



Policy statement

Air pollution

Introduction

Research shows that air pollution can make existing heart conditions worse and cause cardiovascular events in vulnerable groups. Recent studies have linked air pollution to both increased incidence of heart attacks and a worsening of heart failure. The association between elevated levels of air pollution and increased cardiac death rates was first recognised in the early 1950s. Since this time scientists have been researching the nature of the link, and the growing evidence confirms a causal relationship.

Policy statement

Background

Research shows that both long-term and short-term exposure to air pollution can make existing heart conditions worse and can cause cardiovascular events including heart attacks amongst vulnerable groups. Given the large number of people living in the UK with cardiovascular disease and the likelihood of their exposure to air pollution, it is imperative the governments and administrations around the UK ensure they are meeting European Union air quality limits and targets as soon as possible to improve air quality.

BHF Research

Since 2010 the BHF has provided £3.2 million for medical research that will help us better understand the link between air pollution and cardiovascular disease. Most of this research has focused on how small particles known as PM_{2.5} can be easily inhaled and affect the function of blood vessels consequently triggering cardiovascular events. Additional research is urgently needed to investigate the independent health impacts of several gaseous pollutants e.g. ozone and nitrogen dioxide.

Government action needed

In light of the growing evidence implicating air pollution as a cause of cardiovascular disease the BHF is calling on the UK Governments to:

- Explore a range of policy options to act quickly to improve UK air quality and meet all EU air quality targets whilst working towards the lower World Health Organisation guidelines.
- Retain legal duty for local authorities to monitor local air quality.
- Make it mandatory for all diesel powered vehicles, regardless of age, to be fitted with a diesel particulate filter (DPF) that meets Euro 6/VI Standards to reduce the harmful high levels of traffic related particle emissions
- Include within MOT test a physical check of all existing DPFs to ensure they are working properly and have not been tampered with.
- Improved warning systems for public about elevated pollution levels

BHF is aware that a by-product of DPFs is increased nitrogen dioxide emissions and of the debate surrounding independent health effects of nitrogen dioxide. We are maintaining a watching brief on the development of academic evidence linking this pollutant to cardiovascular health.

Current advice for heart patients on air pollution

The Department for Food, Environment and Rural Affairs website [UK-AIR](#) provides advice which classifies daily pollution levels as 'low,' 'moderate,' 'high' or 'very high.' At the extreme end of the scale, when air pollution is 'very high,' at risk individuals are advised to 'avoid strenuous physical activity' compared to the general population who are advised to 'reduce physical exertion outdoors.'

The BHF support this advice, as well as continuing to advocate the importance of being physically active and run fundraising events such as runs and cycles. Current evidence shows that healthy individuals with no prior history of cardiovascular disease have a low risk of suffering a cardiovascular event following exposure to high levels of air pollution. However, we do advise that those living with heart conditions monitor air pollution levels and amend their physical activity accordingly, such as exercising indoors when air quality is poor.

Members of the public can use the UK-AIR postcode finder service to monitor air pollution levels in their area as well as follow @DefraUKAir Twitter feed and sign up for text alerts. The BBC weather forecast also provides an air quality rating on its online forecast service.

However, we do not believe that this advice is currently reaching the population as widely as is needed. Current systems place the onus on individuals to understand the health impacts of pollution and rely heavily on online technology for this information. We would like to see this system improved to ensure advice

Background

What is air pollution?

There are two types of air pollution: indoor and outdoor. Indoor pollution is caused by cooking fumes and heating using solid fuels on open fires or traditional stoves. Outdoor air pollution is caused by emissions from industries such as fuel burning for power, households and vehicles.¹ Road transport is a major source of outdoor pollution, as vehicle engines release nitrogen oxides, carbon monoxide and particles into the atmosphere. Pollution is made up of many different components, including;

- **Particulate matter (PM)**, consisting of solid and liquid particles such as soot and dust, suspended in air. PM is a component of black carbon.
- **Gases**, such as nitrogen dioxide (NO₂), ozone, sulphur dioxide and carbon monoxide
- **Semi-volatile liquids**, such as methane and benzene.

