Extrinsic allergic alveolitis: isocyanates and other occupational causes

Report by the Industrial Injuries Advisory Council in accordance with Section 171 of the Social Security Administration Act 1992 reviewing the prescription of extrinsic allergic alveolitis, isocyanates and other occupational causes

Presented to Parliament by the Secretary of State for Work and Pensions
By Command of Her Majesty
April 2016

Cm 9247

Extrinsic allergic alveolitis: isocyanates and other occupational causes

Report by the Industrial Injuries Advisory Council in accordance with Section 171 of the Social Security Administration Act 1992 reviewing the prescription of extrinsic allergic alveolitis, isocyanates and other occupational causes

Presented to Parliament by the Secretary of State for Work and Pensions
By Command of Her Majesty
April 2016

Cm 9247

This publication is available at **https://www.gov.uk/government/publications/extrinsic-allergic-alveolitis-isocyanates-and-other-occupational-causes-iiac-report**

Any enquiries regarding this publication should be sent to us at **iiac@dwp.gsi.gov.uk**

Print ISBN 9781474130776
Web ISBN 9781474130783

ID 31031622 04/16

Printed on paper containing 75% recycled fibre content minimum

Printed in the UK by the Williams Lea Group on behalf of the Controller of Her Majesty's Stationery Office

INDUSTRIAL INJURIES ADVISORY COUNCIL

Professor K T PALMER, MA, MSc, DM, FFOM, FRCP, MRCGP (Chair)

Dr P BAKER, MA, DM, BS, MRGCP, MFOM

Mr K CORKAN, BA

Professor P CULLINAN, MD, BS, MB, MSc, FRCP, FFOM

Dr S DE MATTEIS, MD, MPH, PhD

Mr R EXELL, OBE

Mr P FAUPEL, CBiol, MRSB, FIOSH (Retired)

Professor S KHAN, BMedSci, FFOM, FRCGP, FRCP, DM

Dr I MADAN MB, BS (Hons), MD, FRCP, FFOM

Professor D McELVENNY, BSc, MSc, CStat, CSci

Ms K MITCHELL, LLB

Professor N PEARCE, BSc, DipSci, DipORS, PhD, DSc

Mr H ROBERTSON

Mr D RUSSELL, BSc (Hons), MSc, CMIOSH

Professor A SEATON, CBE, MD, DSc, FRCP, FRCPE, FMedSci

Dr K WALKER-BONE, BM, FRCP, PhD, Hon FFOM

Dr A WHITE, BSc (Hons), PhD, CMIOSH, AIEMA

HSE Observer:	Mr A DARNTON

IIAC Secretariat:

Secretary:	Mrs R MURPHY/Ms A LOAKES
Scientific Advisor:	Dr M SHELTON
Administrative Secretary:	Ms C HEGARTY

Dear Secretary of State

EXTRINSIC ALLERGIC ALVEOLITIS: ISOCYANATES AND OTHER OCCUPATIONAL CAUSES

The lung condition extrinsic allergic alveolitis (EAA) arises from a potentially serious allergic reaction in the smaller airways and gas-exchanging parts of the lung to various biological and chemical agents that can be encountered in the workplace. Causes already recognised for Industrial Injuries Disablement Benefit (IIDB), within the terms of Prescribed Disease (PD) B6, include fungal spores in mouldy hay (so-called 'farmer's lung') and mouldy maltings ('maltworker's lung').

A review of the evidence confirms that EAA can also arise from a class of highly reactive chemicals, called isocyanates. These have wide application in industry, including for example in polyurethane paints, industrial glues and the manufacture of foam rubber, although few cases of EAA arise from such exposures. The Council recommends that exposure to the vapour of isocyanates be added to the qualifying terms of exposure for EAA. As isocyanates are chemical rather than biological agents, it is proposed that this addition be made to the 'C' or chemical list of prescribed diseases.

