland.

References from American sources are exact and will therefore contain different spelling for key words, for example oestrogen (estrogen), foetal (fetal), behaviour (behavior).

Text within square brackets has been inserted by the writer to clarify meaning.

The objective in primary prevention is to prevent the disease process from starting.

J Muir Gray & G Fowler 'Essentials of Preventive Medicine' Blackwell Scientific Publications UK 1984 p46

1.1 What is primary prevention?

'Primary prevention' means eliminating the causes of a disease before it can affect people. It is historically based on common sense and a recognition of the proven or suspected cause and effect of diseases. For example, the connection between poor standards of sanitation, drainage, water supply and ventilation and diseases such as typhus, cholera and consumption was recognised by the British Parliament's Select Committee on the Health of Towns in 1840.

A primary prevention approach to a multi-factorial disease (i.e. one believed to have resulted from the interaction of genetic factors with environmental factors) such as breast cancer would aim to reduce and eliminate, as far as possible, human exposures to all substances or agents that are known to be, or suspected of being, implicated in the disease process.

The conventional three stages for cancer prevention are defined as:

primary prevention:
- **'education of those at risk about steps they can take control of risk factors by modification of the social and physical environment.'**

secondary prevention:
- **'screening – the detection of the cancer at a pre-symptomatic stage.'**

tertiary prevention:
- **'public education to encourage early presentation [to doctor with symptom]**
- **professional education to promote early diagnosis and effective treatment.'**

J Muir Gray & G Fowler 'Essentials of Preventive Medicine' Blackwell Scientific Publications UK 1984 p178

Primary prevention and UK National Cancer Plan (2000)

A Department of Health (DoH) resource document for progressing the National Cancer Plan's public education programme on cancer prevention uses the term 'primary prevention' in line with the above definition. It says: **'Action to prevent cancer is highlighted as key to delivering The NHS Cancer Plan. It is estimated that a substantial reduction in mortality could be achieved through primary prevention, with the remainder coming from secondary prevention (screening) and improved treatment.'** (p1)

A narrower interpretation is used in the foreword of the same document: **'In relation to primary prevention the 'cancer plan' focused on tackling smoking, diet and nutrition, obesity, physical activity, alcohol, sunlight and radon.'**
'Cancer Prevention: a resource to support local action in delivering the NHS Cancer Plan' Health Development Agency 2003

A complete primary prevention plan for breast cancer would include numerous other risk factors to which women are exposed daily, and measures for their 'control' at source through 'modification of the social and physical environment', as in the above definition.

The role of primary prevention is of particular relevance for lethal diseases like cancer, where reductions in mortality are largely achieved through a reduction in incidence. Primary prevention of human cancer can be accomplished in two ways:
(i) avoiding the introduction of carcinogenic agents into the

environment, and
(ii) eliminating or drastically reducing exposure to carcinogenic agents that are already in our environment.
The second approach involves actions aimed at reducing or eliminating occupational or other exposures to carcinogens.
L Tomatis et al 'Avoided and avoidable risks of cancer' pp97-105 Carcinogenesis Vol 18 no1 1997

1.2 Barriers to a primary prevention focus

There are a number of attitudes, mindsets and misconceptions standing in the way of a primary prevention focus on breast cancer. These include:

Acceptance
We have been conditioned over time to accept cancer as a fact of life (and death). Statistics tell us that breast cancer affects 1 in 9 women, while cancers in general affect 1 in 3 of the population. These frequently reported figures influence the gradual acceptance of breast cancer as both a 'normal' disease and one that must inevitably affect some of us.

The acceptance of breast cancer as a disease to put up with was affirmed in a survey conducted by the charity Breast Cancer Care. When asked about the challenges for breast cancer over the next 30 years, the majority of the 80 participating breast cancer experts predicted that 30 years from now breast cancer will still be incurable but it will be a disease women live with, like diabetes or asthma, rather than die from, and that the biggest problem for the NHS will be the sheer number requiring care.
'Health Service Journal' p13 Vol 113 no5862 July 2003

When we think of breast cancer we think of it as unpreventable.
Jenni Murray (presenter) 'Woman's Hour' BBC Radio 4 November 3 2000

Confusion
The slogan, 'early detection is the best prevention' has attained the status of a 'truth' in the public mind. In fact, early detection, by whatever means, is only detection. Equally persistent has been the promotion of regular mammograms as a 'preventive measure'. Mammography is a tool for detecting breast problems, not for preventing them.

Women have been sold the myth that the answer to breast cancer is early detection and treatment.
Dr Cathy Read 'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 p8

Fixation
Fixation on treatment and control of the disease by medical science has marginalised primary prevention on the national agenda.

The main error of the biomedical approach is the confusion between disease processes and disease origins. Instead of asking why an illness occurs, and trying to remove the conditions that lead to it, medical researchers try to understand the biological mechanisms through which the disease operates, so that they can interfere with them ... These mechanisms, rather than the true origins, are seen as the causes of disease in current medical thinking and this confusion lies at the very centre of the conceptual problems of contemporary medicine.
Fritjof Capra 'The Turning Point – Science, Society and the Rising Culture' Simon & Schuster USA 1982 pp149-150

Vested interests and the status quo
A truth seldom aired is that there is no profit in prevention. The disease of cancer has spawned a major world industry and it is unlikely that such a massive and multi-faceted industry will welcome the prospect of its own demise in the shape of primary prevention.

A firm alliance between the established cancer institutions and the chemical, pharmaceutical and nuclear industries has formed the medical-industrial complex ... At its best, this complex provides better diagnosis, new treatments and first-rate health-care facilities. At its worst, the medical-industrial complex blocks an all-embracing programme for preventing cancer ... What is stopping us [from getting serious about prevention] is the almost suffocating hold the medical-industrial complex retains over cancer policy, and the hugely powerful chemical industry's interest in protecting its products.
Professor Ross Hume Hall 'The Medical-Industrial Complex' pp62-68 The Ecologist Vol 28 no2 1998

Ignorance
We generally trust advice when it comes to us from government; especially when it is reinforced by the media and cancer charities. Both Scottish and UK government cancer plans target lifestyle factors (exercise, diet, alcohol consumption and smoking) as the key to cancer prevention. This narrow focus perpetuates ignorance that dietary and environmental contaminants are significant sources of human exposure to carcinogens which are impossible to avoid.

> **A narrow focus on lifestyle – like a narrow focus on genetic mechanisms – obscures cancer's environmental roots. It presumes that the ongoing contamination of our air, food, and water is an immutable fact of the human condition to which we must accommodate ourselves.**
> Dr Sandra Steingraber 'Living Downstream: An Ecologist Looks at Cancer and the Environment' Virago UK 1998 p262

The media is the main source of public information in today's world. It is an all-pervasive global force in society and is becoming an integral part of the public debate about breast cancer. However, the information industry – print and broadcast – is largely controlled by market forces and these exert strong influences on society, especially through advertising. This can compromise editorial decision-making or it can obscure core issues. For example, the survival of a women's magazine or a TV channel in a very competitive marketplace will depend upon revenue from advertisers selling products – often directed at women – that should arguably be part of the debate on causes of breast cancer. Therefore, it is impossible to get issues like 'primary prevention' taken up by mainstream media. One result, for example, is the widespread misconception that breast cancer is a largely inherited disease.

> **Genetic screening for women with an inherited 'high risk' of contracting breast cancer still tends to dominate popular media reporting, with the effect that most women estimate the genetic cause of the disease to be far commoner than it is: around 5% of all breast cancers.**
> Laura Potts 'Stopping Breast Cancer Before it Starts' Health Matters July 2001

Procrastination
There is a widespread tendency among scientists, industrialists and politicians to claim the need for more research when challenged to implement prevention measures based on existing scientific knowledge.

In the case of breast cancer prevention this delaying tactic devalues a half-century of scientific endeavour, leaving policy makers forever in the grip of 'paralysis by analysis'.

> **We need more study' is the grandfather of all arguments for taking no action.**
> P Infante & G Pohl 'Living in a chemical world: actions and reactions to industrial carcinogens' pp225-249 Teratogens Carcinogens Mutagens 8 1988

> **A myriad of scientific papers exist concerning adverse effects from exposure to radiation and from exposure to hundreds of chemicals. There is more than enough information to make informed decisions about exposures to these entities.**
> Dr Janette Sherman 'Life's Delicate Balance: Causes and Prevention of Breast Cancer' Taylor & Francis USA 2000 p235

The invisibility factor
Away from their source of production, there are no identifying clues, such as odour or colour, that might alert us to the many carcinogenic chemicals and sources of harmful radiation in our everyday environment. The invisibility of such health hazards makes it difficult not only to accept their existence but also their hazardous nature.

> **The reason people don't believe in radiation is, it's out of sight, out of mind.**
> Dr Alice Stewart 'The Woman Who Knew Too Much' Gayle Greene University of Michigan Press 1999 p213

> **Many harmful or suspect chemicals [in drinking water] can't be tasted or smelled even at dangerous levels.**
> Jeffrey Steingarten 'The Man Who Ate Everything' Headline USA 1998 pp61-62

Fear
Fear of cancer feeds our resistance both to learning and even thinking about the disease.

> **Nothing in life is to be feared. It is only to be understood.**
> Marie Curie

Cancer strikes children and adults alike. Cancer is life uncontrolled and occurs when a chemical cascade is set in motion that is difficult-to-impossible to reverse.

Dr Janette Sherman 'Life's Delicate Balance: Causes and prevention of breast cancer' Taylor & Francis USA 2000 p8

2.1 A disease of 'industrialised' societies?

Records from the 19th and 20th centuries show people in traditional societies e.g. the Hunza and Eskimo, living to great ages and in good, cancer-free health. In his search for evidence of cancer in traditional social groups, Zac Goldsmith, editor of 'The Ecologist' magazine, came to the following conclusion: **'It seems fairly indisputable that cancers, in this case of the breast, were extremely rare, if they existed at all.'**

'Cancer: A Disease of Industrialisation' pp93-99 The Ecologist Vol 28 no2 1998

Industrial pollutants were first identified in the 1940s and 1950s as causes of cancer by Wilhelm Hueper, an American doctor working in the chemicals industry. The majority of industrial contaminants affecting the health of present generations did not exist before Hueper's time. Toxicopathologist Dr Vyvyan Howard informs us that, in 2004, **'the average person in the street now has hundreds of groups of completely novel compounds in their bodies that weren't there 60 years ago. We can measure them in adult and foetal tissue. We have changed the chemical environment of the womb.'**

Quoted by Felicity Lawrence 'Chemical World' The Guardian p7 May 15 2004

In today's world, no social group is entirely unaffected by environmental pollution resulting from industrial expansion and international warfare, which continued unabated throughout the greater part of the 20th century to the present day. However, according to World Health Organization (WHO) research, it is the industrialised countries – comprising only one fifth of the world's population – whose populations suffer half the global burden of cancer.

A disease of old age?
Scientists have consistently viewed cancer as a disease of older age groups. **'Consensus opinion at a gathering of international cancer experts (UNESCO, Paris, May 2004) proclaimed that cancer can no longer be categorised as an age-related disease. The evidence shows that cancer now affects all age groups. There have been huge increases in childhood cancers in recent times, only a limited number of which can be attributed to improved methods of detection and diagnosis.'**
'Cancer, Environment and Society' Association for Research and Treatment Against Cancer (ARTAC)

2.2 The cancer process

Cancer is not a single disease. It is a type of disease. There are over 200 different cancers, and each occurs in its own way. What they have in common is that they all start in the same way – with a change in the normal make-up of a cell ... Cells are constantly at work in our bodies, dividing and multiplying to repair damaged skin, maintain hair growth and perform a hundred other everyday tasks.
'Cancer: How to Reduce Your Risks' pp4-5
NHS Health Promotion England 2001

Robert Weinberg, a scientist renowned for expanding our understanding of cancer, explains that **'the 30 trillion cells of the normal, healthy body live in a complex, interdependent condominium, regulating one another's proliferation. Indeed, normal cells reproduce only when instructed to do so by others in their vicinity. Such unceasing collaboration ensures that each tissue maintains a size and architecture appropriate to the body's needs.'**
Professor Robert Weinberg 'How Cancer Arises' pp62-70
Scientific American September 1996

The basics of cell growth

'At their surface, cells have a range of growth factor receptors that interact and bind with growth factors [proteins produced and secreted by cells]. This interaction leads to a series of biochemical events inside the cell – the so-called signalling pathway – which climax in the cell making an exact copy of its DNA and dividing. Results from over three decades of intensive research have provided a number of examples showing how cancer may result from defects or damage to this pathway.'
I Hart & R Dimbleby 'New drugs for novel targets in cancer' p14 i can (quarterly journal for people affected by cancer) Winter 2002 UK

The basics of cell damage

'Damage to the genetic machinery of individual cells can trigger a series of miscalculations, altering a cell's normal function. When a gene is damaged by radiation or chemicals, or receives misinformation from a chemical messenger, and the mistaken signal is not corrected, the result is inappropriate or uncontrolled growth. This is the basis of cancer. We have learned that even irritation, as from chronic formaldehyde exposure, results in increased cell-turnover, the need for repair, and the potential for interference with repair ... Some alterations may be reversed by a cell's innate repair mechanism; some alterations may go unnoticed; but other alterations become permanent and life-threatening, as when a cancer begins.'
Dr Janette Sherman 'Life's Delicate Balance: Causes and prevention of breast cancer' Taylor & Francis USA 2000 pp8-10

What we now know about cancer is that **'the malignant transformation of a cell comes about through the accumulation of mutations [changes] in specific classes of the genes within it. These genes provide the key to understanding the processes at the root of human cancer.'**
Professor Robert Weinberg 'How Cancer Arises' pp62-70 Scientific American September 1996

Proto-oncogenes and **suppressor genes** are the two gene groups (part of a bigger set) that play major roles in triggering cancer. The function of proto-oncogenes is to encourage cell growth. When they are mutated, proto-oncogenes can become carcinogenic oncogenes that drive excessive cell reproduction. The function of suppressor genes is to limit cell growth. Weinberg explains that if they are inactivated by mutations, **'the resulting loss of functional suppressor proteins deprives the cell of crucial brakes that prevent inappropriate growth.'** In this way they can also contribute to the cancer process.
As above

However, in order to become malignant, **'cells must also devise ways to evade or ignore braking signals issued by their normal neighbours in the tissue. In cancer cells, these inhibitory signals may be disrupted, thereby enabling the cell to ignore normally potent inhibitory signals at the surface.'** As above

Normal cell division progresses through four distinct stages, known as the cell-cycle clock. It can now be said that **'most, perhaps all, human cancers grow inappropriately not only because signalling pathways in cells are perturbed but also because the so-called cell-cycle clock becomes deranged.'** Cellular malfunctions and errors are usually and **'rapidly corrected by a repair system that operates in every cell. The system's high repair efficiency is one reason many decades can pass before all the mutations needed for a malignancy to develop, will by chance, come together in a single cell.'** As above

Five stages of tumour development
(adapted from Weinberg)

stage 1: genetically altered cell. Tumour development begins when one cell within a normal cell population sustains a genetic mutation that increases its capacity to reproduce when it would normally rest.

stage 2: hyperplasia. The altered cell and its descendants continue to look normal, but they reproduce too much – hyperplasia. After years, one of these suffers another mutation that further loosens control on cell growth.

stage 3: dysplasia. In addition to proliferating excessively, the offspring of this cell appear abnormal in shape and orientation – dysplasia. Once again, after a time, a rare mutation that alters cell behaviour occurs.

stage 4: in situ cancer. The affected cells become still more abnormal in growth and appearance. If the cell mass has not broken through boundaries between surrounding tissues, it is called an 'in situ' cancer. This tumour may remain contained indefinitely; however some cells may eventually acquire additional mutations.

stage 5: invasive cancer. If the genetic changes allow the tumour to begin invading underlying tissue and to shed cells into the blood or lymph, the mass is considered to have become malignant.

2.3 The susceptibility factor in cancer

The timing and duration of exposures to potential cancer-causing agents are additional crucial factors in the cancer process. In a healthy adult, damaged or altered cells are constantly being repaired or removed from the body by the immune system. An immune system that is weakened (by illness, trauma, chemical and radiation exposure or age), or that is under-developed (as in the very young), can compromise the repair process. Some of the substances (known from laboratory and animal tests) which damage or disrupt cells or cell functions are arsenic, asbestos, benzene, cigarette smoke, oestrogens, organochlorines, dioxins and radiation. Some directly damage the cell e.g. formaldehyde, others aid cancer progression e.g. oestrogens.
Sources: Program on Breast Cancer and Environmental Risk factors in New York State (BCERF) Cornell University Dr Morag Parnell Report 'Breast Cancer: the symbolic disease of our time' 2002. Pepper et al 'Pollution Science' Academic Press Inc USA 1996

2.4 Cancer now

In Britain cancer incidence is increasing, and around 700 people are diagnosed with cancer every day.
'The Cancer Challenge' p4 Cancer Research UK September 2004

The recognised causes – and influences on the causes – of cancer **'are multifactorial and include natural environmental carcinogens (such as aflatoxin and sunlight), lifestyle factors, genetic susceptibility, and more recently, industrial chemicals. Apart from modern lifestyle factors, particularly smoking, increasing cancer rates reflect exposure to industrial chemicals and run-away modern technologies whose explosive growth has clearly outpaced the ability of society to control them. In addition to pervasive changes in patterns of living and diet, these poorly controlled technologies have produced profound and poorly reversible environmental degradation and have resulted in progressive contamination of air, soil, water, food and workplaces with toxic and carcinogenic chemicals, with resulting involuntary exposures.'**
Professor Samuel Epstein 'Losing the War Against Cancer: Who's To Blame and What To Do About It' p54 International Journal of Health Services Vol 20 no1 1990

Although the incidence of some cancers, for example, stomach, bladder and male lung, has fallen in recent times, the incidence of cancers in general has risen dramatically in the past half-century, and is affecting younger people too. Significant changes occurring in the same period with consequential effects on cancer rates include:

- changes in lifestyles and diet
- increased production, by number and volume, of industrial chemicals
- expanded application of industrial chemicals to a wide range of products and uses
- increased levels and numbers of pollutants in the environment.

In young people
Once a disease almost exclusively associated with old age, cancer now affects all age groups, as shown by rising rates in young people. The Automated Childhood Cancer Information System (ACCIS) project, an epidemiological study of cancer incidence in children and adolescents in Europe since the 1970s, provides **'clear evidence of an increase of cancer incidence in childhood and adolescence during past decades, and of the acceleration of this trend.'**
E Steliarove-Foucher C Stiller P Kaatsch F Berrino J-W Coebergh B Lacour M Parkin 'Geographical patterns and time trends of cancer incidence and survival among children and adolescents in Europe since the 1970s (the ACCIS project): an epidemiological study' pp1097-2015 The Lancet Vol 364 December 2004

In the UK
'The lifetime risk of developing cancer is over one in three. Breast, lung, bowel, and prostate cancer account for over half of all new cases. In the young other cancers are more common. Leukaemia is the most common cancer in children. In young men aged 20 to 39, testicular cancer is the most common malignancy. Breast cancer continues to be the most common cancer in the UK with more than 40,000 new cases diagnosed each year, despite the fact that it is very rare in men. Breast cancer accounts for one in three of all cancers in women.'
'Everything Points to Progress' Scientific Yearbook 2003/2004 p9 Cancer Research UK

One of today's most important health issues is the carcinogenicity of the substances to which we are exposed – often in great dilution but often over an extended period of time.
Peter Cox & Penny Brusseau 'Secret Ingredients' Transworld UK 1997 p100

2.5 Carcinogens

Experts agree that most cancers are caused by our bodies or parts of them being exposed to certain substances over long periods of time. These cancer-causing substances are called carcinogens.
Cancer: How to Reduce Your Risks p6 NHS Health Promotion England 2001

Carcinogens fall into three groups – chemical, physical and biological:

chemical carcinogens
This is the largest group of carcinogens. Among the most important are polycyclic aromatic hydrocarbons (PAHs) which are products of combustion and are therefore present in traffic fumes, tobacco smoke, pitch, tar fumes and soot.

physical carcinogens
The best-known example is high-energy radiation, including nuclear radiation and X-rays. High doses destroy cells; lower doses may not kill cells but may cause malignant changes. Radiation is a 'complete' carcinogen because it can initiate, promote and progress a cancer. One form can interfere with regulation of a hormone with significance for breast cancer.

biological carcinogens
Very few biological agents cause cancer in humans, and biological carcinogens are not known to be implicated in breast cancer. However:

- **blood flukes** – responsible for the tropical disease schistosomiasis – can lead to bladder cancer
- **aflatoxin toxin** – produced by fungus contaminating stored grain/peanuts – can lead to liver cancer
- **papilloma virus** causes cervical cancer
- **hepatitis B virus** causes liver cancer.

Carcinogens or cancer-promoters?
Opinion is divided among research scientists about naming endogenous hormones (produced inside the body) and exogenous hormones (produced outside the body) as carcinogens. Both natural and man-made oestrogens appear capable of promoting cancer in breast cells by stimulating cell proliferation already triggered by other agents. This, according to some, makes them carcinogens. Others prefer to call them cancer-promoters.

2.6 Chemical carcinogens

The chemical agents of cancer have become entrenched in our world in two ways: first, and ironically, through man's search for a better and easier way of life; second, because the manufacture and sale of such chemicals has become an accepted part of our economy and our way of life.
Rachel Carson 'Silent Spring'
Penguin Books UK 1986 edition p213 originally published 1962 Houghton Mifflin USA

Chemical carcinogens occur in nature; some are found in mineral ores e.g. arsenic, and in foods e.g. parsnips (hydrazine), celery (psoralens) and moulds in cheese (mycotoxins). In the 1960s arsenic was **'still the basic ingredient in a variety of weed and insect killers ... [it] was the first recognised elementary carcinogen, identified in chimney soot and linked to cancer nearly two centuries ago.'**
Rachel Carson 'Silent Spring' Penguin Books UK 1986 edition p32 originally published 1962 Houghton Mifflin USA

However, man-made chemical compounds provide the main source of human exposures to carcinogens today. In the 1940s and 1950s, Wilhelm Hueper, a medical doctor employed in the chemicals industry, was the first to identify pollution as a cause of cancer. He preceded Rachel Carson in forecasting a steady increase in cancer from our exposures to **'biological death bombs ... that may prove to be, in the long run, as dangerous to the existence of mankind as the arsenal of atom bombs prepared for future action.'**
R Proctor 'Cancer Wars' Basic Books USA 1995 p46

By 1985, it could be stated as a fact that **'nearly all of the synthetic [man-made] chemicals regularly used in industry did not exist 40 years ago (in the 1940s). Of the 45,000 toxic chemicals listed by the US National Institute of Safety and Health (NIOSH) in 1980, 2,500 were identified as carcinogens, 2,700 as mutagens [causing genetic change] and 300 as teratogens [causing malformation of an embryo]. Less than 7,000 had been adequately tested.'**
Thomas Grassert 'The Problem of Toxic Chemicals' in 'Health Hazards in Electronics' Asia Monitor Resource Centre 1985

This is old, not new knowledge. Yet it was only during the last 15 years of the 20th century that medical science began to associate the unprecedented growth rates of many diseases with modern chemicals. While in the same 15-year period some chemical compounds were banned or reduced (in number and use) through tighter

regulations, man-made chemicals continued to be developed and marketed through an ever-widening range of products and applications.

The modern chemicals industry

The third-largest industry and one of the most diverse in the world, the chemicals industry produces a vast range of substances and products. It supplies high-volume raw materials for the production of plastics, semiconductors (silicon chips), fuels, detergents, pesticides, lubricants, pharmaceuticals and solvents, and low-volume, specialized chemicals (some very dangerous) for use in industries such as biotechnology, engineering and cosmetics.

Because the majority of synthetic chemicals in use today are derived from coal and oil, the petrochemical industry is the major supplier of raw materials across the whole chemicals sector. The application of man-made chemicals in every sphere of modern life has made exposure to them an unavoidable, lifelong reality for all of us, yet the vast majority of industrial chemicals have never been tested for their potential to cause or promote cancer.

Chemicals and breast cancer

Synthetic chemicals are in some cases proven to harm – and in other cases suspected of being harmful to – human health for a range of reasons:

- the majority are based on carbon, and for this reason **'are particularly dangerous to us because being based on carbon, the chemistry of all life, they readily enter human tissues and seriously disrupt the body's complex processes and complex chemical reactions.'**
  John Harte et al 'Toxics A-Z' California University Press USA 1991 p30
- many of those which have been tested are known or suspected carcinogens
- the increasing numbers found to disrupt the function of the endocrine (hormone) system. This group has particular significance for hormone-related cancers such as breast cancer
- some are both carcinogenic and hormone-disruptive e.g. atrazine, an agricultural pesticide widely used in the UK
- the increasing numbers found to 'persist' (remain a long time in the environment) as a result of being designed to be 'stable compounds' which are not broken down in the environment by micro-organisms and in the human body by metabolic processes
- the increasing numbers found to be 'bioaccumulative' – i.e. they build up in the body, mostly in fatty tissue. Chemical compounds that accumulate in living tissues increase in number and concentration as they move up the food chain. It follows therefore, that humans, at the top of the food chain, will have the highest concentrations
- many are able to cross the blood-brain and placental barriers
- the increased risk of toxicity resulting from the combined effects of synthetic chemicals on the body.

> **We have developed a very high dependence on chemicals yet this is not matched by sufficient knowledge about their potential risks and long-term effects, for which we are paying a high price.**
> Margot Wallström European Environment Commissioner US-EU Chemicals Conference Virginia USA April 2004

There is a wealth of data from studies over five or more decades that links exposure to specific chemicals with breast cancer. **'Environmental exposures (to carcinogens) are usually studied individually, but we are actually exposed to a multitude of carcinogens, at once or in sequence ... low levels of exposure to multiple carcinogens may seriously impact cancer burden in the general population.'**
L Tomatis et al 'Avoided and avoidable risks for cancer' pp97-105 Carcinogenesis Vol 18 no1 1997

Medical experts have only recently become aware of the epidemic of illnesses associated with modern chemicals. For example, toxicopathologist, Dr Vyvyan Howard notes that there are **'adverse effects observable in the pattern of human disease, both in foetal malformations and the increase in the incidence of cancer – particularly in young people – and we can observe that those changes have taken place over the same period of time as the introduction of these novel chemicals.'**
PAN Europe 'Pesticides News' (no63) p5 March 2004

And with respect to breast cancer, he points out that **'many of the 70,000 synthetic chemicals in regular commercial use are persistent and accumulate in body fat, including the breast. Some 400 have been detected in human body tissues and secretions, including breast milk. Of the fraction that has been tested, several thousand are listed as known or suspected carcinogens, and several hundred as damaging to the developing foetus. A chemical may not, by itself, instigate cancer but it may work with other factors to contribute towards the risk of developing the disease.'**
Dr Vyvyan Howard 'Synergistic Effects of Chemical Mixtures' The Ecologist Vol 27 no5 1997

The National Toxicology Program (NTP) USA, after studying the carcinogenic potential of approximately 500 chemicals, found that **'42 caused mammary [breast] tumors in the tests.'** Carcinogenicity tests conducted on specific chemicals by other research

organisations **'have identified about 160 additional chemicals as mammary carcinogens.'** Julia Brody & Ruthann Rudel 'Environmental Pollutants and Breast Cancer' p1010 Environmental Health Perspectives Vol 111 no8 2003

Several hundred chemicals can be found in a wide range of commercial products and conditions we unknowingly encounter in our daily lives. For example, two groups of chemicals – PCBs (Polychlorinated biphenyls) and PAHs (polycyclic aromatic hydrocarbons) – are both **'potent suppressors of the enzyme oestrogen sulphotransferase-1, which sulphates oestradiol before it is excreted. Such suppression can prolong the action of oestrogen, a change relevant to breast cancer.'** Richard Sharpe D Stewart Irvine 'How strong is the evidence of a link between environmental chemicals and adverse effects on human reproductive health?' pp447-451 British Medical Journal 328 February 21 2004

Often overlooked by regulators is the variation in effects on a population from similar exposures, as remarked by biochemist and cancer researcher Ross Hume Hall: **'Individuals vary greatly in their susceptibility to toxic chemicals, and the differences between men and women can be punishingly large ... Women thus can fall victim to legal limits of residues of pesticides and waste chemicals in their supermarket grapes or in their apple juice. Even at their best, EPA [Environmental Protection Agency, USA] regulations disregard the susceptibility to cancer of 50 per cent of the population.'** 'The Medical-Industrial Complex' p67 The Ecologist Vol 28 no2 1998

Assured by periodic statements from government and industry about the safety of regulated chemicals, and lacking the information to challenge such assurances, most of us are quite unaware that **'little has been done to prevent exposure to carcinogenic chemicals in the environment, despite ample evidence that chemical pollution of our air, water, food and the workplace is the major cause of cancer.'** Dr Samuel Epstein 'Losing the War Against Cancer: Who's To Blame and What To Do About It' p53 International Journal of Health Services Vol 20 no1 1990

2.7 Physical carcinogens – radiation

Radiation is a generic term for the different forms of energy waves to which we are exposed. There are many different forms of energy waves in the electromagnetic spectrum. The energy sources of radiation range from the sun and outer space (cosmic radiation) to the generation of electricity (micro and radio waves).

> **Certain unstable elements spontaneously decay into different atomic configurations, in the process releasing radiation consisting of alpha particles, beta particles or gamma rays. These particles and rays can damage living tissue and/or cause cancer to develop, with the degree of damage depending on the type of radiation and means of exposure (i.e. inhalation, ingestion or external radiation).**
> 'Pollution Science' Eds I Pepper C Gerba M Brusseau Academic Press Inc USA 1996 p33

Scientist Günter Fellenberg explains the effect of radiation damage on a cell: **'Reactive oxygen is formed in every instance of radiation. The presence of oxygen in the cell appears to increase mutagenic effects of radiation. At best, protective materials e.g. antioxidants can only diminish the rate of cell mutation ... even small doses of radiation are carcinogenic though they usually entail a latent period of years or decades ... before resulting in cancer.'**

Fellenberg considers the two most significant sources of artificial radioactivity in the environment in terms of human health to be:

- **'medicine – the diagnostic and therapeutic use of radiation is the main source of synthetic radiation contamination in the population**
- **nuclear power plants and nuclear weapons – environmental contamination from accidents, leakage, waste disposal, and storage.'**
  'The Chemistry of Pollution' John Wiley & Sons UK 2000 p165

Ionizing radiation

Because ionising radiation is of sufficiently high energy to disrupt electrons from atoms it is the most dangerous type of radiation for all living organisms: **'The harmful effects of atomic or ionizing radiation have been known since the early discoveries of Roentgen, Becquerel and Madame Curie, but the present impacts and mechanisms of nuclear pollution are still not fully understood.**

Radiation penetrates biological matter and acts on the cells and their constituent parts by causing chemical, molecular or physical damage often resulting in cell death or genetic mutation. Unlike most toxic chemicals, with radiation there appears to be no level of dose below which damage cannot be caused.'
Adam Markham 'A Brief History of Pollution' Earthscan UK 1994 p76

Examples of some sources of ionizing radiation that we live with:

- **'natural sources – the sun (UV rays), uranium and radon, and building materials containing these elements**
- **industrial sources – fallout from man-made nuclear explosions and power station accidents**
- **medical sources – X-rays**
- **domestic sources – cathode ray tubes (computers and TVs), some smoke alarms, and fluorescent dials**
- **our bodies – radioactive elements e.g. potassium (natural) and strontium-90 (man-made nuclear fission product).'**
  Edward Harland 'Eco-renovation: the ecological home improvement guide'
  Green Books & Ecology Building Society UK 1995 edition p141

Nuclear radiation

> **All over the world, the names Chernobyl, Harwell, Aldermaston, La Hague, Dounreay, Brookhaven, Hanford, Sellafield have become synonymous with mutation, cancer and leukaemia.**
> Dr Chris Busby 'Cancer and 'Risk-free' Radiation' pp54-56 The Ecologist Vol 28 no2 1998

Levels of background radiation from man-made sources have risen significantly since the mid-20th century as a direct result of:

- the increasing number of radiation-emitting appliances in our home, work and community environments
- the development and expansion of nuclear-based technologies by the fuel, weapons and medical industries.

