IT'S A DIRTY WORLD WE LIVE IN

Gone are the days of smoke-filled cities. Pollution is now less visible but, as our research shows, it's still having an impact on our health and environment

We tested for chemical contamination in blood samples from (left to right) the Evans family (Kerri, aged 13, Kyle, 12, Sharon, 31, and Jim, 37), our researcher Cassie Smith, 29, and readers Pam Knott, 33, and Amanda Bailey, 24.

Air quality might be improving, but modern lifestyles mean we're still polluting our environment in a variety of ways – as well as dealing with the fallout from previous generations. Our dependence on fossil fuels, together with our increased reliance on cars, has polluted our air, while irresponsible industrial and agricultural activity has contaminated our water supply. There's also growing concern about the health impact of the chemicals we absorb from everyday products.

It's almost impossible to avoid some contact with chemicals – whether from your sofa, TV, toys, clothes, food or cleaning products. Once they're in our bodies, some chemicals 'bioaccumulate': stay there without easily being broken down. To find out just how they'd been affected, a group of brave *Which?* readers and one member of staff (see opposite) volunteered to have their blood tested. Some of the chemicals we tested for have been proven to have negative health effects. But there's insufficient evidence about the long-term effects, the levels at which they're harmful, or the effect of being exposed to a 'cocktail' of chemicals.

Sharon Evans explained her concerns: 'I've put in a lot of effort in the last few years to make the family live healthily, but I'm worried about what we may have picked up before that!' The family eats organic food and uses environmentally-friendly products but our tests showed that they, together with all the other volunteers, had some chemical contamination. 'It was scary to see how many nasty things had invaded my kids, when they've not been on this planet very long,' Sharon told us. Compared with other tests of the UK population, our

PHTHALATES

Some phthalates, classed as having toxic effects, were banned from toys in 2004. Others are still used in PVC products, and have been found in drinking water, soil, dust and wildlife. Tests show that low exposure damages animals' liver and reproductive systems. Environmental groups believe phthalates can disrupt hormones and cause birth defects in humans, though evidence is as yet inconclusive. Everyone but Kyle and Amanda had the phthalate DEHP (found in PVC) in their blood. Kerri had the highest level.

POLYCHLORINATED BIPHENYLS (PCBs)

In the 1950s and 60s, PCBs were widely used in building materials, plastics and electrical equipment. Their production and use were banned in the UK in the mid-1980s. However, since they bioaccumulate, they can still be found in animals and fish – and humans who eat fish. PCBs have been found even in polar bears in the Arctic. Some PCBs have been shown to have neurological and hormone-disrupting effects. The Food Standards Agency advises pregnant women to eat no more than two portions of oily fish a week – because of concerns about PCB levels. All our volunteers had low levels of PCBs in their blood – even Kyle and Kerri, who were born well after PCBs were banned.

Sharon

Jim

Cassie

Pam

Amanda

ORGANOCHLORINE INSECTICIDES

These chemicals are often used as insect and pest killers in agriculture. They've been phased out in the UK but some remain in use in other parts of the world, so imported food may contain them.

There is evidence that they could cause cancer in animals (and possibly humans) and can have long-term toxic effects on wildlife.

We found relatively low levels in our volunteers (Sharon, Kyle, Cassie, Amanda and Pam were all affected). Previous studies by WWF found more widespread contamination among UK adults.

BROMINATED FLAME RETARDANTS

These are used to protect electrical equipment, carpets

and sofas. Two of the three main BFRs have been phased out in the EU amid fears that they may have hormone-disrupting effects. One type, DecaBDE, remains in common use. We found this chemical in Jim and Kyle's blood.

DIOXINS

These are produced unintentionally when certain chemicals are burnt. Some of them are known to accumulate in the body and some have been proved to cause cancer in humans.

Emissions of dioxins into the air have dropped dramatically in the last 15 years, as industrial sources have become better controlled. Our volunteers had between two and seven different dioxins in their blood. Amanda had the most types, but Cassie had the highest concentration.

