FRIENDS of the earth for the planet for people

Press Briefing

Safer Chemicals Campaign

Chemicals & Health

We are exposed to industrial chemicals all the time - through the products we use, contaminants in our food, pollution and the chemicals that contaminate everyone's bodies.

There is increasing evidence that some of these chemicals are having health impacts. The evidence is outlined in this briefing.

Hormone disruption

More and more chemicals in everyday use are being found to be able to disrupt our endocrine (hormone) systems. At the same time, there are concerns about a number of hormone-associated illnesses; rates of testicular, prostate and breast cancers have all been rising in recent decades, and no one knows why. We do know that we continue to be exposed to a wide range of endocrine disrupting chemicals in our daily lives. Many of these chemicals were not around a hundred years ago. As the eminent Royal Society said in a recent report on the subject [1]:

"In reality, humans are exposed not to a single endocrine disrupter but to a cocktail of such chemicals, and the possibility that such chemicals have additive or reinforcing effects has to be considered seriously"

Research is beginning to prove that exposure to a mix of chemicals can 'add up' to give a greater health effect than you would expect from the individual chemicals [2]. In addition, researchers are finding effects on the female reproductive system of mice from exposures to organochlorine pollutants "*within the same order of magnitude of blood concentrations found in some human subjects from the general population*" [3].

Even more worrying is the evidence that very low doses of some endocrine disrupters can have impacts. A US Government scientific panel has concluded that effects on the immune and nervous systems are caused by low doses of nonylphenol (see alkylphenols in our target list below). They also concluded that experiments which found low dose effects from bisphenol A (also in the target list) were well performed, even though they conflicted with other, mainly industry-funded, studies [4].

With all the evidence building up, it is not surprising that the Royal Society's scientists concluded that:

"Despite the uncertainty, it is prudent to minimise exposure of humans, especially pregnant women, to EDCs....Regulations cannot be 'put on hold' until all the evidence has been collected."[1]

Some disturbing health trends

Low sperm counts in young Danes...

Much research has been published in recent years indicating that sperm counts have fallen over the last half century. One of the most disturbing studies, published in 2000, looked at young men in Denmark who were starting their compulsory military service. The authors stated: *"surprisingly low sperm counts were found in this population of 18-20 year old men....the decrease seemed to be a general phenomenon*'...'*more than 40% of young Danish men have sperm counts below 40x10^6/ml, which according to a recent study is associated with decreased fertility*" [5].

Testicular Cancer increasing...

Testicular cancer has increased in incidence by 55 per cent between 1979 and 1991 in England and Wales; there were 1137 new cases of testicular cancer in 1991 [6]. Testicular cancer is believed to result mainly from problems occurring during development in the womb, and hormone disrupting chemicals are hypothesised to be a cause of the increase [7]. Recent research has provided support for the hypothesis that exposure to oestrogens in the womb increases the chance of getting testicular cancer in later life [8].

A shortage of boys...

In 1976 there was a major chemical accident in Seveso, Italy, releasing more than 30 kg of toxic dioxin. Recent research has found that the higher the concentration of dioxins in men, the more likely they were to father girls rather than boys. Men under 19 at the time of the accident have since fathered 81 girls, but only 50 boys. Other studies of birth ratios in the general population in countries as far apart as Denmark and the US have also found a decreased proportion of male births. [9]. As the authors of a Commentary in the Lancet put it, "*The amount that has been learnt.. makes dioxin a chemical symbolic of the full impact of the chemical age on health*" [10].

Early puberty in girls

Researchers at Bristol University's Institute of Child Health have found that one in six girls in Britain is starting to show signs of puberty at the age of eight, compared to one in a hundred girls a century ago [11]. No-one knows why, and hypotheses include improved diet and exposure to hormone disrupting chemicals - bisphenol a (below) has been shown to advance puberty in female mice [12].

26-28 Underwood Street London N1 7JQ
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Impacts on intelligence

There are also growing concerns about the effects that exposure to chemicals may be having on the development of children's brains; there is already strong evidence of detrimental effects on intelligence caused by exposure to the long-lasting (persistent) pollutants PCBs, which are no longer produced, but which contaminate everyone's body [13].

Allergic epidemic

It is well known that allergies such as asthma and contact allergies are increasing, and no-one really knows why. There is increasing evidence that commonly used chemicals are causing contact allergies [14].

