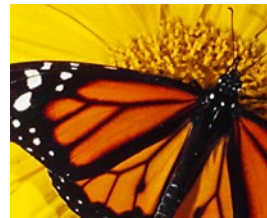


La diffusione di sostanze tossiche nell'ambiente ed i rischi per la salute umana e della fauna selvatica. Il Principio di precauzione

Eva Alessi

Campagna Detox/Svelenati-WWF Italia

5 ottobre 2006





Why is WWF interested in chemicals? (1)

- Industrial chemicals are essential to a modern society – from plastics, to pigments for use in paint and dyes, to precursors for pharmaceuticals including computers, toys, perfume, T-shirts, shoes and products that we use every day
- Are more than 100,000 different chemicals currently available for commercial use.
- The major problem is that we know virtually nothing about their potentially adverse effects because of the way production, marketing and use of chemicals is regulated in Europe.
- Of the minority for which data are publicly available, some are known to present significant problems for the environment and/or human health.





Why is WWF interested in chemicals? (2)

- **The problems caused by toxic chemicals are a global priority for WWF**
 - Wildlife - and humans - throughout the world are contaminated by industrial chemicals
 - and there is considerable evidence of wildlife (and human) impacts.
- **WWF is working to support a more sustainable production and use of chemicals**
 - REACH is one key part of this work
- **WWF has launched an international campaign in favour of a strong REACH:**





Chemical ignorance

- > 30,000 industrial chemicals in use in Europe - lack of safety data
- very little safety information on most of these chemicals, those first produced prior to 1981
- The same problem exists across the world
- No system has managed to properly address the 'existing chemicals' problem.
- It is always easier to start regulating 'new chemicals' – but at some point 'existing chemicals' must be addressed





Contaminating the world...

A growing number of industrial chemicals are known to contaminate wildlife and people; some recent examples:

- **Brominated flame retardants**
 - Contaminating people and wildlife across the world
 - Two phased out in Europe (penta and octa)
 - Deca is in increasing use, despite contamination of polar bears, birds of prey and people
- **Perfluorinated chemicals (PFCs)**
 - Including PFOS (Scotchguard) PFOA (used in teflon manufacture) and telomers (used in coatings, break down into PFOA)
 - Contamination by PFOS and PFOA exists across the world

Action to phase out such chemicals has been slow and ineffective in the EU and US





Addressing the challenge

- **A sustainable chemicals regulatory system requires substantial improvement on current systems:**
 - Ensuring availability of safety data on all chemicals
 - Creating effective methods of restricting and phasing out problem chemicals
 - Assisting downstream users in safe use (and disposal) of chemicals
 - Encouraging chemical users to take more responsibility for what they produce
 - Promoting innovation to safer products

WWF believes that REACH is a good start in creating such a system





What is REACH?

REACH legislation:

- is an integrated approach to the production, import and use of chemicals in Europe.
- aims to create a system based on information about chemicals, rather than ignorance,





REACH as part of the solution

REACH will:

- Ensure that all chemicals used in the EU have safety data publicly available
- Create a globally-available database of this safety data for all chemicals used in the EU
- Create more effective ways of restricting the use of problem chemicals - particularly the authorisation system, to encourage substitution of the worst chemicals
- Provide downstream users of chemicals with much clearer information on safe use
- Create producer responsibility on chemical producers, ensuring that they describe safe use to downstream users
- Promote innovation to safer products, through reduced requirements on new chemicals, promotion of alternatives to problem chemicals and a more transparent system

WWF believes that REACH needs to be improved

The highest priority is to improve the authorisation procedure • We must ensure that it is an effective method to identify the worst chemicals and then push for their phase out wherever safer alternatives are available.





Pollution from toxic chemicals

Since the early 1990s, WWF has studied the impacts of toxic chemicals on biodiversity → wildlife, people and entire ecosystems are threatened by chemicals → serious health problems

- In the 1950s and 1960s it was found out, that certain synthetic chemicals have substantial impacts on human health and the environment - examples: DDT, PCBs
- Many of these chemicals persist for decades and longer
- These chemicals dissolve in fat and thus are absorbed and concentrated in the body fat and milk of animals (and humans)
- Concentration of persistent chemicals increase at the top of a food chain





Why do the Body Burdens Increase Over Time?

- **Persistence**
 - Resistance to biological, chemical, and physical degradation
 - Long Half-Lives in animals and people
 - More Body Fat → Longer Half-Life
 - Half-Life is Dose-Dependent
- **Bioaccumulation**
 - Due to persistence in animal tissues
 - Animals Higher in Food Chain have Higher Concentrations
 - Older organisms have higher body burdens than young





Pollution from toxic chemicals

The potential of a chemical to bioconcentrate, bioaccumulate, or biomagnify in organisms and food webs depends on:

- the properties of the substance
- environmental factors
- biotic factors:
 - trophic position - higher concentrations are generally found in organism that are higher up in the food chain;
 - fat content - many chemicals accumulate in fat, so organism with more fat will have more chemical accumulation ;
 - age - older organism usually have higher contamination levels than younger;
 - metabolism
- bioavailability





How Chemicals contaminants can reach the environment?