Evidence of nuclear fallout can be found in our bones which absorb and store substances such as plutonium, radium, strontium-90, thorium and uranium. These substances are produced and released into air, water and soil by the testing and use of nuclear weapons. At public hearings in New York in 1993 on breast cancer links to environment, Dr Ernest Sternglass, Professor Emeritus of Radiological Physics at the University of Pittsburgh School of Medicine, spoke of new health hazards from nuclear sources: **'Since the beginning of the century we have known that radiation of all types induces cancer. What was not known was how nuclear reactors and nuclear testing would create such sudden, great changes, that radiation produced by the process of fission would act very differently from natural radiation processes of X-rays. Very small amounts of protracted radiation are 1000 times more toxic than a short-term X-ray, because it affects bone marrow and the immune system. Around one nuclear facility after another there has been an increase in cancer.'**
Women's Environment and Development Organisation (WEDO) newsletter Vol 6 no1 April 1993

One example of such an effect is a study of the mortality rates showing a significant increase in breast cancer for women living near nuclear reactors.
See J Gould 'Radiation and Breast Cancer: The High Cost of Living Near Reactors'
Published by Four Walls Eight Windows USA 1995

Low-dose radiation

> **Many referring doctors do not understand the risks of low dose radiation ... patients are developing cancer from radiological tests of unproven and sometimes unlikely benefit.**
> Professor Derek Roebuck (radiology) 'Ionizing Radiation in Diagnosis: do the risks outweigh the benefits?' pp743-746 Medical Journal of Australia (MJA) Vol 164 no12 June 1996

The Oxford Survey of Childhood Cancer (1956-1974), carried out by radiation epidemiologist Dr Alice Stewart, was for many years the only evidence of cancer risk from low-dose radiation. Her 1974 study of workers at the Hanford US nuclear weapons complex found further evidence of dangers to health from low-dose radiation. She reported: **'At Hanford we were looking at people exposed day in and day out over a period of time to doses only a fraction higher than background radiation, and we were finding a cancer effect. We were finding an effect comparable to those absorbed by the general public. This meant there was a serious health hazard not only to workers in the atomic energy industry, but to the general public as well. The Oxford Survey and now the Hanford studies (1974) were challenging the linear extrapolation from high to low dose and were saying that there's no threshold below which radiation is safe.'**
Gayle Greene 'The Woman Who Knew Too Much: Alice Stewart and the Secrets of Radiation'
University of Michigan Press 1999 pp124-125

Experts in radiation science like Dr Alice Stewart and Dr Sternglass (above) experienced particularly strong resistance from a cancer establishment which is unable to:

- accept the evidence from this and similar epidemiological studies
- understand how a small amount of radiation could cause such effects.

Findings from her study of background radiation led Stewart to the conclusion that any increase in background radiation will do harm, and that **'nuclear facilities are bound to increase background radiation, since they cannot operate without routine discharges of radioactive materials both to the sea and air. This means that even the routine operations of nuclear installations increase the risk of cancer.'**
Gayle Greene 'The Woman Who Knew Too Much: Alice Stewart and the Secrets of Radiation' University of Michigan Press 1999 p171

A government-commissioned report prepared by Douglas Black in 1984 drew attention to leukaemia cases in children living within ten miles of the UK's oldest nuclear facility at Windscale (renamed Sellafield in the 1980s). Here, child leukaemia cases were occurring at ten times the national average. A government committee confirmed the higher rate but denied any connection between this and discharges from Windscale. A similar disease pattern was found near the nuclear facility at Sizewell, Suffolk.
See the 'Black Report', 'Investigation of the Possible Increased Incidence of Cancer in West Cumbria' Her Majesty's Stationery Office (HMSO) 1984

Of radiation, Dr Rosalie Bertell writes:
'The bullets are invisible, the dying long and painful, and the wounds are carried by the children and grandchildren.'
'No Immediate Danger' The Women's Press UK 1985 pp173-174

Electromagnetic field non-ionizing radiation

There is no doubt that short-term exposure to very high levels of electromagnetic fields can be harmful to health.
World Health Organization: www.who.int/peh-emf/about/WhatisEMF/en/

Electromagnetic Fields (EMFs) are long-wave forms of non-ionizing radiation. EMF emissions in the environment come from natural sources e.g. the sun and the earth's magnetic field, as well as from manufactured sources e.g. high-voltage power lines, power transmission stations, electrical appliances such as computers, electric blankets, hairdryers, TV sets and microwave ovens.

Natural sources – light and heat from the sun – are beneficial to life at normal levels. Until the recent expansion of the telecommunications industries, non-ionizing radiation was considered to be relatively harmless to human health. Now the signals emitted by TVs, radios, microwave ovens and mobile phones have increased exposure levels in the whole population. Although these exposures are normally low, their effects on human health are the subject of ongoing research.

'Risks posed by EMFs depend on the distance from source and duration of exposure. For instance, transmission lines located only 200 to 300 feet away expose people to fewer EMFs than many common domestic appliances ... Substantial evidence ... strongly suggests the carcinogenicity of EMFs. ... at least eighteen occupational studies link EMF exposure to leukemia, five to brain cancer and thirteen to other cancers, including breast cancer.'
S Epstein D Steinman S LeVert 'The Breast Cancer Prevention Program' Macmillan USA 1997 pp259-260, 264

And **'although a relatively rare condition in men, breast cancer is more common among power station operators, electricians, telephone linesmen, and tram and train drivers.'**
'EMFs and Male Breast Cancer' Lancet 336 1990 'Cancer Incidence in New York Telephone Workers' Lancet 337 1991

EMFs and melatonin

EMFs interfere with the normal production of melatonin, a hormone of particular significance in studying the causes of breast cancer. Melatonin is **'a hormone made by the pineal gland deep within the brain ....[it] is only secreted at night and is an important regulator of the body's 24 hour clock. It also regulates various hormones, including oestrogen. Laboratory tests have shown that melatonin also suppresses the growth of human breast cancer cells.'**
Dr Cathy Read 'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 pp162, 207

Working or sleeping in a situation of near-constant, bright and artificial 'light at night' (LAN) may interfere with the normal production and work of the hormone melatonin. Many scientists consider regular exposure to LAN an added risk for breast cancer since it can affect the pineal gland and therefore regulatory control of oestrogen (the hormone most strongly associated with breast cancer). **'We think nothing of switching on an unnatural 100-watt light bulb ... thereby interrupting the oestrogen-lowering darkness in a manner unthinkable to most of the third world and to most of our grandparents.'**
LAN expert B Harrell – letter in New York Times. Cited in 'The Breast Cancer Prevention Program' S Epstein D Steinman S LeVert Macmillan USA 1997 p267

Two articles by Rory O'Neill, editor of 'Hazards', highlight scientific evidence supporting a link between shift-work and breast cancer risk. The first (Risks 24) refers to conclusions from two independent studies, that **'sleep interruption, especially in women working the graveyard shift, is associated with an increased risk of breast cancer.'** The second (Risks 115) refers to a Health and Safety Executive (HSE) report which cites **'four separate studies investigating whether shift work is associated with risk of breast cancer. Each has different methodological strengths and each found some statistically significant associations.'**
Trades Union Congress (TUC) 'Risks' 24 & 115
HSE Research Report 132 'Shift work and breast cancer: a critical review of the epidemiological evidence.'

The breast-cancer related risk of chronically low melatonin levels in women doing night or shift work, where they are exposed for long periods to artificial light, is an occupational hazard requiring urgent recognition and changes to the organisation of the work carried out by women.

Conclusion
Science has long recognised radiation and chemical carcinogens, and the synergism between the two, as primary causal factors in cancer. There can be no doubt that a major cause of cancer today is our involuntary exposure to carcinogens from an ever-increasing number of sources in our environment, from higher-than-normal levels of background radiation in our homes to hazardous chemicals in products.

Although our knowledge of cancer is incomplete, we do have sufficient understanding of the processes involved to know that cancer incidence can be reduced. Preventing breast cancer entails reducing human exposures to all substances implicated in the disease. Since the universal presence of breast carcinogens makes them impossible to avoid, they must be eliminated from our workplaces, homes and communities, and replaced, where necessary, with safer alternatives.

Expanding public knowledge about the existence and the uses of substances and agents identified as carcinogens by both science and industry is a fundamental first step towards stopping breast cancer before it starts.

More than 1,000 women die from breast cancer every month in the UK. It is now the most commonly diagnosed cancer in women under 35 ...

Sources: Cancer Research UK & Office of National Statistics (ONS) 2003

For more than 100 years breast cancer has been recognised as a hormone-related disease that is influenced by environmental factors. Although appearing in records that pre-date the Egyptian pharaohs, breast cancer was a relatively rare condition until the mid-20th century, when incidence in industrialised countries began to rise significantly.

More than 1,000 women die from breast cancer every month in the UK. With a steady rise in new cases year on year – from 21,446 in 1979 to 41,000 in 2001 – the chance of a woman contracting the disease in her lifetime rose from 1 in 12 to 1 in 9 in the five-year period 1996-2001. It is now the most commonly diagnosed cancer in women under 35 and over 1,400 women between the ages of 35-39 are diagnosed each year. The highest rate of incidence occurs in women in the 50-74 age group. In any one year, breast cancer can affect almost a quarter of a million women in the UK. For example, in 2001 there were 41,000 new diagnoses, 15,000 deaths and 172,000 women living with diagnoses made in the previous ten-year period.

Sources: Cancer Research UK & Office of National Statistics (ONS) 2003.

3.1 Breasts: an anatomy

'Female breasts are one of the most variable parts of the human anatomy. Evolved from sweat glands, they are designed to provide milk for infants through a system of ducts and lobules. The ducts are small tubes that run several inches back from the nipple to the milk-producing lobules which stick out from the ducts like clusters of tiny grapes. Both are enveloped by fat and connective tissue, which are contained within a sac of skin shaped roughly like a teardrop. The whole assembly changes dramatically in size, shape, and constitution during the menstrual cycle, pregnancy, breast-feeding and menopause. Not only do breasts vary from woman to woman but each woman's breasts continue to change throughout her life.'
David Plotkin MD 'Good News and Bad News About Breast Cancer' pp60-63 The Atlantic Monthly June 1996

'Breasts do not complete their development until the last months of a woman's first full-term pregnancy. During this time, the latticework of mammary ducts and lobules differentiate into fully functioning secretory cells. This process of specialization permanently slows the rate of mitosis [cell division], dampens the response to growth-promoting estrogens, and renders DNA less vulnerable to damage. According to the leading hypothesis, a full-term pregnancy early in life protects against breast cancer precisely because it reduces a woman's vulnerability to carcinogens and other cancer promoters, such as estrogens.'
Dr Sandra Steingraber 'Living Downstream: An Ecologist Looks at Cancer and the Environment' Virago UK 1998 p264

3.2 Breast cancer

Breast cancer is a 'multi-factorial' disease, a term **'describing a condition that is believed to have resulted from the interaction of genetic factors, with environmental factor, or factors.'**
Oxford Medical Dictionary

We tend to think of breast cancer as one type of cancer, whereas **'breast cancer is as diverse as the breast itself, appearing in many different guises ... notwithstanding the myriad forms in which breast cancer presents itself, researchers believe that at a fundamental level all breast cancers are similar. In their view, breast cancer, like other cancers, is the result of accidental changes in the genetic makeup of a cell – mutations. When the cell reproduces, it passes on its altered DNA. It begins to reproduce independently, regardless of the body's needs – the defining characteristic of cancer... eventually a discrete mass of aberrant cells becomes identifiable, either as a denser area on a mammogram or as a lump detectable by touch ...'**

'Up to two thirds of all breast tumours have enough sensitivity to reproductive hormones to be ... estrogen- or progesterone-receptor positive ... they retain the biochemical equipment to link up physically with molecules of these hormones. (Given the apparent role of hormones in promoting the disease, their significance in its outcome is unsurprising) ... As it grows, the primary tumour sheds cancer cells into its self-generated network of blood vessels. Spreading through the body, these cells can lodge in almost any vital organ, creating a second tumour – or a third, or a fourth ... Most breast tumours take years to develop to detectable size; some need decades.'
David Plotkin MD 'Good News and Bad News About Breast Cancer' pp60-63 The Atlantic Monthly June 1996

3.3 Risk factors

Removal of both ovaries reduces risk, and increased risk has been observed for women with higher levels of endogenous and pharmaceutical estrogen exposure.
J Brody & R Rudel 'Environmental Pollutants and Breast Cancer' p1010 Environmental Health Perspectives Vol 111 no8 June 2003

The following table identifies women who are at greater risk of developing breast cancer and shows the measure of that risk compared with the standard population risk. Fewer than 50% of breast cancer cases can be attributed to these factors.

Factor	**Relative risk***	**High risk group**
Age	10	Elderly
Geographical location	5	Developed country
Age at menarche	3	**Menarche** before age 12
Age at menopause	2	Menopause after age 54
Age at first full pregnancy	3	First child in early 40s
Family history	2	Breast cancer in first degree relative when young
Previous benign disease	4-5	Atypical **hyperplasia**
Cancer in other breast	4	
Socio-economic group	2	**Groups I and II**
Diet	1.5	High intake of saturated fat
Body weight:		
Pre-menopausal	0.7	Body mass index >35
Post-menopausal	2	Body mass index >35
Alcohol consumption	1.3	Excessive intake
Exposure to ionizing	3	Abnormal radiation exposure in young females after age 10
Taking **exogenous** hormones:		
Oral contraceptives	2	Use for >= 4 years when young
HRT	1.5	Use for >= 10 years
Diethylstilboestrol (DES)	2	Use during pregnancy

McPherson Steel and Dixon 'Breast Cancer – Epidemiology, risk factors, and Genetics' pp1003-1006 British Medical Journal (BMJ) 309 1994

Notes

*Relative risk: this is measured against a baseline of 1 which represents the expected disease rate in the observed population. Anything above 1 indicates a higher than expected risk. Anything below 1 is a lower than expected risk.

Menarche – onset of menstruation

Hyperplasia – excessive growth of cells which differ in appearance from normal cells

Groups I and II – higher socio-economic status

Exogenous – made outside the body

Diethylstilboestrol (DES) – pharmaceutical drug and synthetic oestrogen.

It is clear that the majority of breast cancer risk factors are associated with hormones – variability of hormonal effects in breasts through different life stages, use of pharmaceutical hormones, and activities such as exercise and alcohol consumption that affect hormone levels.

'With the notable exception of ionizing radiation and inherited genetic damage, none of the established risk factors for breast cancer directly cause the disease ... Most ... can be linked with increased lifetime exposure to oestrogen, other hormones, and higher exposures early in life.'

D Davis D Axelrod L Bailey M Gaynor A Sasco 'Rethinking Breast Cancer Risk and the Environment: The Case for the Precautionary Principle' p523 Environmental Health Perspectives 108 (9) September 1998

Important points about breast cancer risk factors:

- there is well-established evidence to show ionising radiation and inherited genetic damage as direct causes of breast cancer
- none of the other risk factors which may be implicated in the process directly causes the disease
- most cannot be altered e.g. age, geographical location
- some breast cancer risk factors relate to early-life exposures and changes e.g. radiation exposure, early menstruation
- many are events over which women have little or no control e.g. onset of menopause.

In theory, the only factors over which women have some control are diet, body weight, alcohol consumption and use of synthetic hormones e.g. HRT. The reality is that these choices are moderated by many other factors – economic, social, cultural, pathological and psychological – affecting women's lives.

Risk is not a cause of illness. Risk is the result of exposure to a hazard, as in the formula HAZARD + EXPOSURE = RISK. Clearly, if either hazard or exposure is missing from the equation, there is no risk.
Dr Janette Sherman 'Life's Delicate Balance: Causes and prevention of breast cancer' Taylor & Francis USA 2000 pp11-12

3.4 'Lifestyle' risk factors

Individual behavior and lifestyle certainly play important roles, but today's trend appears to be that individuals are considered not only responsible for but also guilty of causing their disease.
L Tomatis & J Huff 'Evolution of Cancer Etiology and Primary Prevention' Editorial Environmental Health Perspectives Vol 109 no10 USA 2001

Most women are aware that 'lifestyle factors' such as regular exercise, balanced diet and weight management are beneficial to health in general. The less well-known benefit of these three factors is their effect in lowering oestrogen levels, thus reducing breast cancer risk.

Although important, lifestyle factors constitute only part of the overall risk picture for breast cancer – approximately 5%. Government and media fixation on lifestyle factors as key both to risk and prevention leaves the problem entirely with women themselves. It also misleads by promoting a simple solution to a multi-factorial disease, against which individual actions and choices are limited.

Scientist Dr Sandra Steingraber is critical of an emphasis on lifestyle factors alone: **'At its worst the lifestyle approach to cancer is dismissive of hazards that lie beyond personal choice. A narrow focus on lifestyle – like a narrow focus on genetic mechanisms – obscures cancer's environmental roots. It presumes that the ongoing contamination of our air, food, and water is an immutable fact of the human condition to which we must accommodate ourselves.'**
'Living Downstream: An Ecologist Looks at Cancer and the Environment' Virago UK 1998 p26

This singular focus on lifestyle factors leaves women trapped with the twin problems of 'guilt' and 'victimhood' that have followed in its wake. **'The much recited list of 'risk factors' gives the misleading impression that the clean-living, right-thinking woman who leads a blameless life won't be punished with breast cancer, whereas the woman who makes the selfish, career-led decision to postpone child-bearing until her late thirties and over indulges in fatty foods and alcohol deserves everything she gets.'**
Deborah Hutton 'Breast cancer-private grief is turning to public outrage' British Vogue 157 1993

Women today are constantly reminded that avoiding breast cancer risks is entirely the responsibility of the individual. They are just as constantly reassured, in the popular media and in NHS and other government publications such as the Scottish and UK Cancer Plans, that by following a healthy lifestyle (eating a low-fat diet with plenty of fruit and vegetables, limiting alcohol consumption, reducing body weight and exercising regularly) they are acting responsibly to protect themselves from breast cancer.

The implication is that to do less than this is tantamount to inviting breast cancer, but the truth is that many women who do fulfil all the recommended lifestyle criteria still go on to experience breast cancer.

Conclusion
It makes sense to follow a healthy lifestyle, but that is no guarantee that you will not get cancer. A woman cannot protect herself absolutely from environmental factors beyond her control. And as those factors proliferate, her risk increases no matter how many vegetables she eats, how many drinks she declines or pounds she loses.

Chapter 4
Hormones and breast cancer

Today, breast, ovarian and endometrial uterine cancers are clinically categorized as 'hormone-dependent' cancers.

J Kelsey & A Whittemore 'Epidemiology and primary prevention of cancers of the breast, endometrium and ovary. A brief overview' pp89-95 Annals of Epidemiology 4 (2) 1994 4.1 Hormones

4.1 Hormones

Hormones are:

- substances produced and released into the bloodstream by endocrine glands e.g. thyroid, pancreas, as well as by reproductive organs e.g. testes and ovaries
- chemical messengers with a key role in the control and regulation of cell activity, in growth and development, metabolism, behaviour and reproduction
- potent chemicals that operate at extremely low concentrations.

Hormones enable the body to respond to external and internal stimuli to maintain homeostasis (a balanced state) in a wide range of conditions. Hormones work by attaching themselves to their corresponding receptors on the surface of cells which are then activated to switch on appropriate responses within the cells. For example: **'Receptors act as switches which help to control the action of genes in producing proteins, and through this, the metabolic activity of the cell ... Specific timing of hormone secretion is a common feature of endocrine [hormone] control mechanisms, as are the ways in which the hormones are linked in various 'feedback loops', which serve to control hormone levels.'**

'Hormone Mimics Pose Challenges' Chemistry and Industry May 20 1996 pp364-366

4.2 Hormones and breast development

Hormones are the key chemicals involved both in the development and the function of the breast. Breast development which precedes menstruation by individually variable times, and the changes in breast tissue which begin with the first menstrual cycle, will depend on a complex interplay of hormones, mainly oestrogen, progesterone, prolactin and other growth factors. **'The breast is fairly quiescent from infancy until puberty, then, under the influence of sex steroid hormones, remarkable changes occur ... From here on in, the activity of the breast is firmly locked into our hormonal cycles.'**
Dr Cathy Read 'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 p84

The breast reaches its fully developed, mature state **'only through the hormonal stimuli induced by pregnancy and lactation.'**
Julia Brody & Ruthann Rudel 'Environmental Pollutants and Breast Cancer' pp1007-1019 Environmental Health Perspectives Vol 111 no8 2003

From their own experience, most women can attest to the extreme sensitivity of breasts (and breast tissue) to changing hormonal influences.

4.3 Oestrogen

Oestrogens are produced both by animals and plants.

Oestrogen in humans

The primary female sex hormone, oestrogen, is produced by the ovaries, the adrenal glands and the placenta. Another source of production is body fat, where hormones stored in fat cells are converted into oestrogen by an enzyme called aromatase. The role of oestrogen is not limited to the reproductive system. This is indicated by the presence of oestrogen receptors in other organs e.g. heart, bones, liver, brain, and in the vascular (blood vessel) system. The hormone oestrogen is **'necessary for the normal development and growth of the breasts and organs and important for childbearing. It helps control a woman's menstrual cycles and is essential for reproduction. Estrogen also helps maintain the heart and healthy bones.'**
'Estrogen and Breast Cancer Risk: What Factors Might Affect a Woman's Exposure to Estrogen' Breast Cancer Environmental Risk Factors fact sheet 9 Cornell University

The endogenous oestrogens that we produce in our bodies **'operate at extremely low concentrations, measured in parts per trillion.'**
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p74

The three different forms of endogenous oestrogen are:

- **oestrone** – the most readily used form of oestrogen
- **oestriol** – the weakest form of oestrogen
- **oestradiol** – the most powerful form of oestrogen and the strongest stimulant to breast tissue of the three. It is also important for the health of circulatory system and for maintenance of bone structure by stimulating calcium uptake.

Oestrogen in plants

Phyto-oestrogens with oestrogenic and, in some instances, anti-oestrogenic effects, are produced by many plants, including edible plants such as grains, cabbage, peas, spinach and soya beans. **'To date researchers have found these estrogenic substances in at least 300 plants from more than 16 different plant families.'**
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p76

Scientists tend to fall into two camps regarding the health effects of phyto-oestrogens. Some claim they have a protective role against breast cancer when incorporated in the diet, while others consider they increase breast cancer risk by adding to the overall oestrogen burden. It's perhaps worth remembering that:

- **'plants, and the animals that eat them, including humans, share a long evolutionary history.'**
  As above p80
- breast cancer has only appeared as a major disease in women since the mid-20th century.

4.4 Oestrogen and breast cancer

> **Throughout the life cycle, the hormonal environment plays a critical role in the development of breast cancer.**
> J Brody & R Rudel 'Environmental Pollutants and Breast Cancer' Environmental Health Perspectives Vol 111 no8 June 2003 p1010

Oestrogen, the primary female sex hormone, has been associated with breast cancer since the 19th century when Scottish surgeon George Beatson observed that removal of the ovaries (the main source of oestrogen production) reduced incidence of the disease in women. Natural oestrogen is not a carcinogen – it doesn't initiate the cancer process. It can however contribute to progressing the cancer process by carrying out its normal task of stimulating the growth of breast cells.

'Estrogen may be implicated in breast cancer because of

- **its role in stimulating breast cell division**
- **its work during the critical periods of breast growth and development**

- **its effect on other hormones that stimulate breast cell division**
- **its support of the growth of estrogen-responsive tumors.'**

'Estrogen and Breast Cancer Risk: What Factors Might Affect a Woman's Exposure to Estrogen' Breast Cancer Environmental Risk Factors fact sheet 9 Cornell University

A study of more than 11,000 breast cancer specimens found the strongest increase in breast cancer incidence **'in post-menopausal women with estrogen-responsive tumors – tumors that are rich in estrogen receptors and proliferate when exposed to estrogen.'** The study's research team also reported **'both an increasing proportion of cases of estrogen-responsive breast cancer and an increasing density of estrogen receptors within these tumors'** in patients over the age of 50.

Reporting their results in the journal 'Cancer', the research team suggested that this increase may reflect a change in the hormonal events that promote breast cancer development, such as the onset of menstruation or pregnancy, or exposure to oestrogens other than those produced within the body.
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 pp182-183

Duration of exposure to oestrogen
A woman's lifetime exposure to oestrogen is influenced by her age at three stages in her reproductive history.

1. onset of menstruation [menarche] The earlier the start of menstruation and the later the beginning of menopause, the longer is the period of a woman's exposure to hormones and hormonal cycles affecting the breast.

Such a situation increases the number of opportunities over her lifetime for oestrogen to carry out its normal stimulatory actions on breast cells, including any that may be undergoing pre-cancerous changes. In these circumstances the natural oestrogen produced by a woman can contribute to the progression of a cancer already triggered by other factors.

2. first full-term pregnancy Pregnancy at an early age appears to protect women from breast cancer. **'Epidemiologic studies have consistently shown that early age at first full-term pregnancy is a protective factor for breast cancer.'**
Julia Brody & Ruthann Rudel 'Environmental Pollutants and Breast Cancer'
Environmental Health Perspectives Vol 111 no8 2003 p1010

'According to the leading hypothesis, a full-term pregnancy early in life protects against breast cancer precisely because it reduces a woman's vulnerability to carcinogens and other cancer promoters, such as estrogens.'
Dr Sandra Steingraber 'Living Downstream: an Ecologist Looks at Cancer and the Environment' p264

Breast cells attain permanent maturity during the last months of pregnancy. Mature breast cells divide more slowly, are less responsive to growth-promoting oestrogens, and less vulnerable to internal damage.

3. onset of menopause It seems that unlike other body tissues that tend to become more susceptible to cancerous threats as they age, breast tissue is affected by hormones throughout life. **'For most cancer sites there is a linear log-log [direct, connected] relationship between incidence and age. This relationship does not hold true for breast cancer, and certain 'key' breast cancer risk factors suggest that breast tissue does not 'age' in step with calendar time ... The large (risk) effect of age at menarche and menopause suggests that hormones have a major role in determining breast tissue age, and oestrogens and prolactin appear to be the major hormones involved.'**
M Pike M Krailo B Henderson J Casagrande D Hoel 'Hormonal' risk factors, 'breast tissue age' and the age incidence of breast cancer' Nature Vol 303 June 1983 pp767-770

Levels of oestrogen
In researching reasons for her own breast cancer, geophysicist Professor Jane Plant considered it most unlikely that a woman's natural oestrogen could, on its own, be the main factor in her developing breast cancer. She asks, if that were the case, **'why did all pregnant women not develop breast cancer, and why did women, even before HRT was discovered, develop breast cancer long after their menopause when oestrogen levels were greatly reduced? Indeed, the older the woman (and hence the lower oestrogen levels), the higher the risk. It seemed to me as a natural scientist, more likely that oestrogen promotes breast cancer only when another more fundamental factor, or factors, has caused the body's chemistry to malfunction.'**
Professor Jane Plant 'Your Life in Your Hands: Understanding, Preventing and Overcoming Breast Cancer' Virgin Publishing UK 2000 p68

Results of a 1983 research study showed a marked difference between measures of oestrogen levels in the blood of rural Chinese women and of British women. In British women, levels in the 35-44 age group were 36% higher, 90% higher in the 45-54 age group, and 171% higher in the post-menopausal 55-64 age group.

T Key J Chen D Wang M Pike J Boreham 'Sex Hormones in Women in Rural China and Britain'
British Journal of Cancer 62 1990 pp631-636

The presence of comparatively high levels of oestrogen, well outside the normal range for oestrogen levels in blood, is a significant indicator of malfunction in this UK population sample. Abnormal hormonal effects on breast tissue are also observed as malfunctions in the following three references – that is, they are effects not generally produced by a normally functioning endocrine system, and the normal actions of oestrogen.

- **'A study of breast cancer risk based on oestrogen levels in 15,000 women found that women with higher oestrogen levels were more likely to go on to develop breast cancer.'**
  P Toniolo et al 'Prospective study of endogenous oestrogens and breast cancer'
  American Journal of Epidemiology 138 1993 p601
- **'Estrogen levels of excess amount or prolonged duration of exposure to estrogens may stimulate regular hyperplasia [excessive cell growth] of lobules and galactorrhea [production of milk other than in pregnancy and breastfeeding] and may be associated with increased breast cancer risk.'**
  K McCarty Jr L Glaubitz M Thienemann R Riefkohl 'The Breast: Anatomy and Physiology' in 'Aesthetic Breast Surgery' Ed Nicholas G Georgiade Professor & Chair Department of Surgery Duke University Medical Center Durham North Carolina USA Williams & Wilkins USA 1983 p2
- **'Abnormally high levels of oestrogen may ... affect the working of ovaries and fertility, and may lead to the proliferation of uterine and breast tissue leading to cancers.'**
  Dr Sandra Steingraber 'Living Downstream: an Ecologist Looks at Cancer and the Environment'

Abnormally high levels of oestrogen circulating in the blood of so many women can be explained by:

1. direct action on breast cells of man-made chemicals that mimic oestrogen As shown in various bio-monitoring studies, all of us carry several hundred chemicals in our bodies, including many that have been identified as hormone mimics. For example, **'DDT is regarded as a classic estrogen mimic that elevates hormone levels.'** 'Estrogen and Breast Cancer Risk: What Factors Might Affect a Woman's Exposure to Estrogen' Breast Cancer Environmental Risk Factors fact sheet 9 Cornell University. And scientists have found that **'an oestrogen receptor binds to many chemicals with strikingly different structures.'** Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p84

2. chemically induced impairment of liver function It was already suspected by Rachel Carson in the 1950s that pesticides may indirectly aid reproductive cancers by damaging the liver. The liver is a key organ in maintaining hormone levels by breaking down oestrogens and other hormones to aid their excretion. At that time she speculated that if impaired liver function slowed this breakdown process, it could lead to abnormally high oestrogen levels.

Medical science now acknowledges Carson was correct **'in linking overall estrogen exposure to these cancers and in recognizing that synthetic chemicals can disrupt hormones by impeding normal liver processes.'** Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p201. Any chemical that interferes with the liver's role in breaking down oestrogen prior to its elimination from the body will potentially contribute to higher than normal oestrogen levels. Chemical interference with the enzyme that helps break down oestrogen, for example, would **'cause more estrogen to be available to the receptors and indirectly cause an estrogenic effect without binding itself to the receptor.'** As above p86

'Because total estrogen exposure is the single most important risk factor for breast cancer, estrogenic chemicals, which would add to this lifelong exposure, are an obvious suspect when searching for the cause of rising rates (of breast cancer) over the past half century.' As above p182

4.5 Hormone disruptors and mimics

Strong toxicologic evidence points to a large number of ubiquitous pollutants that are plausibly linked to breast cancer because they mimic or disrupt hormones known to affect breast cancer risk. J. Brody & R. Rudel 'Environmental Pollutants and Breast Cancer' Environmental Health Perspectives Vol 111 no8 June 2003 p1016

Man-made chemical compounds with the capacity to mimic hormones and to interfere with the hormonal messaging systems that direct and regulate our biological development and function are variously known as xenoestrogens, xenohormones, environmental oestrogens, hormone disruptors, hormone mimics or 'hormonally active agents' (HAAs) and endocrine disrupting chemicals (EDCs).