We're all contaminated

Many industrial chemicals don't break down well in the environment (they are persistent) and/or they accumulate in the body (they bioaccumulate) - often in fatty tissues. Researchers have found more than 300 chemicals contaminating our bodies [15], ranging from DDT to musk perfumes (one of our target chemicals, below).

In some cases scientists are not even sure where the chemicals come from. One worrying example of this is TCPM [tris(4-chlorophenyl)methanol], which has been found in Beluga whales, grey seals, dolphins - and in human fat [16-18]. TCPM has also been shown to be a hormone disrupter, imitating the female hormone [19] - yet scientists are not even sure where it has come from, though they are pretty certain that it comes from the chemical industry.

Breast feeding and health

Chemicals that accumulate in body fat also lead to exposure of the developing child both whilst it is in the womb and through breast milk [15]. Friends of the Earth believes that it is always best to breast feed a baby; the advantages to the immune system and general health are substantial. **It is vital that this point is made in any article including reference to chemicals in breast milk**. Contact the National Childbirth Trust press office for further information, on 020 8896 1677.

We are calling for chemicals which contaminate body fat or breast milk to be phased out, whether they are currently thought to be toxic or not. Why should the chemical industry be able to contaminate our bodies?

Our target chemicals

Friends of the Earth has selected 6 groups of problem chemicals as the initial targets of the Safer Chemicals Campaign. We may add more chemicals to this list, if new research raises concerns.

All the groups of chemicals that we are targeting have at least one member that has been shown to be a hormone disrupter. In addition, many of the chemicals we have targeted are persistent and bioaccumulate in our bodies, increasing exposures to the developing foetus and baby. They have all been highlighted as a concern by other Governments such as in Sweden and Denmark, who are encouraging industry to stop using them.

What do we want companies to do about the target chemicals?

We believe that these chemicals should be phased out and replaced by safer alternatives. As the Copenhagen Charter (see Politics briefing) states, we believe that companies should always use the safest chemical for any application, and should phase out the use of any chemicals that are persistent or bioaccumulate, or which are not safe beyond reasonable doubt.

We also believe, as examined in our 'Crisis in Chemicals' report [20], that over the next 5-10 years science will find out much more about the harm done by chemicals, and will also be able to identify individuals who are particularly susceptible to individual chemicals. This new information will make it easier for affected individuals to take legal actions against retailers and product manufacturers.

Artificial musks.

Artificial musks are fragrances added to perfumes, cosmetics, laundry detergents etc.. There are two main groups, the nitro musks and the polycyclic musks, both of which are persistent and bioaccumulative and are widespread contaminants of the environment and the human body, for example being found in breast milk [21]. Musk xylene (a nitro musk) partially breaks down in the body into a chemical that is a female hormone mimic [22]; two of the polycyclic musks have also been found to imitate the female hormone [23]. FOE do not support the use of natural musks, extracted from dead musk deer; we don't consider that the use of musks is essential.

Brominated flame retardants

Brominated flame retardants are a group of chemicals used as flame retardants in fabrics and plastics. Most brominated flame retardants are persistent and bioaccumulative, and several have been identified as endocrine disrupters. Contamination of human breast milk by one group, the PBDEs, is doubling every 5 years in Sweden [24] - one chemical in this group ('penta') is likely to be banned across Europe shortly, but others are still in use [25]. The World Health Organisation has called PBDEs "*not to be used where suitable replacements are available*" [26], whilst the Swedish and Danish Governments have called for PBDEs and another group to be phased out because of their accumulation in breast milk and blood [27]. Alternatives are available immediately for many applications, for example IKEA has already phased out their use.

Bisphenol A

Bisphenol A is used in the manufacture of linings for food cans and lids, and is the main ingredient in polycarbonate plastic bottles. Bisphenol A is an endocrine disrupter - it can imitate the female hormone, and low level exposures of developing female mice have been shown to advance their puberty

[12]. Recent research has shown it can easily cross the placental barrier from mother to foetus in rats [28]. It's also been found to contaminate human blood serum [29]. Not all cans have linings containing bisphenol A, though there is no way consumers can tell.