- Direct discharges from industrial processes
- Inappropriate disposal of waste
- Leaching from waste
- Landfill sites
- Direct application (as pesticides)
- Spillages or leakages during manufacture
- Transport
- Storage
- From products as they are
 - Used
 - Wear out





How do chemicals Move in the Environment?

- If emitted into air, undergo atmospheric transport and deposition on land or water
- If emitted into water, bind to sediment
- Recycle in environment
- Bioaccumulate up the food chain
- Resistance to physical, chemical, and biological degradation

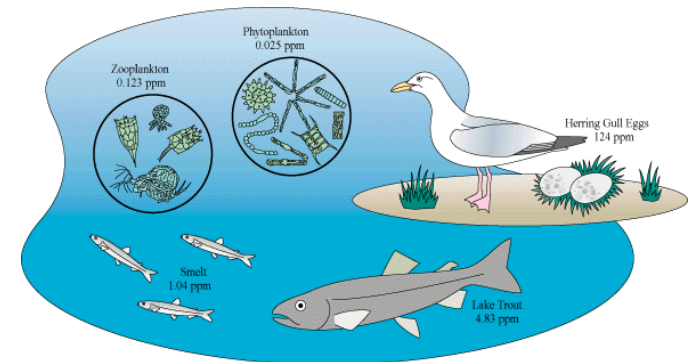
The fact that they are able to travel through air and water (LONG RANGE TRANSPORT) makes no country or human or animal immune against their effects





How are human and wildlife exposed?

- **Chemicals are everywhere**
- Majority of exposure (>95%) is via microcontamination of food
 - Meat, fish, dairy
- Sensitive Subpopulations with High Exposure
 - Subsistence Fishers and Hunters
 - Nursing Infants
 - Occupational Workers
 - Oral, dermal, and inhalation exposures
- Local elevated sources





Emerging Chemical Threats

- **Over the past half century, scientists have uncovered a multitude of risks to wildlife and humans posed by toxic chemicals.**
- Some of the most notorious pollutants, such as PCBs and DDT, are the subject of phaseouts or tight restrictions.
- While a handful of toxic substances are slowly disappearing from the environment, new research reveals that many others could be even more harmful than these legendary chemicals.





Chemicals: cause of concern

- WWF has published numerous reports on the nature and extent of chemical contamination of wildlife and humans.
- The aim of the all the investigations presented by WWF was to assess the pollution by man-made chemicals as:
 - Organochlorine pesticides (as DDT, HCB, Lindane)
 - Polychlorinated bipheniles (PCBs)
 - Brominated flame retardants (BFR) incl. PBDE (polybrominated diphenil ethers)
 - Perfluorinated chemicals (PFCs) incl. PFOS and PFOA
 - Phthalates
 - Artificial musks
 - Organotins incl. TBT

All compounds with suspected or proven endocrine disrupting properties





Chemicals: cause of concern

They have some familiar impacts

- Carcinogenic
- Mutagenic
- Neurotoxic

But it wasn't until the 1990s that scientists began to understand. . . the systemic problem

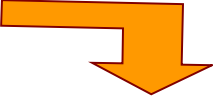
“Many compounds introduced into the environment by human activity are capable of disrupting the endocrine system of animals, including fish, wildlife, and humans. The consequences of such disruption can be profound. . .”

Wingspread Conference in July 1991.





Endocrine disrupting chemicals (EDCs)

- have recently attracted great public and scientific attention
 - are a structurally diverse group of compounds that may adversely affect the health of humans and wildlife and/or their progeny, by interacting with the endocrine system, and particularly influencing reproductive function
- 
- can mimic endogenous hormones, disrupt reproductive functions and cause developmental abnormalities (such as intersexes) in wild animal populations (Colborn et al. 1993, Colborn et al. 1998, Gillesby & Zacharewski 1998).
 - include chemicals heavily used in the past, in industry and agriculture, such as polychlorinated biphenyls and organochlorine pesticides, and chemicals currently used as plasticizers and surfactants.





Endocrine disrupting chemicals (EDCs): linking cause and effect

- May cause adverse health effects in individuals or populations.
- **Effects are often significant at very low levels of exposure – particularly during early development of an organism**
- **Because of the lipophilic and persistent nature can bioaccumulate and biomagnify** (Colborn 1998, Arukwe et al. 1996).