ARTIFICIAL MUSKS

These are used as a fragrance in toiletries and household products. They're not listed on the label – but 'parfum' indicates that the product could contain musks. Artificial musks are known to stick around in our bodies and have even been found in breast milk. They are potential hormone disruptors. Luckily, we found no evidence of musks in any of our volunteers' blood. The Evans family already uses cleaners that don't contain artificial musks.

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volunteers harboured lower than average levels of chemicals, perhaps due to their relatively healthy lifestyles. Previous studies concluded that chemical burden doesn't necessarily increase with age and that children can be contaminated by higher numbers and levels of chemicals than their parents.

The European Environment Agency estimates that, for three quarters of the 3,000 most commonly used chemicals, there's insufficient safety evidence. In fact, the agency admits that 'widespread exposure to low doses of chemicals may be causing harm, possibly irreversibly, particularly to sensitive groups such as children and pregnant women'. Justin Woolford, Chemical Campaigner from WWF, is wary of taking risks: 'Past experience shows that we can't always predict the toxicity of chemicals.' He gives the example of DDT (an organochlorine insecticide) – widely used as an agricultural pesticide in the last century and still used today in tropical countries. It was found to have caused widespread damage to wildlife.

Others think the risk is small. One independent environmental scientist told us: 'I believe it's very unlikely that trace chemicals present a measurable public health risk in the UK.' Meanwhile, the industry is understandably keen to reassure us about the safety of chemicals. Peter Newport, Chief Executive of the British Chemicals Distributors and Transporters' Association (BCDTA), claims: 'We're the most heavily regulated industry on the planet. If chemicals are so bad, why is there such a strong correlation between the growth in chemical use and the lifespan of humans?'

Reaching out

Despite this bullishness from industry, there's recognition at government level that this lack of evidence isn't good enough. New legislation known as Reach (it covers the Registration, Evaluation and Authorisation of Chemicals) is being discussed in the EU. It proposes controlling or banning the most hazardous chemicals and putting the burden on manufacturers to show that a chemical is safe.

Greenpeace and Friends of the Earth are optimistic: 'It's a once-in-a-lifetime chance to regulate and assert control over the manufacture and use of thousands of chemicals,' Mary Taylor from Friends of the Earth told us. Peter Newport of the BCDTA says the chemicals industry supports the proposals but feels they're over-bureaucratic and will create unnecessary costs. He warns:

Air pollutants

The government is aiming to cut emissions of these pollutants.

Since 1980, UK traffic has increased by 82 per cent

CARBON MONOXIDE
Mainly from vehicle emissions. Can cut oxygen flow to the heart and can worsen heart conditions.

LEAD
Comes mainly from industry. Even low levels of lead can affect the central nervous system and brain development of children.

NITROGEN OXIDES
Nitric oxide is emitted from power stations and traffic. High levels can affect lung function. It's often oxidised to nitrogen dioxide, which is more toxic and can cause chest pains and shortness of breath.

OZONE
Caused by sunlight reacting with VOCs and oxides of nitrogen. Can damage the respiratory tract and lung tissue – particularly in people with asthma.

PARTICLES
Mainly from vehicle emissions. Can cause inflammation of lungs and worsen the symptoms of lung and heart conditions. Linked to heart disease and lung cancer.

SULPHUR DIOXIDE
Created by burning fossil fuels. Can irritate eyes and air passages. High levels can cause heart disease and bronchitis.

VOLATILE ORGANIC COMPOUNDS (VOCS)
Mainly from vehicle exhausts. Some VOCs (eg benzene and 1,3-butadiene) can cause cancer. May also cause central nervous system disorders, liver and kidney disease and reproductive disorders.

Pollution protection?

Can you buy a product to combat the effects of pollution? We asked the advice of three experts – a nutritionist, an air pollution specialist and an expert in air quality.

Pollutants such as ozone can increase the body's production of free radicals, which are associated with certain diseases. Our experts agreed that antioxidants can help prevent free-radical damage. But they were dubious about the claims of some specialist supplements. Boots' Living With Pollution capsules, for example, contain antioxidants and claim to be a 'breakthrough formula'. But our air quality specialist told us: 'There is no "breakthrough". The capsules contain many essential nutrients, but all are also found in a normal healthy diet.' In fact, they can be gained more effectively from fruit and veg than from supplements. If you do opt for supplements, bear in mind that generic multivitamins can provide antioxidants such as vitamins A, C and E more cheaply.