EDCs are described as: **'Exogenous [from outside the body] agents that change endocrine function and cause adverse effects at the level of the organism, its progeny, and/or subpopulations of organisms.'**
Environmental Protection Agency (EPA) USA 1997

Authors of 'Our Stolen Future' describe EDCs as **'thugs on the biological information highway that sabotage vital communication. They mug the messengers or impersonate them. They jam signals. They scramble messages. They sow disinformation. They wreak all manner of havoc. Because hormone messages orchestrate many critical aspects of development, from sexual differentiation to brain organization, hormone-disrupting chemicals pose a particular hazard before birth and early in life.'**
Theo Colborn, Dianne Dumanoski, John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 pp203-204

Hormone receptors are found **'in many different types of cells in the reproductive system, and the balance between hormones such as testosterone and oestrogen appears to help determine the number and function of these cells. EDCs disrupting this balance in a foetus or developing child could interfere with these processes, causing irreversible changes in masculinisation, sperm production and possibly cancer.'**
'Hormone Mimicking Chemicals' POST Technical Report 108 January 1998 Parliamentary Office of Science and Technology London UK p3

'EDCs are found in a large number of frequently used products such as weedkillers, foods, petrol, insect sprays, cosmetics, shampoos, disinfectants, plastic linings of food cans, plastic bottles and some medicines. Another main source of hormone-disrupting chemicals are dioxin emissions from waste incineration plants. In most Western European countries 95% of dioxins which humans absorb, enter our bodies in the form of food, particularly milk products and fish oil.'
Corne van Dooren Alternatieve Konsumenten Bond (AKB) 'Sources of Hormone Disrupting Chemicals in the Netherlands' Report of Alternative Europe Summit 'Chemicals Food and Reproductive Health' Amsterdam 1997 p8

Synthetic oestrogens are also found **'in pesticides, in the growth hormones fed to chickens, cows and other animals, and in the contraceptive pill and Hormone Replacement Therapy prescribed to women.'** Sue Hoult 'Breast Health Information Booklet' Women's Health Centre Tasmania Australia 1996 p20. **'To date [2003] more than 500 chemicals have been found to be weakly estrogenic in various assays [studies] including many chemicals in common use, such as constituents of detergents, pesticides, and plastics.'**
J. Brody & R. Rudel 'Environmental Pollutants and Breast Cancer'
Environmental Health Perspectives Vol 111 no8 June 2003 p1011

'Few, if any, safety data exist for many of these chemicals. The safety data that do exist are typically limited to whether the chemical may cause cancer or gross birth defects. Possible effects on the endocrine system or trans-generational [gene inherited] effects are rarely, if ever, examined.'
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p139

In the 1960s, a few scientists were first alerted to links between reproductive cancers and hormone-mimicking contaminants by studies of wildlife. The evidence continues to show **'that humans and animals respond in generally the same way to hormone-disrupting chemicals.'** As above p86. Chemicals are able to act as EDCs because, despite the fact that natural hormones are large and complex molecules **'they still interact with their target cells in a relatively simple way, which it is possible for simpler chemicals to emulate or disrupt.'**
'Hormone Mimicking Chemicals' POST Technical Report 108 January 1998 Parliamentary Office of Science and Technology London UK p1

The fact that humans have no evolutionary history with synthetic compounds is a problem in itself. Man-made hormone mimics differ in fundamental ways from oestrogens produced by plants and humans. Being fat-soluble compounds, most EDCs are not excreted by normal body processes but are stored in body fat, thus impacting on cells in the body over many years. Another important difference is the long-evolved ability of the body to break down and excrete the natural oestrogens, whereas, **'many of the man-made compounds resist normal breakdown and accumulate in the body, exposing humans and animals to low-level but long-term exposure. This pattern of chronic hormone exposure is unprecedented in our evolutionary experience.'**
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 pp81-82

Concerns about the human health effects of EDCs

The new science of 'endocrine disruption' has evolved from concerns about the observed effects of EDCs on living organisms and on the environment. Studies have found a wide range of human health impacts, including reproductive and immune system disfunction and neurological, cognitive and behavioural effects. Specific human health effects associated with EDCs to date are **'testicular cancer, breast cancer, prostate cancer, decrease in sperm concentration and semen volume, cryptorchidism [undescended testicle] hypospadia [where the urethra doesn't open at penis tip] and impaired development of the immune system and the nervous system.'**

Gunnar Lind 'REACH: What Happened and Why?' The Greens/European Free Alliance in the European Parliament 2004 p64

DES – the inadvertent human experiment

Regarded as a quintessential EDC, the pharmaceutical drug diethylstilboestrol (DES) was given to pregnant women for more than 30 years from the 1940s. A potent synthetic oestrogen originally prescribed to prevent miscarriage, DES was also used to mitigate the effects of morning sickness and for **'menopausal symptoms, as a 'morning after' contraceptive, for girls who were growing 'too tall' and most bizarrely of all, by farmers to fatten chickens, cows and other livestock. Years later, daughters and sons of women who took the drug developed various cancers and genital abnormalities.'**

Dr Devra Davis Introduction 'Preventing Breast Cancer: The Politics of an Epidemic' by Cathy Read Harper Collins UK 1995

The most important knowledge gained from **'this tragic and unintended experiment'** is that man-made EDCs can:

- cross the placenta
- disrupt the development of the foetus
- have serious effects that might not be evident until decades later
- be mistaken by the human body for a hormone.

Theo Colborn, Dianne Dumanoski, John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 pp66-67

Observed to have the same effects in humans as those in clinical studies of animals, DES has been linked to increased breast cancer risk in women who took it during pregnancy.

Timing of exposure to EDCs

Scientists are particularly concerned about exposures to EDCs that occur **'when levels of endogenous hormones are very low, such as in utero [foetal] or during pre- pubertal, or postmenopausal time periods.'**

Julia Brody & Ruthann Rudel 'Environmental Pollutants and Breast Cancer' p1011 Environmental Health Perspectives Vol 111 no8 2003. In the opinion of two eminent endocrinologists, **'abnormal hormonal environments during early postnatal (and antenatal) life should not be underestimated as to their possible contribution to abnormal changes of neoplastic [cancerous] significance later in life.'**

Noboru Takasugi & Howard Bern 'Tissue changes in mice with persistent vaginal cornification induced by early postnatal treatment with estrogen') pp855-865 Journal of the American Cancer Institute Vol 33 1964 cited in Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996

Biologist and foetal toxicologist Dr Sandra Steingraber defines life periods when hormonal disturbances pose the greatest risks as 'windows of vulnerability'. These occur:

- **when the foetus is developing in the womb and minute changes in hormone levels switch on the development of each organ system**
- **when newborn babies still have incomplete immune systems and no blood-brain barrier**
- **when puberty, triggered by hormonal changes measured in low parts per billion, leads to rapid cell division and DNA replication**
- **in old age, when the body's defence mechanisms weaken.**

Felicity Lawrence 'Chemical World' p5 The Guardian May 15 2004

Low-level effects of EDCs

The relative strength of EDCs is much lower than the strength of hormones produced by humans. For this reason some scientists claim that EDCs cannot pose any significant threats to human health. However, reproductive biologist Fred vom Saal points out that **'vanishingly small amounts of free [natural] estrogen are capable of altering the course of development in the womb. Given this exquisite sensitivity, even small amounts of a weak estrogen mimic – a chemical that is one thousand times less potent than the estradiol made by the body itself – may nevertheless spell big trouble.'**

Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p141

Pesticides and herbicides are used on lawns and gardens and at various stages of food production, from farm to supermarket. The widely used herbicide glysophate is marketed under the brand name 'Roundup'. During recent laboratory tests, French biochemist Professor Seralini found that: **'Very low doses of glyphosate [the main ingredient in Roundup] were toxic on either human embryonic cells, foetal cells**

or placental cells ... My team has noticed that Roundup disrupts hormones which are modulating the oestrogen synthesis. Oestrogens are known as female hormones but today we know that they are important for bone growth and testicular function at very low doses. So a modulation of oestrogen synthesis could account for sperm decline, increase in cancers and sexual malformations.'
Professor Gilles-Eric Seralini Laboratory of Biochemistry and Molecular Biology University of Caen France
PAN Europe 'Pesticides News' (number 63) March 2004 p4

Confirmation of troubling effects from low-level exposures to EDCs has been found by scientists across many disciplines. Ecological scientist John Peterson Myers questions the use of outdated toxicology in the light of this new knowledge: **'Traditional toxicology focuses on damage such as cell death. 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.'**
JP Myers 'From Silent Spring to Scientific Revolution' San Francisco Medicine 2002

An overview by Myers and five of his colleagues of 'The Emerging Science of Endocrine Disruption' concludes: **'Clearly significant changes are needed to bring current regulatory practices into conformity with new scientific information. We propose that testing for health effects at doses within the range of human exposure (currently not done) with respect to long-latency effects of developmental exposure throughout the life span (currently not done) be required prior to the introduction of any chemical intended for use in commerce.'**
JP Myers L Guillette Jr P Palanza S Parmigiani S Swan F vom Saal 'The emerging science of endocrine disruption' International Seminar on Nuclear War and Planetary Emergencies 28th session Italy 18-23 August 2003 p12

Bioaccumulation
A characteristic common to most EDCs is that they build up [bioaccumulate] in fatty tissues where they remain potentially active for long periods of time. **'Adipose [fat] and other tissues can accumulate HAAs (hormonally active agents or EDCs) and serve as reservoirs or depots ... Adipose tissues in some organs (e.g. breast) might be important direct targets of HAA action or important internal reservoirs of HAAs.'**
'Hormonally Active Agents in the Environment' National Academy Press USA 1999 pp8, 99 It is therefore not surprising that **'a growing number of experts aware of the rise in oestrogen-mimicking chemicals are beginning to suspect that it is not so much the fat that predisposes a woman to breast cancer but the toxins which have accumulated in the fat that then build up in her body.'**
Leslie Kenton 'Passage to Power: Natural Menopause Revolution' Ebury Press UK 1995 p22

The bioaccumulation of toxins in fat cells inevitably produces toxic effects in the body. UK scientist Peter O'Neill points out that such toxic effects **'may result after a relatively long time period either through levels rising above a threshold that induces adverse effects or because some stress event causes the chemical to be released from the fat.'**
Peter O'Neill 'Environmental Chemistry' Chapman & Hall UK 1993 p235

As already noted, **'natural estrogens operate at extremely low concentrations, measured in parts per trillion. In contrast, these so-called weak estrogens are present in blood and body fat in concentrations of parts per billion or parts per million – levels sometimes thousands to millions of times greater than natural estrogens. So even though the contaminant levels may seem miniscule, they are not necessarily inconsequential.'**
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p74

EDCs acting in combination
Another concern among scientists is the demonstrated capacity of hormone disruptors (EDCs) to act and to react in any number of combinations and variations. Studies show that **'hormone-disrupting chemicals can act together and that small, seemingly insignificant quantities of individual chemicals can have a major cumulative effect.'**
As above p140. **'Multiple estrogenic chemicals can act together to produce an effect even when each individual component of the mixture is below a threshold for effect.'**
Julia Brody & Ruthann Rudel 'Environmental Pollutants and Breast Cancer' Environmental Health Perspectives Vol 111 no8 2003 p1011

EDCs and breast cancer
A Spanish study (1996-98) measuring the influence of 16 organochlorine pesticides on cancers in women aged 35-70 who were undergoing surgery for their conditions (including breast cancer) showed significantly increased risk for breast cancer in women of leaner body weight. This study demonstrates firstly the oestrogenic and accumulative properties of specific organochlorine pesticides, and secondly the link between these properties and increased risk for breast

cancer. Ibarluzea et al 'Breast cancer risk and the combined effect of environmental estrogens' Cancer Causes and Control Vol 15 2004 pp591-600 Whereas it appears to contradict the accepted myth that weight is a predominant risk for breast cancer this study bears out that all women are at risk of breast cancer regardless of body size or weight.

Chemicals with the ability to mimic the oestrogen produced by the body can interfere with the many functions of oestrogen – from the way it is produced or transported to specific sites in the body, such as breast cells, to the way it is metabolised and eliminated from the body. Improved understanding of the number of ways in which EDCs affect breast cancer has developed from animal and laboratory tests and reveals that **'[their] ability to bind to the oestrogen receptor (on a cell) appears to be a relatively common phenomenon. Once there, the mimics may act as agonists [aids] or antagonists [blocks], jamming these switches on or off. However, there are other ways in which chemicals can affect the hormone system. Some chemicals are anti-androgenic, blocking the androgen [male hormone] receptor. Some may interfere with the synthesis or metabolism of hormones, or with their transport in the body.'**
'Hormone Mimics Pose Challenges'
Chemistry and Industry May 20 1996 pp364-366

In 1993, a group of US researchers hypothesized that 'hormonally active synthetic chemicals' were the cause of rising breast cancer incidence by:
- increasing overall oestrogen exposure among older women
- directly acting as oestrogen mimics
- indirectly altering the way the body produces or metabolises oestrogen.

They also theorized that **'prenatal exposure to estrogens may predispose a woman to breast cancer later in life through an 'imprinting' process that sensitizes her to estrogen exposure.'**
D Davis H Bradlow M Wolff D Hoel H Anton-Culver 'Medical Hypothesis: Xenoestrogens as Preventable Causes of Breast Cancer' Environmental Health Perspectives Vol 101 no5 1993 pp372-377

Researcher Leon Bradlow and his colleagues found that by altering the way the body processes its own oestrogen, **'a wide variety of pesticides and related compounds clearly have effects on estrogen metabolism that would act in the direction of increasing breast cancer and endometrial cancer risks.'**
Theo Colborn Dianne Dumanoski John Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 pp183-184
Another source of hormonal influence on the breast, often overlooked by researchers, is the capacity of human breast tissue to **'metabolize hormones and create its own local hormonal environment, independent of circulating levels (of hormones). Thus, effects of chemicals on the local hormone environment in the breast may be more relevant than effects on circulating hormones.'**
Julia Brody & Ruthann Rudel 'Environmental Pollutants and Breast Cancer' Environmental Health Perspectives Vol 111 no8 2003 p1013

Conclusion
Because of the importance of hormones in developing and maintaining human health through all stages of life, man-made chemicals that can mimic and therefore interfere with the normal functions of hormones pose a serious threat to public health now and for the future.

David Buffin of the Pesticide Action Network *(UK)*, points out that **'environmental NGOs, the chemical industry, politicians, civil servants and other decision makers are all now aware of the problem of EDCs. Our current ability to quantify and contrast the relative risks of EDCs, to a fine degree, is probably decades away. Therefore we have a responsibility to act on behalf of future generations and adopt the 'precautionary principle'. The only way forward is pollution prevention at source – that is clean industrial and agricultural production. The priorities are those substances that are persistent, bio-accumulative and/or toxic.'**
David Buffin Pesticide Action Network *(UK)* Pesticides News 36 June 1997 p16

Two priorities for dealing with breast cancer prevention at source are:
- full investigation, identification and provision of public information about EDCs in commercial products
- public education to improve our understanding of how oestrogen works in the body and how chemicals in the environment can affect oestrogen levels. This will help women make informed choices about their bodies and their environment.

Hormones of the wrong kind, hormones too soon in a girl's life, hormones for too many years in a woman's life, too many chemicals with hormonal action, and too great a total hormonal load. Another key is the kind of hormones, the foreign chemicals.
Dr Janette Sherman 'Life's Delicate Balance: Causes and prevention of breast cancer' Taylor & Francis USA 2000 p20

Humans are exposed to a large number of known or suspected carcinogens on a daily basis.

'The Primary Prevention of Cancer' Ontario Task Force Report Department of Health Ontario1995

5.1 How are we exposed?

We take in harmful substances (contaminants) from the environment by inhalation (breathing in), by ingestion (eating or drinking), or by absorption through the skin. They may cause local damage to the skin or to the mucous membranes which line all parts of the respiratory or the gastro-intestinal tracts. They can be absorbed into the bloodstream through the skin or mucous membranes and from there to any part of the body. Although environmental contaminants gain entry to the body in a variety of ways, **'blood is the central medium of distribution of chemicals to target organs and cells in the body.'**

'Hormonally Active Agents in the Environment' National Academy Press USA 1999 p116

Hormone-disrupting pesticides are sometimes found in water supplies. Residues of hormone-disrupting pesticides can get into fruit and vegetables from recent crop applications. Persistent pesticides can get into the diet from environmental contamination building up in the food chain. Many industrial chemicals have built up in the food chain and can now be found in meat, fish and dairy produce.

Diet

> **Diet involves not only the active constituents of food products, such as the beneficial components of omega 3 fatty acids in olive oil, but also potentially harmful contaminants such as lipophilic organochlorine residues in animal fat.**
> Devra Davis and Calum Muir
> 'Estimating Avoidable Causes of Cancer' p305
> Environmental Health Perspectives Vol 103
> November 1995

Food is a major source of human exposure to synthetic chemicals, many of which are bioaccumulative, carcinogenic and disruptive to the hormonal system. These are present in numerous dietary guises as described by journalist Felicity Lawrence: **'Some are used as food additives, and not meant to be toxic. Some, such as pesticides, are useful precisely because they are toxic, but end up in food at very low levels. Some are unintentionally present as pollutants in the environment and have built up in the food chain. Some, such as organochlorines, persist. Others, such as organophosphates (which affect the nervous system) and phthalates (endocrine disruptors that are used to soften plastic) are transient, but we may be exposed to them on an almost daily basis.'**
'Chemical World' p6 The Guardian May 15 2004

According to Dr Catherine Dorey, food can become hazardous to health through **'environmental pollution during growth and bioaccumulation along the food chain. This contamination continues due to leaching from components and packaging used during manufacturing, processing and storage, particularly for foods containing higher levels of fat.'**
'Chemical Legacy: Contamination of the child' p19
Greenpeace UK Report 2003

Humans at the top of the food chain are at greatest risk from dietary contaminants because **'contaminant concentrations increase up the levels of the food chain, and longer lived animals accumulate greater concentrations of contaminants in their tissues ... Environmental contaminants have been found in human breast milk and in bovine milk so these media are also possible routes of exposure.'**
'Hormonally Active Agents in the Environment' National Academy Press USA 1999 p116

Scientists have known about the connection between dietary contaminants and cancers for many years because **'both animal studies from the 1960s and human studies from the 1970s confirm the fact that these dietary contaminants cause cancer. Some studies show that carcinogens concentrate in breast tissue, while other studies prove the point in a different way by showing higher concentrations of these carcinogens in the blood of breast cancer patients.'**
Epstein Steinman & LeVert 'The Breast Cancer Prevention Program' Macmillan 1998 p183

The nutritional value of food is significant since we now know that high levels of saturated fat, sugar and salt in our diet can contribute to conditions such as cancer, diabetes and coronary disease. Unfortunately, the fresh, unprocessed foods we are advised to eat for their greater nutritional value are not free of contaminants of the kind that are significant for breast cancer.

Fish

Many studies show the presence in wild fish of pollutants known to be hazardous to human health e.g. phthalates, dioxins, PCBs and brominated flame-retardants. Larger amounts occur in the fattier (more oily) species such as herring and salmon, where they accumulate in fatty tissues. Contamination levels are such that **'most fish sold in supermarkets across Europe would be banned from sale if fish had the same limits for dioxin as milk, eggs, meat or other regulated food.'**
Gunnar Lind 'REACH: What happened and Why?'
The Greens/European Free Alliance in the European Parliament 2004 p24

Yet, writes The Guardian correspondent Ian Sample, **'the virtues of eating fish, which arise largely from the oily fats they contain, still stand, despite warnings that fish absorb and concentrate environmental contaminants such as mercury, DDT, dioxins and PCBs from sea water and the species they feed on ... The problem is acute in salmon because they're fatty and toxins accumulate in fatty tissue. Unsurprisingly, farmed salmon are more prone to contamination, as they are fatter than their wild cousins.'**
The Guardian 'Chemical World' p26 May 15 2004

The government's response to contaminants in oily fish is a recommended limit of two portions per week for girls, for pregnant or breast-feeding women, and for women who may become pregnant in the future. Up to

four portions per week is the limit recommended for boys and all other adults.
Food Standards Agency UK 2003

Fruit and vegetables

These two food groups – promoted by government for their nutritional value and regularly tested – have been shown to be contaminated by substances associated with cancers, including breast cancer. The latest official figures for pesticide residues in food, reported by writer Jeremy Watson, showed that more than 40% of fresh fruit and vegetables sold by supermarkets were contaminated by toxic chemicals. Growers had promised voluntary reductions in pesticides use but analysis of over 4,000 samples revealed that **'overall contamination has barely come down over the past five years.'** For example, the chemicals found on almost all citrus fruits are associated with **'a range of cancers, diseases of the immune system, hormonal changes and declining sperm counts.'**
The Scotsman May 23 2004

Authors of 'The Breast Cancer Prevention Program' explain that dietary contaminants specifically affect breast tissue **'in two different, though related, ways. They may be carcinogenic to the breast and other organs in experimental animals, which means that they trigger healthy cells to become cancer cells by deranging their DNA. Or they may be pseudoestrogenic, which means that they act like female sex hormones although they are structurally very different ... Several contaminants, including the pesticide atrazine, have both carcinogenic and estrogenic effects, which makes them particularly dangerous.'**
Epstein Steinman & LeVert 'The Breast Cancer Prevention Program' Macmillan 1998 p177

Toxicopathologist, Dr Vyvyan Howard, is a member of the government's advisory committee on pesticides. He is concerned about the potential health effects of multiple residues and believes **'there is sufficient evidence already that the pesticide cocktail effect is producing changes. Exposure to chemicals that disrupt hormones in the womb could be the cause of the decreased age of puberty in girls and early onset of puberty is linked to a greater chance of developing breast cancer later in life.'**
Jeremy Watson The Scotsman May 23 2004

Dietary fat

The widely promoted view that high intake of dietary fat constitutes a risk for breast cancer is challenged by Professor Epstein: **'The much-touted role of fat consumption, while clearly linked to heart disease, is based on tenuous and contradictory evidence with regard to breast and colon cancers. The evidence certainly does not justify the wild claims by lifestyle theorists that some 30 to 40 percent of all cancers are due to faulty diet ...'**
Epstein 'Losing the War Against Cancer: Who's to Blame and What to do About It'
p58 International Journal of Health Services Vol 20 no1 1990

A large-scale 1987 study based on the eating habits of nearly 90,000 nurses concluded that **'there is no association between dietary fat and breast cancer. However, US diets are contaminated with a wide range of carcinogens that concentrate in fatty foods and whose presence is not disclosed to the consumer.'**
W Willett et al 'Dietary Fat and the Risk of Breast Cancer' pp22-28 New England Journal of Medicine 316 1987

Occupation

> **The prevention of cancers attributable to occupational and environmental exposures is primarily achieved by regulatory action. Relevant measures include replacement of carcinogens with alternative chemicals or processes, improved ventilation ... A significant reduction in occupational cancers attributable to implementation of preventive measures has been demonstrated in many instances. However, there remains a burden of past exposure.**
> UN 'World Cancer Report 2003' p135

The occupational origins of some cancers were identified a long time ago. For example, **'coal soot in 1775, bitumen coal tar in 1876, coal tar fumes in 1936, shale paraffin oil in 1876, and petroleum paraffin oil in 1910, lubricating oils in 1910 and 1930, creosote in 1920, benzene in 1928, arsenic in 1822, nickel in 1932, and chromates in 1935.'**
Hubert and Barth

The reasonable assumption would be that regulation follows the identification of occupational health hazards. In fact, two centuries-worth of data about occupational cancers have had little effect on regulations to reduce risks from exposures to carcinogenic agents in the workplace. Clearly, as observed by Professor Andrew Watterson, **'inaction cannot be explained by lack of data.'** He describes the continuing situation in the UK, where **'it is generally assumed that work does not cause occupational illness unless an extensive body of research data is provided and a very high level of proof of causality established.'**
'Why We Still Have 'Old' Epidemics and 'Endemics' in

Occupational Health: Policy and Practice Failures and Some Possible Solutions' by Professor Andrew Watterson 'Health and Work: Critical Perspectives' (Eds N Daykin & L Doyal) Macmillan UK pp110, 121

Occupational risks for breast cancer

Approximately 200 substances have been identified as breast carcinogens in laboratory tests on animals but few have been studied in worker-exposed populations. A review of more than 100 studies in occupational cancer, conducted over the past 25 years, concludes that **'few high-quality studies directed specifically towards women have been carried out to allow the unambiguous identification of occupational risk factors for breast cancer.'**

F Labreche & M Goldberg 'Exposure to organic solvents and breast cancer in women: a hypothesis' pp1-14 American Journal of Industrial Medicine 32 1997

What is known about occupational risks for breast cancer? Very little it seems: **'Decades after women first started working in high-risk occupations in the manufacturing and chemical industries, neither the cancer establishment nor the public has recognised the risks of breast cancer involved.'**

S Epstein D Steinman S LeVert 'The Breast Cancer Prevention Program' Macmillan USA 1997 p273

A recent Canadian study based on the occupational histories of cancer patients revealed an unexpected predominance of breast cancer in women working in farming occupations. The study report concludes: **'This excess cancer burden occurs within a population that has generally been viewed as 'healthier' given their reported lower rates of smoking, greater levels of physical activity, and possibly healthier diets. Their lower rates of total mortality, heart disease and several cancers, including cancers of the lung, oesophagus, colon and bladder, have suggested that the etiologic [causal] triggers of these excess cancers may be exposures to pesticides (insecticides, herbicides, fumigants, fungicides), solvents, engine exhaust fumes, welding fumes, viruses and microbes.'**

J Brophy M Keith K Gorey E Laukkanen D Hellyer A Watterson A Reinhartz M Gilbertson 'Occupational Histories of Cancer Patients in a Canadian Cancer Treatment Center and the Generated Hypothesis Regarding Breast Cancer and Farming' pp346-353 International Journal of Occupational and Environmental Health 8 2002

Duration of exposures to occupational factors is also significant, as shown by a study of breast cancer risk in flight attendants, whose work exposes them to more than average amounts of both ionising and non-ionising radiation, particularly electro-magnetic fields. This study, undertaken by the University of Iceland's Department of Preventive Medicine, indicated that **'occupational factors may be an important cause of breast cancer among cabin attendants,'** and therefore a higher risk for women employed as airline cabin attendants for five or more years.

V Rafnsson P Sulem H Tulinius J Hrafnkelsson 'Breast cancer risk in airline cabin attendants: a nested case-control study in Iceland.' pp805-809 Occupational and Environmental Medicine Vol 60 no11 November 2003

Is gender important in occupational risk?

Professor Karen Messing is one of many researchers of occupational health and calls for greater attention to be paid to the differences in response to occupational exposures between men and women.

'Biological differences between the sexes may affect responses to workplace toxins. For example, bone, fat, and immune system metabolism as well as cardiovascular and endocrine function are all known to differ by sex. Little, however, is known about the implications of these differences for the effects of toxic exposures.'

Professor Karen Messing et al 'Be the Fairest of Them All: Challenges and Recommendations for the Treatment of Gender in Occupational Health Research' p621 American Journal of Industrial Medicine 43 2003

Existing data about occupational risks for breast cancer may be limited, but when considered alongside long-term observations of health workers and employee health records, it does provide clear evidence of **elevated incidence** in certain occupations. Occupational studies provide fairly consistent evidence for **elevated risks** associated with exposures to specific substances. For example, nurses represent one group with elevated risk because their work involves substantial exposure to chemicals.

Increased risk is associated with occupations involving extensive use of organic solvents for more than one year e.g. work with metal products, wood, furniture, printing, chemicals and textiles.

Higher potential risk is associated with occupational exposures to solvents such as formaldehyde, methylene chloride and carbon tetrachloride, and to benzene, pesticides, styrene, acid mists, and some metals. Often-overlooked white collar jobs involve chemical exposures common to indoor work areas, such as:

- solvents in inks, cleaning materials, dyes, air sprays
- pesticides for control of insects, moulds
- second-hand tobacco smoke
- flame retardants in furnishings, fabrics and electrical office equipment e.g. copiers, computers.

The micro-electronics industry

In terms of exposure to toxic chemicals, the highest potential health risks for women are to be found in

industries that are the largest users of chemicals. These are chemical, micro-electronics and textile manufacturers – the last two being major employers of women. Because of the intensity of their potential exposure to toxic substances implicated in breast cancer, women working in the micro-electronics industry represent both a 'high-incidence' and 'high-risk' category for this cancer.

Micro-electronics is a relatively new industry producing components for expanding technologies in communications e.g. computers and cell phones. The semiconductor (silicon chip) sector of the industry uses toxic metals, solvents, resins, gases, plasmas and acids in processes requiring hundreds of different chemicals, some of which are known or suspected carcinogens and EDCs. **'Silicon wafers, each about the size of a dinner plate, are imprinted and etched with various acids and solvents to create a three-dimensional pattern that ultimately will carry electric signals through a maze of microscopic wires. At each step (in the process) they are immersed in a chemical bath to render them smooth. To alter the chips' conductivity, chemicals such as arsenic are applied to portions of each wafer.'**
Susan Stranahan 'The clean room's dirty secret' p44
Mother Jones March-April 2002

Chips and components containing chips e.g. circuit boards and computer hard drives, are made in the 'clean room'. It is here that low-level, long-term exposure to a vast array of vaporised chemicals re-circulating and reacting with one another in the air – and particularly those which accumulate in fatty tissues – create a serious health hazard for workers.

According to industry critics, protective clothing and air purifying and monitoring systems currently provide workers with insufficient and inefficient protection from the effects of chemicals exposures. Katherine Hammond, Associate Professor of Health Sciences at the University of California, has studied operations at many semiconductor plants and describes standard clean-room equipment as being designed to keep airborne particles – e.g. dandruff or dust – from contaminating products during their manufacture, **not** for removing chemicals from the air. In other words, **'they protect the silicon-wafers from the people, not the people from the chemicals.'**
Bill Richards staff reporter 'Chip plants not safe'
The Wall Street Journal October 5 1998

The National Semiconductor (US) plant at Greenock, Scotland, began production in the 1970s using equipment from the US. Former employees reported frequent gas and chemical exposures in the clean room. **'In 1998 about 50 workers filed a class action lawsuit against the plant, demanding compensation for cancer, birth defects in their children, undue miscarriages and other illnesses.'**
Andrew Watterson & Joseph Ladou 'Health and Safety Executive Inspection of UK Semiconductor Manufacturers' pp392-395 International Journal of Occupational and Environmental Health Vol 9 no4 October/December 2003

'In 2001, a small government (Health and Safety Executive (HSE)) study of cancer rates at the Greenock plant found higher than average rates for certain cancers – specifically brain in men and lung, gastric and breast in women.'
Bill Richards staff reporter 'Chip plants not safe'
The Wall Street Journal October 5 1998

In 2002, the HSE inspected 25 semiconductor plants in the UK, selecting the production processes for particular attention, **'where carcinogens or suspected carcinogens were likely to be used in semiconductor manufacture.'** The inspection failed to measure ambient levels of chemicals in 'clean rooms' and made no mention in its report **'of any carcinogens other than arsenic, of which there are many in semiconductor clean rooms. Moreover, the exposures of clean room workers to chemical mixtures and reactant products were not assessed or discussed. The exposure of workers to ionizing and non-ionizing radiation went without inspection or consideration. Many of the most serious problems of worker exposure in the semiconductor industry were not addressed at all.'**
Andrew Watterson & Joseph Ladou 'Health and Safety Executive Inspection of UK Semiconductor Manufacturers' pp392-395 International Journal of Occupational and Environmental Health Vol 9 no4 October/December 2003

The HSE's inspection report concluded: **'There is no definite proof that working at the plant has caused an increased risk of employees developing cancer.'**
'Inspections by the Health and Safety Executive in 2002 of manufacturers of semiconductors in Great Britain'

Numerous scientific studies have established that certain chemicals used in manufacturing semiconductors are statistically associated with increased rates of reproductive problems and various types of cancers. Of particular risk to women of childbearing age is chronic exposure to solvents. Studies by the chemical industry and US National Institute of Occupational Safety and Health (NIOSH) in the 1980s provided conclusive evidence that solvents (glycol ethers) were hazards for the human reproductive system. Use of glycol ethers continued in most chip plants until their phase-out in the 1990s, prompted by an industry-sponsored study linking glycol ethers to a 40% increase in miscarriage rates among chip workers in 1989.

According to Joseph Ladou, Director of the International Center for Occupational Medicine, University of California, San Francisco, **'several other chemicals listed in the study are suspected reproductive hazards – hydrogen fluoride, xylene and n-butyl acetate – are still used in chip plants.'**
Bill Richards staff reporter 'Chip plants not safe' The Wall Street Journal October 5 1998

Conclusion
The situation for women employed in the micro-electronics industry exemplifies the urgent need for a major, independent and comprehensive research-based enquiry into gender-specific health risks for women working in industries manufacturing or using carcinogens and EDCs.

Although studies of occupational health risks drawn from women's work histories and experiences are urgently needed, associations can be drawn from existing data to provide enough evidence:
- of increased risk of breast cancer for women experiencing specific occupational exposures
- on which to base precautionary-based regulations to protect women from workplace hazards.

5.2 When are we exposed?

> **Because cancer is a multi-causal disease that unfolds over a period of decades, exposures during young adulthood, adolescence, childhood – and even prior to birth – are relevant to our present cancer risks.**
> Dr Sandra Steingraber 'Living Downstream' Virago UK 1998 p267

Human exposures to carcinogens and endocrine disruptors can occur at any stage of human development, from conception to death. As well as differing from males – body weight, body mass, fat-to-muscle ratios, reproductive functions and hormones – women are particularly vulnerable to biological damage from exposures:
- during periods of illness or trauma
- during pregnancy
- during the foetal development, early childhood and pubertal stages of life
- in the period from puberty to first pregnancy
- in the period after menopause
- in old age.

The foetal stage

> **The process that unfolds in the womb and creates a normal, healthy baby depends on getting the right hormone message to the fetus at the right time.**
> T Colborn D Dumanoski J Peterson Myers 'Our Stolen Future' Little Brown & Co UK 1996 p204

Numerous studies show that:
- the foetus is exceptionally vulnerable to effects of toxins from both the internal and external environment
- exposures, particularly to EDCs and carcinogens, at the foetal stage affect subsequent susceptibility to breast cancer, and to many other disease and developmental problems in later life.

