

Guidance for appointed doctors on the Control of Lead at Work Regulations 2002

Medical surveillance of workers exposed to lead



Introduction

- 1 This guidance explains how appointed doctors should conduct medical surveillance on workers exposed to lead for the purposes of the Control of Lead at Work Regulations 2002 (CLAW).¹ It replaces the 2002 version in Appendix 5 of the Approved Code of Practice (ACOP) and guidance *Control of lead at work* (L132),² following a review by the Health and Safety Executive (HSE). Appointed doctors should be familiar with L132, especially the section covering regulation 10 on medical surveillance, and HSE's appointed doctor website.³ Any subsequent reference to L132 in this guidance means the ACOP and guidance to regulation 10 unless otherwise specified.
- 2 Employers must ensure employees are under medical surveillance by an appointed doctor or employment medical adviser where exposure to lead is, or is liable to be, significant as defined in CLAW.

Exposure to lead

- 3 Exposure is dependent not only on the concentration of lead in air at the workplace, but also on working practices as well as personal hygiene and habits of individual workers.
- 4 Exposure to inorganic lead and its compounds can occur by inhalation of dust, fume or vapour and by ingestion. Inorganic lead is used in a wide variety of industrial activities including:
 - lead acid battery manufacture and recycling;
 - smelting, refining, alloying and casting;
 - working with metallic lead and lead containing alloys (eg soldering);
 - paint removal;
 - recovering lead from scrap and waste (eg pipes, flashing, cables);
 - hot cutting in demolition and dismantling operations;
 - manufacturing lead compounds;
 - painting of buildings and vehicles;
 - glass making;
 - recycling of materials containing lead (eg TVs, monitors);
 - manufacturing and using pigments, colours and ceramic glazes;
 - and
 - shipbuilding, repairing and breaking.
- 5 Exposure to organic lead compounds can occur by inhalation, ingestion and absorption through the skin. Their use is declining, particularly with the dramatic reduction in the use of lead alkyls in petrol. However, exposure may still occur, for example when maintaining or cleaning storage tanks that previously contained leaded petrol.

Clinical effects of lead poisoning

- 6 Once absorbed, inorganic lead is mainly transported in blood and distributed to soft tissues and bone where it accumulates. In adults, approximately 90% of the body burden is in bone where the half-life of lead is 10-30 years. Lead can be mobilised from bone where there is bone resorption or increased demand for calcium, for example during pregnancy or breastfeeding. This can result in a rise in blood lead levels. The half-life of lead in blood and soft tissues is 20-40 days. Lead can cross the placenta and is readily transferred to maternal milk during breastfeeding. It is mainly excreted in urine and faeces.
- 7 Chronic exposure to inorganic lead can affect the gastrointestinal, haemopoietic, neurological and cardiovascular systems, and renal function. It may also affect the reproductive system and the developing foetus. Lead poisoning can develop rapidly but is usually insidious in onset. Signs and symptoms include tiredness, lethargy, headache, abdominal pain, constipation, nausea, vomiting, arthralgia, myalgia, muscle weakness and anorexia.
- 8 Continued exposure can cause anaemia, encephalopathy, peripheral motor neuropathy, nephropathy, elevated blood pressure and adverse effects on fertility.⁴ Anaemia is caused by reduced haemoglobin production and shortened red cell lifespan. Lead inhibits enzymes involved in haem synthesis, which results in decreased haem production and accumulation of aminolaevulinic acid, coproporphyrin and zinc protoporphyrin (ZPP). An elevated ZPP can also occur in iron deficiency.
- 9 An individual with inorganic lead poisoning should be removed from further exposure to lead. They may need chelation therapy under close specialist medical supervision.
- 10 Lead alkyls are metabolised in the liver. They are mainly excreted in urine and, if unmetabolised, by exhalation from the lungs. Poisoning by organic lead can develop rapidly and may result in life threatening encephalopathy. Initially, the individual might be irritable, restless and confused. Ataxia and tremor may occur. As the condition progresses, they become increasingly disorientated and uncooperative and may experience nausea, abdominal pain and vomiting. In severe cases, people can become overtly psychotic and self-destructive or may lapse into a coma with subsequent cardiorespiratory failure.
- 11 An individual with organic lead poisoning needs urgent hospital admission. Treatment consists of supportive care, including sedation.