This nose guard helps filter out particles

BREATHE EASY
We also took a look at Nasal Air Guard (£7 for ten) – a small plastic device worn in the nose. It claims to filter out airborne pollutants. Our air pollution specialist thought it would be fairly effective and could provide safe and inexpensive relief for people with severe allergic symptoms. It's less conspicuous than a face mask but it can't prevent you from inhaling pollutants through your mouth.

'Industry accepts that it will pay the costs but ultimately consumers will pay.'

Justin Woolford from WWF, on the other hand, describes part of the proposed legislation as crazy. He told us: 'It would still be possible to keep making and using a hazardous chemical even where there's a safer alternative. The government must support regulation to ban the worst chemicals.' Whatever the outcome of the discussions about Reach, it's unlikely that the legislation will be implemented fully for another ten years.

Another issue – not covered by the Reach legislation – is a lack of information for consumers. If you buy a computer or carpet, for example, there's usually nothing to tell you what chemicals are present. Friends of the Earth recommends asking shops about the chemicals used in products you want to buy: 'It will help retailers be more proactive about questioning their suppliers.' See www.greenpeace.org.uk/products/toxics for more about chemicals in everyday products.

SOMETHING IN THE AIR

Even if you managed to create a chemical-free home, you wouldn't be able to avoid pollutants from the air. These are released when fossil fuels (such as coal and petrol) are burnt to power industry, homes and vehicles. In the last 20 years, emissions from industry have fallen, thanks to increased regulation. Now traffic emissions pose the biggest threat to air quality, with traffic volumes in the UK predicted to rise by 40 per cent over the next 20 years. Vehicle exhausts churn out a mixture of chemicals, some of which react in sunlight to create other pollutants such as ozone – meaning pollution levels are much higher during hot weather.

In the short term, people in good health are unlikely to be affected by air pollution. But, according to the Department of Health (DoH), poor air quality can worsen symptoms of asthma, lung disease and heart conditions. It was estimated that, in 1998 in the UK, air pollution caused 8,100 premature deaths and around 10,500 hospital admissions for respiratory problems. DoH research indicates that long-term exposure could have an even greater impact on our health. The World Health Organization estimates that air pollution in the EU is high enough to reduce life expectancy by more than eight months.

As well as health problems, we're all at risk from the effects of global warming. It's now accepted that the earth's natural greenhouse effect is enhanced by 'greenhouse' gases, such as carbon dioxide and nitric oxide, from industry and traffic. This could result in droughts, storms, higher temperatures, floods, and higher sea levels. Greenpeace says that the only way to halt this is to use less energy and to ensure the energy we use is from clean, renewable sources such as wind or solar power.