According to toxicologists Linda Birnbaum and Suzanne Fenton of the US Environmental Protection Agency (EPA): **'Industrial chemicals, drugs, and radiation have been associated with an elevated incidence of neoplasms [new tumours] in both experimental animals and in humans after early life-stage exposure. Prenatal exposure to natural and synthetic estrogens is associated with increases in breast and vaginal tumors in humans as well as uterine tumors in animals ... Implications of these new findings suggest that causes of endocrine-related cancers or susceptibility to cancer may be a result of developmental exposures rather than exposures existing at or near the time of tumor detection.'**
'Cancer and Developmental Exposure to Endocrine Disruptors' pp389-390 Environmental Health Perspectives Vol 111 no4 April 2003

Of greatest concern to many in the scientific community are the long-term effects of early life exposures, such as **'how exposure in the womb can affect children's mental development, increase their risk of cancer, reduce their defence against disease or their ability to conceive and bear children themselves later in life.'**
Gwynne Lyons 'Chemical trespass: a toxic legacy' Executive Summary p3 WWF-UK June 1999

Reasons for the extreme vulnerability of developing foetuses exposed to toxins include:
- the placenta not providing the protective barrier that was assumed in the past, **'illustrated by measurements of detectable levels of synthetic chemicals in cord blood, reflecting placental transfer.'**
  F Brucker-Davis K Thayer T Colborn 'Significant Effects of Mild Endogenous Hormonal Changes in Humans: Considerations for Low-Dose Testing' p25 Environmental Health Perspectives 109 (supplement 1) March 2001

- the protective placenta and the blood-brain barriers not being completely formed during the foetal stage

- undeveloped capacity to metabolise and eliminate substances, **'leaving the fetus and the newborn particularly susceptible to adverse effects of environmental compounds.'**
  L Birnbaum & S Fenton 'Cancer and Developmental Exposure to Endocrine Disruptor pp389-390 Environmental Health Perspectives Vol 111 no4 April 2003

- the fact that **'during pregnancy, body fat will be mobilised, releasing stored toxins, which reach the baby in the womb and in breast milk.'**
  Dr Vyvyan Howard 'Chemical World' p23 The Guardian May 15 2004

Infancy to pre-puberty
In April 2004, the Ontario College of Family Physicians (OCFP), representing more than 6,700 family doctors, published a comprehensive review of pesticide research. This report identifies children as the group at greatest risk of serious illness and disease because of their constant exposure to low levels of pesticides in their food and their environment. The latter is as a result of the widespread use of pesticides in homes, gardens and public spaces. **http://www.ocfp.on.ca**

More than ten years earlier, a National Academy of Sciences (NAS) report, 'Pesticides in the Diets of Infants and Children' concluded: **'Exposure to pesticides early in life can lead to a greater risk of chronic effects that are expressed only after long latency periods have elapsed. Such effects include cancer, neuro-developmental impairment, and immune dysfunction.'**
National Academy Press Washington DC USA 1993

Toxicologists explain that during the early-life period of exceptionally rapid growth, the developing child **'is particularly susceptible to environmental insult, because development is a highly integrated process in which high rates of (cell) proliferation and extensive (cell) differentiation are coordinated with each other and with programmed cell death.'** Such rapid growth rates **'offer multiple opportunities for the initiation of lesions [cell damage] as well as the promotion of the growth of altered cells; these are hallmarks of the complex process known as cancer.'**
Linda Birnbaum and Suzanne Fenton 'Cancer and Developmental Exposure to Endocrine Disruptors' pp389-390 Environmental Health Perspectives Vol 111 no4 April 2003

Early development is further explained as a period of high-risk because, relative to their size, **'children are exposed to more toxic chemicals in food, air and water than adults because they breathe twice as much air, eat three to four times more food, and drink as much as seven times more water.'**
'Chemicals and Health in Humans' p5 WWF briefing May 2003

Scientific knowledge about the exceptional vulnerability of children to lifelong, irreversible effects from exposures to environmental contaminants has made no impact on a regulatory system in which exposure levels deemed 'safe' for adults are still assumed to be equally safe for children.

Breast milk
More than 350 man-made contaminants have been found in human breast milk. Any chemicals stored in human body fat can potentially transfer to the newborn infant during breast feeding. Dr Sandra Steingraber, an internationally renowned scientist with personal experience of cancer, describes human breast milk as **'the most chemically-contaminated food on the planet.'** She chose to breastfeed both her children, in the knowledge that despite the presence of toxins, **'breast milk is absolutely the best food for human infants. The data on the health benefits of breast milk are absolutely unanimous that babies who are breastfed are healthier, they die less often in their first year of life and they enjoy health benefits for a lifetime.'** Use of formula milk as a substitute for breast milk is not a solution to contaminants in breast milk because it is also likely to be chemically contaminated.

It is her opinion that **'any chemical, (a) known to be inherently toxic and (b) known to accumulate in mothers' milk, has no place in the 21st century economy and we need to immediately phase out any dependency our economy has, whether industrial or agricultural, on the use of this chemical.'**
Rachel Carson Memorial Lecture London December 2003 'Pesticides News' (number 63) p16 March 2004

> **We need to develop a "child-centred" regulatory system for chemicals and there seems little doubt that this will need to include the phasing out of persistent bioaccumulative organic chemicals.***
> Dr Vyvyan Howard quoted by John Humphrys in 'The Great Food Gamble' Hodder and Stoughton UK 2001 p70

Critical periods in female development
Although a woman is vulnerable to adverse effects from internal and external environments throughout her life, there are particular stages in her development when breast cells are more than usually susceptible to damage.

*'Organic chemicals' means those made from a carbon base.

This knowledge is the imperative for reducing exposures to all cancer-causing agents during critical periods in a woman's life. For example: **'Greater susceptibility to genotoxic agents is expected during periods of rapid breast cell proliferation, such as prenatal, perinatal, and pubertal time periods and during pregnancy.'**
J Brody & R Rudel 'Environmental Pollutants and Breast Cancer' p1010 Environmental Health Perspectives Vol 111 no8 June 2003

Radiation risks for girls during three critical periods have consistently been confirmed by studies. These show that **'females exposed to radiation prior to puberty have a much greater risk of developing breast cancer than do older women subject to the same level of exposure ... Radiation during the critical periods when breast cells are first forming prenatally or during early adolescence induces proportionally more neoplastic transformation of cells and is thereby more carcinogenic than exposures that occur later in life.'**
D Davis D Axelrod L Bailey M Gaynor A Sasco 'Rethinking Breast Cancer Risk and the Environment: the Case for the Precautionary Principle' p524 Environmental Health Perspectives 106 (9) September 1998

'Breast cells are not fully mature in girls and young women prior to their first full-term pregnancy. Breast cells which are not fully mature bind carcinogens more strongly than, and are not as efficient at repairing DNA damage as, mature breast cells.'
Adapted from 'The Biology of Breast Cancer' fact sheet (R Clark R Levine S Snedecker)
Program on Breast Cancer and Environmental Risk Factors in New York State (BCERF) 2003

'There is particular concern about the effects of EDCs for exposures that take place when levels of endogenous [produced in the body] hormones are very low, such as in utero or during prepubertal, or post menopausal time periods.'
J Brody & R Rudel 'Environmental Pollutants and Breast Cancer' p1011 Environmental Health Perspectives Vol 111 no8 June 2003

Human exposure to all EDCs (especially during pregnancy), and their release to the environment should be minimised on grounds of prudence.
'Endocrine disrupting chemicals (EDCs)' p3 Royal Society UK June 2000

5.3 Where are we exposed?

Except for the original blueprint of our chromosomes, all the material that is us – from bone to blood to breast tissue – has come to us from the environment.
Dr Sandra Steingraber 'Living Downstream' Virago UK 1998 pp266-267

Environment
Changes to the environment in the last half century have been rapid and dramatic. **'In the last decades the release of large quantities of synthetic chemicals such as solvents, plasticizers, insecticides, herbicides and fungicides into the environment, through industrial, agricultural, medical and domestic activities has created considerable ecotoxicological problems with heavy consequences for human health and generally for all living organisms.'**
Enrica Galli 'The Role of Micro-organisms in the Environment Decontamination'
'Contaminants in the Environment: A multidisciplinary assessment of risks to man and other organisms' Eds A Renzoni N Mattei L Lari M Fossi Lewis Publishers UK 1994 pp235-236

In every man-made and natural environment we occupy we are exposed to toxins, many of which are carcinogens and endocrine disruptors. These are present in the water we drink, the air we breathe, the food we eat, the places we play in, the houses we live in, the machines we use, the cars we drive, the places we work and in the ways we dispose of waste (landfills, incinerators).

Toxins are substances that have the ability to cause illness and disease, including cancer, genetic mutations, behavioural abnormalities, physiological or reproductive malfunctions and physical deformities in any organism or its offspring. Toxins become more toxic as they concentrate and move through the food chain and combine/react with other substances.

'Metabolic [bodily absorption and breakdown] pathways for naturally occurring chemicals have been developed over millennia. This is not the case for the majority of man-made chemical compounds. These persistent toxic substances:
- **remain in the biophysical environment for long periods of time**
- **become widely dispersed**
- **bioconcentrate in plants and animals, including humans.**

The ecosystem is unable to break many of these toxic man-made substances down because they have been developed precisely not to be readily metabolized and detoxified.'
'The Primary Prevention of Cancer' p30 Ontario Task Force Report 1995

Environmental pollutants and cancer
Medical oncologist Professor Dominique Belpomme reports that in France, **'between 70% and 80% of cancers are now due to environmental pollution from chemicals such as polycyclic aromatic hydrocarbons [PAHs], polyvinyl chloride [PVC], some heavy metals, nitrites, dioxins, some food additives and pesticides.'**
'Pesticides News' No 63 p6 March 2004

Meanwhile, **'studies in laboratory animals, in vitro [tests on cells/tissues] assays, and wildlife provide further evidence of mechanisms for effects of environmental pollutants on breast cancer risk through exposure to compounds that mimic or disrupt hormones that promote or inhibit tumor growth, act as breast carcinogens, or affect the development and vulnerability of the breast.'**
J Brody & R Rudel 'Environmental Pollutants and Breast Cancer' p1009 Environmental Health Perspectives Vol 111 no8 June 2003

Living with environmental hazards

> **We can encounter synthetic chemicals when we rock our babies, relax on our sofas, watch TV, or enjoy a delicious dinner. All of us have an intimate relationship with synthetic chemicals, whether we want to or not – chemicals that invisibly surround us in our products, our air, our water, food and land – chemicals that are getting into our bodies even if we try to avoid them.**
> Joseph DiGangi (Environmental Health Fund USA) Foreword 'REACH What Happened and Why?' by Gunnar Lind
> The Greens/European Free Alliance in the European Parliament 2004

Dr Cathy Read reminds us that hazardous chemicals are not all 'out there'. **'Over the last few decades we have brought numerous chemicals into our homes and gardens, cosmetically concealed in tins, sprays and boxes to clean, shine, polish and kill all manner of crawling and flying pests. The insecticides and herbicides which we worry about farmers using have been liberally used around gardens and homes for several decades.'**
'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 p216

In 2002, a Greenpeace analysis of house dust samples taken from 100 homes across the UK more than confirmed this reality: All samples contained phthalates, brominated flame retardants and organotins; 75% also contained alkylphenols and chlorinated paraffins. All except one contained a range of industrial chemicals e.g. solvents and pesticides.

Guardian writer Hilary Freeman's article 'House of Horrors' describes the average Briton's home as **'almost certainly swimming in a cocktail of chemicals, many of which have been linked to allergies, cancers and infertility. These chemicals line your walls, carpets and flooring. They emanate from curtains, PCs, toiletries, even children's toys. And while the products you rely upon to keep your home clean do wipe out bacteria and viruses, they also spread toxic chemicals across every surface.'**
The Guardian (Health p8) January 13 2004

Helen Lynn, Campaigns and Health Co-ordinator of the Women's Environmental Network, advises that, **'at least until the laws allowing such toxic substances into our homes are changed, we'd be better off ... cleaning our homes with lemon juice, vinegar and bicarbonate of soda, choosing furnishings, cosmetics and toiletries that are as natural as possible and demanding products that are not just fit for their immediate purpose but are safe in all respects.'**
The Guardian (Health p8) January 13 2004

Cosmetics
Many of the 5,000 chemicals used in cosmetics and toiletries have not been properly safety-tested. Some can trigger allergic reactions or chemical sensitivity, others are suspected EDCs and have been linked to reproductive disorders, effects on the immune system and cancer. One family of widely used cosmetics ingredients used as preservatives – parabens – have been found in a small study sample of human breast tumours. Parabens have since been removed from most brands of deodorants and antiperspirants but are still used in many other cosmetics products where they have the ability to penetrate the skin.
'Concentrations of parabens in human breast tumours' Darbre et al pp5-13 Journal of Applied Toxicology Vol 24 issue1 2004
www.annieappleseedproject.org/deodorantissue.html

> Toxicopathologist, Dr Vyvyan Howard's rule-of-thumb regarding any substance in the environment:
> **If we evolved with it, we have a fair chance of coping with it, and if we haven't, there's a fair chance it will cause harm. When things persist in our bodies, it tells us that we're not very good at breaking them down. There is a double jeopardy if we know they are toxic.**
> Quoted by Felicity Lawrence The Guardian 'Chemical World' p7 May 15 2004

Air, soil and water

> **Exposure to environmental carcinogens causes cancer, and it is therefore obvious that measures of primary prevention aimed at avoiding or drastically reducing exposures will be the most efficient way to prevent environmentally associated cancers.**
> Lorenzo Tomatis & James Huff National Institute of Environmental Health Sciences Research USA Editorial
> 'Evolution of Cancer Etiology and Primary Prevention' Environmental Health Perspectives Vol 109 no10 October 2001

The elements that sustain life are air, soil and water, and the quality of each is crucial to human health.

Outdoor air

Exhaust emissions are a major source of airborne contaminants in urban and industrial areas, and **'cars and other vehicles powered by fossil fuels contain a number of suspected carcinogens, including benzene and polycyclic aromatic hydrocarbons (International Association for Cancer Research (IARC) 1994).'**
'The Primary Prevention of Cancer' p30 Ontario Task Force Report Department of Health Ontario Canada 1995

Indoor air

A large number of toxins from the air can become concentrated in our homes and offices. Derrick Crump from the UK's Building Research Association, describes indoor air as **'a cocktail of volatile organic compounds from all furnishings, paints and cleaning products ... it means the concentration of the broad sweep of chemicals you find indoors is 10 times higher than you might get outdoors due to traffic and industry.'**
Chemical World Series part 3 'Home and Garden' The Guardian May 22 2004

In the UK **'most of us spend an average of 90% of our lives indoors, the highest proportion of this being in winter, when indoor air pollution is at its worst. We are thus much more likely to breathe in and absorb into our bodies any gas, vapour or airborne particle that escapes into the air indoors. Without adequate ventilation, we are in danger of concentrating our own home-produced pollutants to the point where our health may be threatened.'**
Edward Harland 'Eco-Renovation: The Ecological Home Improvement Guide' Green Books UK 1993 p122

Studies of household dust show that indoor air can be contaminated by:

- a build-up of chemicals released from use of cosmetic, personal care, cleaning, art and craft products
- vapours off-gassing from fabrics (curtains, cushions, upholstery), floor coverings, electrical goods (TVs and computers), interior decorating materials (paint, varnishes)
- sources of combustion such as gas, oil, wood, coal, kerosene, and tobacco products
- central heating and cooling systems
- pollutants in air outside the home e.g. traffic fumes, pesticides.

Public information produced by the Environmental Protection Agency (EPA) in the US details common sources of indoor air pollutants: **'Some sources, such as building materials, furnishings and household products like air fresheners, release pollutants more or less continuously. Other sources, related to activities carried out in the home, release pollutants intermittently (e.g. tobacco smoke, malfunctioning ovens and heaters, solvents, glues, paint strippers, pesticides, cleaning products) ... High pollutant concentrations can remain in the air for long periods after some activities. High temperatures and humidity levels can also increase concentrations of some pollutants. Health effects from indoor air pollutants many be experienced soon after exposure or, possibly, years later ... or only after long or repeated periods of exposure. These (longer-term) effects, which include some respiratory diseases, heart disease and cancer, can be severely debilitating or fatal.'**
Indoor Air Quality fact sheet US Environmental Protection Agency (EPA)

Soil

> **The lesson of history is that, even in temperate Europe, soil is all too vulnerable to foolish and greedy farming practices.**
> John Humphrys 'The Great Food Gamble' Hodder and Stoughton UK 2001

Little is known about the quality, condition and general state of the soil in Britain today. What is known is that depleted, contaminated or undernourished soil is unable to sustain life. **'Microorganisms play an important role in the natural cycling of elements. In fact, they are widely distributed in soil and water, where they are able to degrade and utilize for growth naturally occurring compounds synthesized by plants and animals.'**
Galli 'The Role of Micro-organisms in the Environment Decontamination' p235 in 'Contaminants in the Environment: A Multidisciplinary Assessment of Risks to Man and Other Organisms' Eds A Renzoni N Mattei L Lari MC Fossi. Lewis Publishers 1994

Problems for health and environment are created by synthetic chemicals and materials that have been designed to persist in unaltered states in the environment. Whereas micro-organisms aid the gradual breakdown of natural compounds, the majority of synthetic compounds remain unaffected and unchanged **'because microorganisms lack the enzymes necessary for their disintegration.'**
Günter Fellenberg 'The Chemistry of Pollution' John Wiley & Sons UK 2000 p71

Conventional farming practice uses a non-selective approach to pest and disease control. Broad-scale application of more than 2,000 synthetic compounds registered as pesticides in 1990 tends to destroy not only the target but many other life forms both above and below ground, including the micro-organisms crucial to soil quality.

By contrast, the number of pesticides used by organic farmers is limited to 25 plant-derived compounds. Organic farming is a selective and sustainable approach to food production, pest control and soil management which **'seeks to avoid, as far as possible, the use of outside inputs. In general, nutrient supply, weeds, pests and disease control are achieved by rotational practices including legumes, recycling of manures and vegetable residues, variety selection and the creation of a diverse ecology within and around cropped land. If outside inputs are required, then the least environmentally disruptive – at soil, plant and human level – are used.'**
Nigel Dudley 'Nitrates: The Threat to Food and Water' Green Print UK 1990 p110

Radio journalist and farmer John Humphrys believes soil is an undervalued natural resource. **'The soil survey programmes of Great Britain once collected valuable information on the nature and quality of soils across our rich and varied landscapes. But all of them have been suspended for the past fifteen years. In 1996 the Royal Commission on Environmental Pollution reported that there was serious cause for concern over what was happening to the soil.'**
'The Great Food Gamble' Hodder and Stoughton UK 2001 p130

A number of encouraging actions have followed the Royal Commission's 1996 recommendation for implementing a national soil strategy in the UK. A Soil Action Plan for England was launched in 2004 and Wales is in the process of developing its own soil strategy. Concerns about the degradation of soils in the European Union (EU) have led to the on-going development of a Europe-wide strategy to protect soils. Launching the strategy, EU Environment Commissioner Margot Wallström said: **'We are now placing soil protection on a level with cleaning up our water and air. For too long, we have taken soil for granted. However, soil erosion, the decline in soil quality and the sealing of soil are major problems across the EU. This is a sustainability issue given that these trends are largely irreversible and that soil is vital for our livelihood.'**

Water

Many harmful or suspect chemicals [in drinking water] can't be tasted or smelled even at dangerous levels.
Jeffrey Steingarten 'The Man Who Ate Everything' Headline USA 1998 pp61-62

The quality of the water we drink and use to prepare and cook our food is vital to our health. As domestic water supplies are now controlled by private water companies, there can be considerable variation in water quality. The quality of the water supplied to our homes will depend on many factors. As well as the main constituents of natural water – oxygen, carbon dioxide and salts – there are **'additives such as chlorine and aluminium nitrate that are designed to kill bacteria and settle contaminants. After this comes the increasing list of pollutants that are contaminating the sources of mains supply water, whether from ground water, rivers, lakes or reservoirs.'**
Edward Harland 'Eco-renovation: The Ecological Home Improvement Guide' Green Books UK 1993 p130

Ecologists and researchers noted that the 'new' freshwater pollution problems in developed countries – **'oxygen depletion, eutrophication, heavy metal contamination, acidification, toxic chemicals and nitrates began to be manifested from the 1950s onward.'**
M Meybeck et al 'Global Freshwater Quality: A First Assessment' Blackwell UK 1989 p53

Chemicals contaminate rivers and streams that feed water supply sources:
- by leaching, seeping from sewage, waste disposal areas and landfill sites
- through discharges from industrial sites
- from run-off into streams following crop or soil treatments
- from pollutants carried in rainfall.

'An increasing number of rural and urban communities have found themselves located on or near hazardous waste sites, or downstream, downgradient or downwind from such sites. Particularly alarming is growing evidence of contamination of groundwater from hazardous waste sites, contamination that poses grave hazards for

centuries to come. Once contaminated groundwaters are difficult, and sometimes impossible, to clean up.'
Professor Sam Epstein 'Losing the War Against Cancer: Who's to Blame and What to do About It' pp53-71 International Journal of Health Services Vol 20 no1 1990

Drinking water
The public water supply system is a major source of human exposure to chemical carcinogens and EDCs. Carcinogens are formed as a by-product of the disinfection process in water treatment. Disinfection is achieved by adding an oxidant, most commonly chlorine, during the water filtration stage to destroy micro-organisms such as bacteria and viruses that would otherwise pass through.

'Chlorine is, by far, the most common disinfectant used to treat drinking water; but other oxidants, such as chloramines, chlorine dioxide, and even ozone are also used. However, each of these disinfectants can also produce disinfectant by-products, which may be carcinogenic or otherwise deleterious.'
'Pollution Science' Eds I Pepper C Gerba M Brusseau Academic Press Inc USA 1996 pp317-318

For example, chlorine reacts with other organic (carbon-based) substances present in water. This reaction creates hundreds of chemical by-products – trihalomethanes – some of which are carcinogenic. **'The most widely recognized chlorination by-products include chloroform, bromodichloromethane, bromoform and dibromochloromethane ... these compounds are formed by the reaction of chlorine with organic matter – largely humic acids – naturally present in water ... Many of these by-products are classified as possible carcinogens.'** As above

As long ago as 1986 the carcinogen nitrate was recognised as a serious threat to human health in Britain's drinking water. **'Nitrate forms the basis of the bulk of the artificial fertilizers applied to the land ... (with resulting) high levels ... accumulating in food and water ... Nitrate is a proven carcinogen in 30 species of animals.'** Brian Price 'Pollution on Tap' Green Britain or Industrial Wasteland? Eds Edward Goldsmith & Nicholas Hildyard Polity Press UK 1986 pp238-239. Despite this fact, nitrate continues as the dominant fertilizing substance used by the agricultural industry in the UK today.

In 1994, British researchers discovered that alkylphenol compounds (APEs), a group of chemicals widely used since the 1940s, act like oestrogen. Even trace amounts can stimulate the growth of breast cancer cells. APEs are used as surfactants (surface-active substances) in many different products e.g. paints, detergents and pesticides. As a result of their long-term environmental spread via waterways, APEs are a common contaminant in drinking water.
Source: R White et al 'Environmentally persistent alkylphenol compounds are oestrogenic' pp175-182 Endocrinology 135 1994

By 1999, additional sources of carcinogens and EDCs in drinking water had been identified by researchers for the UK government's Drinking Water Inspectorate (DWI). Their work showed that water-pipe materials e.g. rubber, plastics, resins and cements contribute to overall contamination of drinking water.
Source: 'Plastics contaminate tap water with hormone disrupters' pp4-5 ENDS Report no 293 1999

In 2002, a survey of rainwater samples from Belgium, Germany and the Netherlands showed most containing synthetic chemicals known to be EDCs and almost all samples contained synthetic musk compounds used to scent personal and cleaning products.
www.greenpeace.org

Quality of drinking water – who is responsible?*
Ten private companies manage water supplies in the UK. Drinking water quality in England and Wales is regulated by the government through the DWI. In Scotland, Scottish Water is a publicly owned body. Here, the Drinking Water Quality Regulator has powers and functions similar to those of the DWI.

The main task of the DWI is to check that the private water supply companies supply water that is safe to drink and meets the standards set in water quality regulations. Water quality is assessed by the DWI on the basis of information provided by the water companies themselves. DWI informs consumers that:

- **'nitrates from fertilisers used on farms can get into drinking water, and can harm very young children**
- **water companies have been taking action to control nitrate levels (a known carcinogen)**
- **traces of pesticides can be found in some drinking water**
- **these are the result of public use by farmers, gardeners and public authorities**
- **water companies have been installing treatment to remove pesticides from drinking water.'**

*Emissions to air and water are regulated and overseen by environment protection agencies. Installations are allowed a level of emission for each pollutant and are expected to record and report any level above this to regulatory bodies. All reported emissions are published in the European Emissions register. See www.defra.gov.uk/environment, and www.sepa.org.uk

5.4 Workplace

In the early 1900s, miners routinely took canaries into the mines. If the canaries collapsed or died, it warned the miners that life-threatening, odourless, toxic gases such as carbon monoxide were present. It is the view of occupational health expert, Dr Peter Infante, that workers exposed to cancer risks in the workplace are the 'canaries' of today: **'Blue-collar workers appear to be the canaries in our society for identifying human chemical carcinogens in the general environment. (Today, their plight is even worse because we are paying little attention to their deaths.) The fact that occupational cancer is a sentinel for identifying carcinogenic exposures in the general environment is reason alone to justify an intensified cancer research effort in the workplace. Yet, our efforts to study their exposures to carcinogens, or to develop technology to decrease that exposure, or to develop safe substitutes have been relatively minimal.'**
'Cancer and Blue-Collar Workers: Who Cares?' pp52-67 Scientific Solutions Winter 1995 USA

A National Health Service (NHS) publication informs us that many jobs today involve regular contact with known carcinogens, for example, **'benzene in rubber manufacture, wood dust from hardwood furniture, vinyl chloride used to make PVC, cutting oils used by metal workers – these are just a few.'** It further informs us that **'the Health and Safety at Work Act (1974) obliges employers to inform employees of the presence of toxic substances in the workplace and to take reasonable steps to protect workers from exposures,'** and that **'union safety representatives have the right to see industry data sheets on chemicals used in the workplace.'**
Cancer: How to Reduce Your Risks' p28 Health Promotion England 2001

Yet we learn from a WWF report that **'workplace exposure is responsible for an estimated 6,000 cancer deaths a year ... Although Health and Safety legislation exists to control hazardous chemicals, evidence and experience indicates gaps in the regime.'**[6]
'Chemicals and Health in Humans' p6 May 2003

Women's health and safety at work

The 2001 guide, 'Women's Health and Safety' produced for its safety representatives by Britain's largest union, UNISON, begins: **'Almost nothing is known about the effects of work on women's health and safety. Yet nearly half of the UK workforce are women, with a large number of these working part-time or doing several part-time jobs. In many sectors ... women are frequently exposed to harmful chemicals (which can) increase the risk of (other) diseases such as dermatitis, allergies, and even cancer ...Where women experience gynaecological or reproductive problems and other possible work-related concerns, a link is hardly ever made with their work. It is still the case today that women approaching their GP are rarely asked about their work or work patterns.'** (p3)

The clearly incorrect yet common perceptions that **'women's work is safe, the work women do is light, easy and risk free, only men do dirty, heavy, dangerous or stressful work'** are the main reasons for women consistently being **'left out of research into occupational ill health.'** (p5)

A health and safety guide produced by Britain's General Union (GMB) **'challenges the myth that women's work is 'safe' and recognises that women face specific health hazards over and above the general hazards that all employees need protection from.'** The reality is that **'many women can come into contact with hazardous substances in their workplaces, in for example, cleaning materials, pesticides, hairdressing preparations, and through the use of chemicals. Typical examples of hazardous substances can include solvents used in adhesives, and photocopier and laser printer hazards. There are additional concerns for women working with hazardous substances because there may be genetic effects on reproductive capacity which are different from those of men. Also exposure limits set for work with dangerous chemicals and other hazardous substances may be inappropriate for women. This is because women's physiology may be different from men's, and because safety standards are often designed with men's bodies in mind.'***
'Working Well Together: Guide to Health and Safety for Women' p16 GMB 1998

Workplace safety – the law

'The Health and Safety at Work Act is designed to protect the health and safety of all workers in the workplace. It requires the Health and Safety Commission and its Health and Safety Executive to act in an advisory capacity, to produce regulations and codes of practice, to investigate injury and deaths resulting from workplace practices, and to take action where breaches of the regulations occur.'

*Permissible Exposure Levels for toxic substances are set at sufficiently low levels to avoid acute toxic reactions occurring except in the case of accident or negligence. These are for single substances and fail to take into consideration the dangers of carcinogens and EDCs from repeated small exposures, bioaccumulation, exposures to carcinogens from other sources, history of exposures or illness and individual vulnerability.

UNISON's guide for health and safety representatives 'Hazardous Substances at Work' points out that people's standard, everyday exposure to thousands of hazardous substances are bound to include exposures where we work, because **'virtually all workplaces use or contain hazardous substances.'** (p4)

The guide explains that the Control of Substances Hazardous to Health Regulations (COSHH) is the main law for protecting workers. **'COSHH covers virtually all workplaces, obliging employers to prevent, where reasonably practicable, workers' exposure to hazardous substances, and to control it where not.'** (p6) The law also requires all suppliers to provide specific information on hazards. The Chemical Hazard Information and Packaging for Supply Regulations (CHIP) **'requires that safety data sheets be supplied with all substances classified as dangerous, including the 2,500 on the Health and Safety Commission's (HSC) approved supply list.'** (p23)

While there is no obligation under CHIP for employers to provide safety data sheets to employees, **'the Health and Safety at Work Act requires employers to give all necessary information to their employees where it is necessary to ensure their health and safety at work. The HSC's Approved Code of Practice (ACoP) on safety data sheets states that: 'Safety data sheets should be regarded as open documents and they, or the information they contain, should be available to employees or their appointed safety representatives.'** (pp24-25)

Workplace safety – the reality

Given the legal obligations, both for suppliers and for employers, **'getting material on dangerous substances should be easy. However, in practice the law is often abused and very rarely enforced.'** Intended as an essential aid to employers, safety data sheets **'vary considerably in quality and many are inaccurate or incomprehensible ... Safety reps are entitled to copies of safety data sheets for any substance used in their workplace. Often however, the employer cannot provide them because they were not kept, or were not sent by the supplier.'** In a situation where adherence to workplace regulations will depend entirely on individual employers, UNISON advises its members to seek hazards information from the many government and independent sources now available.

'Hazardous Substances at Work' Unison guide for health and safety representatives 2003 pp23-24

It seems that workplace safety is far from guaranteed even by an impressive list of regulations. In order to know what you are exposed to in your workplace, you will need:

- excellent management and practice standards, OR
- an effective trade union with a pro-active safety representative, OR
- an on-site incident or accident to reveal the problem.

However, none of this will necessarily protect you from workplace risks for breast cancer. Why? Because the commonest cancer in women is not recognised as an occupational disease and is therefore not included in occupational health and safety guidelines. Thus, women cannot expect to be informed, either by their employers or their safety representatives, about workplace risks associated with breast cancer.

5.5 The increased jeopardy for women

> **We need a new methodology and a new language to describe the great diversity of women's work and workplaces.**
> Karen Messing (Professor of Biology University of Quebec Canada) Address to Trades Union Congress (TUC) symposium 'Women, Work and Health' November 3 1998 London UK

Multiple exposures to breast-cancer related environmental factors (radiation, carcinogens and endocrine disruptors) are a fact of life for the whole population. Exposures to many such health hazards appear to affect men and women differently. Some of these are explained by biology – differences in metabolism, body fat and hormones, and work patterns – and by differences in exposure levels and locations.

Toxicologist Miriam Jacobs further explains: **'Both local environment and differences in body fat are likely to have greater impact on women, who typically spend more time in the home and locality, and naturally store more fat-soluble toxic material, even when exposed to the same amount as men.'**

'Silent Invaders: pesticides, livelihoods and women's health' Eds Miriam Jacobs & Barbara Dinham Zed Books UK 2003 p99

'Biochemical investigations show that women are less able than men to detoxify chemicals normally encountered in the home and the workplace, even when exposures are at the same or lower levels. And women's medical histories indicate that they suffer 'more significant clinical effects and longer-term problems' than men as a result of such exposures.'

David Watt 'Double jeopardy: chemicals in the home and workplace' 'Silent Invaders: pesticides, livelihoods and women's health' Eds Miriam Jacobs & Barbara Dinham Zed Books UK 2003 p237

Double jeopardy
Britain's General Union (GMB) recognises that women workers are doubly exposed to hazardous substances, when their paid work is similar to the work that they do in the home. For example, **'many women cleaners will be exposed to the same chemicals at work as they are at home. The home is potentially less safe and healthy for working in than a workplace. Environmental hazards can include those of space to work in, dirt, noise, electrical and fire hazards. Fewer safety features are incorporated into the design of a home than in most workplaces.'**
'Working Well Together: Guide to Health and Safety for Women' p46 GMB 1998

Quadruple jeopardy
In the opinion of two UK researchers, exposure jeopardy for women may even be quadrupled **'for those (women) exposed to pesticides at work through additional exposure in the home, in the garden and leisure activities, and in the wider environment including food, water and airborne exposures.'**
A Watterson & J Watterson 'Implementing pesticide regulation gender differences'
'Silent Invaders: Pesticides, livelihood and women's health' Eds Miriam Jacobs & Barbara Dinham Zed Books UK 2003 p225

Both double and quadruple jeopardy are explained by the number of opportunities for multiple exposures to the same or similarly acting toxic substance in different situations. For example, a woman could encounter repeated low-level exposures to specific carcinogenic or endocrine-disrupting substances:

- in places of work outside the home
- inside the home from foods, insecticides, cleaning products, surface materials and treatments, internal air quality, furnishings, and from building, interior decorating and hobby materials
- outside the home from garden and pest sprays, fertilizers, weed killers
- from long-term use of pharmaceutical drugs, cosmetics, personal care products and hormone-based medications.