This report considers also the expediency of making more generic changes to prescription for this disease to reflect an evidence base that is frequently changing. New causes of EAA are commonly discovered and the current list of recognised causes is now much longer than that in the existing prescription. To avoid the need for repeated changes to the legislation regarding the terms of prescription, and to offer future claimants of occupationally-caused EAA more rapid access to benefit, the Council recommends that an open category of claim be created, to cater for other biological and chemical substances that cause EAA.

Although the disease has many recognised causes, few cases arise annually, as identified by national surveillance and reporting schemes. Additional costs arising from claims activity will therefore be very small. Our report identifies a way in which the processing of open category claims can be streamlined, with Council support.

Yours sincerely

Professor Keith Palmer
Chairman
Industrial Injuries Advisory Council 12 April 2016

Summary

1. Extrinsic allergic alveolitis (EAA) is a potentially serious lung condition arising from an allergic reaction in the smaller airways and gas-exchanging parts of the lung to a range of biological and chemical agents.

2. Several well-recognized occupational causes of the condition are prescribed within the Industrial Injuries Disablement Benefit (IIDB) Scheme in the terms set out for Prescribed Disease (PD) B6.

3. This review, which was prompted by an inquiry from a member of the public, considers whether the terms of prescription for EAA should be extended to include a class of chemicals called isocyanates. It also considers the expediency of making more generic changes to the prescription for EAA to reflect an evidence base that is frequently changing.

4. There is published evidence that high exposures to isocyanates can give rise to acute and chronic EAA. It is therefore recommended that the terms of *prescription* for EAA be extended to cater for cases of disease arising from exposure to such vapours. As isocyanates are chemical rather than biological agents, it is proposed that this addition be made to the 'C' or chemical list of prescribed diseases.

5. New causes of EAA are regularly emerging. Diagnosis of EAA and its attribution to work is reasonably straightforward with specialist input. To avoid the need for repeated reviews of the terms of prescription of EAA, with regular changes to the legislation, and to offer future claimants of occupationally-caused disease more rapid access to benefit, the Council further recommends that an open category of claim for PD B6 should be created – namely exposure to moulds or fungal spores or heterologous proteins "*or another biological substance that causes extrinsic allergic alveolitis in…(f) any other workplace*"; similarly, it is proposed that an open category be created within the 'C' disease section of the schedule to facilitate more rapid recognition of new chemical causes of EAA.

6. In practice, the cost of this will be slight as, while many agents can cause the disease, the number of recognised cases in any year is very small.

Introduction

The Industrial Injuries Disablement Benefit Scheme

7. The IIDB Scheme provides a benefit that can be paid to employed earners because of an occupational accident or prescribed disease. The benefit is no-fault, tax-free, non-contributory and administered by the Department for Work and Pensions. It is paid in addition to other incapacity and disability benefits, but is taken into account when determining the level of payment for income-related benefits.

The Industrial Injuries Advisory Council

8. The Industrial Injuries Advisory Council (IIAC) is an independent statutory body established in 1946 to advise the Secretary of State for Social Security and the Department for Social Development in Northern Ireland on matters relating to the IIDB Scheme. IIAC advises on the prescription of occupational diseases; matters referred by the Secretary of State; draft regulations or proposals concerning the IIDB Scheme; and any other matter relating to the Scheme or its administration. IIAC is a non-departmental public body and has no power or authority to become involved in individual cases or in their decision making processes.

Prescribed Disease provisions of the IIDB Scheme

9. The Social Security Contributions and Benefits Act 1992 states that the Secretary of State may prescribe a disease where he or she is satisfied that the disease:

    a) ought to be treated, having regard to its causes and incidence and any other considerations, as a risk of the occupation and not as a risk common to all persons; and
    b) is such that, in the absence of special circumstances, the attribution of particular cases to the nature of employment can be established or presumed with reasonable certainty.