Role of the appointed doctor

- 12 Your role as an appointed doctor is to:
- liaise with the employer to ensure you understand the nature of the work being done and visit the workplace, where practicable, to see the working conditions, the workers under medical surveillance and the control measures in place;
 - conduct medical examinations and assess the fitness of individuals to work with lead, and as appropriate;
 - recommend a review of the risk assessment;
 - indicate where a review of control measures may be necessary;
 - where a worker's blood lead has reached the suspension level, review the health of employees similarly exposed;
 - inform HSE of any employee suspended from working with lead (see paragraph 37);
 - maintain adequate clinical records for the medical examinations completed;
 - provide workers with information on the health effects associated with exposure to lead;⁵ and
 - submit statistical returns on request (see paragraph 41).
- 13 As an appointed doctor, you are responsible for conducting clinical examinations on workers and assessing their fitness to work with lead. You cannot delegate these parts of the medical surveillance.

Medical surveillance

- 14 Medical surveillance is required where:
- exposure to lead is, or is liable to be, significant (see paragraph 15);
 - blood lead or urinary lead levels (measured as part of the assessment process or at any other time during employment) equal or exceed the levels specified in regulation 10(2) of CLAW; or
 - the appointed doctor certifies the employee should be under medical surveillance (eg where poor working practices or poor standards of personal hygiene suggest a greater risk of the employee absorbing lead).
- 15 An employee's exposure is significant if:
- it exceeds half the occupational exposure limit for lead;
 - there is a substantial risk of the employee ingesting lead; or
 - there is a risk of skin contact with lead alkyls or other substances containing lead which may be absorbed through the skin.
- 16 Medical surveillance should consist of initial and periodic medical assessments and biological monitoring. The objectives of medical surveillance are to:

- make an initial assessment of employees' fitness to work with lead;
 - assess the effect of lead absorbed by employees and advise them on their current state of health;
 - monitor exposure of female employees of reproductive capacity and advise them on the importance of protecting any developing foetus;
 - assess the fitness of employees to continue working with lead;
 - identify early health effects arising from excessive exposure to lead and remove employees from exposure to prevent development of further health effects and lead poisoning; and
 - assist employers in their duty to control employees' exposure to lead.
- 17 The appointed doctor should make an entry in the health record (see paragraph 39) of any female employee whose exposure to lead is significant, to indicate whether she is of reproductive capacity. A woman of reproductive capacity is an individual who is medically and physically capable of becoming pregnant. A young person is an individual who has not reached the age of 18 and is not a woman of reproductive capacity.
- 18 CLAW makes provision for an employee or employer who is aggrieved by a decision of an appointed doctor to apply for the decision to be reviewed by HSE. Such an application should be made to HSE's Principal Medical Adviser within 28 days of being informed of the decision. An employee or employer who wishes to appeal should follow the general procedure set out for appeals under the Ionising Radiations Regulations 2017.⁶

Biological monitoring

- 19 Biological monitoring is a tool for assessing uptake of lead. It helps with the evaluation of health risks and contributes to overall risk management by checking whether exposure to lead is adequately controlled.
- 20 For biological monitoring of exposure to inorganic lead, measurement of blood lead concentration is used. It is influenced by the concentration of lead in air and other factors, including physical properties of lead compounds, working practices and personal hygiene and habits of individual workers. Blood lead levels represent the most recent exposure to lead. In workers with low current exposure, blood lead may be influenced by mobilisation of lead from bone.
- 21 Biological monitoring for exposure to organic lead is undertaken by measuring total lead in urine, which reflects exposure to both organic and inorganic lead.