Stored in body fat these exposures could produce higher levels of toxicity than levels resulting from single or intermittent exposures to the same substance.

Conclusion: environmental contaminants and breast cancer
Both evidence and expert opinion would strongly suggest that we need to see and understand breast cancer as a disease more strongly influenced by environmental than genetic factors. For example **'studies of migrants from Japan to Hawaii show that the rates of breast cancer in migrants assume the rate in the host country within one or two generations'.**
K McPherson CM Steel JM Dixon 'Breast cancer – epidemiology, risk factors and genetics'
p624 British Medical Journal Vol 321 September 9 2000

British epidemiologist Professor Klim McPherson summarises what the epidemiological evidence tells us about breast cancer: **'That we are concerned not with an intrinsic genetic pre-disposition, but with some environmental influences which affect the incidence. So therefore, we should know how to prevent it because it is in large measure effected by environmental factors as opposed to genetic factors.'**
'What do we know about breast cancer and what do we need to know'
p7 Social Science Research Unit (SSRU) University of London Consent Conferences Series No 6 1994

Addressing the House of Commons forum 'Stopping breast cancer before it starts', medical oncologist Professor Charles Coombes, Director Cancer Research UK Laboratories, concluded: **'I don't think it is too far fetched to say that reduction in breast cancer incidence could result from cleaning up the environment ... in the absence of evidence ... when you've done the thing about preventing obesity, reducing alcohol and eating more fruit and vegetables, what is there left to do than make more efforts to reduce the carcinogens that surround us?'**
Forum Report Women's Environmental Network (WEN) London November 2000

Common carcinogens and endocrine disruptors (EDCS)

Most of us are unknowingly and unavoidably exposed to carcinogens and EDCs from the following sources and consumer products on a daily basis. We absorb these substances into our bodies through the respiratory tract, the gastro-intestinal tract and through the skin.

Key:

C Carcinogen
EDC Endocrine Disrupting Chemical
B Bioaccumulative
P Persistent in the environment

Industrial chemicals

Alkylphenol ethoxylates (APEs) EDC/B/P: APEs are used as surfactants to lower the surface tension of fluids so they can foam or penetrate solids. They are used in the manufacture of textiles and paper, and are found in paints, industrial detergents, pesticides, herbicides, plastics, insulating foams, cosmetics, nappies and sanitary towels (as wetting agents that allow liquids to spread more easily), shampoos, hair-colour products, shaving gels and spermicides.

Atrazine C/EDC/B: Atrazine is a pesticide approved for use in the UK, where it is used extensively on food crops. It is one of 20 pesticides commonly found in drinking water, and residues have been found on radishes and carrots.

Benzene C: A colourless, volatile, carcinogenic liquid derived from petroleum (crude oil) and coal tar. It is in the top 20 highest-by-volume industrial products. Benzene is used industrially as a fuel (gasoline) and a solvent, and is used in the manufacture of many other products – styrene, plastics, resins, synthetic fibres, some rubbers, lubricants, dyes, detergents, drugs and pesticides. It is an ingredient in waxes, resins, oils and paints.

Bisphenol-A (BPA) EDC/B/P: Used in the manufacture of polycarbonate plastics (used to make food and beverage containers) and epoxy resins; also used in a wide range of products e.g. white dental fillings, nail polish, food packaging, lenses (eye and safety glasses), water filters, adhesives, water pipe linings and flooring. BPA is an ingredient in resins used for lining cans of food and has been found to leach into certain food products e.g. peas, mixed vegetables, mushrooms.

Chloroform C/EDC/B: Chloroform is used industrially as an extracting agent and solvent, as the working fluid in industrial refrigeration systems and in the manufacture of cosmetics, dyes, drugs, fluorocarbons, glues and pesticides. Chloroform is an ingredient in medicinal/ pharmaceutical products such as cough syrups, liniments, mouthwashes and toothpastes, and in domestic cleaning products containing bleach. Because chloroform is widely distributed in air and water, we are exposed to it in air emissions from pulp/paper and chemicals and drugs manufacture, vehicle exhausts, tobacco smoke, burning of plastics, and evaporation from polluted waterways. We are also exposed through water sources such as tap water, showers and swimming pools.

Ethylene Oxide (EO) C/EDC: Ethylene Oxide is an important industrial chemical used mainly in the manufacture of other chemicals and chemical products such as anti-freeze, polyester, solvents, detergents, and polyurethane foam. It is also used as a fumigant (foods and spices), as a sterilizer (medical and dental), and for pest control (textiles, books, furniture, product packaging). It is found in breast implants (as result of sterilizing process), food residues, pest control products, cosmetics and food packaging. General environmental exposures come from food residues, tobacco smoke and air emissions from combustion of materials containing EO. It was banned from use as a pesticide in 1991.

Formaldehyde C: Used as preservative, germicide, disinfectant, fungicide, defoamer, tissue fixative, fumigant (glasshouses), fabric finish, soil sterilant (mushroom houses), silage additive, and bactericide (kills bacteria). Formaldehyde is found in household cleaners, cosmetics (nail varnish), personal care products (soaps, deodorants), plastic foams (cushion fillings, insulation), fabrics (leather, furnishings, clothing, tea bags), building products (plywood, particle board, flooring), decorating products (paints, sealants, pigments) and furniture. Exposure to formaldehyde in the general environment comes from vehicle exhausts, smoke (tobacco, coal, wood), dust and vapours off-gassing (being released) from construction, insulation and interior decorating materials, fashion and furnishing fabrics.

Organochlorines (Ocs) C/EDC/B/P: Chlorine is a naturally occurring substance. Chlorine is combined with hydrogen and carbon to form organochlorines. Its manipulation and use in forming artificial chemical products has had devastating effects on the environment that we are only just beginning to understand. Ocs are used in a vast range of everyday products from pesticides to plastics, detergents, cosmetics, bleaches and shampoos.

Parabens (Alkyl Parahydroxy Benzoates) EDC/B: A group of chemicals used as preservatives in most cosmetics, personal care products (deodorants, shampoos, toothpastes, moisturisers) and some foods and drinks (pie fillings, beers, jams, pickles).

Phthalates C/EDC/B: Phthalates are a group of chemicals used extensively in industry. Because they are classified as 'inert' there is no product-labelling requirement for them. Their main use is in plastics manufacture, to soften and make flexible rigid plastics like

PVC. Phthalates are also used in the manufacture of lubricating oils, detergents and solvents, and in intravenous tubing and other polyvinyl chloride (PVC) plastics.

They are found as ingredients of inks, paints, adhesives, and are used in cosmetic products as carriers for perfumes, skin moisturisers and skin penetration enhancers, to denature alcohol, and as volatile ingredients in hairsprays, nail polish and perfumes. Phthalates in packaging materials such as paper, board, cellophane and plastic can leach from food packaging into food contents. In 1999 the EU banned six phthalates from use in children's toys which are intended to be placed in the mouth by children under three years of age. Two of these phthalates, DEHP and DBP, were also banned in cosmetics from mid-2005 (EU Directive).

The phthalate DEHP is mainly used in the manufacture of PVC products e.g. disposable medical products (intravenous tubing, oxygen therapy systems) because it is cheap, flexible and clear. Because it does not bind with the plastic, DEHP can leach out of a PVC product. The general population is exposed to DEHP in air, food, and water as a result of off-gassing from products and emissions from industrial facilities. Human exposure to DEHP begins in the womb when DEHP crosses the placenta.

Polycyclic Musk Compounds (synthetic musks) C: A group of petrochemicals used as fragrances to substitute natural musk in cosmetics, personal care products and detergents. Musk xylene is a carcinogen, and the most acutely toxic compound in the group.

Styrene C/EDC/B/P: Raw materials for styrene production are derived from the petrol and coal-tar industries. One of the most widely used industrial chemicals, styrene is used as a starting material in the manufacture of a wide range of plastics – polystyrene foam, synthetic rubber, plastic food wrap, photographic film, car parts, PVC piping, insulated cups, plastic bottles, spectacle lenses.

Styrene is used in adhesives, inks, cooking utensils, floor waxes and polishes, copier paper and toner, decorating materials (varnishes, putty, paints), metal cleaners, asphalt, petrol products and carpet backing. We are exposed to styrene in the general environment by emissions from vehicle exhausts, tobacco smoke, incinerators and industrial sites, and by vapours from plastic and plastic foam products (off-gassing).

Sources:
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Mark Rossi & Manfred Muehlberger 'Neonatal Exposure to DEHP and Opportunities for Prevention in Europe' Health Care Without Harm October 2000

Pesticides

> **Go to the shelf where you keep your pesticides and herbicides and fungicides. Put them in a bag. Seal them up. Hand them in. Dispose of them safely. They are poisons. They are poisoning you, they are poisoning your garden and they are poisoning the planet. There is no good in them at all.**
> Monty Don gardening expert 'Pesticide Problems and Solutions' Greenfly Summer 2004 Pesticide Action Network *(UK)*

Pesticides constitute one of the largest groups of toxic man-made chemicals to which we are routinely and inescapably exposed. Pesticide regulation is the responsibility of government ministers in the departments of Health (DoH), Environment, Food and Rural Affairs (DEFRA), Trade and Industry (DTI), and Work and Pensions (DWP).

'Pesticide' (officially referred to as a 'plant protection product' since 2003) is a generic term for a group of chemical compounds that are formulated specifically to kill or alter the growth rates of both plants and other living organisms. For example: herbicides kill plants, rodenticides kill rats and mice, fungicides kill moulds and fungal growths, growth regulators retard or stimulate plant growth, defoliants destroy plant leaves.

Most pesticides are fat-soluble, and many have been shown to be carcinogenic and hormonally active. Some pesticides linked to breast cancer in toxicology tests are atrazine and cyanazine (herbicides); captafol (fungicide); dichlorvos and flucythrinate (insecticides); ethylene dibromide and ethylene dichloride (fumigants).

Chemicals that adversely affect the endocrine (hormone) system are increasingly recognised as significant in hormone-related cancers such as breast cancer. Some pesticides known from experimental evidence to affect oestrogen levels are DDT, methoxyclor, chlordecone and atrazine.

The concerns of scientists such as Rachel Carson about the potential harm to human health from pesticides were widely refuted and discredited by industry and science in the 1960s. She warned then that new synthetic insecticides **'have immense power not merely to poison but to enter into the most vital processes of the body ... They destroy the very enzymes whose function is to protect the body from harm; they block the oxidation processes from which the body receives its energy; they prevent the normal functioning of various organs; and they may initiate in certain cells the slow and irreversible change that leads to malignancy.'**
'Silent Spring' Penguin Books UK 1986 edition pp32-33 originally published 1962 Houghton Mifflin USA

More than 40 years later, Marion Moses, scientist and founder of the Pesticide Education Center in San Francisco, wrote: **'The toxic impact of pesticides on women's health is only now emerging from decades of scientific and regulatory neglect ... Long-term low-level exposures (to pesticides) that do not cause acute illness are linked to chronic diseases, cancer in children and adults, adverse reproductive outcomes, Parkinson's and other neurological diseases, among others.'**
Introduction 'Silent Invaders: Pesticides, livelihood and women's health' Eds Miriam Jacobs & Barbara Dinham Zed Books UK 2003

Effects on the general public
The current knowledge of the biological effects of bystander exposure is limited by the fact that there is no monitoring by any government agency of the chronic effects of pesticide exposure, nor of the health of people likely to be chronically exposed to these chemicals. New evidence suggests that exposure to low doses of common pesticides, at levels currently assumed to be safe, and within dose ranges measured on people, can have significant effects during the early stages of development.
www.protectingourhealth.org/newscience/infertility/2004/2004-0122greenleeetal.htm

'Over the past ten years new concerns have emerged about the effects of pesticides on the hormonal system.'
Pesticide Action Network *(UK)* 'The List of Lists' November 2001

'Studies of the effects of low doses and work by national and international authorities on endocrine disrupting chemicals (EDCs) have identified these effects at very low doses.'
Environmental Working Group 'Body Burden – the pollution in people' 2003

Produced by Professor Andrew Watterson, the following breakdown of population groups at risk from the health and safety hazards of pesticides illustrates the extent of their environmental pervasiveness.

- **workers in agro-chemical manufacturing and formulating plants**
- **those transporting pesticides**
- **those applying pesticides**
- **those picking treated crops**
- **those workers coming into contact with pesticide-treated areas**
- **flaggers for aerial sprayers**
- **gardeners and home users of pesticides**
- **emergency services dealing with pesticide incidents**
- **consumers through accidental or deliberate ingestion**
- **consumers through contamination of water, food and air-contaminating pesticide residues**
- **bystanders and the public passing through or near areas where pesticides have been applied.**

'Pesticide Users Health and Safety Handbook' Gower Publishing UK 1988 p7

Measures to prevent cancer ... must include protecting the public from exposure to known or suspected human and animal carcinogens, as no dose of a carcinogen can be deemed to be safe.

'The Primary Prevention of Cancer' p29 Ontario Task Force Report Department of Health Ontario 1995

The deliberate and routine release of carcinogens into the environment is as unthinkable as the practice of slavery.

Dr Sandra Steingraber ecologist and author addressing an environmental symposium Philadelphia USA 1997

Human exposure to all EDCs (especially during pregnancy), and their release to the environment should be minimised on grounds of prudence.

'Endocrine disrupting chemicals (EDCs)' p3 The Royal Society UK June 2000

We will not invest in any business whose core activity contributes to the manufacture of chemicals which are persistent in the environment and linked to long-term health concerns.

Ethical Policy Statement The Co-operative Bank UK April 2003

If you pollute when you *do not know* if there is any safe dose, you are performing improper experimentation on people without their informed consent ... If you pollute when you *do know* that there is no safe dose with respect to causing extra cases of deadly cancers, then you are committing premeditated random murder.
John Gofman MD PhD Professor of molecular and cell biology and physician University of Berkeley USA 1998

Ethics and ethical principles are impossible to avoid when making the case for the primary prevention of breast cancer. Questions about responsibility for primary prevention and how primary prevention might be achieved are inevitably ethical questions, because they are fundamentally related to the proper governance of public health, the environment and social justice. Some of the many ethical issues related to the primary prevention of breast cancer are public right to know, management of environmental hazards, workers' rights, the protection of children, control of scientific research, environmental justice and the independence of the regulatory process.

6.1 Ethics and environmental hazards

The rationale for banning, reducing or eliminating man-made carcinogens and endocrine-disrupting chemicals from our environment is an ethical one. The release of such agents into the air we breathe, their presence in the food chain and the potential for their absorption in human blood, bone, body tissues and organs are the most compelling reasons for making ethically based decisions to safeguard both environmental and human health.

The fact that:
- more than 300 man-made chemicals can be found in humans, and that
- children are born with a toxic burden from the womb

leads to questions about how our regulatory system allows this to happen.

'Despite the implicit and potential hazards, chemical-manufacturing companies are not required to show that their products are safe before they are marketed.'
'Chemicals and Health in Europe' p2 WWF May 2003

The current regulatory system leaves the responsibility for proving the harm of any substance or product with affected individuals, employees, consumers and communities. In ethical terms, the harm or non-harm to humans or environment should begin and end with the manufacturer:
- before a substance is licensed
- before a substance is released into the environment.

The 'ethical' edict 'first do no harm', attributed to Hippocrates, is still invoked today. Its influence was evident in the concluding words of Stirling University's Professor Andrew Watterson in his address to the House of Commons forum, 'Stopping breast cancer before it starts': **'Will we be doing harm by reducing pollution? No. If we create a cleaner environment will we be doing any harm? No. If we adopt toxic reduction programmes will we be doing any harm? No. So if we wanted to use the precautionary principle to stop known and suspected carcinogens that would be a sensible policy.'**
Forum Report Women's Environmental Network (WEN) London November 2000

6.2 The scientific community and ethics of prevention

If scientific evidence is to make a meaningful contribution to decision making aimed at the protection of human health, it must exist within a policy framework composed of value-based principles for decision making.
'The Primary Prevention of Cancer' Report of Ontario Task Force p14 Department of Health Ontario 1995

There is an urgent need to reinstate independent science, and to define a new holistic ethic of science that can guide us in the safe and sustainable use of increasingly powerful technologies.
Dr Mae-Wan Ho 'Towards a New Ethic of Science'

Despite growing recognition in the scientific community of the impact of specific environmental factors on health, few from that community are seen or heard expressing interest in 'primary prevention' or concern about its neglect.

The crucial role of 'independent' scientists

While a scientist can not predict how increased future knowledge may change the current understanding of the effects of certain substances, they can incorporate the best available current knowledge in the decision-making process.
P Anastas & J Warner 'Green Chemistry: Theory and Practice' Oxford University Press UK 1998 p65

Concern about the erosion of 'independence' both in scientific opinion and practice is expressed by outspoken scientists like Dr Mae-Wan Ho, Director of Institute of Science in Society, and Professor Seralini, Professor of Molecular Biology at the University of Caen, France: **'Independent, honest scientists are absolutely necessary in a present-day democracy, whether they are working within the Government, paid by the taxpayer, or in the commercial sector. Important decisions impacting on public health and safety, the environment, as well as the social and economic benefit to civil society, all hinge on the honesty of scientists and the reliability of scientific advice given ... there must be open debate when scientists disagree with one another ... conducted in terms comprehensible to the general public, so that the public can participate in making decisions.'**
Dr Mae-Wan Ho 'Towards a New Ethic of Science'

Professor Seralini, in an interview with Pesticide Action Network *(UK)*, echoed this sentiment: **'We must have independent and contradictory experts in all instances where pesticides, and other industrial products which could cause harmful effects to humans, are evaluated.'**
'Pesticides News' (no63) p4 March 2004

Michael Meacher, MP and ex-Environment Minister in the UK parliament, expressed similar concerns when addressing the Independent Science Panel in February 2005: **'... science can only be fully trusted if it is pursued with the most rigorous procedures that guarantee total independence and freedom from commercial and political bias. That is far too often not the case today.'**

One example of the importance of independence in assessing health risks was a review of studies of selected chemicals (alachlor, atrazine, formaldehyde and perchloroethylene) **'that exposed industry bias in findings where 60% of studies conducted by non-industry researchers found these chemicals hazardous, while only 14% of industry-sponsored studies did so.'**
D Fagin M Lavelle 'Toxic Deception: How the Chemical Industry Manipulates Science, Bends the Law, and Threatens Your Health' Seacaucus NJ Birch Lane Press 1997 (cited in L Rosenstock LJ Lee 'Attacks on Science: The Risks to Evidence-Based Policy' p15 American Journal of Public Health Vol 92 no1 2002)

It smells, doesn't it? When those who are assessing the danger of the (nuclear) industry are in the pay of the industry. It's like the fox guarding the hen house.
Alice Stewart radiation epidemiologist quoted in 'The Woman Who Knew Too Much: Alice Stewart and the secrets of radiation.' Gayle Greene University of Michigan Press 1999 p147

The special obligations for scientists

Scientist Dr Devra Davis and Cancer Registrar Calum Muir believe that: **'Scientists have a special obligation to pursue opportunities to prevent cancer and to present their information in ways that can be understood by those who are not experts in the field.'**
Devra Davis and Calum Muir 'Estimating Avoidable Causes of Cancer' pp301-306 Environmental Health Perspectives Vol 103 Supplement 8 November 1995

Often overlooked is the obligation of science to ensure the ethical application of research. Questions arise, for example, about the use of gene technology as a prevention tool. Breast cancer as a consequence of inherited breast cancer genes accounts for 5-10% of cases. The choices for women who test positively for breast cancer genes are extremely limited and invasive e.g. prophylactic mastectomy and/or oophorectomy.
(see page 68)

Ross Hume Hall, former cancer researcher, Biochemistry department, McMaster University, Ontario, Canada, acknowledges the contributions made by genetic research: **'In many ways this highly sophisticated research does increase our understanding of human biology.'** But he also questions the real value of research focused on gene technology as the breast cancer (and cancer) prevention tool of the future. **'What is of concern ... is the way the medical-industrial complex uses the research. They would have us believe that because of various findings, such as cancer genes, the cure lies just around the corner. The truth is, however, it doesn't make much difference if a cure ever emerges. The search is a splendid money generator.'**
'The Medical-Industrial Complex' p65 The Ecologist Vol 28 no2 1998

The particular obligation for chemists

The following, from the work of two American scientists, Paul Anastas, Office of Pollution Prevention and Toxics, Washington and John Warner, Department of Chemistry, University of Massachusetts in Boston, makes very clear the ethical choices and responsibilities for scientists working in the chemicals industry today: **'Chemists possess the knowledge and skills to make decisions in the practice of their trade that can result in immense benefit to society or cause harm to life and living systems and they therefore have responsibility for the character of the decisions made.'**
P Anastas & J Warner 'Green Chemistry: Theory and Practice' Oxford University Press UK 1998 Preface

'One of the most basic philosophical reasons that chemists must try to make the work they do and the substances they use as environmentally benign as possible is that we can. With knowledge of how to manipulate and transform chemicals, coupled with the basic hazard data that can be accessed readily from a variety of sources, chemists have it in their power to reduce or eliminate the risk posed to themselves and society in general by the chemical enterprise.'

'That does not mean eschewing knowledge to avoid all possible harm, it means using the knowledge chemists already have to pursue further innovations in ways that are safest for human health and the environment.' As above p13

'Chemists have the knowledge and skills to minimize the hazard faced by the public, the environment and users of chemicals in general. With possession of that knowledge there is a responsibility to ensure that no harm is done wherever practicable. Preface (this book) does elucidate the obligations that chemists, as scientists, have in making choices when designing chemical methodologies.'
As above p35

6.3 The 'precautionary principle'

It is a truth very certain that, when it is not in our power to determine what is true, we ought to follow what is most probable.
Descartes

The 'precautionary principle' argues that, in order to protect the environment, prudent social policies must precede absolute scientific proof that any particular chemical or intervention does harm.
Dr Cathy Read 'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 p219

In an historical overview of the subject, the precautionary principle is defined as: **'An overarching framework of thinking that governs the use of foresight in situations characterised by uncertainty and ignorance and where there are potentially large costs to both regulatory action and inaction.'**
'Late lessons from early warnings: the precautionary principle 1896-2000' p192 European Environment Agency (EEA) 2003

The precautionary principle is embodied in the very tradition of public health. Significant examples of its use have been control of cholera in the 19th century through improvement of public sanitation systems before scientific evidence could show any causal link between cholera and poor sanitation, and reduction in mid-20th century lung cancer rates in response to public education about health risks associated with smoking, well before science explained the cancer connection.

The principle was approved at a conference in the United States in 1998. It says: **'When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. Recognition of the precautionary principle includes taking action in the face of uncertainty; shifting burdens of proof to those who create risks; analysis of alternatives to potentially harmful activities; and participatory decision making.'**
John Humphrys 'The Great Food Gamble' Hodder and Stoughton UK 2001 p107

To use the precautionary principle is to use the ethical and common sense approach to prevention by taking action to prevent illness and death in the face of incomplete evidence. The two tests that underpin the precautionary principle are:
- scientific uncertainty
- reasonable suspicion of harm.

Peter O'Neill, Department of Environmental Sciences, University of Plymouth, UK, explains the basis for 'scientific uncertainty' about chemicals as causal agents in cancer thus: **'How can the cause of cancer, say, be identified when the population is exposed to a large number of possible, and different, trigger chemicals that may be of different or anthropogenic [man-made] origin? In addition there may be synergistic effects between these chemicals which considerably increase the risks posed by the individual chemicals separately. The long gestation time between exposure and clinical appearance of the cancer may well make it impossible to be certain of the cause.**

The outstanding work of analytical chemists in developing methods for the recognition and determination of extremely low concentrations of various elements and compounds has made us aware of their presence. Unfortunately our knowledge of toxicology has not kept pace and we are not able to quantify the risk that these low levels of chemicals pose.'
'Environmental Chemistry' Chapman & Hall UK 1993 edition pp238-239

Who decides?
Scientist, Dr Mae-Wan Ho believes that **'responsibility for deciding where and when to apply the precautionary principle resides ultimately with government.'** Science must play its part in the process, for example, in identifying health hazards since **'the proper use of science and scientific findings is precisely to enable us to act with precaution.'**
'Towards a New Ethic of Science' www.i-sis.org.uk

Final decisions regarding the protection of environmental and public health are bound to be political decisions because **'weighing the relative importance of protecting public health and economic interests in the face of uncertainty is a public policy judgement, not a scientific one.'**
US National Research Council policy, 'Hormonally Active Agents in the Environment' National Academy Press USA 1999 p14

In formulating its recommendations to government, the Ontario Task Force on the Primary Prevention of Cancer, after acknowledging **'uncertainty about the extent to which environmental contaminants contribute to cancer'**, considered that despite this uncertainty, **'the only prudent approach to safeguarding the health of the public from known and suspected environmental carcinogens is to be precautionary while the necessary research efforts are being made to resolve the uncertainty.'**
'The Primary Prevention of Cancer' Report of Ontario Task Force p29 Ministry of Health Ontario 1995

The importance of establishing the precautionary principle as the universal standard in both old and new policies pertaining to health and environment cannot be over-estimated.*

Intelligent use of the precautionary principle can stimulate innovation, encourage better and more systems-based science, and improve public decision-making.
'Late lessons from early warnings: the precautionary principle 1896-2000' p182
European Environment Agency (EEA) 2003

*Throughout the year 2000, the UK (along with 150 other governments) agreed to implement the precautionary principle by signing the International Biosafety Protocol (also known as the Cartagena Protocol). The protocol was designed to help protect the environment, and to ensure safe transfer, handling and use of living modified organisms (LMOs) resulting from modern technology. The single most important development to arise from the protocol is the official incorporation of the 'precautionary principle'. www.biodiv.org

If the prospect of enough profit comes in through the door, precaution often flies out of the window.
John Humphrys 'The Great Food Gamble' Hodder and Stoughton UK 2001 p107

6.4 Human rights and primary prevention

Give the people the facts, and let them decide.
Abraham Lincoln

Access to information is the cornerstone of democracy all over the world. It allows people to make informed decisions about their lives.
'Defending Free Speech' p2 Article 19 International Centre Against Censorship London 1997

We have subjected enormous numbers of people to contact with these poisons (biologically potent chemicals) without their consent and often without their knowledge.
Rachel Carson 'Silent Spring' Penguin Books UK 1986 edition p29 originally published 1962 Houghton Mifflin USA

The 'right to know' (RTK)
The internationally recognised term 'right to know' refers to the right of people to have access to information that is of concern to them. The need to be informed about anything that has the potential to affect our health is regarded as a right.

The right of workers to know about hazards in the workplace is written into occupational health and safety laws (i.e. the Health and Safety at Work Act 1974) and is incorporated in the 'duty of care' responsibility that employers bear to their employees. There is no equivalent right to know outside the workplace. Extension of this right to the general community is fundamental to attaining reduction and prevention of any disease.

'For many, the only source of environmental information is media reporting, which often leaves the public confused and frustrated. To benefit from public access to information, increasingly via the internet, people need basic environmental and health information, resources for interpreting, understanding and evaluating health risks and familiarity with strategies for prevention of or reduction of risk.'
Black's Medical Dictionary

RTK – consumer and community information

It is right and proper that citizens are fully informed about hazards in their homes, communities and workplaces. Public information about risks from exposures to substances, products or environmental conditions known or suspected to cause or promote cancer (or any other threat to human health) must be provided by government, employers, unions, product manufacturers and product marketers, as for example, health warnings on cigarette packaging. We have to persist in claiming this right because **'governments of every persuasion use censorship to conceal their policies on the environment, and to silence protestors. The dumping of toxic waste, exploitation of agricultural land by multinational companies and the long-term effects of chemicals and nuclear accidents are often shrouded in secrecy.'**

'Defending Free Speech' p9 Article 19 International Centre Against Censorship London 1997

Product labelling

The 1998 Aarhus Convention – attended by 84 parliamentarians from 36 European countries (including the UK) – stressed the importance of open administration and the people's right to know, especially with respect to hazardous, persistent, bioaccumulative and mobile chemicals. It called for **'governments to support national, European and international legislation on product labelling to ensure that consumers are aware of the known or potential hormone disrupting substances in the products they buy.'**

Proceedings of conferences 'Our Common European Garden in 1998' and 4th Pan-European Ministerial Conference 'An Environment for Europe' Environment Committee Danish Parliament (Folketing)/Globe Europe

In order to act responsibly and to exercise consumer choice we first need to be fully informed about the contents of the products we use. Such basic RTK information could effectively be provided by legislation introducing a mandatory and standardised labelling system for all consumer products. Information could be simplified by use of special logos or warnings indicating both known and suspected health and environmental impacts of ingredients, packaging, manufacturing processes, end use and disposal of the product.

RTK chemical health hazards

> **The right of citizens and workers to know about the hazards they have been or may be exposed to and the risks flowing from those hazards should be fundamental in any democratic society.**
>
> Professor Andrew Watterson 'Whither lay epidemiology in UK public health policy and practice? Some reflections on occupational and environmental health opportunities' pp270-274 Journal of Public Health Medicine Vol 16 no3 1994

The government is responsible for the assessment and regulation of chemicals, including hazardous chemicals. Information about the environmental and industrial management of chemicals and about the health risks (hazards assessment) associated with the production, use, release and disposal of chemicals is produced by the industry, then reviewed and held by government. Decisions made by the three government departments involved in the chemicals' registration process (the departments of health, environment and trade & industry) are based solely on information provided by the manufacturer. This same information, deemed 'commercially sensitive' by manufacturers, is not made available to the public. Thus, **'commercial and official secrecy continue to deprive us of the information which we require and to which we are entitled ... If companies are willing to provide the Government with evidence which purports to show their products are safe, then the public should be fully entitled to see that information. If they are not prepared to share it with the public then it should not be admissible as evidence.'**

Erik Millstone 'Food Additives: What Are We Really Eating?' Green Britain or Industrial Wasteland? Eds Edward Goldsmith & Nicholas Hildyard Polity Press 1986 pp187-188

Public opinion now

Recent research reviewing public opinion about the role of government in preventing ill health found that a large majority of those questioned said that the government should intervene to prevent illness by:

- **'providing information and advice (86%)**
- **putting health warnings on products that present a proven risk to health (84%)**
- **encouraging employers to promote health at work (82%)**
- **preventing actions that put others' health at risk (77%)**
- **actively discouraging people from putting their own health at risk (75%).**

A smaller majority (59%) said the Government should intervene by taxing products that present a serious risk to health.'

Although survey questions were focused on health risks – smoking, diet, exercise, alcohol and sexual health – the results reveal both public perceptions and public expectations of the proper function of government in public health protection, with an emphasis on public RTK.

Opinion Leader Research 'Public Attitudes to Public Health Policy' p13 King's Fund June 2004 www.kingsfund.org.uk

The Freedom of Information (FOI) Act 2000 holds the promise of delivering RTK to the UK population, but among the many exemptions allowed in the bill were three of key importance for public health and prevention. These were **commercial interests, public safety** and **policy advice** (advice used by ministers to formulate policy). Thus, the FOI Act (effective from January 1 2005) forbids public access to certain areas of information which are relevant to breast cancer prevention e.g. environment and product hazards.

Pre-requisites of an effective breast cancer prevention programme would include the amendment of the FOI Act to:

- include government and industry-held information about the manufacture, processing, by-products and applications of chemicals, and about their storage and disposal
- rescind the 'commercially confidential' criteria for chemical compounds known or suspected of having carcinogenic and/or endocrine-disrupting properties.