    In other words, a disease may only be prescribed if there is a recognised risk to workers in an occupation, and the link between disease and occupation can be established or reasonably presumed in individual cases.

10. Some diseases are not uniquely occupational, and when caused by occupation, are indistinguishable from the same disease occurring in someone who has not been exposed to a hazard at work. In these circumstances, attribution to occupation depends on epidemiological evidence that work in the prescribed job, or with the prescribed occupational exposures causes the disease on the balance of probabilities (previous reports of the Council give further detail). Other occupational diseases are relatively simple to verify, as the link with occupation is clear-cut. For example, the proof that an individual's dermatitis is caused by their occupation may lie in its improvement when they are on holiday and regression when they return to work, and in the demonstration that they are allergic to a specific substance with which they come into contact only at work.

11. EAA falls into this second category, as the disease can be attributed to particular work exposures with reasonable confidence in the individual case by applying clinical methods.

Extrinsic allergic alveolitis

12. EAA, also known as hypersensitivity pneumonitis, is an allergic reaction in the smaller airways and gas-exchanging parts of the lung (the alveoli). It can present in an acute or a chronic manner; the former tends to resolve spontaneously, although complete recovery may take several months. Chronic EAA is characterised by irreversible scarring of the lungs and, often, associated emphysema. Together these cause breathlessness on exertion. Early diagnosis with avoidance of exposure to the causative agent can prevent progression from acute to chronic EAA.

13. The diagnosis of EAA usually requires the opinion of a medical specialist, but it is reasonably straightforward and usually possible by non-invasive means. Diagnoses with which EAA may be confused (e.g. interstitial pneumonia and sarcoidosis, each being other forms of lung disease) are sufficiently rare that a compatible clinical appearance in a worker exposed to an established causal agent is likely to be work-related EAA. For many causal agents, diagnosis can be supported by the demonstration of a specific serological response to the antigens in question in the individual patient. Thus, both the diagnosis and its link with the workplace are potentially verifiable by applying clinical methods.

14. EAA is uncommon in the UK. The annual incidence of the disease is about 1 case per 100,000 of the population. In a substantial proportion of cases, especially those with chronic disease, the causal agent remains unidentified. Where cause is established, most cases arise from an allergy to birds (especially budgerigars and pigeons) kept as pets.

15. Less commonly, cases have their origin in allergens encountered at work. Rare but well-known occupational causes of EAA include ‘farmer’s lung’ (from fungal spores in mouldy hay), ‘maltworker’s lung’ (from mouldy maltings) and ‘mushroom worker’s lung’ (from fungal spores). The commonest occupational cause of EAA is the inhalation of contaminated, aerosolised metalworking fluid; the nature of the contaminant(s) is unclear in most cases.

16. EAA has been a prescribed disease since 1964 when farmer’s lung due to “exposure to the dust of mouldy hay or other mouldy vegetable produce” was scheduled. The terms of prescription were extended in 1983 to include a list of other well-established causal agents, and in 2006 to include cases caused by contaminated metalworking fluid. The current terms of prescription are given in the table below.

Prescribed disease	**Occupation**
B6 Extrinsic allergic alveolitis	Exposure to moulds or fungal spores or heterologous proteins by reason of employment in a) agriculture, horticulture, forestry, cultivation of edible fungi or maltworking; or b) loading or unloading or handling in storage of mouldy vegetable matter or edible fungi; or c) caring for or handling birds; d) handling bagasse or e) work involving exposure to metalworking fluids.

17. Most cases of EAA arise from a biological allergen (agent that causes allergy), and so the prescribed disease has been classified with other ‘B’ diseases (diseases with a biological causation). More occasionally, however, the causal allergen is a chemical.

Isocyanates and EAA

18. Isocyanates are a family of reactive chemicals that have widespread applications. Most commonly they are used in polyurethane paints (hexamethylene diisocyanate), or in industrial glues or as a primary component in the manufacture of foam rubber or insulating materials (toluene diisocyanate and methylene diphenyl diisocyanate). In Europe, increasingly restrictive environmental regulations are limiting the use of all isocyanates.