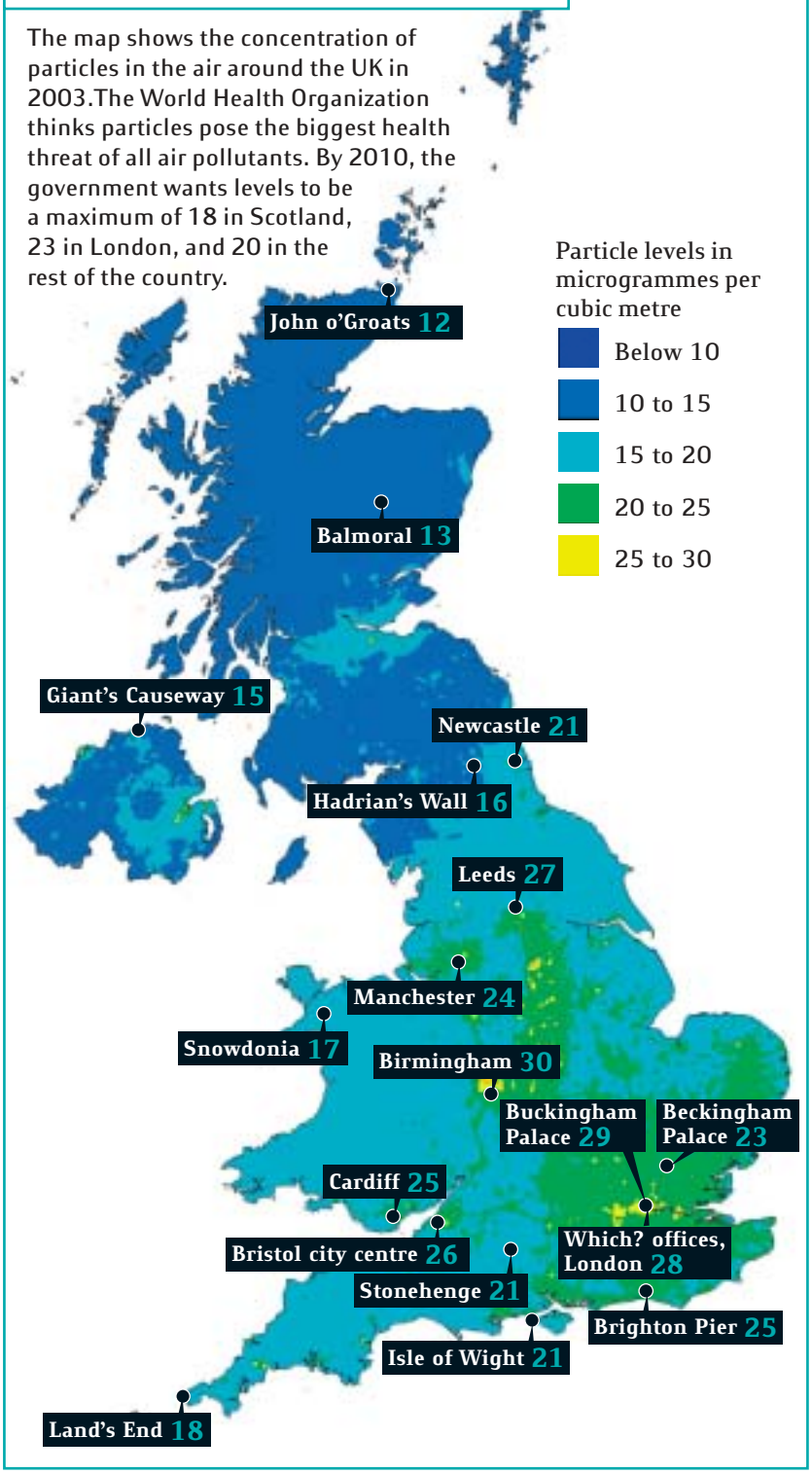
Fighting the fumes

Efforts are being made to reduce air pollution. In 1997, the government implemented the UK Air Quality Strategy – with the aim of reducing emissions of the most harmful pollutants (see 'Air pollutants', opposite). Local authorities are now responsible for working with the Environment Agency to set targets, and to control and monitor emissions from industry. They also identify any local pollution hotspots and implement strategies to reduce pollution, such as controlling traffic.

So far, only the targets for carbon monoxide, lead, and the VOCs benzene and 1,3-butadiene have been met, though levels of sulphur dioxide and particles have also

Mapping pollution levels

The map shows the concentration of particles in the air around the UK in 2003. The World Health Organization thinks particles pose the biggest health threat of all air pollutants. By 2010, the government wants levels to be a maximum of 18 in Scotland, 23 in London, and 20 in the rest of the country.



PHOTOGRAPHY ALAMY, STUDIO 21

reduced. Ozone is the only pollutant that's predicted to increase – thanks to an increase in the number of vehicles on our roads. The amount of traffic has increased by 82 per cent since 1980.

Internationally, pollution is being addressed by the Kyoto Protocol, which came into force this year and binds member countries to reduce greenhouse gas emissions. However, the United States, which churns out more than a third of the world's emissions, refused to sign the agreement.