¹ Excluding cigarette smoke. Health impacts from cigarette smoke are not included in these definitions. For more information please see our policy statement on [passive smoking](#)

Particulate Matter

Particles are grouped according to their size, which ranges from clusters of molecules called ultrafine particles (UFPs) with a diameter of $0.1\ \mu\text{m}$ or less, through to fine particles with a diameter of $2.5\ \mu\text{m}$ or less ($\text{PM}_{2.5}$), and coarse particles with a diameter between $2.5\ \mu\text{m}$ and $10\ \mu\text{m}$ (PM_{10}).

The majority of research has focused on fine particles and cardiovascular disease, and there is now enough evidence to support a causal link.^{2,3,4} The association with cardiovascular disease and exposure to PM is strongest for exposure to $\text{PM}_{2.5}$ and ultrafine particles derived from diesel vehicle exhausts.^{5,6}

Studies suggest that traffic pollution is specifically associated with cardiovascular risk due to the high level of fine and ultrafine particulate matter emitted.⁷ Experts believe this is one of the major public health burdens today because we're all exposed to traffic pollution so often.^{8,9} This is exacerbated by two factors. Firstly, the number of cars on UK roads has risen from 19 to 34.5 million vehicles between 1980 and 2012^{10,11} Secondly, following Government promotion of diesel cars through favourable tax rates based on carbon dioxide emissions, registrations of diesel cars now outstrip petrol.¹²

The link to cardiovascular disease

The cardiovascular effects of air pollution were first observed after the major smog that occurred in London in 1952. Based on available data from the previous year, it was estimated that there were 4,000 extra premature deaths attributed to respiratory and cardiovascular disease during the three weeks after the smog began.^{13, 14}

Since the 1970s hundreds of epidemiological studies have demonstrated an association between PM and adverse health effects.¹⁵

Research suggests there are three potential mechanisms by which PM may contribute to cardiovascular disease (CVD):

² Committee on the Medical Effects of Air Pollutants (2009) 'The mortality effects of long-term exposure to particulate air pollution in the UK.'

³ American Heart Association (2010) 'Particulate matter air pollution and cardiovascular disease. An update to the scientific statement from the American Heart Association.' <http://europepmc.org/abstract/MED/20458016>

⁴ Pope & Dockery (2006) 'Health effects of fine particulate air pollution: Lines that connect.' *Air & Waste Management Association* 56:709-742

⁵ Brook et al (2008) 'Cardiovascular effects of air pollution.' *Clinical science* 115, 175-187

⁶ *ibid*

⁷ Hart JE et al. (2013) 'Changes in traffic exposure and the risk of incident myocardial infarction and all-cause mortality.' *Epidemiology* 24(5) <http://www.ncbi.nlm.nih.gov/pubmed/23877047>

⁸ American Heart Association (2010) 'Particulate matter air pollution and cardiovascular disease. An update to the scientific statement from the American Heart Association.' <http://europepmc.org/abstract/MED/20458016>

⁹ Dr Nawrot T S et al (2011) 'Public health importance of triggers of myocardial infarction: a comparative risk assessment.' *The Lancet* Volume:377(9767) [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(10\)62296-9/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(10)62296-9/abstract)

¹⁰ House of Commons Environmental Audit Committee (2010) 'Air Quality' Fifth report of the session 2009-10 Vol 1.' <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/229/22902.htm>

¹¹ UK Government (2013) 'Vehicle licensing statistics 2012.' <https://www.gov.uk/government/publications/vehicle-licensing-statistics-2012>

¹² Society of Motor Manufacturers and Traders (2014) 'New Car CO2 Report 2014 The 13th Report' <http://www.smmt.co.uk/co2report/>

¹³ Wilkins, E.T. (1954). 'Air pollution and the London fog of December, 1952' *J.R. Sanit. Instit.* 1-21