19. Many types of isocyanate vapourise easily and are thus readily inhaled. They are an important cause of occupational asthma (PD D7), and in the UK suitable protection and regular health surveillance is mandatory for those whose work involves their use.

20. Isocyanates are also recognised to cause EAA and around 100 cases worldwide, acute and chronic, have been documented in the medical literature. These probably arise from more intense levels of exposure than those causing occupational asthma. Several types of isocyanate have been implicated.

21. In almost all instances attribution is made on the basis of symptoms and characteristic functional and radiographic changes that follow exposure to airborne isocyanates, with resolution once such exposure has ceased. Repeated experiences of this acute illness are common and a helpful pointer to cause. Antibody tests in serum are available and provide evidence to support diagnosis. Very occasionally, provocation tests (involving experimental inhalation exposures under strictly controlled conditions) have been used to demonstrate, directly, the link between isocyanate exposure and acute EAA.

22. EAA arising from isocyanates is uncommon in the UK; between 1996 and 2014 six cases of EAA attributed to isocyanates were reported by specialist physicians to the national surveillance scheme for occupational respiratory diseases (R Agius, personal communication).

Other non-prescribed causes of EAA

23. The Council's consideration of prescription in relation to occupational exposure to isocyanates prompted it also to examine other established causes of EAA that are not presently covered by the current terms of prescription.

24. The list of recognised causes in the specialist literature is regularly expanding, such that fungal and other biological allergens have now been identified in a broad variety of workplaces, including sawmills, vineyards, sewage works, and sites where cheese and other foodstuffs are manufactured. Other chemical causes of EAA, such as acid anhydrides used in epoxy resins, have also been identified, albeit very rarely (with few or no cases reported to the national surveillance scheme in most years – R Agius, personal communication). A concluding appendix lists most of the currently recognised biological and chemical causes of EAA.

25. Between 1996 and 2014 some 152 cases of EAA from all causes were reported to the UK's national occupational disease surveillance scheme (R Agius, personal communication). Collectively, therefore, while recognised causes are numerous, expected numbers of claims for EAA will be small.

The case for extending prescription

26. EAA is an uncommon disease reported infrequently to national surveillance schemes. Cases which occur in an occupational setting do so in response to airborne allergens in the workplace.

27. EAA is one of a few prescribed diseases where prescription can be based on individual attribution (paragraph 10). Its diagnosis and attribution to work is reasonably straightforward with specialist input (paragraph 13) and potentially verifiable by means of laboratory investigations. Most claimants of EAA are likely to be advised of their diagnosis by a respiratory specialist in circumstances where supporting clinical evidence will be available.

28. There is published evidence that high exposures to isocyanates of all types can give rise to acute and chronic EAA. As such, a strong case exists for adding exposures to isocyanates to the circumstances listed as causing EAA.

29. As the full list of agents recognized to cause EAA is now long, and new (albeit rare) causes are regularly emerging, the Council has also weighed the merits of creating an 'open' category of exposure for EAA, akin to that used for prescriptions of occupational asthma (PD D7) and occupational rhinitis (PD D4) in similar constantly changing circumstances.

30. This approach would have the advantage of avoiding the need for repeated reviews of the terms of prescription for EAA, with regular changes to the legislation; it would also offer future claimants of occupationally-caused EAA a more rapid and flexible route to benefit.

31. A possible downside, identified by medical policy advisers of the Department, is that the processing of an open category of claims creates additional work in establishing entitlement to benefit.

32. The apparatus to make such an assessment exists already for PD D7 where, in open-category asthma cases, contracted medical advisers provide a specialist advisory service to the Department. In doing so, they consider first whether or not the claimed occupational exposure is to a substance appearing on a list of recognised sensitising agents; and if not, whether a systematic search of the medical literature can identify evidence that the exposure claimed may sensitize (be a possible cause of PD D7). If not, the decision maker would normally disallow the claim but otherwise it would proceed to medical assessment.