There is a serious gap of knowledge regarding the effect of EDCs
....identification of causative chemicals is complicated by the
possibility that disorders may become manifest long after
exposure has taken place.





Hormones

- Chemical messengers produced in a variety of organs, e. g. testes, ovaries, pituitary, thyroid, adrenals
- Circulate in the blood and act through binding to specific cellular receptors
- Important for reproduction, development, and on-going integrated functioning of many body systems
- Should also consider signaling molecules that are not traditional hormones, e. g. neurotransmitters

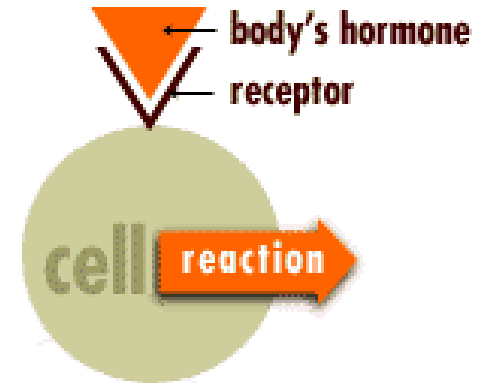




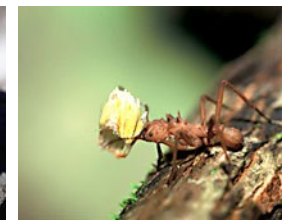
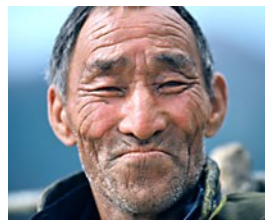
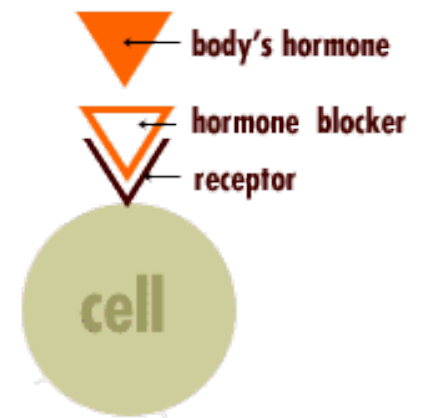
Mechanisms of endocrine disruption

- Mimic or block hormone (context dependent)
- Alter hormone production, metabolism, excretion
- Alter hormonal transport, e. g. on carrier proteins
- Alter carrier protein levels
- Alter hormone/ receptor gene transcription activity
- Alter receptor levels in various tissues
- Other

normal



blocked





Sources of endocrine disrupting chemicals

- Farming, livestock, forestry
- Industrial chemicals
- Waste incineration
- Consumer products
- Food
- Pharmaceuticals
- Sewage discharge – human and industrial waste





Examples of endocrine disrupting

include :

- **chemicals used heavily in the past, specifically in industry and agriculture**
- **chemicals currently used**

...let's see some examples





Brominated flame retardants (BFR) (1)

- Flame retardants save lives
- Structurally very different chemicals with a wide variety in physicochemical and reactivity characteristics and include:
 - polybrominated diphenyl ethers (PBDEs),
 - tetrabromobisphenol A (TBBP- A) and
 - hexabromocyclododecane (HBCD).
- They are widely used in polymers and textiles, and applied in construction materials, in carpets and furniture and in electric and electronic equipment.
- Global problem
- Persistence
- Potential for bioaccumulation
- Limited Data Base





Brominated flame retardants (BFR) (2)

- Structurally very different chemicals with a wide variety in physicochemical and reactivity characteristics and include:
 - polybrominated diphenyl ethers (PBDEs),
 - tetrabromobisphenol A (TBBP- A) and
 - hexabromocyclododecane (HBCD).
- They are widely used in polymers and textiles, and applied in construction materials, in carpets and furniture and in electric and electronic equipment.
- Global problem
- Persistence
- Potential for bioaccumulation
- Limited Data Base





Polybrominated diphenyl ethers (PBDEs) (3)

- commonly used (209 congeners)
- chemically similar to PCBs
- 3 major classes :
 - Deca-BDE –Polymers for textile backing, electrical & electronic equipment
 - Octa-BDE - Plastic housings esp. office equipment
 - PentaBDE - Flexible polyurethane foam (up to 30%), Cushions; mattresses; carpet padding
- Characteristics of PBDEs:
 - Lower numbers of bromines are more bioaccumulative and persistent
 - low solubility in water
 - Strong adsorption to sediment/sludge with low breakdown
 - Bioaccumulation - (Penta, Octa)
 - Long Range Transport - Evidence of remote contamination (e.g., Arctic)



Polybrominated diphenyl ethers (PBDEs) (4)