Phthalates

Phthalates are a group of chemicals used as plasticisers in many PVC products (e.g. vinyl floor tiles, toys [though they are banned in toys designed to be put in the mouth of children under three]), glues and inks and as solvents in cosmetics. Four commonly used phthalates, DEHP (a contaminant of house dust [30]), DBP, BBP and DINP have been shown to disrupt the development of male sex organs in rats - they are all hormone disrupters, acting as anti-androgens (reducing or blocking male hormone action) [31, 32]. US researchers have found phthalates contaminating human urine, with the authors stating "*From a public health perspective, these data provide evidence that phthalate exposure is both higher and more common than previously suspected*" [33]. A study on young Puerto Rican girls with premature breast development found that they had higher blood phthalate levels than unaffected girls [34].

Alkyltin

Alkyltin compounds such as tributyltin (TBT) and dibutyltin are persistent and bioaccumulative chemicals used as preservatives, antibacterial agents and catalysts in the production of some plastics. They have been found in human blood [35] and liver [36], and have been shown to be hormone disrupters in human prostate cancer cells [37]. They also have possible immunotoxic effects and cause hormone disruption to marine molluscs, making female whelks grow penises ('imposex'), devastating their populations [38].

Alkylphenols and their derivatives.

Alkylphenol ethoxylates are used as industrial detergents and in some paints. In addition, derivatives of these chemicals, the alkylphenol phosphites, are used as UV stabilisers in some plastics. Alkylphenols such as nonylphenol are proven hormone disrupters - they can imitate the female hormone [39].

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Summary of target chemicals

Risky Chemical	What in	Hazards
Brominated flame retardants	Circuit boards and some plastics in TVs, computers etc. In household fabrics e.g. sofas	Some hormone disrupting, accumulate in breast milk* and blood
Artificial musks	Fragrances added to perfumes, cosmetics and household products	Accumulate in breast milk* and body fat, some hormone disrupting
Phthalates	Plasticisers in many PVC products, e.g. toys, flooring. Also used as a solvent in cosmetics	Hormone disrupting, contaminates breast milk *, found in urine.
Bisphenol a	Linings of food cans [it's a secret which ones], transparent (polycarbonate) baby bottles [Health advice: can leach out if bottle worn; replace worn bottles]	Hormone disrupting, found as contaminant in umbilical cord, new research shows can rapidly go through placental 'barrier'.
Alkyltin	Antibacterial agent in some antibacterial duvets, insoles, also used as anti-fouling paint in boats (being phased out globally from this application). Used in manufacture of some plastics	Powerful hormone disrupter in wildlife (makes female dog whelks grow penises), can be absorbed through skin, toxic to immune system.
Alkylphenols	Some paints, industrial detergents, additives to some plastics.	Hormone disrupter

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References

1. The Royal Society, *Endocrine disrupting chemicals (EDCs)*, 2000, The Royal Society, London, UK. http://www.royalsoc.ac.uk/templates/statements/StatementDetails.cfm?statementid=111

2. Payne, J., N. Rajapakse, M. Wilkins, and A. Kortenkamp, 'Prediction and assessment of the effects of mixtures of four xenoestrogens', *Environmental Health Perspectives*, 2000, 108: p. 983-987.

3. Ulrich, E.M., A. Caperell-Grant, S.-H. Jung, R.A. Hites, and R.M. Bigsby, 'Environmentaly relevant xenoestrogen tissue concentrations correlated to biological responses in mice', *Environmental Health Perspectives*, 2000, 108: p. 973-977.

4. Cooney, C.M., 'Science panel confirms low-dose estrogenic effects', *Environmental Science and Technology*, 2000, 34: p. 500A.

5. Andersen, A.G., T.K. Jensen, E. Carlsen, N. Jørgensen, A.M. Andersson, T. Krarup, N. Keiding, and N.E. Skakkebæk, 'High frequency of sub-optimal semen quality in an unselected population of young men', *Human Reproduction*, 2000, 15: p. 366-372.

6. CRC, *Testicular and prostate cancer statistics*, 12/1/98 1998, Cancer Research Campaign.

7. Skakkebaek, N.E., R. Rajpert-De Meyts, N. Jørgensen, E. Carlsen, P.M. Peterson, A. Giwercman, A.-G. Andersen, T.K. Jensen, A.-M. Andersson, and J. Müller, 'Germ cell cancer and disorders of spermatogenesis: An environmental connection?', *APMIS*, 1998, 106: p. 3-12.