¹⁴ Greater London Authority (2002) '50 years on: The struggle for air quality in London since the great smog of December 1952' http://legacy.london.gov.uk/mayor/environment/air_quality/docs/50_years_on.pdf

¹⁵ For example: Wold, L E. (2010) 'Cardiovascular effects of ambient particulate air pollution exposure.' *Circulation* 121(25) <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2924678/pdf/nihms-213443.pdf>

- PM may stimulate receptors in the lung that then alter the function of our nervous system, causing deleterious changes to our heart rhythm
- Inhaled particles produce inflammation of the lung and inflammatory chemicals may pass into the blood and damage the cardiovascular system
- Very small particles may be able to pass into the blood and directly affect blood vessels.¹⁶

The pathways are thought to affect the cardiovascular system by making the fatty deposits in the arteries less stable, narrowing the blood vessels, causing cardiovascular inflammation, and increasing coagulation, blood clots and sensitising the heart to damage. The effects of this include hypertension, atherosclerosis, arrhythmias, myocardial ischemia, heart attacks, heart failure, and strokes.¹⁷

The three mechanisms are not mutually exclusive. They may overlap temporally or be activated at different time points, for example within minutes, hours or days of exposure.¹⁸ The types, size and chemical composition of pollutants inhaled may also determine their toxicity and importance of each pathway.¹⁹

Both long-term and short-term exposure to air pollution has been associated with cardiovascular risk. Short-term exposure to elevated concentrations of particulate matter has been linked with an increase in the risk of heart attacks within a few hours to one day after exposure.²⁰ In 2013 BHF-funded research also found a link between increased hospitalisation rates and poor short-term air quality in those with heart failure, with the highest effects a result of PM_{2.5} from traffic exhaust fumes.²¹ A link between short-term exposure and atrial fibrillation (AF) has also been suggested. Research conducted in Boston found that the relative risk of an episode of AF in patients with dual chamber implantable cardioverter-defibrillators (ICDs) increased by 26 per cent for each 6 µg/m³ increase in PM_{2.5} two hours prior to the episode.²²

In 2014, the European Study of Cohorts for Air Pollution Effects (ESCAPE) found that long-term exposure to PM_{2.5} is strongly linked to heart attacks and angina.²³ Researchers found that a 5 µg/m³ increase in PM_{2.5} was associated with a 13 per cent increased relative risk of coronary events and a 10µg/m³ increase in PM₁₀ was associated with a 12 per cent increased risk of coronary events. The study involved over 100,000 participants with no prior history of heart disease over a ten year period (1997-2007). Worryingly, this study found that the risk of heart attack and angina increased at levels of PM_{2.5} exposure below current EU limit thresholds [see below for EU limits and UK guidelines].²⁴ This mirrors findings from a study conducted in Italy which found that long-term exposure to both PM_{2.5} and NO₂ had a negative association on mortality from coronary heart disease.²⁵

¹⁶ Brook et al (2008) 'Cardiovascular effects of air pollution.' *Clinical science* 115, 175-187

¹⁷ Brook et al (2008) 'Cardiovascular effects of air pollution.' *Clinical science* 115, 175-187

¹⁸ Langrish JP et al. (2012) 'cardiovascular effects of particulate air pollution exposure: time course and underlying mechanisms.' *Journal of International Medicine*. 272:224-39.

¹⁹ Brook et al (2008) *Cardiovascular effects of air pollution*. *Clinical science* 115, 175-187

²⁰ Peters A et al (2001) 'Increased particulate air pollution and the triggering of myocardial infarction.' *Circulation* 103:2810-2815

²¹ Mills, NL et al. (2013) 'Global association of air pollution and heart failure: a systematic review and meta-analysis.' *The Lancet*, Volume382 [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(13\)60898-3/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(13)60898-3/fulltext)

²² Link MS et al (2013) 'Acute exposure to air pollution triggers atrial fibrillation.' *Journal of the American College of Cardiology* 62(9) <http://www.ncbi.nlm.nih.gov/pubmed/23770178>