- Human health studies have not been conducted
- Animal studies show:
 - Nervous system toxicity
 - Reproductive and developmental disruption
 - **Endocrine disruption**
 - Cancer (at high doses)

Penta and OctaBDE banned in EU

DecaBDE still used in electronics (greatest use of deca): form breakdown products





Organochlorine pesticides (1)

- Extensively used in agriculture during the 1960s, banned in the 1970s in Europe: nonetheless they are still detected in habitats and biota (Goutner et al., 2001).
- lipophilic structure → tend to accumulate in food chains, especially in higher organisms → found at elevated levels
- high toxicity and environmental persistence (Guruge et al., 1997; Harding et al., 1997).
 - pose threats to humans and wildlife at high and low concentrations (Longnecker et al., 1997)
 - Hormone disruption is also a proven effect (Ropstad et al., 2006; Asawasingsopon et al., 2006).
- Examples of the most common OCPs are:
 - DDT
 - HCB





DDT and metabolites

- developed in the 1940s and used as an insecticide against a very wide range of insect pests, particularly malarial mosquitoes and as an agricultural insecticide.
- long-lasting toxic chemical → builds up in the tissue of living organisms
 - plants
 - in fatty tissues of fish, birds and other animals.
- Sticks to soil → slowly broken down to DDE and DDD
- can travel long distances → widespread global dispersion. DDT, and especially
- banned in many countries, including the EU (regulated by international treaty as a “POP”).
 - still used in some developing countries. It is– a
- IARC :may cause cancer in humans.
- EPA: probable human carcinogens.
- proven **endocrine disruptor** (Debier et al. 2005)





HCB (hexachlorobenzene)

- industrial chemical used active ingredient in fungicides or production of chlorinated chemicals; also a by-product of incineration of municipal waste.
- agricultural application major source of HCB release (Storelli et al., 2004).
- banned in several countries
- most persistent environmental pollutants due to its chemical stability and persistence → bioaccumulation → travel around the globe.
- IARC : a possible human carcinogen.
- proven **endocrine disruptor** (Ralph, 2003).





Polychlorinated biphenyls (PCBs) (1)

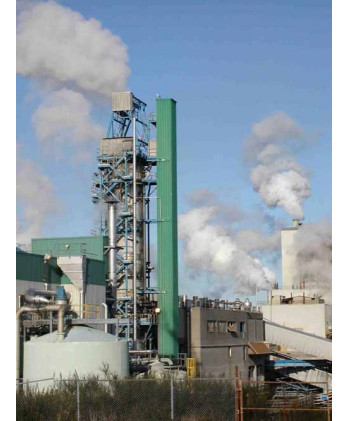
- group of 209 synthetic compounds → mixtures
- produced for : dielectric fluids transformers, heat transfer fluids, hydraulic fluids, additives in pesticides, paints, plastics
- 1970s evidence of the extreme persistence and adverse health effects → banned in some industrialized countries.
- High resistance to degradation → extremely persistent in the environment.
- affinity for suspended particles and bottom sediments and lipids of aquatic biota
- problematic for :
 - remobilisation from sediments (long-term concern) → uptake in biota for decades (Perez *et al.*, 2003).
 - human exposure → 90% consumption of seafood, such as fatty fish (Alcock *et al.*, 1998, Anderson *et al.*, 1998, Kannan *et al.*, 1994)..





Polychlorinated biphenyls (PCBs) (2)

- variety of adverse effects (Birnbaum and DeVito, 1995). :
 - chloracne,
 - thymic atrophy, liver damage,
 - birth defects,
 - immunotoxicity
 - cancer
- children exposed prenatally or through mother's milk → transient developmental neurological deficits (Brouwer *et al.*, 1995, Huisman *et al.*, 1995)
- IARC and EPA : probably carcinogenic to humans
- **endocrine disrupting properties** (Tabuchi *et al.*, 2006; Fonnum *et al.*, 2006; Brevini *et al.*, 2005; Debier *et al.*, 2005; Braathen *et al.*, 2004)





Perfluorinated compounds (PFCs) (1)

- used in a wide diversity of products:
 - name-brand products such as Teflon, Scotchgard and related products,
 - industrial and consumer products various protective, stain-resistant coatings for (Kannan et al., 2004).
 - carpets
 - clothes
 - paper coatings
 - insecticides
 - surfactants
- The properties that make PFCs so effective are also the reasons why they tend to persist in the environment → nevertheless can be transformed in the environment or in living organisms to more stable PFCs
- bioaccumulate in the blood and liver of living organisms and data have emerged about their toxicity





Perfluorinated compounds (PFCs) (2)