Greenpeace and Friends of the Earth don't believe that either national or international legislation goes far enough. Greenpeace wants more road tolls and higher tax for 'gas-guzzling' vehicles. According to Mark Strutt from Greenpeace: 'A lot of people will change their behaviour only if it's going to affect their pocket'. A clear sign that money can significantly affect our actions is the 19 per cent drop in carbon dioxide levels in London since the introduction of the congestion charge.

'A lot of people will change their behaviour only if it's going to affect their pocket'

Mark Strutt, Greenpeace campaigner

The Society of Motor Manufacturers and Traders has a different solution. It says that the government should provide incentives to promote the take-up of cleaner technologies and to encourage investment in fuel-efficient vehicles. It told us that the motor industry is already working hard to cut emissions. Carbon dioxide emissions from new cars, for example, have fallen by 9.7 per cent since 1997, with most improvement in the 'gas-guzzling' people-carriers and 4x4s. However, levels of ozone and particles haven't dropped significantly. This, combined with increased traffic levels, means we can't ignore the problem of air pollution.

WATER POLLUTION

One form of pollution that you might be less aware of is the contamination of our water supply. Water coming out of our taps tends to look and smell clean – but this is only after water companies have spent around £3 billion a year removing bacteria, chemicals, and pesticides. So how do these contaminants get there in the first place?

In 2003, the water and sewage industry was responsible for 25 per cent of serious water pollution incidents. Stephen Swain from South West Water told us: 'We do everything we can to avoid pollution incidents but regrettably, from time to time, there may be problems that we have to deal with.' Spills may be caused by faulty equipment or by a third party blocking the sewers. Since privatisation in 1989, water companies have had to spend billions of pounds updating archaic sewerage systems. WaterVoice, the consumer watchdog, thinks these improvements should be paid for from general taxation rather than expecting water customers to pick up the tab. This would help to smooth out the large regional differences in bills (South West Water, for example, charges customers £400 a year compared with bills of just £252 from Thames Water).

Another 13 per cent of serious water pollution is caused by agriculture (for example due to pesticides, fertilisers and manure entering our water supplies) and another 12 per cent is due to pollution by industry. Some of these pollutants

A drop in the ocean

'There are currently more incentives to pollute than to comply with regulations.' This is the view of Neil Smith from the government's Environment Agency, who is keen for this situation to change.

The average fine for companies found guilty of polluting water supplies was just £8,412 in 2003. This does little to deter companies with multi-million pound turnovers.

South West Water concedes that it's right that polluters should pay but told us: 'If fines were any higher, it would take away money that could be invested to better protect the environment.'

When we spoke to the Department for Environment, Food and Rural Affairs (Defra) about whether fines were helping to prevent pollution, it told us it's currently looking at 'more tailored and flexible sanctions' for companies that pollute. However, it couldn't give us any details about what these alternative sanctions might be.

Fines for polluters aren't working

According to Environment Agency figures, the following companies were responsible for the most pollution offences in 2003.

United Utilities Water
Incidents: 15
Fines: £46,500.
Example: discharged sewage effluent into controlled waters. Fined £1,000.

South West Water
Incidents: 15
Fines: £41,000
Example: caused sewage to cross public footpath and enter Stover Lake. Fined £4,000.

Southern Water Services
Incidents: 11
Fines: £75,700
Example: discharged sewage into the River Solent. Fined £5,000.

Eurocare Environmental Services
Incidents: 11
Fines: £100,000
Example: caused poisonous and noxious matter to pollute controlled waters. Fined £20,000.

Silent night?

Pollution isn't always about chemicals. Noise pollution can have serious effects – from interrupting sleep to causing anxiety and illness. We joined Anita and Lee from the London Borough of Camden's noise patrol on their Saturday-night shift to look at the effects of excessive noise.

The most common complaints are about amplified music (anything from stereos to practising musical instruments), with dog barking a close second. 'Noise that affects a large number of people is our priority,' Anita told us. 'So a rave would be more important than banging on a ceiling.'

Our first visit was to assess a couple's complaint about noisy neighbours. The second was to subdue a party that had spilt out into the garden. The first couple was clearly distraught by the ongoing problem. 'The noise can go on till five or six in the morning,' they told us. It was the fifth time the noise patrol had visited but the noise had stopped by the time we arrived. The couple had been taping the noise but Anita and Lee have to witness it to take the matter further.