²³ Peters A et al (2014) 'Long-term exposure to ambient air pollution and incidence of acute coronary events: perspective cohort study and meta-analysis in 11 European cohorts from the ESCAPE project.' *British Medical Journal* <http://www.bmj.com/content/348/bmj.f7412>

²⁴ Peters A et al (2014) 'Long-term exposure to ambient air pollution and incidence of acute coronary events: perspective cohort study and meta-analysis in 11 European cohorts from the ESCAPE project.' *British Medical Journal* <http://www.bmj.com/content/348/bmj.f7412>

²⁵ Cesaroni G. (2013) 'Long-term exposure to urban air pollution and mortality in a cohort of more than a million adults in Rome.' *Environmental Health Perspective* 121(3) <http://www.ncbi.nlm.nih.gov/pubmed/23308401>

Impacts of air pollution

In 2012 the Global Burden of Disease study stated that outdoor air pollution was the ninth leading cause and indoor air the fourth leading cause of morbidity and mortality worldwide; estimating that over 3.5million deaths worldwide each year can be attributed to indoor and outdoor pollution.²⁶

According to the Organisation for Economic Co-operation and Development, urban air pollution is set to become the top environmental cause of mortality worldwide by 2050, ahead of dirty water and lack of sanitation.²⁷ At a European level the European Commission's *Clean Air Programme 2013* names air pollution as the number one environmental cause of premature death in the UK, responsible for ten times the toll of road traffic accidents, contributing to over 400,000 premature deaths across the EU in 2010 as well as costing between €330-940 billion when taking into consideration avoidable sickness and decreased productivity.²⁸

In England, the House of Commons Environmental Audit Committee reported that a reduction in man-made PM_{2.5} would increase life-expectancy by 7-8 months—more than the elimination of traffic accidents and passive smoking. (Results are below)²⁹

	Reduction in PM _{2.5} (reduction of 10 µg/m ³)	Elimination of road traffic accidents	Elimination of passive smoking
Expected gain in life expectancy	7-8 months	1-3 months	2-3 months

Who is at risk?

Increases in acute cardiovascular morbidity and mortality as a result of exposure to high levels of air pollution, are mainly amongst susceptible, but not critically ill, individuals such as older people with existing coronary artery disease.³⁰ Obese people may also be at higher risk.³¹ Factors that increase the risk of a heart attack, such as high blood pressure and high cholesterol, may also increase the risk from particles.³²

Children are at risk because their lungs are still developing. They also spend more time at high activity levels and can be more likely to have asthma.³³ A study in Mexico found that the heart begins to show adverse effects of air pollution in young adults. Researchers believe this may be due to an inflammatory response which leads to chronic inflammation in the heart, although they note that this inflammation doesn't appear to create any immediate harm.³⁴

²⁶ Lim S et al. (2012) 'A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010): a systematic analysis of the Global Burden of Disease Study 2010.' *The Lancet* 380: 2224-60 <http://download.thelancet.com/pdfs/journals/lancet/PIIS0140673612617668.pdf?id=baaZsePJpxz4l-p3zKhsu>

²⁷ The OECD Environment Outlook 2050 available at http://www.oecd.org/document/11/0,3746,en_2649_37465_49036555_1_1_1_37465.00.html.

²⁸ European Commission (2013) 'A Clean Air Programme for Europe' <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0918:FIN:EN:PDF>

²⁹ House of Commons Environmental Audit Committee (2010) 'Air Quality Fifth report of the session 2009-10 Volume 1.' <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/229/22902.htm>. Evidence provided by Department of Health

³⁰ Ibid

³¹ Ibid

³² Air Now. 'Particle pollution and your health.' Accessed at http://www.airnow.gov/index.cfm?action=particle_health.page1#3

³³ Ibid

³⁴ Federation of American Societies for Experimental Biology (2010, April 28). *Mexico City air pollution adversely affects the hearts of young people.* *ScienceDaily*. Retrieved May 19, 2010, from <http://www.sciencedaily.com/releases/2010/04/100428153256.htm>

The BHF has recently funded research to help us understand the impact exposure to pollutants has on fire-fighters' cardiovascular health. We know that fire-fighters are at an increased risk of heart attack during rescue and duties. The research findings are expected to be published later this year.