33. Such an advisory process, if used for open claims for EAA would pose additional costs to the Department. However, it would be called on only infrequently. The work of claims assessment would also be eased by the likely availability of expert medical evidence in individual claims and by the availability of a list such as that in the Appendix of this report. The Council undertakes to maintain and update the list of causative substances as required. The Council has concluded that any additional costs arising from open category claims would be small and there are off-setting efficiencies, such as negating the need for future reviews and leglislative changes.

Recommendations

34. IIAC recommends that the terms of prescription be amended both to recognise that exposure to the vapour of isocyanates can cause EAA and to create new open categories of exposure to other biological and chemical agents that can cause EAA.

35. Regarding the first of these amendments, since isocyanates are chemical and not biological agents, the Council has been advised that coverage is best achieved by a new entry for EAA within the 'C' disease section of the prescription schedule. With regard to the second amendment, it is proposed that the generic changes to create an open category be made in both the 'B' and 'C' disease sections of the schedule, thus maximising flexibility to expedite recognition of new chemical and biological causes of the disease. The revised terms that are proposed appear below, with proposed changes highlighted in bold.

Prescribed disease	**Occupation**
B6 Extrinsic allergic alveolitis	Exposure to moulds or fungal spores or heterologous proteins **or another biological substance that causes extrinsic allergic alveolitis** by reason of employment in a) agriculture, horticulture, forestry, cultivation of edible fungi or maltworking; or b) loading or unloading or handling in storage of mouldy vegetable matter or edible fungi; or c) caring for or handling birds; or d) handling bagasse; or e) exposure to the mists from metalworking fluids; or **f) any other workplace**
C34 Extrinsic allergic alveolitis	**Exposure to airborne isocyanates; or to another chemical substance that causes extrinsic allergic alveolitis**

Prevention

36. EAA arising from workplace exposures to isocyanates or other causal agents is a preventable illness. The Control of Substances Hazardous to Health Regulations 2002 (as amended) (COSHH) applies to work with isocyanates and other agents which can cause EAA. COSHH requires employers to undertake a suitable and sufficient assessment of the risks created by the work and to identify and take measures to prevent exposure as far as is reasonably practicable. Where it is not reasonably practicable to prevent exposure by substitution with a safer substance or total enclosure, exposure must be adequately controlled by the use of appropriate work processes, systems and engineering controls and measures including local exhaust ventilation systems to control exposure at source. Suitable respiratory protective equipment may be used in addition where adequate control cannot otherwise be achieved. Using these control measures, isocyanates should be controlled to at least the Workplace Exposure Limits as listed in HSE publication EH40 (http://www.hse.gov.uk/pubns/priced/eh40.pdf) and as far below these are reasonably practicable.

37. Workers handling isocyanates and other established agents that cause work-related EAA need to be informed of the hazards/risks and be provided with appropriate training. In addition, COSHH requires employers to arrange appropriate health surveillance for EAA where employees are exposed to a substance known to cause the disease and there is a reasonable likelihood of it occurring under the conditions of work.

Diversity and equality

38. IIAC is aware of issues of equality and diversity and seeks to promote as part of its values. The Council has resolved to seek to avoid unjustified discrimination on equality grounds, including age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, gender and sexual orientation. During the course of the review of occupational extrinsic allergic alveolitis no diversity and equality issues were apparent.