Camden noise patrol tries to keep nuisance noises to a minimum

Anita told us how she assesses problems: 'You have to look at duration, volume, time and location. When a noise interferes unreasonably with someone else's enjoyment, it becomes a nuisance.' Anita and Lee try to resolve problems informally but they can serve noise abatement notices that ask offenders to stop. A repeat of the behaviour can mean prosecution and a fine of up to £5,000. The council can also seize equipment used to make noise.

If you have noisy neighbours, speak to them first and give them the chance to quieten down. If they don't, contact the noise pollution office at your council's environmental health department. If it's a regular occurrence, start keeping a 'noise diary' of when disturbances occur.

can have severe effects on plants and animals, and some, such as PCBs, can also affect humans if we eat fish from contaminated water (see 'Polychlorinated biphenyls', p10).

Another threat to public health are the bacteria that enter our bathing waters (rivers, lakes, streams and the sea) through sewage spills. Exposure to concentrated levels of these bacteria can increase the risk of gastrointestinal and respiratory illnesses and ear and eye ailments. In 2004, 20 per cent of the designated bathing waters in England and Wales failed to meet the highest EU standard.

Fortunately, legislation over the last few years has done much to tackle river, bathing and drinking water quality, and the improvements have been noticeable. The quality of our drinking water is now higher than it has ever been. However, it's important to prevent pollution of our waters happening in the first place rather than paying for huge clear-up operations.

Stopping pollution from occurring is also the best way to tackle air and chemical pollution. And, while industry has a clear role to play, we all need to take responsibility for the results of our actions. It's also up to the government to make it as easy as possible for us to change our behaviour – for example, by encouraging both businesses and consumers to adopt and promote 'green' products and services.

For at least one of our volunteers (see p10), finding out what chemicals she had absorbed was a prompt to change behaviour. 'I've definitely started to look at labels more and take notice of what goes into things,' Pam Knott told us. 'I know they're more expensive, but I've been looking for cosmetics that don't use so many chemicals, and I'm coming round to buying more organic food, too.' See 'What can I do?', right, for more changes you can make.

What can I do?

Here are some ways you can help to reduce pollution and cut your exposure to various pollutants. Even small individual actions can add up to make a real difference.

REDUCE YOUR CHEMICAL BURDEN

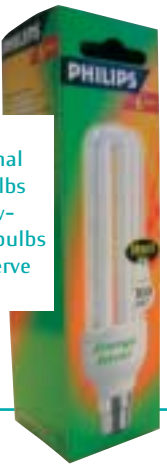
- Really thorough vacuuming may help to reduce chemicals and dust in your home.
- Eat organic food to avoid pesticides.
- Avoid artificial scents and perfumes (look for the word 'parfum' in ingredient lists).
- Try traditional cleaning methods (see *Which?*, March 2005, p24).
- Look for household products and toiletries that contain fewer chemicals of concern (see *Which?*, April 2005, p24).

USE LESS ENERGY

- Turn your thermostat down a degree or two.
- Turn off your lights, heating and appliances when you're not using them.
- Replace light bulbs with low-energy bulbs.
- Choose a 'green' energy tariff that sources energy from renewable resources.

REDUCE TRAFFIC EMISSIONS

- Think about how you use your car and avoid unnecessary trips.
- Combine several visits into one journey or share lifts.
- Use public transport, cycle or walk.
- Check emissions data if you're buying a new car, or consider one that runs on LPG.



Replace traditional light bulbs with low-energy bulbs to conserve energy

DON'T ADD TO WATER POLLUTION

- Think about what you pour down the drain. Your local council should be able to give advice on safe disposal of chemicals.
- Use products that don't contain harmful chemicals and are biodegradable. For example, use water-based instead of solvent-based paints.
- If you see anyone polluting rivers, streams, ponds or lakes, tell the Environment Agency (08708 506 506).

PHOTOGRAPHY ALAMY, ROBIN BECKHAM