Policy Context

As air pollution is a global issue the World Health Organisation sets recommended limits for levels in its Air Quality Guidelines.³⁵ The limits recommended by WHO are substantially lower than the current limits set by the European Union (EU) and implemented in UK legislation. It is estimated that some 40 million people in the 115 largest cities in the EU are exposed to air exceeding WHO guideline values for at least one pollutant.³⁶ The United Nations Economic Commission for Europe also plays a key role in legislating for better air quality under the Convention on Long Range Transboundary Air Pollution. This acknowledges that as a global issue States must co-operate to achieve better air quality. This body also convenes the Gothenburg Protocol. This important piece of legislation sets targets that guides European law on emission limits. A review of the Gothenburg Protocol took place in 2012 and the ratification of this review has been included in the European Commission's 2013 Clean Air Quality Package.³⁷

The EU regulates air quality through a number of directives. The Ambient Air Quality Directive (2008/50/EC) and the Fourth Daughter Directive (2004/107/EC) are the key pillars of EU legislation which govern air quality. The National Emission Ceilings Directive (2001/81/EC) sets emission limits that the UK is required to meet.³⁸

Current EU targets and limits for key pollutants³⁹

Pollutant	Concentration	Averaging period	Timeline	Permitted exceedances (per annum)	UK compliance 2012 ⁴⁰
PM _{2.5}	25 µg/m ³	1 year	Target from 2010 Limit from 2015	n/a	<input checked="" type="checkbox"/>
PM ₁₀	50 µg/m ³	24 hours	Limit from 2005	35	<input checked="" type="checkbox"/>
	40 µg/m ³	1 year	Limit from 2005	n/a	<input checked="" type="checkbox"/>
NO ₂	200 µg/m ³	1 hour	Limit value from 2010	18	2 zones failed
	40 µg/m ³	1 year	Limit value from 2010	n/a	34 failed zones

³⁵ World Health Organisation (2005) 'WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide.' http://whqlibdoc.who.int/hq/2006/WHO_SDE_PHE_OEH_06.02_eng.pdf

³⁶ World Health Organisation. 'Data and Statistics' <http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/data-and-statistics>

³⁷ European Commission (2013) 'A Clean Air Programme for Europe' <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0918:FIN:EN:PDF>

³⁸ European Commission (2013) 'New Air Quality Directive' <http://ec.europa.eu/environment/air/quality/legislation/directive.htm>

³⁹ European Commission. 'Air Quality Standards.' <http://ec.europa.eu/environment/air/quality/standards.htm>

⁴⁰ Department for Environment Food and Rural Affairs. (2013) 'Air pollution in the UK 2012.' http://uk-air.defra.gov.uk/library/annualreport/air_pollution_uk_2012_Compliance_Assessment_Summary.pdf

The responsibility to comply with EU targets is devolved in the UK. As well as having responsibility for compliance in England the Department for Environment, Food and Rural Affairs (DEFRA) also co-ordinates the assessment of air quality plans for the UK as a whole. Each local authority in the UK is responsible for monitoring and reporting compliance with EU regulations. This is then fed back to the EU annually. The UK Government is answerable overall to the EU for failure to comply with the EU's limits and deadlines. In 2013 DEFRA launched a consultation proposing the removal of the duty on local authorities to perform this monitoring function, but were forced to reconsider as a result of strong opposition.⁴¹