The right to live and work in a clean environment

> **Every family should be able to obtain water, food and air free from chemical and radiological contamination. Dr Janette Sherman**
> 'Life's Delicate Balance: Guide to Causes and Prevention of Breast Cancer'
> Taylor & Francis USA 2000 p233

Joe DiGangi of the Environmental Health Fund, USA, writes: **'Everyday routines, even those that focus on clean living, bring the unexpected consequences of chemicals in our bodies. Some of these chemicals come from consumer products. Others linger from substances such as DDT and PCBs that seemed like great ideas decades ago. We didn't intend to ingest them like medicine, and few of us would grant permission for them to be in our bodies, if we had the choice.'**
Foreword 'The Only Planet Guide to the Secrets of Chemicals Policy in the EU: REACH – What Happened and Why?' by Gunnar Lind Greens/EFA 2004

International endorsement and promotion of this right is found in:

- the 1998 Aarhus Convention: **'Every person has the right to live in an environment adequate to maintain his or her health and wellbeing.'**
- the United Nations (UN) Commission on Human Rights proclamation that everyone has the right to live in a world free from toxic pollution and environmental degradation.
  Environmental News Service (ENS) New York April 30 2001

The Human Rights Act

The appropriate framework for civil action to challenge non-regulated threats to public health is provided by the Human Rights Act. Its incorporation into UK law in October 2000 created new possibilities for public intervention on ethical issues, such as the right to know, which have a bearing on human health and disease prevention. The Act says that: **'All public authorities must pay proper attention to your rights when they are making decisions that affect you. Public authorities include government ministers, civil servants, your local authority or health authority, and also agencies like the police, the courts and private companies when carrying out public functions.'**
'Human Rights Act: an introduction' pp8, 10 Home Office Communication Directorate 2000

Conclusion

In the current climate of political neglect of common-sense approaches to cancer prevention (i.e. eliminating production of, and exposures to, man-made carcinogens and EDCs) it is important to emphasise primary prevention's ethical context. We possess the knowledge, but not yet the political will, to effectively reduce the incidence of breast cancer. As a matter of urgency:

- we need to apply our knowledge to the task
- we need to act now to reduce production, release and use of toxic substances
- we need to act now to reduce our dependence on toxic substances
- we need to prioritise primary prevention.

> **The considerable evidence of cancers caused by agents in the environment tends to be minimised by the cancer establishment. The task before us now is making primary prevention an urgent priority.**
> Dr Richard Clapp School of Public Health Boston University USA 'Cancer and environment – the epidemiological approach' International conference 'Cancer, Environment and Society' ARTAC/UNESCO Paris May 7 2004

Every day we are exposed to chemicals in our environment; at work or in our homes. However for many of them, we do not know enough about their risks or longer term effects.

Environment Commissioner Margot Wallström, April 2003

Examples of breast cancer prevention-related policies and projects from other countries, at both national and regional levels, provide some inspiring models for the UK.

7.1 Regulation of chemicals – Europe www.europarl.org.uk

The European Parliament passes laws that affect everyone in the European Union (EU). It deals with issues such as economic development, consumer and human rights, environment and public health. One example is the 'new EU chemicals legislation' which is known by the acronym REACH (Registration, Evaluation and Authorisation of Chemicals) and which aims to:

- overhaul and modernise the EU's regulatory system for chemicals
- replace 40 different pieces of current legislation
- increase protection of human health and environment from exposure to chemicals
- maintain and enhance competitiveness and innovative capability of the EU chemicals industry.

At the presentation ceremony for the Draft Regulation in April 2003, Environment Commissioner Margaret Wallström said: **'Every day we are exposed to chemicals in our environment: at work or in our homes. However, for many of them, we do not know enough about their risks or longer term effects. Our reform proposal requires industry to provide public information on the chemicals they produce or import and the risks associated with their use. This will allow users to choose safe alternatives. It will greatly enhance the protection of people's health and the environment because we will insist on strict authorisation procedures for the substances which cause most concern.**

'Obliging the industry to provide information on what it produces will also help to enhance the image of the chemicals sector. Industry will finally have an interest in investing in innovation of new safe chemicals – the current trend of using old chemicals to avoid the cumbersome current evaluation procedures has stopped investment into safer chemicals.'

The proposed reforms were applauded by organisations campaigning on health and environment issues. Months later these same organisations were expressing concerns about the successful lobbying of the governments of the UK, France, Germany and USA, together with the chemicals industry, to weaken and delay the proposal: **'In its original form the proposal, once passed into law, would have subjected more than 30,000 chemicals to far more stringent safety testing than is now the case, and would have forced industry to disclose basic information for the chemicals each produces. In its altered and reduced form the proposal cannot provide the levels of health and environmental protection promised by the original proposal. Despite this drawback, REACH stands as an intentional move towards improving the current European system, and as a model for governments and people to build on.**

'While European leaders are caving in to the pressure from the chemicals industry and overseas governments, REACH has embarked on a voyage of its own. Beyond the wide, but shortsighted, circles of the multinational chemical industries and their protectors, the interest for REACH is mounting. People around the world are inspired by the fact that politicians are trying to address something that concerns people in their everyday life.'
Gunnar Lind 'REACH-What Happened and Why?'
p129 The Greens/European Free Alliance April 2004

We must ensure that our governments support a strong REACH regulation which, based on the ethical principles of precaution, is designed to significantly reduce human exposures to toxic chemicals.

7.2 National models of public and environmental health measures

Pesticide-use reduction programmes are already in place in Denmark, Sweden and Germany. Initiatives have also been taken in the Netherlands, Finland, the Belgian region of Flanders, and Norway. These countries have demonstrated that pesticide-use reduction can be achieved without reducing agricultural productivity.

Sweden: Pollution Reduction Programme (PRP)
http://www.internat.naturvardsverket.se/
A pesticide re-registration programme, carried out in Sweden between 1985 and 1995, resulted in more than half of the180 pesticides in general use at that time being permanently removed from the market because of concerns about their effects on the environment and human health. Mainly through the introduction of a tax on pesticides remaining in use, Sweden has achieved a 65% reduction in use of pesticides over a period of nine years. This is part of Sweden's 20-year programme to significantly reduce pollution.

The first indication of a positive public health effect resulting from the PRP is provided by the findings of a Swedish study which provides concrete evidence that preventative public health measures produce healthier populations. Through analysis of data from the National Swedish Cancer Registry, the study links Sweden's national policies to reduce chemical exposure with fewer cases of non-Hodgkin's lymphoma (NHL).
'Is the decline of the increasing incidence of non-Hodgkin's lymphoma in Sweden and other countries a result of cancer preventative measures?' L Hardell and M Eriksson Environmental Health Perspectives February 7 2003

The Cancer Registry data indicates the incidence of NHL increased annually in Sweden at a rate of 3.2% for men and 3.1 % for women between 1971 and 1990. The increase became a decrease (0.8% for men and 0.2% for women) between 1991 and 2000, roughly 20 years after use of a number of chemicals associated with NHL was severely restricted.

NHL is associated with a decrease in immune system function and has been connected with exposure to three types of chemicals: phenoxyacetic acids and chlorophenols (both banned in Sweden during the 1970s); organic solvents (restricted for use in Sweden), and persistent organic pollutants (POPs) listed for global elimination under the 2001 Stockholm Convention. Since the cancer can develop decades after exposure, an emerging trend in NHL now is likely to be the result of environmental factors decades ago. Restrictions on the use of these chemicals, improved work practices to reduce occupational exposure and cleaner products have probably all contributed to the lower rates of NHL in Sweden.

Although the model used in this study may need further evaluation and study, this work clearly shows that preventative policy measures can result in a clear public health benefit.
Extracts from 'Swedish Study Shows Power of Prevention' Pesticide Action Network Updates Service (PANUPS) September 8 2003

Denmark: The Danish Chemicals Strategy
http://www.mst.dk/
This model of reduction in the production and use of toxic substances is also a model of a government taking the lead by offering industry one of two policy-setting choices:

- fairly strict regulation where industry could not categorically claim public and environmental safety
- industry emission limits ten or a hundred times stricter where it could assure public environmental safety.

Industry chose the latter. In 2001, Helge Andreason, Deputy Head of the Danish Environmental Protection Agency, said: **'Industry in Denmark is happy with a precautionary policy on chemicals because the government is willing to assume greater responsibility,'** all of which has led to greater public trust of the government and favourable reactions from retailers, both to the chemicals policy and the responsible behaviour of government.

Denmark set new policy standards in the mid 1980s, by introducing a mandatory 'toxics reduction programme' for industry and agriculture, which by the mid 1990s achieved drastic reductions in the use of solvents in heavy industries, and of pesticides in agriculture. In 1999 the government issued a 'Chemicals Strategy', giving special consideration to population groups more at risk (children, pregnant women, allergy sufferers) because of their vulnerability. The strategy focused on persistent and bioaccumulative substances, endocrine disruptors and substances causing irreparable damage to health.

Giving a priority rating to chemicals listed as 'undesirable substances' served as an early warning to industry and major users for them to move towards reducing or phasing out specific substances. Statutory bans and phase-outs were introduced for some hazardous substances e.g. mercury and lead, while for others, like phthalates, the aim is a 50% reduction in use by 2009.

The introduction of taxes on phthalates and PVCs in 2000 was a further incentive for industry to consider alternatives that, in turn, were encouraged by the government's Cleaner Product Programme, funding projects to develop safer substitutes.
Environmental Data Services (ENDS) report 320 September 2001

USA: Consumers' Union Initiative for Consumer Information
The Consumers' Union in the USA has developed a Toxicity Index (TI) as a consumer guide to levels of toxic residues present in and on the most commonly eaten foods. The union tested more than 27,000 food samples for residues between 1994 and 1999 and computed comparative toxicity levels for 27 different foods. Exceptionally high toxicity levels were found in squash, beans, spinach, grapes, apples, peaches and pears. The TI process revealed that overall, fresh food contained more residues than processed food and that 67% of food produced in US had higher TI scores than imported foods.
Joanna Blythman The Guardian Weekend October 20 2001

Cancer prevention centres:

The Silent Spring Institute A non-profit scientific research organisation dedicated to identifying the links between the environment and women's health, with a particular focus on breast cancer. The work of the institute is carried out collaboratively by scientists, medical practitioners and community activists. **www.silentspring.org**

The Environmental Oncology Center The centre was established in 2004 by the University of Pittsburgh Cancer Institute with the aim of examining how to protect individuals and the community at large from environmental factors that can cause cancer, and providing people with information about cancer-related risks to avoid. **www.upci.upmc.edu/ceo/**

Dr Devra Davis, Director of the centre, is an expert on environmental links to public health trends, particularly breast cancer, and is Professor of Epidemiology in the School of Public Health at the university. The work of the centre will focus on:
- basic research
- molecular epidemiology
- environmental assessment and control
- community and professional education
- public policy.

'Through its research and outreach, the center will serve as a tool to educate and change the behaviors of individuals and institutions, and affect public policy. One of the first projects conducted by the center will study why African-American women under 40 develop breast cancer twice as frequently as white women.'
Sources: Michelle Massie Pittsburgh Post September 21 2004 WEN News (newsletter WEN UK) p4 Autumn 2004

7.3 Regional models of environmental and public health measures

Ontario, Canada: The Ontario Task Force on the Primary Prevention of Cancer
The Ontario Task Force on the Primary Prevention of Cancer was appointed by the Minister for Health in February 1994. Its mandate was to recommend measures to prevent cancer that must include protecting the public from exposure to known or suspected human and animal carcinogens, acknowledging that no dose of a carcinogen could be deemed to be safe. During its deliberations on the identified and suspected links between environmental toxins and cancer, the Task Force considered:
- lists of known and suspected environmental carcinogens
- the site-specific neoplasms associated with environmental carcinogens
- the methodological limitations impeding a greater understanding of the relationship between cancer and the biophysical environment
- the other health risks (e.g. reproductive disorders) posed by environmental carcinogens
- strategies for reducing or, where feasible, eliminating exposure to environmental toxins such as PVCs, vehicle emissions, nuclear fission products and specific pesticides.

After reviewing the literature on cancer-related risk factors, and on the effectiveness of primary intervention approaches, and after considering expert evidence on risk factors and interventions, the Task Force prepared an action plan detailing recommendations for primary prevention strategies and targets for reduction of site-specific cancer incidence. These urge the elimination or reduction of cancer-causing agents in communities and work places, and point to the availability of safe substitutes for many of these.
'Recommendations for the Primary Prevention of Cancer' Report of Ontario Task Force Department of Health Ontario 1995

Toronto, Canada: The Toronto Cancer Prevention Coalition
This coalition began in 1998 at a University of Toronto conference where a wide range of organisations concerned with cancer-related issues joined to form a single, mutually supportive cancer prevention network. The strength of its formulation lay in its core principle – that in order to implement a comprehensive, integrated cancer prevention agenda, the role of the citizen and expert must be balanced. **www.city.toronto.on.ca**

Only months after the conference, the Board of Health responded to the proposal for a coalition to address comprehensive action on cancer prevention with the proposed City of Toronto Action Plan for Cancer

Prevention. At the founding meeting, convened by Toronto Public Health, participants agreed the structure, key values and principles of the coalition. Its founding goal was: **'To strengthen cancer prevention efforts by creating a high profile/effective/powerful/multi-stakeholder/sustainable coalition, evidence and suspect based, which advocates for prevention policy, education and action at the local government levels and beyond.'**

By early 1999, the working structure of steering committee, coordinating team and eight working groups was established with the support of Toronto Public Health. The coalition symposium, 'From Policy to Action: Charting a Course for the Toronto Cancer Prevention Coalition' (March 2000) was funded by Cancer Care Ontario, and drew over 200 participants to hear the eight working groups (on tobacco, alcohol, dietary risk factors, ultraviolet radiation, occupational carcinogens, environmental carcinogens, physical activity, screening/early detection of women's cancers) present their findings and recommendations for policy and action, generating in the process a broader understanding of prevention issues and new partnerships for dealing with them.

At the request of the City Council a series of round tables (May 2002) aided both the phase-in of the coalition's proposed Frameworks for Implementation and the building of ongoing collaborative working relationships across Toronto. Following adoption of the implementation frameworks by the City Council and the Board of Health (November 2002), the Action Plan was adopted by Council as the cornerstone of cancer prevention in the City of Toronto. This unique coalition, supported equally by citizens and experts, has now grown to 150 members representing 60 agencies and organisations. **www.city.toronto.on.ca**

The City of Toronto Cancer Prevention Strategy summarises the key elements necessary in cancer prevention. These are:

- **the precautionary principle:** when an activity causes threats to human health or the environment, precautionary measures should be taken, even if some cause and effect relationships are not fully established scientifically
- **the 'weight of evidence' approach:** when assessing the health risks associated with a product or activity, all of the combined results of many kinds of research investigating harm or potential harm should be included
- **pollution prevention:** it is cheaper and more effective to prevent environmental and human health damage than to attempt to manage or cure it
- **just transition:** workers and communities have the right to both economic security and a healthy environment for themselves, their families and future generations. They should not have to choose between paying the bills and their own health, or the health of their children
- **community 'right to know':** community members, workers and consumers have a right to know about the environmental and occupational risks to which they are exposed and to participate in making the decisions that affect their health.

'Preventing Occupational and Environmental Cancer: A strategy for Toronto' pp6-7 Toronto Cancer Prevention Coalition

Seattle, USA: Safe alternatives

A resolution passed by Seattle City Council in July 2002 tabled detailed plans and a work programme designed to reduce the use of persistent and bioaccumulative chemicals by introducing and promoting the use of safe alternatives. **www.safealternatives.org**

Windsor, Canada: Lifetime Occupational and Environmental History Record (LOEHR)

By taking account of a woman's family, lifestyle, medical, occupational and residential history, this three-year breast cancer case-control study (started in 2004) represents a significant new approach in the field of occupational health research.

Researchers heading the project hope to gain new insights about the relationship between women's work and breast cancer incidence from analysis of detailed data collected by personal interview from a broad sample of women in the Windsor region of Ontario.

The sample will consist of two groups:

- 1,000 women diagnosed with breast cancer in the period since September 1993
- 1,000 randomly selected women with no history of breast cancer.

In analysing the data the research team will compare the occupational histories of both groups while controlling for other risk factors associated with breast cancer. As well as initiating new standards and directions in occupational health research, this work has the potential:

- to improve general understanding of the aetiology of breast cancer
- to reveal work-related patterns and factors affecting incidence of breast cancer
- to provide a basis for developing and delivering preventive strategies in the longer term.

More information on LOEHR can be found on the Occupational Health Clinics for Ontario Workers website **www.ohcow.on.ca**

What is being done in the UK to stem the rise of breast cancer and who is responsible for preventing it? And what are the real prospects for 'primary prevention' of breast cancer?

8.1 Current breast cancer prevention options

For women at risk

Elective medical intervention

Medical prevention is electively available to women perceived to be in the 'high-risk' category for breast cancer. The choices are:

- oophorectomy – removal of ovaries (by surgery) or destruction of ovaries (by drugs or radiation) to eliminate a main source of oestrogen production
- bilateral mastectomy – the surgical removal of both breasts.

Both could qualify as 'primary' prevention since each aims to prevent the onset of breast cancer by 'modifying the physical environment' i.e. the body of a woman.

Chemoprevention
(prevention through the use of drugs)

Designed to reduce or block the action of the hormone, oestrogen, Tamoxifen and similar oestrogen-inhibiting drugs are currently used as a preventive measure for women perceived to be in high-risk categories either for disease onset or for disease recurrence. Some researchers favour limiting their use to women in high-risk categories, while others favour their use as a life-long breast cancer prevention drug regime for all women. However, expanding the use of hormone-suppressing drugs to prevent breast cancer in all women remains a highly controversial issue in the UK.

For the general population

Implementation of three government campaigns aimed at reducing cancer mortality rates through screening and public education demonstrates awareness and ownership of responsibility by UK governments for tackling major diseases such as cancer.

The aim of the 1992 Health of the Nation Targets on Breast Cancer was to reduce the death rate from breast cancer among those invited for screening by at least 25% by the year 2000* (UK Department of Health). At the time, public health researcher Professor Andrew Watterson observed: **'Successful screening detects disease at a stage when there is scope for effective treatment. In terms of screening and treatment, these are sensible targets. But where is the preventive approach?'**
'Breast Cancer and the Links with Exposure to Environmental and Occupational carcinogens: A Study of Public Health Concerns and Public Policy Failures' 1995 p35

*Death rates for breast cancer did fall through the 1990s but incidence rates in the same period continued to rise.

The aim of both **The National Cancer Plan (NCP) 2000** and **The Scottish Cancer Plan (SCP) 2001** is to reduce cancer death rates by 20% in people under the age of 75 by 2010. A large-scale public education campaign is targeting lifestyle changes (exercise, diet, alcohol consumption and smoking) regarded by both governments as key factors in cancer prevention.

The Scottish Executive's 'Cancer in Scotland: Action for Change' 2001 does refer to the environment, acknowledging that **'several forms of radiation and industrial chemicals have been linked with cancer.'** The Executive then dismisses environmental factors as insignificant, claiming that **'most concerns in this area have been addressed and risks eliminated in terms of occupational and environmental exposure, such that their contribution to the overall cancer burden is now very small.'**
Departments of Health UK and Scotland

There is obvious merit in any programme promoting 'healthy diet and lifestyle', but the exclusive focus on lifestyle factors with no recognition of environmental factors in both plans:

- passes full responsibility for prevention to the individual
- deflects attention from 'primary' prevention by overlooking human exposures to environmental risk factors over which individuals have no control.

> **A narrow focus on lifestyle – like a narrow focus on genetic mechanisms – obscures cancer's environmental roots. It presumes that the ongoing contamination of our air, food, and water is an immutable fact of the human condition to which we must accommodate ourselves.**
> Dr Sandra Steingraber: 'Living Downstream: An Ecologist Looks at Cancer and the Environment' Virago UK 1998 p262

In ignoring the links between environmental and occupational exposures to carcinogens and EDCs as major and preventable factors in breast cancer, the government's prevention campaigns:

- take no account of the vast amount of international scientific work establishing the association between breast cancer and environmental exposures to man-made carcinogens and EDCs
- include no public warnings about man-made carcinogens and EDCs encountered in everyday life
- propose no strategies for 'primary prevention' of breast cancer e.g. banning production and use of man-made carcinogens and EDCs.

Instead, the fixation on prevention through 'changing public behaviour' suggests widespread ignorance among MPs and their advisers about the significance of environmental factors in breast cancer incidence.

> **Breast cancer is a public health concern akin to an epidemic in that it is spreading rapidly and affecting a large portion of the population. 'Primary prevention' – action to reduce or eliminate the causes – should be reflected in all public health policies and strategies. Current approaches lie with encouraging individual action such as better diets and increased exercise; this lays the cause of the disease at the feet of the individual, as opposed to exposure to possible carcinogens in our environment. A more balanced approach is needed from government, the medical establishment and cancer charities. Primary prevention cannot continue to be neglected or be seen only in terms of lifestyle. Environmental causes of cancer are not acknowledged enough, on the contrary they are suspiciously sidelined ... a precautionary approach to curb breast cancer is long overdue.**
> 'Breast cancer and the environment – unearthing the links' pp4-5 Branches newsletter Issue 8 September 2003 Women Taking Action for a Healthier Planet Women's Environmental Network (WEN)

8.2 Primary prevention: how well-informed are decision makers?

The UK parliamentary system is well served by informational support from:

- regular internal publications e.g. POST Technical Report 108 'Hormone Mimicking Chemicals' 1998
- parliamentary proceedings (Hansard)
- reports and briefings from government committees.

One such committee is the All-Party Parliamentary Group (APPG) on Breast Cancer. Its purpose is 'to provide a forum for MPs and peers to discuss breast-cancer related issues and to raise particular issues of concern with government and other policy makers.' A meeting of the Breast Cancer APPG in 2002 **'agreed the need for a working group to establish a public health context for the primary prevention of breast cancer – in Parliament (ensuring joined-up work between departments with related responsibilities),**

among breast cancer charities and support groups, and among the wider public.'
Laura Potts 'Time to take prevention seriously' p15
Health Matters issue 56 August 2004

Two years later in November 2004 a parliamentary debate, the 'Primary Prevention of Breast Cancer', was introduced and led by joint chair of the APPG, Dame Marion Roe MP. The breast cancer charity 'Breakthrough Breast Cancer' briefed Dame Marion for the debate and reported: **'We were pleased that she raised a number of issues of concern to us. She stressed the importance of more research into the causes and prevention of breast cancer, and called for NHS screening programmes to be made more flexible ... more government action on obesity.'**
Report 'MPs debate breast cancer' p11 'The Advocate' (Breakthrough newsletter) December 2004

Prior to this the following action points:
- to fund and support further research and development into the role of endogenous and exogenous hormones so as to reduce the incidence of breast cancer
- to reduce potential environmental hazards by tighter regulation and better application of the precautionary principle

had been decided at the Britain Against Cancer conference in 2003. This is an annual event jointly organised by the APPG on Cancer and the charity Cancer BACUP.

While APPGs have no power either to make or alter laws, they do serve as sources of expert advice and information to others in government, and can therefore influence both government thinking and decisions on topics such as breast cancer prevention.

Government also seeks and hears policy and planning advice from key people in academic institutions, from professional bodies such as The Royal Society and the British Medical Association, and organisations such as the Pesticide Action Network *(UK)*.

Recent reports with significance for breast cancer prevention policies are:

Stopping Breast Cancer Before it Starts (2000), produced by the Women's Environmental Network. A multi-disciplinary forum identified the urgent need for a comprehensive, national plan to tackle breast cancer from a primary prevention perspective. Participants, representing cancer charities, unions, NGOs, scientists, oncologists, consumers and breast cancer patient-activists endorsed the recommendation that government set up a broadly representative working party to produce a national plan for the primary prevention of breast cancer.

Effects of Pesticides on Human Health (1992), produced by the British Medical Association (BMA) recommended government provision of resources **'for research and development of alternatives to chemical pesticides' and 'development of a central strategy for governing the use of pesticides.'**
'The BMA Guide to Pesticides, Chemicals and Health' Edward Arnold UK 1992

Chemicals in Products – Safeguarding the Environment and Human Health (2003), produced by The Royal Commission on Environmental Pollution. This wide-ranging, three-year study of the long-term effects of chemicals on the environment and on human health made 54 recommendations based on recognition of the failure of regulatory systems to address problems associated with persistent and bioaccumulative substances.

Perhaps most significant, in terms of future change, is the information reaching national parliaments from the European Union (EU) – a newly expanded federation of 25 member states including the UK. All of this points to the probability that most politicians are exposed to the evidence that shows:
- the relationship between environment and health
- the environmental origins of most cancers
- cancer (and breast cancer) as a largely preventable disease
- the existence of scientific evidence supporting primary prevention actions and policies.

It would seem reasonable to assume therefore, that the majority of government members, their advisers and civil servants in related departments (health, industry, environment, public health), must be equally aware of the 'ethical' decisions and policy choices confronting government.

We have strong scientific evidence about toxic chemicals in the environment that mimic female sex hormones and overload a woman's hormonal system, a known cause of breast cancer. We know how pesticides, industrial pollutants, atomic radiation and other factors are linked – part of the social context of breast cancer. Yet, neither government agencies nor societies responsible for dealing with breast cancer acknowledge this context. WHY?
Professor Ross Hume Hall 'Female Biology, Toxic Chemicals and Preventing Breast Cancer: A Path Not Taken'
International Conference on Breast Cancer and the Environment Ontario Canada November 1995

8.3 Who is responsible for breast cancer prevention?

The European Community aims to reduce the yearly number of deaths from cancer. But this needs action by everyone, including the government and industry as well as individuals.
'Cancer: How to Reduce Your Risks' p3 NHS publication 2001

Some of the causes of breast cancer and related diseases can only be controlled by political and social action aimed at reducing the production, use, transport and disposal of agents that directly or indirectly affect breast cancer risks ... The public and private sectors could, for example, devise policies to prevent, restrict, or reduce exposures to agents in the household, workplace, and general environment that extend the duration and onset of breast growth or alter the hormonal environment.
D Davis D Axelrod L Bailey M Gaynor A Sasco 'Rethinking Breast Cancer Risk and the Environment: The Case for the Precautionary Principle' p528 Environmental Health Perspectives 106 (9) September 1998

Responsibility for putting in place the legislative and regulatory measures for preventing breast cancer lies first and foremost with government. Science and industry bear responsibility for any adverse impacts of their actions and products on wildlife, people and environment. And trade unions have responsibility for ensuring that the health and safety of people in their place of work is protected in accord with workplace regulations.

Theoretically, there are any number of obligatory and voluntary actions that could be taken by government, science, industry and unions, which together could contribute to a significant reduction of breast cancer in the population. However, the reality is that, **'in spite of the fact that sufficient information was available for its implementation on a wide scale, primary prevention (of cancer) has continued to encounter serious obstacles and unjustified delays.'**
Lorenzo Tomatis & James Huff National Institute of Environmental Health Sciences Research USA 'Evolution of Cancer Etiology and Primary Prevention' Editorial Environmental Health Perspectives Vol 109 no10 October 2001

8.4 Science

Prevention and science

'We need science, more and better science, not for its technology, not for leisure, not even for health or longevity, but for the hope of wisdom which our kind of culture must acquire for its survival.'
Professor Lewis Thomas 'The Wonderful Mistake: Notes of a Biology Watcher' Oxford University Press UK 1988

It is the business of science to do no harm, to sustain, protect, and improve the quality of life and health in the population and in the environment. It is not the business of science to damage, degrade and destroy life and life-sustaining elements – air, water, soil – in our environment. Science is:

- the original source of the knowledge and technology behind the product and the pollution
- the creative source of man-made substances and agents affecting health and environment
- the knowledge source of their potential for irreversible, accumulative and persistent harm to humans and the environment.

There is consensus among scientists that, **'disease is not conquered by treatments but by prevention.'** John Cairns (British molecular biologist, Sociologist of cancer, Professor of Public Health Harvard) John Cornwell 'Cancer the war against it' The Sunday Times Magazine June1 1997 p19. There is also a consensus that cancers are largely preventable. Few scientists would disagree that **'the most effective means of reducing (cancer) risk are avoidance of tobacco use, consumption of appropriate diets, and limiting exposure to occupational and other environmental carcinogens.'**
(Summary) 'Food, Nutrition and the Prevention of Cancer: a global perspective' p12 World Cancer Research Fund & American Institute for Cancer Research 1997

In reality, this latter means of reducing cancer risk – limiting exposure to occupational and other environmental carcinogens – remains under-acknowledged as a preventive measure by the very community which once, among its most eminent cancer researchers, **'shared the belief that malignant diseases can be reduced significantly by determined efforts to identify environmental causes and to eliminate them or reduce their impact.'**
Rachel Carson 'Silent Spring' Penguin Books UK 1986 edition p213 originally published 1962 Houghton Mifflin USA

The means favoured by science today for cancer prevention are:

- biological intervention at the cellular level (gene therapy)
- chemical control of disease onset and spread through lifelong drug treatment (chemoprevention)
- technological control through early detection by screening.

The industry-science relationship

The independent status of science is at risk of compromise when it has a financially dependent relationship with industry. For example, how often are scientists in a financial or working relationship with industry seen or heard expressing their 'independent' views on cancer prevention? If heard at all, their views tend to support (or appear to support) those of the industry they serve.

'Independent, honest scientists are absolutely necessary in a present-day democracy, whether they are working within the Government, paid by the taxpayer, or in the commercial sector. Important decisions impacting on public health and safety, the environment, as well as the social and economic benefit to civil society, all hinge on the honesty of scientists and the reliability of scientific advice given.'
Dr Mae-Wan Ho 'Towards a New Ethic of Science'

It is the business of scientists working for industry to ensure profitable returns from their enterprise. History shows that this is too often achieved by giving insufficient consideration to the long-term consequences for human health and the environment.

Industry-sponsored research has delivered many benefits to society. However, the increasing dependence of science on industry sponsorship also raises concerns. **'At the extreme are instances in which an industry sponsors research with the direct goal of countering existing scientific opinion. Economic interests may adversely affect scientific integrity through the delaying or witholding of research results and by directly or indirectly influencing the content of results.'**
L Rosenstock LJ Lee 'Attacks on Science: The Risks to Evidence-Based Policy'
American Journal of Public Health Vol 92 no1 2002 p15

Prevention research

Where it has obtained research funding for breast cancer, the science industry **'has been devoted to treatment of breast cancer rather than its prevention. To date, potential environmental causes of breast cancer have received little attention, even though there is increasing evidence that such links exist.'**
Dr Devra Davis 'Environmental Links to Breast Cancer and Other Reproductive Health Problems' The Breast Cancer Fund 2001 USA

A particular barrier to prevention research is **'a general lack of recognition of the relative importance of cancer prevention research ... researchers are unlikely to get their work published in top ranking journals and this will have impact on peer review ratings/research assessment exercise.'** NCRI report October 2004 'Prevention and Risk Research in the UK' p21. Analysis of research spending by the National Cancer Research Institute (NCRI – a consortium of 19 cancer research organisations from government, industry and charities) in 2002 revealed only 2% of allocated cancer research funds were spent on 'prevention'. NCRI Strategic Analysis 2002

To redress this imbalance, in October 2004, the NCRI launched the £12 million National Prevention Research Initiative (NPRI) to fund research into prevention of major diseases. The emphasis on 'smoking, alcohol misuse, obesity and exercise' again mirrors the prevention campaigns of both governments. In the words of Health Minister, Lord Warner: **'Preventing disease through trying to change people's behaviour is key to reducing deaths from major killers such as heart disease and cancer ... That is why the government is contributing funding to this partnership approach to change health-related behaviour.'**
NCRI press release October 20 2004 '£12 Million Boost for Prevention Research'

Of the 23 listed research projects, those related to breast cancer are:

- **'clinical trial/chemoprevention – to evaluate the feasibility and safety of using a dietary supplement for prevention of breast cancer in healthy women**
- **population and behavioural studies on association between hormone levels and cancer risk – investigation of the role of hormonal and reproductive factors in breast cancer**
- **clinical trial – study of duration oestrogen after menopause.**

NCRI report October 2004 'Prevention and Risk Research in the UK' p31

Where is 'primary' prevention on the prevention research agenda?

In terms of primary prevention, it is precisely because hormones play a major role in both breast and prostate cancer and the incidence rates of both continue to climb steadily that **'the quest to discover the role of hormone-disrupting chemicals in these cancers deserves higher priority than the quest for hereditary breast and prostate cancer genes because research aimed at environmental factors offers the hope of finding ways to prevent these devastating diseases in the vast majority of victims.'**
Theo Colborn John Peterson Myers Dianne Dumanoski 'Our Stolen Future' Little Brown & Co UK 1996 p186

One patient's view about primary prevention is that **'the ultimate priority for [cancer] patients is for the medical profession to look more closely at primary prevention. I don't mean screening or eating more fruit and vegetables. I mean spending more time and money on finding out why one in three of us in this country will develop cancer at some point during our lives. Primary prevention is far too low down on the political agenda and for patients that's unacceptable. For us it is not just about gaining access to the best treatments available; it is about not getting cancer in the first place.'**
Jane Stephenson Chair UK Breast Cancer Coalition
'Cancer care: what are the priorities?'
The Lancet Oncology 2 (10) October 2000 p237

Signs of change
The science sector, in general, is unlikely to support a primary prevention agenda due to its continuing dependency on commercial sponsorship, thus creating partnerships geared more to market and shareholder interests than to public or environmental health outcomes. However, there is a countering trend to the invisibility and silence of scientists beholden to industry. Some, regardless of personal and professional costs, are prepared to challenge the status quo.