- derive from POSF → produce several other fluorinated compounds, including **PFOS** (Kissa, 2001).
 - Is stable and has the potential to bioaccumulate (Giesy and Kannan, 2001)
 - identified in serum samples from human populations and wildlife
- FOSA, PFOA and PFHxS are intermediates or impurity
 - studies of occurrence in wildlife are scarce
 - PFOA have been detected in human blood (Hansen *et al.*, 2001).
- PFOS and PFOA harmful effects on cell membranes and on communication between cells (Hu *et al.*, 2003)
- Effects as memory decline; impaired learning; decreased reflex response time and neonatal deaths in rats (Austin *et al.*, 2003; Grasty *et al.*, 2003).
- ubiquitous global contaminants: PFOS is the predominant followed by PFOA
- The EU → preparing legal restrictions
- **endocrine disruption** and other harmful health effects (Lau *et al.*, 2006; Maras *et al.*, 2006; Nakayama *et al.*, 2005; Harada *et al.*, 2005; Lau *et al.*, 2004; Hekster *et al.*, 2003)





Other classes of contaminants

Phthalates

- Used to make plastics flexible (particularly PVC) and in toiletries and cosmetics.
- Concerns over **endocrine disrupting properties**. Linked to negative effects on male sexual development (birth defects, testicular cancer, low sperm counts).
- Some phthalates restricted in EU, some not.

Artificial musks

- Fragrance chemicals used in toiletries, cleaning products, air fresheners, cosmetics.
- Persistent and bioaccumulative
- Suspected **endocrine disruptors**.
- Some now significantly reduced in EU



Organotins incl. TBT (tributyltin)

- Used as biocides, wood preservatives, marine antifoulants.
- Persistent and bioaccumulative, endocrine disrupting → TBT caused population crashes in marine invertebrates
- Global ban agreed for TBT in ship paints and being implemented in EU.

Heavy metals Arsenic, Lead, Cadmium, Mercury



Animal evidence surrounds us

- Like many other mammals affected by EDCs, otters from the Lower Columbia River are infertile because the males' penises are too small to mate
- Alligators affected by pesticides cannot reproduce
- Male fish develop female hormones
- In birds, eggshells thin so chicks cannot survive