8. Weir, H.K., L.D. Marrett, N. Kreiger, G.A. Darlington, and L. Sugar, 'Pre-natal and peri-natal exposures and risk of testicular germ-cell cancer', *International Journal of Cancer*, 2000, 87: p. 438-443.

9. Mocarelli, P., P.M. Gerthoux, E. Ferrari, D.G. Patterson, S.M. Kieszak, P. Brambilla, N. Vincoli, S. Signorini, P. Tramacere, V. Carreri, E.J. Sampson, W.E. Turher, and L.L. Needham, 'Paternal concentrations of dioxin and sex ratio of offspring', *The Lancet*, 2000, 355: p. 1858-1863.

10. Clapp, R. and D. Ozonoff, 'Where the boys aren't: dioxin and the sex ratio', *The Lancet*, 2000, 355: p. 1838-1839.

11. Hill, A., 'One girl in six hits puberty by age of eight', in *The Observer*, London, 18th June 2000. http://www.guardianunlimited.co.uk/Archive/Article/0,4273,4030928,00.html

12. Howdeshell, K.L., A.K. Hotchkiss, K.A. Thayer, J.G. Vandenbergh, and F.S. vom Saal, 'Exposure to bisphenol A advances puberty', *Nature*, 1999, 401: p. 763-764.

13. Winneke, G., A. Bucholski, B. Heinzow, U. Krämer, E. Schmidt, J. Walkowiak, J.-A. Wiener, and H.-J. Steingrüber, 'Developmental neurotoxicity of polychlorinated biphenyls (PCBs): cognitive and psychomotor functions in 7-month old children', *Toxicological Letters*, 1998, 102-103: p. 423-428.

14. SCCP, *Fragrance allergy in consumers: A review of the problem. Analysis of the need for appropriate consumer information and identification of consumer allergens.*, 1999. http://europa.eu.int/comm/food/fs/sc/sccp/out98_en.html

15. Lyons, G., *Toxic Trespass*, 1999, World Wide Fund for Nature, Godalming, UK. http://www.panda.org/toxics/downloads/chemical_trespass.doc

16. Binh Minh, T., M. Watanabe, S. Tanabe, N. Miyazaki, T.A. Jefferson, M.S. Prudente, A. Subramanian, and S. Karuppiah, 'Widespread contaminationby tris(4-chlorophenyl)methane and tris(4-chlorophenyl)methanol in cetaceans from the North Pacific and Asian coastal waters', *Environmental Pollution*, 2000, 110: p. 459-468.

17. Lebeuf, M., K.E. Bernt, S. Trottier, M. Noël, M.O. Hammill, and L. Measures, 'Tris(4-chlorophenyl)methan and tris(4-chlorophenyl)methanol in marine mammals from the Estuary and Gulf of St. Lawrence', *Environmental Pollution*, 2001, 111: p. 29-43.

18. Binh Minh, T.B., M. Watanabe, S. Tanabe, T. Yamada, J.-i. Hata, and S. Watanabe, 'Occurrence of tris(4-chlorophenyl)methane, tris(4-chlorophenyl)methanol, and some other persistent organochlorines in Japanese human adipose tissue', *Environmental Health Perspectives*, 2000, 108: p. 599-603.

19. Lascombe, I., D. Beffa, U. Rüegg, J. Tarradellas, and W. Wahli, 'Estrogenic activity assessment of environmental chemicals using *in vitro* assays: Identification of two new estrogenic compounds', *Environmental Health Perspectives*, 2000, 108: p. 621-629.

20. Warhurst, A.M., *Crisis in Chemicals: The threat posed by the 'Biomedical Revolution' to the profits, liabilities, and regulation of industries making and using chemicals*, 2000, Friends of the Earth, London, UK. http://www.foe.co.uk/campaigns/industry_and_pollution/pdf/crisisinchem.pdf

21. Kallenborn, R. and G.G. Rimkus, 'Synthetic musks in environmental samples: indicator compounds with relevant properties for environmental monitoring', *Journal of Environmental Monitoring*, 1999, 1: p. 70N-74N.

22. Riedel, J. and W. Dekant, 'Biotransformation and toxicokinetics of musk xylene in humans', *Toxicology and Applied Pharmacology*, 1999, 157: p. 145-155.

23. Seinen, W., J.G. Lemmen, R.H.H. Pieters, E.M.J. Verbruggen, and B. van der Burg, 'AHTN and HHCB show weak estrogenic activity - but no uterotrophic activity', *Toxicological Letters*, 1999, 111: p. 161-168.