Any future hope for science leading and influencing primary prevention policies lies with those scientists who:

publicly acknowledge the association between environmental pollution and escalating cancer rates. For example:

- Professor C Pritchard, Faculty of Social Science University of Southampton and B Evans, Southampton University Trust Hospitals: **'We need to accept that amongst the multiplicity of [cancers'] causal factors, some are 'environmental' and therefore may be population related. There are some examples concerned with electro-magnetic fields, water pollution, types of occupations, and changing lifestyles, but all are potentially to our control.'**
  'Population density and cancer mortality by gender and age in England and Wales and the Western World 1963-1993' pp215-220 Public Health (111) 1997
- Professor Sam Epstein: **'Cancer is not a normal phenomenon. It is an expression of exposure to contaminants and carcinogens in our environment. The majority of scientists are interested only in damage control, not in prevention.'**
  International conference 'Cancer, Environment and Society' ARTAC/UNESCO Paris May 7 2004
- Professor Eric Lovgren, Member of the Royal Institute of Technology Sweden: **'We have to help industry get out of the position they're in – we have to discuss 'values' about chemicals and society.'**
  International conference 'Cancer, Environment and Society' ARTAC/UNESCO Paris May 7 2004
- Dr Vyvyan Howard, Toxicopathologist, University of Liverpool UK: **'We're not adapted to the many other factors now in our environment. Impacts on a foetus in the womb are considerable and are having effects on cancer rates today.'**
  International conference 'Cancer, Environment and Society' ARTAC/UNESCO Paris May 7 2004

take up new challenges in research and development e.g. green chemistry, endocrine disruption. For example:

- the work of scientists currently developing 'green chemistry', defined as **'a fundamental methodology for changing the intrinsic nature of a chemical product or process so that it is inherently of less risk to human health and the environment [by] utilizing a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products.'**
  P Anastas & J Warner 'Green Chemistry: Theory and Practice' Oxford University Press 1998 p11
- Professor Martyn Poliakoff, Professor Steve Howdle and Dr Mike George of the Clean Technology Group, School of Chemistry, University of Nottingham, who are using carbon dioxide instead of traditional solvents to find ways for making chemical reactions cleaner.
- Dr Nicholas Leadbeater and his research group at King's College London, who are working in areas of organic and inorganic synthesis, and are interested in new ways to make molecules and cleaner ways to do chemistry and minimise waste. **'We want to make a product with no waste and no by-products and hence less chance of polluting the environment.'**
  Guidebook – Royal Society Summer Science Exhibition London July 2002

are unequivocal about the task facing all governments. For example:

- David Gee, European Environment Agency (EEA) Brussels Belgium: **'New political initiatives such as putting much more money into cancer prevention are needed to give European citizens the protection they deserve.'**
  International conference 'Cancer, Environment and Society' ARTAC/UNESCO Paris May 7 2004
- Professor Dominique Belpomme, Medical oncologist, University of Paris, France: **'Public health policies must now focus on the relationship between environment and health. Realistic primary prevention policies should be introduced with the aim of avoiding the deleterious factors which we introduce into the environment.'**
  PAN Europe Pesticides News (number 63) p6 March 2004

- Richard Sharpe and D. Stewart Irvine, Endocrinologists, Medical Research Council UK: **'Reducing exposures by reducing release of chemicals to the environment ... requires action by industry and government. The proposals by the Royal Commission on Environmental Pollution as to how this may be achieved seem to be a practical and effective path towards such a goal.'**
  Clinical Review: 'How strong is the evidence of a link between environmental chemicals and adverse effects on human reproductive health?' British Medical Journal (BMJ) 328 pp447-451 February 2004

Independent scientific opinion, free from the constraints of vested interests, will be crucial to the process of developing primary prevention strategies. There is therefore a need for:

- independent scientists to express their concerns in public forums
- government to heed the voices and warnings of 'independent' scientists.

> **Science is a continuous endeavour. But it will only help to stem the breast cancer epidemic if its findings are put to use by government and others who make public policy.**
> Dr Cathy Read 'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 p210

8.5 Industry

Industry manufactures, produces, transports and markets a great variety of products. Most are produced to enhance and improve our daily lives. However, many chemically based, chemically treated and radiation-emitting products are proven and potential threats both to health and environment. Industry is the major source of toxic substances creating hazardous conditions in the environment.

To what extent is industry responsible for human and environmental health? In theory, all industry sectors, from mine to laboratory, from manufacture to market, have a legally mandated responsibility for preventing adverse effects on human and environmental health from their decisions, activities and products.

In reality it is the business of industry to profit from its products. Key figures in the UK cancer establishment have said: **'The pharmaceutical industry will always fund areas that are in their best direct interests. Cancer prevention is not currently one of these ... People value treatment more than prevention so that is where the profit now lies.'**
Angus Dalgleish Mike Richards Karol Sikora 'Prevention' p21 'Cancer 2025: the future of cancer care' Ed Karol Sikora Future Drugs Ltd June 2004

History shows that industry:

- **'Has aggressively pursued short-term economic goals, recklessly uncaring or unmindful of harm to workers, local communities, and the environment. So far, industry has shifted responsibility for the damage it has caused and has externalized these costs onto society at large.'**
  Professor Sam Epstein 'Losing the War Against Cancer: Who's to Blame and What to Do About It' International Journal of Health Services pp53-71 Vol 20 no1 1990

- **'Neither plans nor accounts for the social and economic costs of its products and processes on the environment and on people. Corporate accounting does not calculate the real value of economic and human loss of the toxins they add to our lives. Occasionally trial lawyers, unions, environmentalists, public health workers and government agencies and their economists do.'**
  Professor Robert Chernomas & Lissa Donner 'The Cancer Epidemic as a Social Event' p7 March 2004 Canadian Centre for Policy Alternatives

Peter Frankental (UK business group manager for Amnesty International UK) claims that: **'Corporate boardrooms, rather than Mother Nature, are producing new diseases, such as smoking-related cancers, thalidomide, BSE and Creutzfeldt-Jakob disease. Shareholders in tobacco companies benefit from the sale of cigarettes, but many smokers pick up lung diseases and society picks up the health and social costs. Many companies achieved record sales of animal feedstuff and paid record dividends, but consumers collected the mad cow disease. Apart from those few companies operating in a niche ethical market, there are no examples of major corporations that have changed their business models or their business strategies to improve their social and environmental impacts. There is an urgent need to bring corporations under public control, enhance stakeholder rights and change the way they are governed. But that is not on the government's agenda.'**
'The Giving List' pp32-33 The Guardian in association with Business in the Community's Per Cent Standard November 8 2004

Voluntary control by industry
Although favoured by industry and preferred by government, voluntary control has produced no

significant change in industry attitudes regarding health and environment. Prem Sikka, Professor of Accountancy at Essex University, believes that **'in an environment of voluntarism, many companies will continue to produce statements proclaiming "core values of honesty, integrity and respect for people." The corporate mammoths are unlikely to volunteer any meaningful information about deaths and diseases caused by their products unless parliament lays down firm enforceable requirements.'**
As above pp28-29

Against constant business demands for a purely voluntary approach, non-governmental organisations urged the EU and other public authorities to the realisation that **'only binding legal measures will establish a general incentive for responsible corporate behaviour which matches their general incentive to be profitable.'**
David Gow European business editor The Guardian 'The Giving List' p14 The Guardian in association with Business in the Community's Per Cent Standard November 8 2004

Resistance to changes intended to protect the health of workers, the general population, and the environment is a familiar industry response. Two examples of the financial and political power industry can wield against scientifically supported reforms for public health are provided by the tobacco (anti-smoking measures) and asbestos (exposure of workers to asbestos dust) industries. Both **'have been notable in the past for selecting, excluding or suppressing epidemiological and toxicological data so that the health hazards attached to their industries or products have been neglected or distorted.'**
Professor Andrew Watterson 'Whither lay epidemiology in UK public health policy and practice? Some reflections on occupational and environmental health opportunities' pp270-274 Journal of Public Health Medicine Vol 16 no3 1994

Regarding proposed regulatory action to reduce environmental health hazards such as EDCs, **'industry argues that to take action without a sufficient body of scientific evidence would be premature and disproportionately expensive.'**
'Hormone Mimicking Chemicals' POST Technical Report 108 p7 Parliamentary Office of Science and Technology London January 1998

As remarked by Prem Sikka: **'UK history shows that change often had to be imposed in the teeth of opposition from the entrenched business elite (e.g. health and safety laws).'**
pp28-29 Guardian Society 'The Giving List' November 8 2004

Even when proposed changes are informed by science and endorsed by government, co-operation from industry sectors with a record of persistent and powerful opposition to change – and of judging change in terms of real or perceived industry benefit – is highly unlikely without government leadership and legislative reform.

It is clear that **'without the support of industry the urgent reductions that are needed in emissions of virtually every chemical pollutant are unlikely to be achieved ... legislation is crucial. Businesses are unlikely to change their operations, especially where cost is involved, if competitors do not also have to do so ... once everyone is on the same footing industry will act.'**
Adam Markham 'A Brief History of Pollution' Earthscan UK 1994 p131

> **"Industry" is not a homogenous entity ... A general observation is that market leaders, at least initially, are against new legislation as any change threatens their position, but that innovative, dynamic companies frequently embrace new legislation as a way to acquire a greater market share.**
> Report 'Cry Wolf' p15 International Chemical Secretariat April 2004 **www.chemsec.org**

Public opinion of industry
Past irresponsible behaviour of industry has had a huge impact on public opinion. An annual review of the public's views on corporate responsibility found that 82% of British adults think most companies try to get away with as much as they can. The same study shows that more than half the population doesn't trust the motives of big business.
Guardian Society November 8 2004 p11 'The Giving List'

According to the 2002 Eurobarometer survey, 93% of Europeans believe that chemicals have a negative impact on health. In other words, a large majority of consumers in the European market have a negative attitude towards chemicals.
'What we need from REACH: Views on the proposal for a new chemical legislation within the EU'
International Chemical Secretariat, Sweden

Signs of change
Aside from legal controls the two key factors shown to influence change at industry level are:
- the actions of competitors
- the behaviour and opinion of informed consumers.

Public opinion may alter as more ethical business enterprises build in strength and number. In WWF's view: **'Companies that eliminate their reliance on chemicals with known hazards or inadequate safety information will find a**

growing market for their greener, safer products among the EU's 550 million consumers. This will lead to increased trust among consumers, employees, local communities and investors.'
WWF briefing 'Chemicals and Health in Europe' p4 May 2003

Increasingly some companies are working with environmental groups and trade unions to remove potential harmful chemicals from products and the workplace. Ahead of the REACH legislation, companies such as Boots, Marks & Spencer, Electrolux and Hennes and Mauritz (H&M) have identified a list of priority substances to be phased out from their products in advance of any legislation.

Market evidence already shows a shift in consumer behaviour and the emergence of commercial and production industries attuned to public concerns about environment and health. This trend is demonstrated in surveys such as the Ethical Purchasing Index (EPI), conducted by the The Co-operative Bank. The EPI for 2002 reported seven out of ten parents becoming more interested in environmental issues following the birth of their children. There was 19% growth in spending on 'green' products and services in the same period compared with an overall growth of 2.1% in the British economy. **www.cooperativebank.co.uk/epi**

The need to reduce levels of chemical and radiation pollution is creating opportunities for new partnerships between science and industry. Whether by design or default, scientists and industries responding to such opportunities will benefit the health of future generations and the quality of the environment. The expanding range of safer alternatives to dominant product brands and goods testifies to industry's capacity:

- to initiate change
- to respond to market trends and consumer concerns
- to set and meet more exacting standards relating to health and environment
- to heed the broader implications of the science behind the product
- to develop safer products
- to succeed in the marketplace.

8.6 Trade unions

Addressing a symposium about the invisibility of women in occupational studies, Karen Messing, Professor of Biology, University of Quebec, Canada, said: **'We need a new methodology and a new language to describe the great diversity of women's work and work places. There's a place for listening to women's voices in [occupational] research studies and trade unions should be getting involved with this.'**
'Invisibility Hurts' Keynote address Trades Union Congress (TUC) symposium 'Women, Work and Health' November 3 1998 London

Trade unions could:

- take seriously the health of women members and workers by listening to and recording women's views on the health risks and safety issues they experience in their places of work
- take account of adverse health impacts of women's multi-occupational work patterns
- identify and take remedial action on workplace and occupational factors which affect women's health as distinct from effects on male employees
- document and disseminate information about workplace hazards/risks for breast cancer.

8.7 Government

Implications of accepting that the cancer epidemic may essentially be preventable will pose some difficult problems for politicians and decision-makers, who will have to consider adopting policies that may damage the economy in the short term in order to reap health benefits which will only become apparent several decades in the future.
Extract from the publisher's briefing: 'Cancer as an Environmental Disease' Eds P Nicolopoulu-Stamati L Hens V Howard N Van Larebeke Book Series: Environmental Science and Technology Library 20 Kluwer Netherlands 2004

Empowered by the people and obligated by law, it is the duty of government:

- to protect public health and the environment from man-made materials and practices that damage or have the potential to damage either
- to control industry behaviour in order to prevent adverse effects on health and environment
- to safeguard the population against science and industry-produced hazards, particularly those with irreversible effects such as cancer.

In reality, public and environmental health depend upon the will of government to act in the interests of the population and the environment that sustains it. In the absence of political will to legislate effective industry controls and environmental management, government is condoning serious and irreversible impacts on human and environmental health for generations to come. As a consequence of governments' failure to adopt effective preventive measures, citizens find themselves caught between two extremes:

- government policy promoting lifestyle changes as key to prevention

- industries producing and marketing carcinogenic 'lifestyle' products.

David Hunter, Professor of Health Policy and Management Durham University, in his address to the UK Public Health Association conference in April 2004, referred to **'the stewardship function of government in creating the conditions for people to lead healthier lives,'** and a forthcoming government paper on public health which he feels **'will demonstrate the extent to which government recognises its responsibility to act.'**

However, he warns that **'if history is any guide, we should not hold our breath. Complex problems demand complex solutions and action on many fronts. This is a government that, with few exceptions, remains in thrall to big business and worships the twin gods of productivity and markets even when these actively contribute to the very anti-health forces it seeks to confront ... identifying and mainstreaming interventions that work will need to bring together biological, psychological, sociological and organisational approaches that, for the most part, remain locked into their respective silos.'**
Public Health News pp10-11 April 2004

Prevention economics
In two reports prepared for the Treasury by Sir Derek Wanless on future health spending (April 2002, February 2004), he warns that **'the huge sums invested in NHS modernisation will be wasted if the health service is hit by high levels of preventable illness over the next 20 years.'**
'Putting Health First' King's Fund fact sheet August 2004
www.kingsfund.org.uk

Both in economic and social terms, prevention is the common sense approach to sustainable, long-term health service provision. Government must decide.

Public (mis)information
Members of the public depend on government agencies such as the Food Standards Agency and the Health and Safety Commission for up-to-date, accurate and detailed information about environmental health hazards.
'Government agencies charged with regulating chemicals in the environment (air, soil, water and food), assure the public that these chemicals are safe ... The public is routinely informed that these chemicals have been tested, that there are studies demonstrating the absence of their risk, and that regulatory agencies adequately protect public health.'
JP Myers L Guillette Jr P Palanza S Parmigiani S Swan F vom Saal 'The emerging science of endocrine disruption' p12 International Seminar on Nuclear War and Planetary Emergencies 28th Session Italy August 18-23 2003

The sort of information government should provide is instead produced by non-governmental organisations such as The Hazards Centre and Women's Environmental Network (WEN).

Directions for responsible government
Deep public mistrust stemming from a recent history of government failures to protect public health (BSE and CJD etc) makes more urgent the need for resolute government action on many issues related to the primary prevention of breast cancer. For example, a resolute and 'responsible' government would:

prioritise the primary prevention of breast cancer Give breast cancer prevention the highest priority by setting up a working group:
- made up of professionals experienced in occupational and environmental cancers, independent scientists committed to cancer prevention, representatives of public interest (employee, consumer, citizen), breast cancer, environment, union and workplace organisations dedicated to the development of comprehensive primary prevention policies and strategies
- which would be given a proportion of annual health expenditure to implement its policies and strategies.

make the goal 'pollution prevention' instead of 'pollution control' There are sufficient common sense reasons for pollution control programmes in the workplace and the general environment. There is also a mass of research supporting the need for pollution prevention.

adopt 'the polluter pays' policy Move the cost of environmental pollution from society (taxpayers) to the polluting company. BBC radio news (December 22 2004) reported The European Commission's criticism of the UK government for taking the responsibility for the decontamination of nuclear sites away from the British Nuclear Fuels corporation, and thus evading the proper use of the 'polluter pays' principle.

honour the commitment made to implement the precautionary principle In signing the International Biosafety Protocol in 2000, the UK government signed its commitment to implementation of the precautionary principle in future policy designs and decisions.
The government should honour this commitment, particularly with regard to substances known or strongly suspected of harming human health.
The precautionary principle acts on the basis of evidence of harm rather than definitive proof of harm traditionally demanded by industry and policy makers.

'Government regulators face powerful lobbying efforts by the chemical industry demanding scientific certainty in demonstrating the dangers of pesticides. In order to ban, restrict, or otherwise regulate

a pesticide the chemical must be shown to pose an unacceptable risk. On behalf of farm workers, rural residents, consumers and the environment, we should replace the current system with a precautionary principle approach in which pesticides are assumed dangerous until proven safe.'
Margaret Reeves and Lucy Rosas 'Nobody told me they were harmful' p28 in 'Silent Invaders: Pesticides, Livelihood and Women's Health' Eds Miriam Jacobs & Barbara Dinham Zed Books and Pesticide Action Network *(UK)*

'Our guiding principle should be that the safest exposure is no exposure to carcinogens. We must shift our thinking from an assumption that chemicals are safe until proven guilty to one in which we act to protect public health even in the face of uncertainty.'
Professor Robert Chernomas & Lissa Donner
'The Cancer Epidemic as a Social Event' p20
Canadian Centre for Policy Alternatives

A key requirement of the precautionary principle is 'shifting the burden of proof' of harm from those who are, or are likely to be harmed, to those who create the risk in the first instance. Dr Sandra Steingraber points out that the burden of proof borne by chemicals producers is **'already the standard we uphold for pharmaceuticals, and yet for most industrial chemicals, no firm requirement for advance demonstration of safety exists.'**
'Living Downstream: an Ecologist Looks at Cancer and the Environment' Little Brown & Co UK 1998 p270

> **The pharmaceutical industry ... is now able to screen millions of compounds for their potential to exhibit complex physiological effects, rapidly and effectively. In contrast, the regulatory systems for other synthetic chemicals have failed to assess the basic properties for a mere 30,000 or so compounds.**
> The Royal Commission on Environmental Pollution p9 para 1.28 24th Report June 2003

introduce a toxics reduction programme
Develop national and regional industry-based policies (modelled on the successful Scandinavian programmes) to reduce both levels and numbers of unavoidable toxic hazards impacting on workers and communities.

actively promote the development and use of safe alternatives to hazardous chemicals
Offer incentives to promote the development of green chemistry with an emphasis on its application to product design and use.

extend regulatory requirements to all chemical compounds, old and new Little or no safety data exists or is required for chemical compounds created before 1981. The majority of these 'older' chemicals are still being produced and used in many forms e.g. formaldehyde, parabens.

bring the UK's outdated regulations into line with advances in the field of toxicology e.g. new processes and testing methods, emerging knowledge and current data. For instance, five renowned scientists in the field of endocrine disruption propose that new standards of testing for the health effects of EDCs **'at doses within the range of human exposure (currently not done) with respect to long-latency effects of developmental exposure throughout the lifespan (currently not done) be required prior to the introduction of any chemical intended for use in commerce.'**
JP Myers L Guillette Jr P Palanza S Parmigiani S Swan F vom Saal 'The emerging science of endocrine disruption' p12
International Seminar on Nuclear War and Planetary Emergencies 28th Session Italy August 18-23 2003

extend the application of regulations to the whole community e.g. in schools, homes, recreational spaces.

incorporate lay knowledge in the regulatory process **'Workers, users and neighbours evidently can bring important information to the regulatory appraisal process ... lay views can help ensure that the regulatory process remains (or becomes) attached to prevailing ethical and socio-cultural values.'**
'Late lessons from early warnings: the precautionary principle 1896-2000' p178
The European Environment Agency (EEA) 2003

integrate health and environment policies
There is a clear need for a more integrated and comprehensive approach to the public health problems of the early 21st century that would both form and inform policies for major diseases like breast cancer. **'Public health and the environment [are] two fields of science and policy-making that have become specialised and somewhat polarised in the last 100 years. Individuals experience their health and their environment as one, interconnected, reality: science, regulatory appraisal and policy-making need to be similarly integrated.'**
'Late lessons from early warnings: the precautionary principle 1896-2000' p193
European Environment Agency (EEA) 2003

get serious about occupational factors affecting the health of women There is an urgent need for government agencies, such as the Health and

Safety Commission/Executive (HSC/E), occupational health experts and unions to:

- give serious attention to the full range of known and suspected risk factors associated with breast cancer
- commission and fund research studies to underpin improved health and safety measures for women across **all** occupations.

A fully staffed Occupational Health Service within the NHS could be integrated and cross-referenced with public health, GP and hospital services to provide a better service allowing for collection and collation of valuable information.

take stringent measures to protect vulnerable people, particularly children, by:

- banning from production and registration processes all substances which cause irreversible effects e.g. carcinogens, reproductive toxins, mutagens, EDCs
- reformulating regulations from male-centred/adult-centred to child-centred safety standards.

> **Reducing exposures by reducing release of chemicals to the environment ... requires action by industry and government. The proposals by the Royal Commission on Environmental Pollution as to how this may be achieved seem to be a practical and effective path towards such a goal.**
> R Sharpe & D Irvine Clinical Review: 'How strong is the evidence of a link between environmental chemicals and adverse effects on human reproductive health?' British Medical Journal (BMJ) 328 pp447-451 February 2004

Conclusion

Reducing the exposure of the population as a whole to toxic substances and agents associated with breast cancer will, coincidentally, have immeasurable positive effects on the economy and society over time resulting in:

- a reduction in a wide range of health problems arising from similar environmental sources and conditions e.g. allergies, other cancers, reproductive, developmental and neurological disorders
- a reduction in huge budget outlays on treatments
- a reduction in health stress and anxiety in the population.

Reducing human exposures to carcinogens and EDCs will require:

- a massive rethinking and reordering of priorities by science, industry and government
- a political and cultural shift where protection of public and environmental health takes priority over protection of industry, trade and the economy
- interaction and co-operation between independent organisations and public institutions.

Above all, future policies for protecting and benefiting human, environmental and economic health will require a return to the basic principles of common sense and a valuing of life and the environment that sustains it.

REACH (Registration, Evaluation and Authorisation of Chemicals)

REACH is a contemporary example of government working with industry against the interests and welfare of people, environment and future generations.

REACH is the title of proposed EU legislation to reform regulations applying to the chemicals industry across Europe.

In its original form (2001) the REACH proposal was designed to protect both public and environmental health, and to place the onus on producers of chemicals to prove the safety of their products. Ideally, the new laws under REACH would see the phase-out of the most toxic chemicals.

Since 2001, REACH has been determinedly undermined and weakened by:

- a huge campaign by the combined US and European chemicals industry opposing the legislation
- French, German, and UK governments expressing the same concerns as chemicals industry.

Gunnar Lind 'REACH: What Happened and Why?' The Greens/European Free Alliance in the European Parliament 2004 pp83-89 **www.chemicalreaction.org**

Chemical manufacturers **'foresee rising costs and unemployment, while environmentalists predict large savings plus benefits in human health and the environment ... The benefits of a more effective system e.g. reduced costs for disease related health care and liabilities are largely ignored in the industry-sponsored studies (produced in response to REACH). In studies that do estimate social and environmental benefits, it is shown that these savings largely out-weigh the predicted costs for implementation of REACH.'**

The highest implementation costs so far estimated by the industry amount to less than 0.3% of the chemical industry's annual turnover. The report concludes with the plea that even a 0.5% annual cost to industry **'is surely a small price to pay for better protection of wildlife and human health.'**
'Cry Wolf – predicted costs by industry in the face of new regulations' Report published by The International Chemical Secretariat (ChemSec) April 2004 pp17-18

8.8 The cancer industry

The 'cancer industry' is a generic term for the ever-expanding industry which has grown up around the disease. It is a vast industry incorporating all services, products, materials and technologies required for the orthodox management of the disease.

Given its:
- traditional preoccupation with control and management of the disease
- current preoccupation with new therapies (drug and gene) to meet future demands
- huge (research and financial) investment in therapies for a burgeoning future market
- awareness that profits for society from 'primary prevention' represent a loss of industry profits,

there would appear to be little hope for the 'primary prevention' of breast cancer becoming a priority for the cancer industry.

Evidence for this situation can be found in the long-prevailing silence from the industry on environmental and occupational factors in breast and other reproductive cancers. Silence from this source in particular deprives citizens of control over their health and their lives by depriving them of basic 'right to know' information.

This is the silence that allows industries to continue:
- producing carcinogens and carcinogenic products
- using carcinogens and carcinogenic products.

Cancer charities

As major fundraisers for research and major providers of public information and patient support services in the UK, cancer charities work in close association with the cancer industry. Primary prevention is not their objective. At this time (2005) the few that are addressing 'prevention' e.g. Breakthrough and World Cancer Research Fund (WCRF) are endorsing and promoting the lifestyle focus of government campaigns both in their literature and prevention-related research.

A cancer-industry view of its future

A comprehensive picture of the cancer industry's perception of its future growth and direction is provided in the report 'Cancer 2025: the future of cancer care'. Predicting a continuing rise in cancer rates (two in every four people by 2025) authors of the report expect cancer will increasingly be managed with lifelong drug treatment and lifelong monitoring as in diabetes and asthma. Contributing engineers and scientists demonstrate a ready acceptance of a 'cancer-forever' scenario with prospects for expansion of the cancer industry as a whole.

The social and economic impacts of 'cancer forever'

What are the costs to the health service, the tax-payer, the economy and to the quality of life of the increasing numbers of people affected by cancer?

According to the report, the direct cost for managing the medical care of one cancer patient was approximately £20,000 in 2004. If we are heading into 'a positive chemotherapy future' then, **'by 2025 this figure could easily rise to £100,000 per patient per year – a total of perhaps £1 million over a lifetime. We are starting to spend vast amounts of UK tax on the National Health Service (NHS) taking the total healthcare budget up to £80 billion per year. We could consume a lot more than this in the future just on treating cancer. The explosion of new therapies in cancer care is going to continue and pricing of these drugs will remain high. If effective drugs emerge from the research and development pipeline, the cancer drug market will be worth US$300 billion globally by 2025.'**
'Cancer 2025: the future of cancer care' Editor Professor Karol Sikora Future Drugs Ltd UK June 2004 pp46-50

Conclusion

A thriving enterprise with a guaranteed future, 'cancer' is a growth industry in every sense of the word.
It would be extremely unlikely that this particular industry would champion a case which has the potential to undermine its very existence.

8.9 Citizens

Public opinion, when it is truly aroused, can be unstoppable.
John Humphrys 'The Great Food Gamble' Hodder and Stoughton UK 2001 p95

Health hazards, although of vital importance both to the public health and those who specialise in their control, do not necessarily have the same degree of priority for politicians, and they have to be moved up the agenda before action will be taken. More commonly, the reason why change does not come about more quickly is simply that there is inertia in any political and bureaucratic system and action is not taken until sufficient pressure has built up to move the system.
J Muir Gray & G Fowler 'Essentials of Preventive Medicine' Blackwell Scientific Publications UK 1984 pp148-149

Despite all the research conducted for breast cancer during the 20 years since corporations created 'Breast Cancer Awareness Month', breast cancer rates continue to rise. We need more than awareness. We need action.
Barbara Brenner Director Breast Cancer Action USA

Who or what will finally move primary prevention and other prevention-related issues to the top of the breast cancer agenda? History confirms that the majority of improvements in the health and environment of a society have invariably come about as a result of citizen-driven actions and demands.

Peter Frankental (UK business group manager for Amnesty International) reminds us of **'the many layers of social protection that safeguard us from corporate malpractice – anti-discrimination legislation, health and safety regulation, consumer safeguards, or environmental protection.'** He also makes the point that **'in each case, many years of campaigning were required to generate the public concern and the political pressure to enable legislation to be enacted.'**
'The Giving List' The Guardian Society November 8 2004 pp32-33

Primary prevention – the vital role of citizens
References throughout this document indicate both public and professional opinion favouring 'prevention' over 'treatment' of disease. Yet, with the exception of sunlight and tobacco smoke, reference to the links between chemical/environmental exposures and cancer is selectively omitted from:
- government cancer-prevention campaigns
- government and industry-sponsored/commissioned cancer-prevention research programmes
- government's white paper on public health
- government debate on primary prevention of breast cancer (see next page).

Thus the officially endorsed view of cancer prevention is one that determinedly ignores the correlation between cancer and exposures to environmental agents with carcinogenic, endocrine-disrupting and radiation-emitting properties.

Official disregard for public opinion and for evidence supporting primary prevention makes it clear that the only hope of seeing primary prevention enacted into law and implemented as policy lies with citizens:
- becoming sufficiently informed to protect themselves and their families
- demanding safe alternatives to toxic substances proven to be essential in functional terms e.g. food preservatives
- insisting that government, industry and science demonstrate their joint responsibilities for delivering primary prevention.

In the final analysis, it is down to ordinary people to **'successfully challenge the status quo, and to insist that science, the state and corporations operate in the public interest.'**
Professor Robert Chernomas & Lissa Donner 'The Cancer Epidemic as a Social Event' p21
Canadian Centre for Policy Alternatives 2004

When award-winning food writer, Felicity Lawrence asks the question **'who will concern themselves with whether we are sold junk [food]?'** few would be surprised at her answer: **'We must look to ourselves. It will take a coalition of interests in which the public, as in previous centuries, takes the lead. Change will come when ordinary people, realising that our current food system is environmentally, ethically and even biologically unsustainable, exert their buying power and say, 'Enough is enough.'**
'Not on the Label: What Really Goes into the Food on Your Plate' Penguin UK 2004 p225

Information is the key
Without essential information (and adequate resources) citizens cannot take, or be expected to take, either individual or collective responsibility for disease prevention. Without information we have no choice but to remain:
- vulnerable to exposure
- ignorant about risk
- powerless to choose.

The power of 'informed' consumer behaviour
How many of us know which ingredients in cosmetic and personal care products are harmful and which are not? From interviews with representatives of the cosmetics industry, WEN has learned that, **'apart from legislative changes, cosmetics companies have said the only thing that will make them change their products or ingredients is consumer pressure.'**
'Getting Lippy' Women's Environmental Network (WEN) Cosmetics Briefing p6 2003

Once in possession of the facts about health hazards in everyday products, **'consumers can respond by using the marketplace as a 'regulatory tool' by shopping for safe products and by boycotting unsafe products.'** Professor Sam Epstein 'Carcinogens At Home' Address to Conference: 'Everyday Carcinogens: Stopping Cancer Before It Starts' Hamilton Ontario March 1999. By acting in sufficient numbers to affect purchasing patterns, consumers can exercise enormous power in the marketplace by sending the 'right' message about the 'wrong' product directly to industry.

Sources of information
Where industry and government have failed in their responsibilities regarding provision of public information about human and environmental health hazards, comparatively less well-resourced citizens have taken on that responsibility themselves. Dedicating a huge effort in time and energy, national, regional and local non-profit, non-governmental organisations endeavour to fill important gaps in public and consumer information by:

- producing information (print and electronic)
- conducting awareness-raising campaigns (see Appendix II).

Tackling official misinformation
There is an urgent need for informed citizens to challenge and expose the misuse and distortion of the term 'primary prevention' at every opportunity. For example, in the Parliamentary debate (November 9 2004) on the primary prevention of breast cancer prepared by the charity Breakthrough Breast Cancer and led by MP and joint-chair of the All-Party Parliamentary Group (APPG) on Breast Cancer, Dame Marion Roe, the only topics addressed were screening, obesity and alcohol use.

Since screening is a tool for detection, not prevention, and since alcohol use and obesity have no direct effect on breast cancer, although it is thought that both may increase disease risk, none of the topics raised in the debate was about primary prevention – i.e. stopping breast cancer before it starts.

An incorrectly titled debate and incorrect use of the term by MPs who are generally perceived as informed authority figures is now fixed on the public record of parliamentary proceedings (Hansard). Distortion and misuse of this kind allows MPs, and the cancer charities who brief them, to claim they are addressing primary prevention. If not challenged, this will become the officially accepted, though entirely false, view of governments and their policy makers.