Appendix 1
List of agents and sources

Agent	Source	Notes
Moulds/bacteria		
Altenaria	mouldy wood/bark/ pulp	wood pulp worker's lung/sawmill lung/woodmen's disease: *may not be occupational*
Aspergillus clavatus/fumigatus	whisky or other maltings	malt worker's lung
Aspergillus fumigatus	vegetable compost/ hay	farmer's lung
Aspergillus fumigatus	esparto dust	stipatosis
Aspergillus versicolor	straw dog bedding	dog house disease
Aspergillus spp/Scopulariopsis brevicaulis	tobacco plants	tobacco grower's lung
Aureobasidium pullulans	redwood (sequoia)	sequoiosis
Bacillis subtilis	mouldy wood/bark/ pulp	wood pulp worker's lung/sawmill lung/woodmen's disease: *may not be occupational*
Botrytis cinerea	mouldy vine leaves	vine worker's lung
Cephalosporium/gram -ve bacteria	sewage	sewage worker's lung
Cryptostroma corticale	maple bark	maple bark stripper's lung
Endotoxin	aerosolised from sprays/fountains	lifeguard lung
Graphium spp	redwood (sequoia)	sequoiosis
Lycoperdon	puffball spores	lycoperdonosis
Merulius lacrymans	mouldy wood/bark/ pulp	wood pulp worker's lung/sawmill lung/woodmen's disease: *may not be occupational*
Mucor stolonifer	paprika	paprika splitter's lung
Penicillium casei	cheese	cheese washers's lung
Penicillium chrysogenum and other spp	mouldy wood/bark/ pulp	woodmen's disease
Penicillium frequentens/ P. glabrum/Conidia spp/ Thermoactinomycetes viridis	cork	suberosis

Agent	Source	Notes
Rhizopus spp/Mucor spp	mouldy wood/bark/ pulp	wood trimmer's disease
Saccharomonspora viridis	mouldy thatch	thatcher's lung
Saccharopolyspora rectivirgula	hay, straw, grain, mushroom compost, bagasse	farmer's lung/mushroom worker's lung/potato riddler's lung/bagassosis
Sporobolomyces	cereal grain, stable straw	grain measurer's lung
Streptomyces albus	soil/peat	
Thermophilic actinomycetes	hay, straw, grain, mushroom compost, bagasse	farmer's lung/mushroom worker's lung/bagassosis
Trichoderma spp	mouldy wood/bark/ pulp	wood pulp worker's lung/sawmill lung/woodmen's disease: *may not be occupational*
Trichosporon cutaneum	summer air in Japan	not occupational
Animal sources		
Arthropods (Sitophilus granarius *et al.*)	infested grain/flour	miller's lung/wheat weevil lung
Bat droppings		bat lung
Bird bloom/avian serum proteins/feathers	budgerigars, pigeons, parakeets, poultry	poultry worker's lung/duck lung/ turkey handler's lung; *may not be occupational*
Fish	fish meal	fish meal worker's lung
Cattle/pig	pituitary extracts	*may not be occupational*
Furred mammals	fur	furrier's lung
Mollusc shell	nacre	button maker's lung
Oyster shells	unclear	Pearl pneumonitis
Vegetable sources		
Cloth mummy wrapping	unclear	coptic lung
Coffee bean	coffee bean dust	coffee worker's lung
Gonystylus dust	wood dust	wood worker's lung
Unknown	velvet	velvet worker's lung

Agent	Source	Notes
Chemicals		
Acid anhydrides	plastics industry/ others	
Bordeaux mixture ($CuSO_4$)	vineyard fungicide	vineyard sprayer's lung
Diisocyanates	various	
Metal working fluid	aerosolised synthetic/semi-synthetic MWF	metal working lung
Pauli's reagent (sodium diazobenzene sulphate)	laboratory chemical	
Pyrethrum	insecticide	

This publication can be accessed online at:
https://www.gov.uk/government/publications/extrinsic-allergic-alveolitis-isocyanates-and-other-occupational-causes-iiac-report

For more information about this publication,
iiac@dwp.gsi.gov.uk

Copies of this publication can be made available in alternative formats if required.

ISBN 978-1-4741-3077-6

Department for Work and Pensions

April 2016

www.gov.uk