24. Norén, K. and D. Meironyte, 'Certain organochlorine and organobromine contaminants in Swedish human milk in perspective of past 20-30 years', *Chemosphere*, 2000, 40: p. 1111-23.

25. ENDS, 'Ban on flame retardant imminent', *ENDS Report*, 2000, 308: p. 41.

26. World Health Organisation, *Environmental Health Criteria 205: Polybrominated dibenzo-p-dioxins and dibenzofurans*, 1998, World Health Organisation, Geneva.

27. Sjödin, A., L. Hagmar, E. Klasson-Wehler, K. Kronholm-Diab, E. Jakobsson, and A. Bergman, 'Flame retardant exposure: Polybrominated diphenylethers in blood from Swedish workers', *Environmental Health Perspectives*, 1999, 107: p. 643-648.

28. Takashi, O. and S. Oishi, 'Disposition of orally administered 2,2-bis(4-hydroxyphenyl)propane (bisphenol a) in pregnant rats and the placental transfer to fetuses', *Environmental Health Perspectives*, 2000, 108: p. 931-935.

29. Inoue, K., K. Kato, Y. Yoshimura, T. Makino, and H. Nakazawa, 'Determination of bisphenol A in human serum by high-performance liquid chromatography with multi-electrode electrochemical detection', *J Chromatogr B Biomed Sci Appl*, 2000, 749: p. 17-23.

30. Øie, L., L.-G. Hersoug, and J.Ø. Madsen, 'Residential exposure to plasticizers and its possible role in the pathogenesis of asthma', *Environmental Health Perspectives*, 1997, 105: p. 972-978.

31. Gray, L.E., C. Wolf, C. Lambright, P. Mann, M. Price, R.L. Cooper, and J. Ostby, 'Administration of potentially antiandrogenic pesticides (procymidone, linuron, iprodione, chlozolinate, *p, p'*-DDE, and ketonazole) and toxic substances (dibutyl- and diethylhexyl phthalate, PCB 169, and ethane dimethane sulphonate) during sexual differentiation produces diverse profiles of reproductive malformations in the male rat', *Toxicology and Industrial Health*, 1999, 15: p. 94-118.

32. Gray, L.E., J. Ostby, J. Furr, M. Price, D.N. Veeramachaneni, and L. Parks, 'Perinatal exposure to the phthalates DEHP, BBP, and DINP, but not DEP, DMP, or DOTP, alters sexual differentiation of the male Rat', *Toxicological Sciences*, 2000, 58: p. 350-65.

33. Blount, B.C., M.J. Silva, S.P. Caudill, L.L. Needham, J.L. Pirkle, E.J. Sampson, G.W. Lucier, R.J. Jackson, and J.W. Brick, 'Levels of seven urinary phthalate metabolites in a human reference population', *Environmental Health Perspectives*, 2000, 108: p. 979-982.

34. Colón, I., D. Caro, C.J. Bourdony, and O. Rosario, 'Identification of phthalate esters in the serum of young puerto rican girls with premature breast development', *Environmental Health Perspectives*, 2000, 108: p. 895-900.

35. Kannan, K., K. Senthilkumar, and J.P. Giesy, 'Response to comment on "Occurence of butyltin compounds in Human blood"', *Environmental Science and Technology*, 2000, 34: p. 1879-1880.

36. Takahashi, S., H. Mukai, S. Tanabe, K. Sakayama, T. Miyazaki, and H. Masuno, 'Butyltin residues in livers of humans and wild terrestrial mammals and in plastic products', *Environmental Pollution*, 1999, 106: p. 213-218.

37. Yamabe, Y., A. Hoshino, N. Imura, T. Suzuki, and S. Himeno, 'Enhancement of androgen-dependent transcription and cell proliferation by tributyltin and triphenyltin in Human prostate cancer cells', *Toxicology and Applied Pharmacology*, 2000, 169: p. 177-184.

38. ENDS, 'Belgium TBT ban falls foul of EC treaty', *ENDS Report*, 2000, 308.

39. Routledge, E.J. and J.P. Sumpter, 'Structural features of alkylphenolic chemicals associated with estrogenic activity', *Journal Of Biological Chemistry*, 1997, 272: p. 3280-3288.