Inorganic lead

Initial medical assessment

- 22 The initial medical assessment should be carried out before the person starts work with lead and certainly no longer than 14 working days after first exposure. It should consist of the following:
- general medical history, noting any conditions of importance to work involving exposure to lead (eg anaemia);
 - occupational history, recording any previous exposure to lead and any suspensions;
 - a clinical examination, noting any relevant problems (eg extensive dermatitis), and personal hygiene and habits (eg smoking and nail biting); and
 - measurement of baseline blood lead, haemoglobin and ZPP levels.
- 23 A list of laboratories conducting blood lead analyses is available on HSE's appointed doctor website.³
- 24 You should complete form FODMS98⁷ for each worker and obtain consent, if possible, for disclosure of biological test results to the employer. You should confirm whether the person is fit to work with lead, fit with restrictions or unfit. Your assessment of fitness should be recorded in the worker's health record (see paragraph 39). You should also record the date of the next medical assessment and blood lead measurement, and inform the employer. Blood lead should be assessed within three months of the initial measurement. If exposure to lead is likely to be variable (see paragraph 28), you may decide to considerably reduce the interval between baseline and first follow up measurements (eg to two weeks). The employer has a duty to ensure employees attend for appointments.

Periodic medical assessments

- 25 These assessments should be conducted at intervals of not more than 12 months. However, you can use discretion to shorten the interval where blood lead concentration remains below the suspension level. This may be necessary where poor working practices or poor standards of personal hygiene suggest there is a greater risk of the employee absorbing lead. The assessments should consist of the following:
- a review of the employee's medical record and occupational history, including details of exposure to lead since the last medical;
 - a clinical examination, noting any relevant problems such as extensive dermatitis, and any signs and symptoms associated with excessive exposure to lead;
 - consideration of whether there are any observable trends in an employee's blood lead levels and how they might relate to

- working practices, personal hygiene and habits, changes in exposure and any current ill health or sickness absence; and
- measurement of blood lead concentration and, if appropriate, other relevant biological tests (eg haemoglobin and ZPP).

- 26 You should record your findings on form FODMS99.⁸
- 27 Where employees are significantly exposed to lead, you should measure their blood lead every three months. If exposure is uniform and a consistent blood lead pattern is established, the frequency of measurements depends on the blood lead level, as set out in L132. At lower levels, the frequency of measurements can be reduced. However, for women of reproductive capacity and young people, you should assess blood lead at least every three months.
- 28 Exposure may be so variable that a clear pattern of lead absorption cannot be established, for example when burning lead paint or lead covered metal during demolition work, scrap metal work and blast removal of old lead paint. In these circumstances, it may be necessary to continue three monthly blood lead measurements or to assess blood lead even more frequently if you consider it appropriate.
- 29 You should provide the employer with the results of biological tests, where employees have given their consent. In the absence of consent, you should provide enough information to enable the employer to investigate any adverse trends and review their risk assessment and control measures. You can use form FODMS102⁹ to notify the employer of biological test results or, where consent is not given, provide them with the appropriate blood lead range as indicated on the form. FODMS102 also acts as a record of medical surveillance.

Action levels

- 30 All employees significantly exposed to lead are subject to the action levels for different groups of employees set out in L132. The action level warns the employer that an employee's blood lead is approaching the suspension level. It also prompts the employer to investigate why the action level has been breached. They should review the range and effectiveness of control measures used with the aim of reducing the employee's blood lead below the action level and preventing it reaching the suspension level.
- 31 You should immediately inform the employer of any employee whose blood lead concentration reaches the action level.

Suspension levels

- 32 Blood lead concentrations at which different groups of employees are considered for suspension from further work with lead are set out in L132. Where blood lead reaches the suspension level, you should suspend the employee from further work with lead. You should ensure you see them to check for signs and symptoms of

excessive lead exposure. In addition, you may need to refer them for chelation therapy to be considered. If necessary, you can seek further advice from the National Poisons Information Service.¹⁰ Even where an employee's blood lead concentration is below the suspension level, you can use discretion in deciding whether they are fit to work with lead.