Wildlife studies

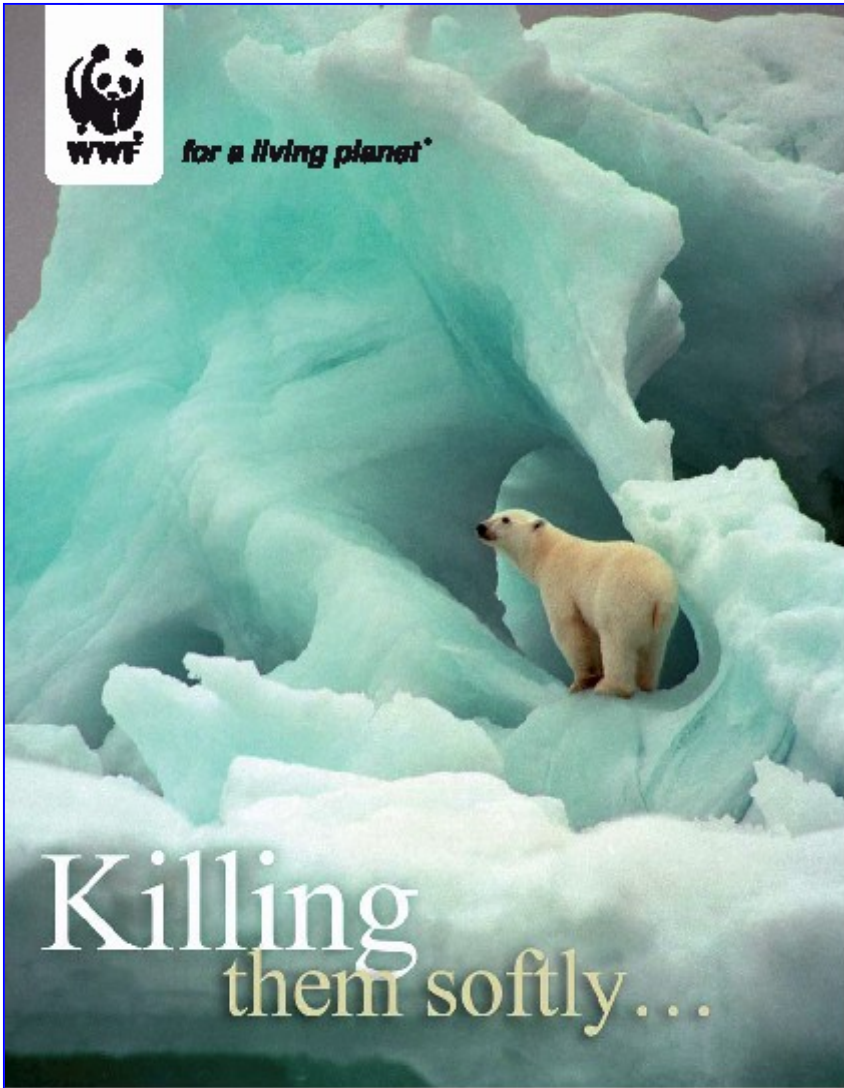
Alligators in Lake Apopka, FL

- Lake contaminated with dicofol, DDT, other industrial chemicals
- Reduced survival rates and egg hatching
- Many alligators have combinations of male and female reproductive organs
- Abnormal ovaries and testes, small penises
- Males with elevated estrogen and females with elevated testosterone levels





for a living planet®



Killing them softly...

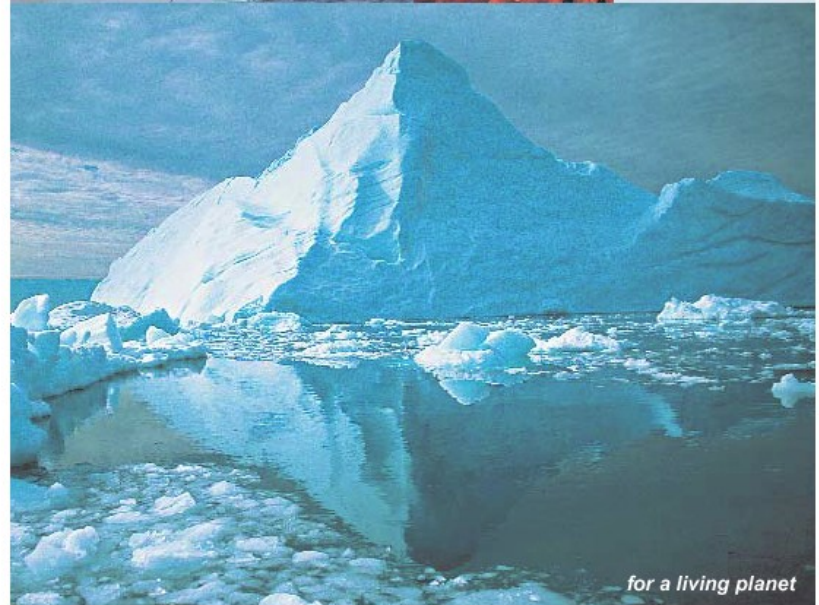
HEALTH EFFECTS IN ARCTIC WILDLIFE LINKED TO CHEMICAL EXPOSURES



DETOX
CAMPAIGN

The tip of the iceberg: Chemical contamination in the Arctic

WWF International Arctic Programme



for a living planet



Wildlife studies: the Arctic

- Despite its remote location, the Arctic is affected by distant pollution.
- Up the food chain results in the highest chemical levels
- Animals found to be contaminated by chemicals, including current-use chemicals found in household items, such as BFRs and fluorochemicals (PFOS), pesticides and PCB.

HEALTH EFFECTS ALREADY OCCURRING IN ARCTIC SPECIES

Species	Health Effects
POLAR BEARS	Impaired immune system, vitamin A and hormone alterations; decreased bone mineral density
SEALS & SEA LIONS	Skeletal deformities, reproductive problems, skin disease, immune toxicity, cancers, and changes in vitamin A and thyroid hormone levels
BELUGA WHALES	Parasitic infections, other infectious diseases, cancers (especially intestinal), lesions indicating reproductive and immune problems
BIRDS	Effects on reproduction, behaviour, immune function, and development; reduced parental attentiveness during egg incubation, feather alterations



CHEMICAL CONTAMINATION IN THE MEDITERRANEAN: THE CASE OF SWORDFISH





Wildlife studies: the case of swordfish

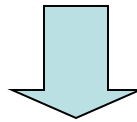
- Important ecosystem component
- Edible fish species of high commercial interest → important nutritional contribution to the human diet (proteins and fatty acids) → fish consumption is one of the major pathways for human exposure to contaminants.
- **First Italian results** on Mediterranean swordfish (*Xiphias gladius*), were analysed for 28 EDCs of older (those already banned as DDT) and newer chemical (e.g. **19 PBDE**)
- BFR were detected in all swordfish tested but one. In liver : 189-11184 pg/g w.w., in muscle : <0.04-1882 pg/g w.w.
 - prevalent PBDE congeners were 47 and 100, two of the most common congeners found in marine organisms.
- OCs were found in all swordfish samples.
 - DDE average levels of 173 ng/g w.w. (muscle) and 309 ng/g w.w. (liver)
 - HCB <0.01-0.53 ng/g w.w. (muscle) and <0.01-0.84 ng/g w.w. (liver)