> **To compete with the well-financed propaganda of industry, tacitly supported by the cancer establishment and lifestyle academics, an educational offensive must be mounted to inform the public and develop grassroots pressures for a cancer prevention campaign.**
> Professor Sam Epstein 'Losing the War Against Cancer: Who's to Blame and What to Do About It' International Journal of Health Services Vol 20 no1 1990 p66

Examples of recent breast cancer prevention actions taken by concerned UK citizens:

Citizens challenging government: The Ban Lindane Campaign In 1994, a television documentary making the link between the pesticide lindane, its use on crops in eastern England, and breast cancer incidence 40% higher than the national average in Lincolnshire prompted concern and anger among women union members. Their subsequent campaign to ban the use of lindane moved from regional to national union level, and by 1996 they had joined forces with other campaigning organisations and gained the attention of the media and MPs. Consumers also became involved, carrying out market surveys of products containing lindane. Success came in July 2000, when the UK government supported an EU directive to remove lindane from agricultural and garden use throughout Europe.
'The Campaign Against Lindane: the lessons of women's action' by Jill Day in 'Silent Invaders: Pesticides, livelihoods and women's health' pp272-279 Eds M Jacobs & B Dinham Zed Books UK 2003

Citizens challenging industry: 'Think Before You Pink' campaign A postcard campaign, originally developed by the US organisation Breast Cancer Action, inspired the public service union UNISON to partner Women's Environmental Network (WEN) in a similar campaign in the UK. Carried out during Breast Cancer Awareness Month, October 2004, the UK campaign was directed at major cosmetics companies and called upon them to **'show true support for the 'fight' against breast cancer by removing known or suspected carcinogens, mutagens or reproductive toxicants from their products.'** It questioned their support of the corporate-driven 'pink ribbon' campaign (which promised a percentage of sales for research) while producing and selling products containing carcinogens and EDCs, and reminded target companies that **'safer alternatives are available. It's time for companies to phase out these chemicals.'**

Citizens working with one industry sector to challenge science, industry and government:

A Bio-monitoring Survey 'Bio-monitoring' is the scientific testing of biological samples e.g. blood or urine, to identify the presence and levels of certain substances in the body. Results provide a record of:

- chemicals to which a person has been exposed
- chemicals which have been retained in the body
- chemicals which are accumulating in body tissues.

In partnership with the National Federation of Women's Institutes (NFWI) and The Co-operative Bank, WWF conducted a bio-monitoring tour of the UK in 2003. The aim of the survey was to raise awareness about the presence of specific man-made chemicals in everyday

products and situations and the extent to which these contaminate people.

Blood samples from 155 volunteers were analysed for 78 man-made chemicals belonging to one of three groups of industrial chemicals:

- PCBs (polychlorinated biphenyls) – a group of industrial chemicals used in electrical equipment until banned as toxic in the 1970s
- OCPs (organochlorine pesticides) – a major group of pesticides used from the 1950s until banned. The last to be banned was lindane, in 2002
- PBDEs (polybrominated diphenyl ethers) – brominated flame retardants widely used on many everyday items.

All survey blood samples carried at least one chemical from each group with the highest load being 49 chemicals in one person. A significant finding was the comparatively lower levels of PCBs in blood samples of women who had borne children, the levels reducing in relation to the number of children, suggesting that PCBs are off-loaded from mother to child.

International action by citizens

Challenging the cancer establishment: World Conference on Breast Cancer The first World Conference on Breast Cancer (Kingston, Ontario, Canada 1998) was organised by various international women's groups as a vote of 'no confidence' in major cancer charities. Their failure to address prevention was a major theme at this landmark event and was attended by hundreds of women afflicted by breast cancer. It was they who placed 'primary prevention' high on their agenda from the outset.

Challenging industry and government: Chemicals regulation in Europe (REACH)
The following submission to the European Commission on the REACH Proposal was a joint declaration signed by citizens representing environmental, health and consumer interests. It stands as an example of what can be achieved by individuals acting from a basis of shared concern.

'We, the undersigned 429 organizations and 22,464 citizens around the world, from Australia to Zaire, wish to ensure that our health and that of the environment will be properly protected from hazardous chemicals. We therefore ask the European Commission to ensure that the new chemicals legislation enforces:

- **An obligation to phase out chemicals that accumulate in wildlife, humans or the environment, and those that disrupt hormones. Restricted uses of such chemicals should only be permitted temporarily, if safer alternatives are not available, and the use is essential to society**
- **A full right to know for both consumers and businesses, including what chemicals are present in products**
- **A requirement that products imported into the EU have to conform to the same safety standards as those made in the EU.**

The draft legislation does not implement these points. We consider that the new system will not be workable, and will not effectively protect future generations, unless these measures are taken. Please take this declaration as our submission to the Commission's consultation on the workability of the chemicals legislation.'

While industry builds powerful resistance and hindrance to the proposed REACH reforms of chemicals testing and regulation, voices representing government, science and communities across Europe are calling for urgent primary preventive actions to stem rising cancer rates. Consequently, the 'pressure' theory is borne out by a broadly based international take-up of the REACH reform agenda as a model for policy changes at the local community level.
Gunnar Lind 'REACH: What Happened and Why?' The Greens/European Free Alliance in the European Parliament 2004 p91

The Paris Appeal

In May 2004 a documented appeal was made to national decision makers, international organisations, the United Nations (UN) and the European Union (EU) to apply the precautionary principle to chemicals which constitute a danger to health, and to support the proposed new EU chemicals legislation (REACH). This Paris Appeal has already been signed by numerous international scientists, Nobel Prize winners, 400 non-government organisations (NGOs), and 90,000 EU citizens. It has also been signed by two million doctors representing the Standing Committee of European Doctors (CPME).
http://www.artac.info/

The Human Rights Act

Incorporated into the UK legal system since 2000, the Human Rights Act provides the appropriate framework for citizens deciding to take the 'civil action' path to gain public attention and progress for primary prevention or for related issues such as 'right to know'.

Conclusion

Individuals gaining new insights into the many factors contributing to rising breast cancer rates tend to react with shock and anger. Once armed with an understanding of the prevailing politics of the breast cancer prevention situation, each of us is forced to the realisation that our elected governments are:

- choosing to turn a blind eye to the evidence and imperatives for primary prevention
- unwilling to take the necessary political steps to prioritise primary prevention

- sacrificing public and environmental health to protect industry and the economic status quo.

With no sign of leadership from government regarding primary prevention and little evidence of a move towards safer, carcinogen-free developments from industry, it is clearly the responsibility of informed citizens to draw attention to, and gain support for, the primary prevention of breast cancer from those who influence policy and from policy makers at all levels of government.

Little has been done to prevent exposure to carcinogenic chemicals in the environment, despite ample evidence that chemical pollution of our air, water, food and the workplace is the major cause of cancer. On the contrary, government, industry and a small coterie of scientists have combined to stymie efforts to introduce preventive measures, such as strict pollution control standards. But cancer remains a preventable disease. It is up to citizens to push for action.
Professor Sam Epstein
'Losing the War Against Cancer: Who's to Blame and What to Do About It'
International Journal of Health Services Vol 20 no1 1990 p53

Chapter 9
Case summary

Some see things as they are, and ask why?
I see things as they should be and ask why not?

Adapted from George Bernard Shaw's play 'Back to Methuselah' Act 1
Frequently attributed to Robert Kennedy and quoted in his eulogy by his brother Edward Kennedy in1968

Given:

- our expanded understanding about the relationship between environment and human health
- the production, use and disposal of man-made carcinogens and EDCs in vast numbers and volumes in the environment
- the body of knowledge linking specific environmental agents to the major cancer affecting women
- the scientific data which underpins the case for breast cancer as a preventable disease
- the international models and ethical imperatives for prevention-related actions at government, industry and community levels,

the time has come:
'to de-emphasise the chase for risk factors and to re-focus on the implementation of current knowledge in populations in which thousands if not millions of frequently premature deaths could be avoided.'

Professor Peter Boyle, European Institute of Oncology 'Global Burden of Cancer' Lancet Oncology Supplement 13 November 1997

'to develop a balanced approach that recognises and deals with all facets of a disease that one in three of us will get. While a continued search for improved treatment and a possible cure is all very well and good, we should acknowledge that prevention is both feasible and preferable. The causes in most cases are clear. Systematic research can pinpoint them in more detail and social policies can eliminate them from public and home life.'

Ross Hume Hall The Ecologist Vol 28 no2 1998 p68

to acknowledge that:
'at its core, cancer prevention is not a political issue but a matter of public health and common sense.'
D. Davis & C. Muir 'Estimating Avoidable Causes of Cancer' Environmental Health Perspectives 103 Supplement 8 1996 pp301-306

'the medical establishment's preferred strategies of early detection and treatment have failed to reduce the global toll from this disease.'
Dr Cathy Read 'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995 p12

'exposure to environmental carcinogens causes cancer, and it is therefore obvious that measures of primary prevention aimed at avoiding or drastically reducing exposures will be the most efficient way to prevent environmentally associated cancers.'
Lorenzo Tomatis & James Huff 'Evolution of Cancer Etiology and Primary Prevention'
Editorial Environmental Health Perspectives Vol 109 no10 October 2001

'a myriad of scientific papers exist concerning adverse effects from exposure to radiation and from exposure to hundreds of chemicals. There is more than enough information to make informed decisions about exposures to these entities.'
Dr Janette Sherman: 'Life's Delicate Balance: A guide to causes and prevention of breast cancer'
Taylor & Francis USA 2000 p235

'in reality, the only effective remedy available to us is to reduce the exposure of the general population, on a precautionary basis, by removing from production those groups of chemicals which have been shown to potentially pose a hazard.'
Dr Vyvyan Howard Preface to report 'Chemical Legacy: Contamination of the Child' by Dr Catherine Dorey Greenpeace October 2003

to clean up the environment:
'there are enough known health problems from environmental pollution to convince us that it needs to be seriously curtailed.'
Susan Love MD 'Dr Susan Love's Breast Book' Perseus Publishing USA Third Edition 2000 p256

'man has put the vast majority of carcinogens into the environment and he can, if he wishes, eliminate many of them. The most determined effort should be made to eliminate those carcinogens that now contaminate our food, our water supplies, and our atmosphere, because these provide the most dangerous type of contact – minute exposures, repeated over and over throughout the years.'
Rachel Carson 'Silent Spring' Penguin Books UK 1986 edition p213 originally published 1962 Houghton Mifflin USA

'surely we have a duty to leave a planet that is healthy and habitable for all species.'
Sir David Attenborough, 2004

to reduce human exposures at all life stages:
'to synthetically produced carcinogenic and hormone disrupting substances and to the many forms of ionizing radiation implicated in the onset of breast cancer. Prudent precautionary measures suggest that reducing exposure to avoidable or modifiable risk factors should receive high priority from the public and private sectors.'
D. Davis, D. Axelrod, L. Bailey, M. Gaynor, A. Sasco 'Rethinking Breast Cancer Risk and the Environment: The Case for the Precautionary Principle' Environmental Health Perspectives 108 (9) September 1998 p523

to make primary prevention THE priority:
'primary prevention of human cancer can be accomplished in two ways:
(1) avoiding the introduction of carcinogenic agents into the environment, and
(2) eliminating or drastically reducing exposure to carcinogenic agents that are already in our environment.
The second approach involves actions aimed at reducing or eliminating occupational or other exposures to carcinogens.'
L Tomatis et al 'Avoided and avoidable risks of cancer' pp97-105 Carcinogenesis Vol 18 no1 1997

Scientific research evidence

Dating from the 1930s, animal, human, laboratory and field studies provide incontrovertible evidence for the role of man-made (and therefore reducible or modifiable) environmental factors in human diseases such as breast cancer.

A growing body of scientific evidence relates the toxicity of a wide range of industrial chemicals, pesticides and environmental hazards such as radiation, to breast cancer. Such evidence is generally dismissed, or overlooked as 'invalid' and 'inconclusive' by government and industry.

Since publication of Rachel Carson's ground-breaking work 'Silent Spring' in 1962, wildlife studies have continued to provide strong evidence of cancer links from exposure to environmental contaminants. Identification of approximately 200 breast carcinogens and 500 EDCs has resulted from laboratory tests carried out on animals. In the UK, only a small percentage of synthetic chemicals have been tested for effects on human health.

In addition to research references used in the main document, the following list provides a selection of findings related to synthetic chemicals and breast cancer. Although not all provide conclusive evidence, many point to the need for further research.

Organochlorines in the environment and breast cancer T Key and G Reeves 1994
British Medical Journal 308 pp1520-1521

Endogenous hormones and the aetiology of breast cancer T Key P Verkasalo 1999
Breast Cancer Research 1 (1) pp18-21

No-threshold dose for estradiol-induced sex reversal of turtle embryos: how little is too much? D Sheehan E Willingham D Gaylor J Bergeron D Crews 1999 Environmental Health Perspectives 107 (2) pp155-159

Hormones and mammary carcinogenesis in mice, rats and humans: A unifying hypothesis S Nandi RC Guzman J Yang 1995 Proceedings National Academy of Sciences USA 92 pp3650-3657

Breast Cancer: environmental factors Breast Cancer Prevention Collaborative Research Group 1992 Lancet 340 p904
Two 1992 studies show increased levels of chlorinated pesticides DDT and HCB in fat from human breast cancer. A 1990 study had shown an association between a decrease in exposure to organochlorides and a reduction in breast cancer mortality.

Organochlorine exposure and risk of breast cancer AP Hoyer P Grandjean T Jorgensen J Brock H Boggild Hartvig 1998 Lancet 352 pp816-1820
Findings support hypothesis that exposure to xenoestrogens (EDCs) may increase the risk of breast cancer.

Oestrogen fractions during early reproductive life in the aetiology of breast cancer P Cole B MacMahon 1969 Lancet 1 pp604-606

Health effects of exposure to low levels of ionizing radiation Committee on the Biological Effects of Ionizing Radiation (BEIR)
Board on Radiation Effects Research National Academy Press Washington DC 1989
Shows greater carcinogenicity of radiation to breast cells at prenatal and adolescent stages than at later life stages.

Pesticides and polychlorinated biphenyl residues in human breast lipids and their relation to breast cancer F Falck Jr A Ricci Jr M Wolff J Goldbold P Deckers
1992 Archives of Environmental Health 47 pp143-146

Blood levels of organochlorine residues and risk of breast cancer M Wolff G Paolo P Toniolo E Lee M Rivera N Dublin
1993 Journal National Cancer Institute 85 pp648-652

High organochlorine body burden in women with estrogen receptor-positive breast cancer M Dewailly S Dodin R Verrault P Ayotte I Sauve J Brisson
1994 Journal National Cancer Institute 86(3) pp232-234

Dichlorodiphenyltrichloroethane serum levels and breast cancer risk: a case-control study from Mexico L Lopez-Carillo A Blair M Lopez-Cervantes M Cebrián C Rueda R Reyes A Mohar J Bravo
1997 Cancer Research 57 pp3728-3732

Breast cancer and serum organochlorines: a prospective study among white, black and Asian women N Krieger M Wolff R Hiatt M Rivera J Vogelman N Orentreich
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Plasma organochlorine levels and the risk of breast cancer D Hunter S Hankinson F Laden G Colditz J Manson W Willett F Speizer M Wolff
1997 New England Journal of Medicine 337 pp1253-1258

DDT (dicophane) and postmenopausal breast cancer in Europe: case-control study P van't Veer E Lobbezoo J Martin-Moreno E Guallar J Gomez-Aracena A Kardinaal L Kohlmeier B Martin J Strain M Thamm et al 1997
British Medical Journal 315 pp81-85

Circulating concentrations of insulin-like growth factor 1 and risk of breast cancer S Hankinson W Willett G Colditz D Hunter D Michaud B Deroo B Rosner F Speizer M Pollak
1998 Lancet 351 pp1393-1396

Risk of premenopausal breast cancer in association with occupational exposure to polycyclic aromatic hydrocarbons and benzene S Petralia J Vena J Freudenheim M Dosemeci A Michalek M Goldberg J Brasure S Graham 1999 Scandinavian Journal of Work and Environmental Health Vol 25 (3) pp215-221

P-nonylphenol: an estrogenic xenobiotic released from modified polystyrene A Soto C Sonnenschein J Wray 1991 Environmental Health Perspectives 92 pp167-173
Researchers use oestrogen to stimulate growth of breast cells for laboratory studies. Carrying out research on breast cells in a plastic dish, biologist Dr Soto discovered cell growth in the absence of oestrogen. Explanation was found in substance leaching from plastic dish, later identified as the xenoestrogen (EDC) nonylphenol – a synthetic chemical additive in plastics production to prevent cracking in end product, also an ingredient of detergents and pesticides.

Environmentally persistent alkylphenol compounds are oestrogenic R White S Jobling S Hoare J Sumpter M Parker 1994 Endocrinology 135 pp175-182

Estrogenic activity of natural and synthetic estrogens in human breast cancer cells in culture D Zava M Blen G Duwe 1997 Environmental Health Perspectives 105 (supplement 3) pp637-645

Xenoestrogens released from lacquer coating in food J Brotons et al 1995
Environmental Health Perspectives 103 (6) pp608-661
Spanish scientists discovered some tinned foods e.g. peas, mushrooms, tomatoes are contaminated by the xenoestrogenic chemical used to line cans.

In vitro synergistic interaction of alligator and human estrogen receptors with combinations of environmental chemicals S Arnold P Vonier B Collins D Klotz L Guillette Jr J McLachlan 1997 Environmental Health Perspectives 105 (supp3) pp615-618

Hazard proximities of childhood cancers in Great Britain from 1953-1980 EG Knox EA Gilman 1997 Journal of Epidemiology and Community Health 51 pp151-159
A study carried out in 1997 by the University of Birmingham used postcodes to group UK cancer incidence rates between 1953 and 1980, and found a 20% increased risk of illness (especially cancer) for children living near industrial sites.

Residence near industries and high traffic areas and the risk of breast cancer on Long Island James Melius et al 1994
New York Department of Health
The New York Department of Health case control study of female residents of Long Island showed a significant association between residence near chemical plants and risk of contracting breast cancer.

Acid haze, air pollution and breast and colon cancer mortality in twenty Canadian cities B Gorham C Garland F Garland 1989 Canadian Journal of Public Health 80 pp96-100

Cancer mortality in US counties with hazardous waste sites and environmental pollution J Griffith et al 1989 Archives of Environmental Health 44 pp69-74

Review: Environmental oestrogens and human reproductive cancers WR Miller and RM Sharpe 1998 Endocrine Related Cancer 5 pp69-96

Environmental oestrogens: consequences to human health and wildlife 1995 Assessment A1 Medical Research Council (MRC) Institute for Environment and Health UK
Report conclusion: The evidence (for the trends) is particularly convincing for breast cancer in women Source: Chemistry & Industry May 20 1996

Significant Effects of Mild Endogenous Hormonal Changes in Humans: Considerations for Low-Dose Testing F Brucker-Davis K Thayer T Colborn Environmental Health Perspectives 109 (supplement 1) March 2001
Information stemming from clinical observations leads to the concept of 'no threshold' within the endocrine system and thus illustrates the importance of considering low-dose testing for chemicals that interfere with hormone activity.

Epidemiology and primary prevention of cancers of the breast, endometrium and ovary. A brief overview J Kelsey and A Whittemore Annals of Epidemiology 4 (2) pp89-95 1994

Final report of Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) Vols 1 and 2 The Environmental Protection Agency (EPA) Washington DC USA 1998

Shift work and breast cancer: a critical review of the epidemiological evidence
Professor Anthony Swerdlow
Epidemiologist Institute of Cancer Research
A report published by the Health and Safety Executive July 15 2003 which shows the probability of increased potential for contracting breast cancer.

Cancer by industry: an analysis of a population-based cancer registry with an emphasis on blue-collar workers N Hall & K Rosenman American Journal of Industrial Medicine 19 pp145-159 1991

Breast cancer mortality among female electrical workers in the United States
D Loomis P Savitz C Ananth
Journal of the National Cancer Institute 86 pp921-925 1994

Parabens in Human Breast Tumors P Darbre A Aljarrah W Miller N Coldham M Sauer G Pope
Journal of Applied Toxicology pp5-13 Vol 24 Issue 1 2004
Shows parabens, a group of chemicals with oestrogenic properties used in underarm cosmetics, remaining intact in human breast tissue.

Perinatal Exposure to Bisphenol A alters peripubertal mammary gland development in mice M Munoz-de-Toro C Marbey PR Wadia H Lugue B Rubin C Sonnenscheim A Soto
Endicronology May 26 2005
The changes in mammary gland development observed in this study are consistent with changes that, were they taking place in humans, could contribute to an increase in breast cancer risk.

Avoidable Causes of Breast Cancer: The Known, Unknown and the Suspected DL Davis D Axelrod M Osborne N Telang HL Bradlow E Sittner
Annals New York Academy of Sciences Vol 833 pp112-129 1997
Reviews evidence indicating that environmental factors affecting hormone levels can constitute avoidable causes of breast cancer.

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A report prepared by a Royal Society working group chaired by Professor Patrick Bateson
The Royal Society London UK June 2000

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'The Breast Cancer Prevention Program' Macmillan USA 1997
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Ian L Pepper Charles P Gerba Mark L Brusseau (editors)
'Pollution Science' Academic Press USA 1996
ISBN 0125506600

Adam Markham
'A Brief History of Pollution' Earthscan UK 1994
ISBN 1853832138

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Blackwell Scientific Publications UK 1984
ISBN 0632010444

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'Preventing Breast Cancer: The Politics of an Epidemic' Harper Collins UK 1995
ISBN 0044409095

Peter Cox & Peggy Brusseau
'Secret Ingredients: The Essential Guide to What's Really in the Products You Buy' Transworld UK 1997
ISBN 0553505548

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Committee on Hormonally Active Agents in the Environment
Board on Environmental Studies and Toxicology Commission on Life Sciences National Research Council National Academy Press USA 1999
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John Wiley & Sons UK 2000
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ISBN 0873718534

John Harte Cheryl Holdren Richard Schneider Christine Shirley
'Toxics A to Z: A Guide to Everyday Pollution Hazards' University of California Press USA 1991
ISBN 0520072235

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Houghton Mifflin USA 1962 (1991 Penguin edition ISBN 0140138919)

Sandra Steingraber
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Little Brown & Co UK 1998
ISBN 1860494692

'Putting Breast Cancer on the Map'
Women's Environmental Network UK 1999

'Recommendations for the Primary Prevention of Cancer'
Ontario Task Force Report Ontario Ministry of Health Ontario Canada 1995

John Humphrys
'The Great Food Gamble' Hodder and Stoughton UK 2001
ISBN 0340770465

Gayle Greene
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University of Michigan Press USA 1999
ISBN 0472111078

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Dr Rosalie Bertell 'No Immediate Danger: Prognosis for a Radioactive Earth'
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Karen Messing
'One Eyed Science: Occupational Health and Women Workers' Temple University Press USA 1998
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Glossary

adipose relating to fat or fatty tissue

aetiology the study of the origins and causes of disease

aflatoxin a carcinogenic toxin produced in foodstuffs by a species of mould

agonist agent which acts on cell receptors to provoke a biological response

androgens group of hormones controlling male sexual development e.g. testosterone

antagonist agent which competes for cell receptor site and prevents action of agonist

DNA deoxyribonucleic acid: the chemical of which the genetic material is composed

Electro-magnetic long-wave radiation emitted naturally and by electrical fields (EMFs) appliances, equipment, power lines, power stations

endocrine system composed of organs (glands) which make and secrete substances (hormones) directly into the bloodstream. The biological system which controls the production, transport and utilisation of hormones in the body.

endogenous originating from within the body

epidemiology the study of disease/ill health – its distribution and the contributing factors in a population

exogenous originating outside the body

genomics new science studying the genetic makeup of organisms and the use of such information to find applications in biology, medicine and industry

hyperplasia excessive cell growth

inorganic chemical or compound not containing carbon

in vivo experiments carried out on a live animal

in vitro experiments carried out in a laboratory on cells and tissues outside the body e.g. micro-organisms in a test tube

leaching percolating through something

menarche onset of menstruation

metabolic/ metabolism all physical and chemical processes which maintain and energise the body

mutagen agent which causes permanent change in genetic material carried in cells

mutation a change in the genetic material of a cell (DNA)

neoplasm a new growth consisting of abnormal cells (a tumour)

nucleus central mass in cells; contains the chromosomes and DNA

oestrogen steroid hormone that controls the growth, development and function of female reproductive organs and female sexual characteristics

off-gassing occurs when a substance which is stable at lower temperatures is warmed and becomes a gas e.g. as in volatile compounds below

oncogenes genes involved in the genesis of cancer

organic chemicals or chemical compound containing carbon atoms

PCBs polychlorinated biphenyls: a family of 209 substances having a large number of ill effects on health including cancers. Used in electrical equipment as coolants, lubricants and insulators. Now banned but very persistent and widespread in the environment.

pre-eclampsia disorder of pregnancy and the post-birth period; characterised by high blood pressure and protein in the urine. Can affect both mother and baby.

prophylactic preventing illness

prostate an organ in the male situated at the neck of the bladder and part of the male reproductive system

synergism interaction between two or more chemicals

teratogen a substance which causes abnormalities in a foetus

toxicologist one who studies the effects of toxins on tissues and organs

volatile compound a substance which readily evaporates to form a gas or vapour

Appendix I

Experts featured in 'Breast cancer: an environmental disease'

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Office of Pollution Prevention and Toxics
Environmental Protection Agency Washington DC USA

Dominique Belpomme
Professor of Clinical Oncology University of Paris President Association for Treatments Against Cancer (ARTAC) France

Dr Rosalie Bertell
Epidemiologist President International Institute of Concern for Public Health Toronto Canada

Dr Julia Brody
Executive Director Silent Spring Institute Newton Massachusetts USA
An independent research group dedicated to studying links between the environment and women's health

Robert Chernomas
Professor of Economics University of Manitoba Canada

Dr Theo Colborn
Senior Zoologist World Wildlife Fund Washington USA
Leading expert on environmental hormones

Charles Coombes
Clinical Professor and Director of Medical Oncology
Charing Cross Hospital London
Director of Cancer Research UK laboratories

Dr Devra Davis
Epidemiologist and researcher on environmental health and chronic disease
Director Environmental Oncology Center University of Pittsburgh Cancer Institute

Dr Richard Denison
Senior Scientist Environmental Health & Environmental Alliances Washington DC USA

Lissa Donner
Researcher and writer Winnipeg Canada

Dianne Dumanoski
Award-winning reporter on environmental science and policy Boston Globe USA

Samuel Epstein
Professor of Environmental and Occupational Medicine
School of Public Health University of Illinois Chicago USA

Dr John Gofman
Director Committee for Nuclear Responsibility (independent research institute) USA

Zac Goldsmith
Editor of The Ecologist magazine
Winner of Global Green Award for International Environmental Leadership 2004

Dr Mae-Wan Ho
Director Institute of Science in Society London UK

Dr Vyvyan Howard
Head of Developmental Toxico-Pathology Research Group
Department of Human Anatomy and Cell Biology
Liverpool University UK

James Huff
National Institute of Environmental Health Sciences
North Carolina USA

Ross Hume Hall
Microbiologist and Professor Emeritus McMaster University Ontario Canada
Former Co-Chair Human Health Committee International Joint Commission (IJC)

Dr Peter Infante
Occupational health expert USA

Dr D Stewart Irvine
Clinical consultant Medical Research Council (MRC)
Human Reproductive Sciences Unit University of Edinburgh

Miriam Jacobs
Anthropologist toxicologist and nutritionist School of Biomedical and Life Sciences University of Surrey
Royal Veterinary College University of London UK

Joseph Ladou
Director of the International Center for Occupational Medicine University of California San Francisco USA

Felicity Lawrence
Consumer affairs correspondent the Guardian newspaper
Winner – BBC's Food and Farming award for investigative journalism 2003
Guild of Food Writers Awards investigative journalist of the year 2004

Klim McPherson
Professor of Public Health Epidemiology University of Bristol Member of Medical Research Council UK

Karen Messing
Professor of Biology University of Quebec Montreal Canada
Government and trade union consultant on women's occupational health

Dr Marion Moses
Founder of the Pesticide Education Center
San Francisco USA

Dr John Peterson Myers
Director Alton Jones Foundation
an independent environmental organisation Virginia USA
Senior Adviser to UN Foundation Senior Fellow Commonweal

Dr Cathy Read
Locum Consultant in Public Health Barnsley Primary Care Trust UK

Ruthann Rudel
Senior scientist and director of research in environmental toxicology and risk assessment
Silent Spring Institute Newton Massachusetts USA

Gilles-Eric Seralini
Professor of Biochemistry Caen University France

Dr Richard Sharpe
Senior research scientist Medical Research Council (MRC) Human Reproductive Sciences Unit
University of Edinburgh Chairman of UK Society for Endocrinology Expert Group on Endocrine Disruptors

Dr Janette Sherman
Toxicologist and adviser for health advocacy groups
Professor of Sociology Western Michigan University
Michigan USA

Dr Sandra Steingraber
Professor at Cornell University biologist ecologist poet writer

Dr Alice Stewart
Physician radiation epidemiologist UK

Lorenzo Tomatis
National Institute of Environmental Health Sciences
North Carolina USA

Frederick Vom Saal
Professor of Biology reproductive biologist
University of Missouri-Columbia USA

John C Warner
Department of Chemistry University of Massachusetts
Boston USA

Professor Andrew Watterson
Chair of health in the faculty of human sciences
Director of the occupational and environmental health
research group University of Stirling Scotland

Robert Weinberg
Professor of Biology Massachusetts Institute
of Technology USA
Member of the National Academy of Sciences USA

Appendix II

Information and campaign links

Alliance for Safe Alternatives www.safealternatives.org
Association for Research and Treatment against Cancer
www.artac.info
Breast Cancer Fund www.breastcancerfund.org
Center for Green Chemistry www.greenchemistry.uml.edu
Chemical Reaction www.chemicalreaction.org
Communities against Toxics
www.communities-against-toxics.org.uk
Environmental Working Group www.ewg.org
EPHA Environment Network (EEN) www.env-health.org
European Consumers' Organisation (BEUC) www.beuc.org
European Environment Agency (EEA) www.eea.eu.int
Friends of the Earth (FoE) / Scotland (FoES)
www.foe.co.uk and www.foe-scotland.org.uk
Green Network www.green-network.organics.org
Greenpeace www.greenpeace.org.uk
Hazards Campaign www.hazardscampaign.org.uk
hazards magazine www.hazards.org
Health Care Without Harm www.noharm.org
Institute of Science in Society www.i-sis.org.uk
London Hazards Centre www.lhc.org.uk
Our Stolen Future www.ourstolenfuture.org
Pesticide Action Network UK (PAN-UK) www.pan-uk.org
Soil Association www.soilassociation.org
The Campaign for Safe Cosmetics www.safecosmetics.org
Women's Environmental Network (WEN) www.wen.org.uk
Women in Europe for a Common Future www.wecf.org
WWF – Chemicals and Health Campaign site
www.wwf.org.uk/chemicals

Dates of knowledge on epidemiology of breast cancer causation linked to chemicals

1976 **Israeli study found breast cancer mortality declined after 1976 when organochlorine pesticides were banned or usage controlled in the country.**

1978 **Israeli study showed an increased level of pesticides in breast tissues of women associated with increased incidence of breast cancer.**

1985 **Women working as professional chemists were reported to have high incidence of breast cancer.**

1986 **Exposure to agricultural pesticides known to cause cancer in rodents linked by US Government researchers to high incidence of human breast cancer in Nassau and Norfolk counties.**

1987 **Study of Yusho area in Japan, where population was exposed to dioxins and PCBs, revealed elevated breast cancer rates.**

1989 **Correlation between proximity of homes to hazardous waste sites and major increases in breast cancer risks.**

1991 **High levels of breast cancer reported in German pesticide plant where women were exposed to dioxins.**

1991 **Women exposed to chlorinated organic solvents reported to have high incidence of breast cancer.**

1992 **Women born to mothers with pre-eclampsia and therefore lower oestrogen levels during pregnancy had significantly reduced risks of developing breast cancer compared with controls. Women born to mothers with elevated oestrogen during pregnancy had an increased risk of breast cancer.**

1993 **Women working as hairdressers and women using hair dyes were reported to have an excessive incidence of breast cancer.**

Andrew Watterson 'Breast Cancer and the Links with Exposure to Environmental and Occupational Carcinogens: A Study of Public Health Concerns and Public Policy Failures' pp29-30 1995

This Case was produced by the following members of the UK Working Group on the Primary Prevention of Breast Cancer:

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One breast cancer patient's view on primary prevention:

The ultimate priority for (cancer) patients is for the medical profession to look more closely at primary prevention. I don't mean screening or eating more fruit and vegetables. I mean spending more time and money on finding out why one in three of us in this country will develop cancer at some point during our lives.

Primary prevention is far too low down on the political agenda and for patients that's unacceptable. For us it is not just gaining access to the best treatments available. It is about not getting cancer in the first place.

Jane Stephenson, Chair UK Breast Cancer Coalition

Dedicated to the memory of all women who have died from breast cancer

UK Working Group on the Primary Prevention of Breast Cancer:

Breast (Cancer) UK
Breast Cancer Research Ethics and Advocacy Strategy

Women's Environmental Network

UNISON
the public service union

With thanks to seesaw pr