The most recent UK Air Quality Strategy was published in 2007 and is now vastly out of date. The Strategy document outlines current policies along with proposed new measures. These focus on reducing emissions from transport. For example, by designing transport infrastructure to improve air quality, providing duty incentives for cleaner fuels, and promoting the uptake of less polluting vehicles. The document describes an 'exposure reduction' strategy to tackle PM exposure. Whereas other pollutants will be tackled in local hotspots of high concentrations, PM is to be reduced nationally. This is because there is no safe threshold for this pollutant and driving improvement across the UK will help maximise the benefits to public health.⁴² Similarly, the European Clean Air Quality Package is focused towards reducing emission at the source. In May 2014 the Environment Audit Commission announced an inquiry to assess the steps taken by the UK Government following the Committee's recommendations of 2010 and 2011. After initially refusing to give oral evidence at the Inquiry, Boris Johnson, Mayor of London, finally agreed to attend. The Inquiry is due to commence on 25 June. The BHF submitted written evidence to this Inquiry.

In May 2013 the European Supreme Court ruled that the UK Government were in breach of EU regulations for NO₂ as 40 of the 43 air quality zones in Britain exceeded the EU NO₂ limits. Furthermore Government plans meant that 16 of the 43 areas would not meet limits until 2020 and London until 2025, a full 15 years after the EU deadline. The European Commission launched legal proceedings against the UK Government on 20 February 2014, the outcome of which could amount to a substantial multi-million pound fine.⁴³

2013 was the EU's 'Year of Air' which aimed to review existing evidence on the link between air pollution and health and subsequently review their air quality policy.

In December 2013 the European Commission launched their Air Quality Package which proposed the following; The 'Clean Air Programme for Europe' document, which outlines key problems and sets new interim objectives up to 2030; a revised National Emission Ceilings Directive containing updated national ceilings for key air pollutants (including PM_{2.5} and nitrogen oxides) for 2020 and 2030; a new directive for medium-sized Combustion Plants and a ratification proposal for the 2012 amended Gothenburg Protocol.

NGO's including Client Earth, European Environmental Bureau and AirClim have criticised the package as 'too little too late' arguing that in prolonging the deadline to 2030 for compliance and failing to propose a revised Ambient Air Quality Directive, the EU have bowed to industry pressure.⁴⁴ This package is now being negotiated by member states which could take up to three years.

⁴¹ Department for Environment Food and Rural Affairs. (2013) 'Local Air Quality Management Review: Summary of responses and government reply' https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/265819/lqgm-sum-resp-20131213.pdf

⁴² Department for Environment Food and Rural Affairs. (2007) 'Air Quality Strategy'

<http://archive.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-qualitystrategy-vol1.pdf>

⁴³ European Commission (2014) 'Commission takes action against UK for persistent air pollution problems.' http://europa.eu/rapid/press-release_IP-14-154_en.htm

⁴⁴ European Environment Bureau (2014) 'NGO Assessment of the European Year of Air: Achievements, failures and next steps.' <http://www.eeb.org/?LinkServID=13110E1F-5056-B741-DB5B8C89AC46D071&showMeta=0&aa>

Diesel Particulate Filters

A diesel particulate filter (DPF) is a device that filters PM from exhaust fumes. It does this by trapping solid particles while letting gases escape. Like any other filter DPFs need to be emptied regularly, this is done by a process called regeneration. This involves burning the soot to a gas at a high temperature, which leaves behind only a small amount of residue. Failure to do so can lead to DPFs being less effective.⁴⁵

Under Euro Standards it has been mandatory for all new buses and HGVs to be fitted with a DPF since 2006 and for all new diesel cars since 2011.⁴⁶ From February 2014 a visual check for modification or removal of DPFs will be included as part of the MOT test. However, no efficiency or physical examination is included; meaning modification and inefficient DPFs can be missed. This is a watering down of the Department for Transport's original proposal of a full efficiency check.⁴⁷ Importantly older vehicles which are still on the UK's roads that were manufactured under previous Euro Standards do not have to be fitted with a DPF.