Wildlife studies: the case of swordfish

- New evidence indicates that swordfish, but also other fishes, is a specie potentially “at risk” for the feminization:
 - Male fish with female characteristics – oocytes in the testes (De Metrio *et al.*, 2003)
 - Elevated levels of egg- yolk protein (vitellogenin) (Fossi *et al.*, 2003, 2006);



potential reproductive alterations in large pelagic fish and suggest the need for continuous monitoring to avoid reductions in their populations





Contamination affects not only swordfish but the entire ecosystem

Range of species representing various trophic levels:

- fish
 - invertebrates
 - Sea mammals
 - seabirds
- Difficult direct cause-effect linkages → severity of adverse effects, depend:
- biological and physiological traits of the species
 - prolonged exposure to many of the described pollutants can, even at low concentrations, interfere with the normal physiology of the organism → long living species accumulate contaminants over many years
- Marine mammals biological traits that make them particularly prone to accumulate :
- high in the food chain;
 - warm blooded,
 - high metabolic rates and, high food intake
 - Large proportion of body mass is composed of lipid-rich blubber→retains and accumulates





Sea Mammals (seals, sea lions, cetaceans)

Comparing OCs in swordfish with levels found in marine mammals-in pinnipeds and odontocetes- → levels 10 to 20 times higher in cetaceans (Fossi & Marsili 2003).

high levels of OCs → high levels EDC

levels of PCBs found in odontocetes (Fossi et al. 2003) are similar to those detected in the population of beluga whales of the St. Lawrence estuary in which was detected a hermaphrodite specimen (PCBs mean value = 78900 ng/g l.w.) (Muir et al., 1996).

This observation suggests the potential toxicological hazard due to organochlorines and emerging contaminants, such as PBDEs, with **endocrine disrupting capacity**

Effects (Brouwer et al., 1998):

- Adrenal hyperplasia;
- Reproductive failure;
- Decreased thyroid hormone levels;
- Increased susceptibility to infection;
- Increased incidence of cancer





Waterbird species

Pelecaniform (pelican, cormorant) and Larid (gull, tern)

Negative effects of contaminants are:

- **thinning of bird eggshells.**
 - severe reductions in reproductive success.
 - In most cases is caused by pp'-DDE
 - several authors presented dose-effect relationships between levels of pp'-DDE in the egg and eggshell thickness.
 - levels in eggs reflect the diet of the female (Furness, 1993).
- **interference with development of chicks**





Research over the last years has shown that a variety of persistent, bioaccumulative contaminants in the food chain are impacting marine species, some of which are food species used by humans.

There is a growing body of literature supporting the use of wildlife populations as indicators of ecosystem health, suggesting that many species are sentinels for toxic chemical effects which may also affect humans.





Human data



DETOX
CAMPAIGN



GENERATIONS



WWF | 2005

Results of WWF's
European Family Biomonitoring Survey

WWF Blood test

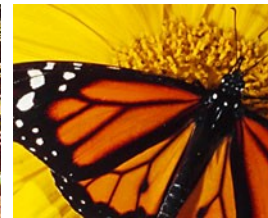
revealed the extent to which people across Europe are contaminated by a cocktail of hazardous man-made chemicals

investigates the types and levels of chemical contamination in:

- 3 generations from 13 families across Europe
- 18 MEPs and VIP
- 14 Director of magazine and newspaper

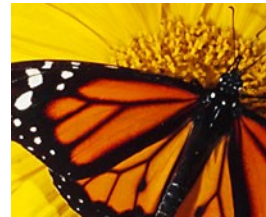


Blood samples were analysed for more than 100 of persistent, bioaccumulative and/or endocrine disrupting chemicals, many of which are found in everyday consumer products: organochlorine pesticides (including DDT), PCBs, PBDEs and other BFR, PFCs, artificial musks, antimicrobials (triclosan) and bisphenol-A.

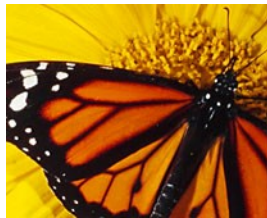


WWF Blood test: some results

- The results of these survey show that every person, from grandmothers to children, to VIP to MEP is contaminated by a **cocktail of at least 20 different man-made chemicals**.
- Some of the identified chemicals such as PCBs and DDT, have been banned for decades but persist in the environment and continue to contaminate new generations
- Some key findings are:
 - Of the 107 chemicals analysed, 73 in total were detected in the whole survey. 63 were found in the grandmothers, 49 in mothers and 59 in children.
 - Brominated flame retardants, organochlorine pesticides, PCBs, perfluorinated chemicals and artificial musks were found in the blood of every family member tested, including children as young as 12.
 - The children's generation has the highest median level of PBDE flame retardants, PFCs and artificial musks.
 - Of the 31 different PBDEs analysed, 17 were found in the children compared to 10 in the grandmothers and 8 in the mothers.