- 33 You should immediately provide the employer, in writing, with the names of all employees you decide should be suspended from working with lead or who may work with lead under specified conditions. You can use form FODMS103¹¹ for this purpose. The form also allows you to record the return to work of previously suspended employees and any conditions imposed upon them when they resume working with lead. You should inform HSE of any employee suspended from working with lead (see paragraph 37).
- 34 A woman of reproductive capacity who becomes pregnant should inform her employer as soon as possible. The employer should then notify the appointed doctor. To protect the developing foetus, a pregnant employee should be removed from any work where exposure to lead is significant.

Organic lead

- 35 The general arrangements for medical surveillance of workers exposed to inorganic lead also apply to employees exposed to organic lead. Initial and periodic medical assessments should include measurement of total lead in urine for biological monitoring of lead absorption. This is corrected for urinary creatinine concentration to account for differences in volumes of urine produced. Intervals between periodic urinary lead measurements for different groups of employees are set out in L132. At least once a year, medical assessment should include measurement of blood lead as well as urinary lead. You should conduct a clinical assessment where indicated by the results of these tests.
- 36 There are no action levels for workers exposed to organic lead. Urinary lead concentrations at which different groups of employees are considered for suspension from further work with lead are set out in L132. If the suspension level is triggered, you should suspend the employee from further work with lead. Even where an employee's urinary lead concentration is below the suspension level, you can use discretion in deciding whether they are fit to work with lead. You should inform HSE of any employee suspended from working with lead (see paragraph 37).

Actions to take when certifying an employee as unfit to work with lead

- 37 When you certify an employee as unfit to work with lead or fit with restrictions by making an entry in their health record (see paragraph 39), the employer has a duty to ensure compliance with that certificate. **You should inform HSE of any employee suspended from working with lead, within seven days of certifying them as unfit, by emailing a copy of the Certificate of unfitness/fitness form (FODMS103)¹¹ to: appointed.doctor@hse.gov.uk.** You should also advise HSE of any unsatisfactory trends or matters of concern. In taking these actions, you will help the employer discharge their responsibility to make sure you inform HSE.
- 38 Following suspension, you should authorise any decision on when an employee can return to work with lead.

Records

Health record

- 39 Under regulation 10(5) of CLAW, the employer must maintain a health record for each employee exposed to lead who is under medical surveillance. It should contain the information listed in Appendix 6 of L132. It should not contain confidential clinical information and must be kept for at least 40 years from the date of the last entry.

Clinical records

- 40 You should maintain adequate and comprehensive clinical records.

Statistical returns

- 41 Once a year, HSE will contact you requesting a statistical return covering the number of workers under medical surveillance, the lead sectors they work in, information on their blood lead measurements and any suspensions. The request will include a form for recording the data and guidance on how to complete it.

References

- 1 The Control of Lead at Work Regulations 2002 SI 2002/2676 The Stationery Office
www.legislation.gov.uk/ukxi/2002/2676/contents/made
- 2 *Control of Lead at Work. Control of Lead at Work Regulations 2002. Approved Code of Practice and guidance L132* (Third edition) HSE Books 2002 www.hse.gov.uk/pubns/books/l132.htm
- 3 HSE appointed doctor website: www.hse.gov.uk/doctors/
- 4 HSE lead web pages: www.hse.gov.uk/lead/
- 5 *Lead and you* INDG305(rev2) HSE 2012
www.hse.gov.uk/pubns/indg305.pdf
- 6 Medical appeal: Ionising Radiations Regulations 2017
www.hse.gov.uk/radiation/ionising/appeals.htm
- 7 Initial medical assessment FODMS98 HSE 2008
www.hse.gov.uk/doctors/forms.htm
- 8 Surveillance record for person exposed to lead FODMS99 HSE 2002
www.hse.gov.uk/doctors/forms.htm
- 9 Notification to employer of biological test results and record of medical surveillance FODMS102 HSE 2008
www.hse.gov.uk/doctors/forms.htm
- 10 National Poisons Information Service: www.npis.org/
- 11 Certificate of unfitness/fitness FODMS103 HSE 2019
www.hse.gov.uk/doctors/forms.htm

Further information

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