Research funded by BHF has recommended that DPFs are a highly efficient method of reducing particle emissions from diesel engines. As there is no threshold below which PM is deemed safe, further reduction below EU limits could help prevent several adverse cardiovascular effects.⁴⁸ DPFs would significantly reduce the levels of PM_{2.5} and ultra-fine particles in the atmosphere close to busy roads. **The BHF therefore believes that all diesel vehicles regardless of age should be fitted with a DPF that meets Euro Standard 6/VI requirements. We believe that this should be enforced over the next 3 years as a mandatory part of the MOT test to ensure road worthiness of vehicles.** Euro 6 Standards count total particle emission numbers rather than measuring by mass. This ensures the smallest particles, which are most easily inhaled, are included within the Standards. DPFs are expensive to fit therefore the Government should investigate options to subsidise retrofitted DPFs as an effective part of their Air Quality Strategy.

The BHF acknowledges that a side effect of the regeneration process is an increased production of NO₂. There is currently a debate on the health impact of NO₂, with some academic studies likening the impact to that of PM_{2.5}.⁴⁹ However there is also contradictory evidence that disputes an independent health impact on the cardiovascular system from NO₂.⁵⁰ This is an area where greater research is urgently needed to further understand the independent health impact on the cardiovascular system of this pollutant. The UK Government's Committee of the Medical Effects of Air Pollution is currently considering this and a report is expected late 2014/early 2015. The BHF will monitor the emerging evidence.

BHF Activity

- We are funding research to establish the mechanistic link between long and short-term exposure and cardiovascular disease and the effect that air pollution has on the

⁴⁵ UK Government (2013) 'Diesel Particulate Filters'

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263018/diesel-particulate-filters-guidance.pdf

⁴⁶ Client Earth 'Reducing Particulate Matter Emissions from Diesel Vehicles and Equipment.'

<http://healthyair.org.uk/documents/2013/10/black-carbon-retrofit-guidance.pdf>

⁴⁷ The Telegraph (2014) 'DPF removal; the facts' <http://www.telegraph.co.uk/motoring/10573720/DPF-removal-the-facts.html>

⁴⁸ Newby, D, E. (2011) 'Particle traps to prevent adverse vascular and prothrombotic effects of diesel engine exhaust inhalation in men.' *Circulation* April.

⁴⁹ Faustini, A et al (2014) 'Nitrogen dioxide and mortality: review and meta-analysis of long-term studies.' *European Respiratory Journal* Feb

⁵⁰ Langrish, J P et al. (2010) 'Exposure to nitrogen dioxide is not associated with vascular dysfunction in man.' *Inhalation Toxicology*, 22(3)

blood vessels. This research is currently focusing on the public health questions raised by this and identifying novel solutions to reduce the harmful effects such as removing toxic constituents from fuels, interventions, alternative fuels and susceptible populations. This is led by BHF Chair of Cardiology Professor David Newby at the University of Edinburgh.

- In 2010 BHF-funded research found some evidence that wearing a highly efficient facemask may help protect against the harmful effects of pollution for people with existing coronary heart disease.⁵¹ However, the research was carried out in Beijing where levels of pollution are very high. At present there is not enough evidence to advise the use of face masks in the UK.
- In 2013 the BHF joined the Healthy Air Campaign, a coalition of organisations including Client Earth, Clean Air for London, Asthma UK and the Climate and Health Council. This campaign group is focused on improving air quality across the UK.

Case study

“I try to live a heart healthy lifestyle and being physically active is an important part of that.

I love getting out and about on my bike but I hate the pollution.

When you're cycling you are exposed to everything. There's nothing worse than being hit straight in the face with warm exhaust fumes, especially knowing the harm that they can do your health.

I do what I can to avoid it, using smaller roads and cycling in parks and green spaces as much as I can. But sadly you can't always avoid the busy roads and this put me off taking the kids out cycling.



Graham, Cyclist

For more information please contact policy@bhf.org.uk

⁵¹ British Heart Foundation (2010) Press release: <http://www.bhf.org.uk/media/news-from-the-bhf/news-archive/pollution.aspx>