**If you eat
“high on the food chain”
- lots of meat, fish,
or dairy products -
you (and your children) are
exposed to Endocrine
Disrupting Chemicals**





WWF Food test

This report is the culmination of WWF's 10 years of work on the toxics issue.

Following on from those studies we present here new data on the chemical contamination of food, the most important route of human exposure for many persistent, bioaccumulative and endocrine disrupting chemicals.

The results are placed in a broader context – that of a global chain of contamination where industrial chemicals and those designed for use in everyday products find their way into the environment, food, wildlife and humans.

This global chain of contamination is the perfect illustration of why REACH needs to be strengthened to effectively protect humans and wildlife.





WWF Food test

- Food represents a part of the global environment which can be contaminated by chemicals from many different sources.
- Following their release into the environment (soil, sediment, water, air) chemical contaminants can enter plants and animals at the bottom of the food chain which are then consumed by animals higher up.
- The chemicals contained in these animals and plants can enter our own bodies when we consume them as food e.g. meat, dairy products, fish, vegetables, fruit..
- Many of these chemicals have been detected in young children as well as adults, and in some cases at higher levels in children than in adults. Alongside this, there is growing concern over possible links between certain chemicals (particularly endocrine disrupting chemicals) and human health impacts such as cancer, reproductive problems, birth defects, asthma, allergies, behavioral problems, disruption of infant brain development, cardiovascular disease, diabetes and obesity.





WWF Food test

- Food represents a part of the global environment which can be contaminated by chemicals from many different sources.
- Following their release into the environment (soil, sediment, water, air) chemical contaminants can enter plants and animals at the bottom of the food chain which are then consumed by animals higher up.
- The chemicals contained in these animals and plants can enter our own bodies when we consume them as food e.g. meat, dairy products, fish, vegetables, fruit..
- WWF's focus was on those chemicals that get into food primarily due to contamination of the environment and subsequently, the global food chain.
 - not those most commonly associated with food, such as modern pesticides and artificial additives.
 - chemicals that have entered the environment due to man's past and present use of consumer products and synthetic agricultural and industrial chemicals.
- The results show that many of these compounds are present in food in a concentration range of **0.1 to 10 ng/g** with the exception of phthalates for which typical concentrations are two orders of magnitude higher”.





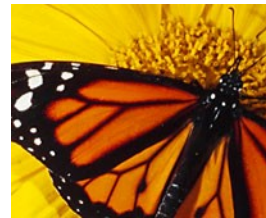
WWF Food test

- The analysis reported here is intended to provide a snapshot of the broad selection of man-made chemicals that can be found in everyday food items and therefore the kinds of chemical contaminants people can consume as part of a normal diet.
 - It is not a comprehensive food survey aimed at determining dietary intakes or evaluating the risk of eating certain foods.
- WWF is of the opinion that chronic, low level exposure to a combination of chemical contaminants via the diet and other exposure routes has not been given sufficient consideration in past decision making on chemicals.
- WWF is therefore calling on EU decision makers to ensure the EU's proposed REACH legislation is suitably strengthened, as it offers a once in a lifetime opportunity to tackle the problem of food chain contamination by driving the substitution of persistent, bioaccumulative and endocrine disrupting chemicals with safer alternatives.



In other words, EDC are everywhere...and we don't fully understand what does it mean

- **Because the biology and the impacts are complicated, and exposures to many different EDCs occur over a lifetime**
- **Species react differently**
- **Age groups and sexes at exposure react differently**
- **Impacts can occur in the next generation, or the next..**





But we know that:

The timing rather than the level of exposure is crucial

- Exposure to very low dose during a critical stage of embryonic development can cause permanent damage.
- The damage is **cumulative** (tending to accumulate or increase) and **synergistic** (tending to combine to even greater amounts).





Mixture effects

- Humans are exposed to low levels of large number of EDC
- Mixture effect can occur even when each component is present at dose that individually does not produce effects
- A dose of a single chemical judged to be safe after testing in isolation may give a false sense of security when exposure includes large number of EDC which may interact





The Precautionary Principle

A new principle for **guiding human activities**, to prevent harm to the environment and to human health, has been emerging during the past 10 years. It is called the "principle of precautionary action" or the "precautionary principle"

In order to protect the environment, the **precautionary approach shall be widely applied**. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation (*Wingspread Statement*).

In view of the magnitude of the potential risks associated with **endocrine disruptors, scientific uncertainty should not delay precautionary action** on reducing the exposures to and the risks





DETOX
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Thanks for your attention!

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