HEALTH MONITORING FOR EXPOSURE TO HAZARDOUS CHEMICALS

GUIDE FOR MEDICAL PRACTITIONERS

FEBRUARY 2013

safe work australia

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1. INTRODUCTION

The *Work Health and Safety(WHS) Act* places a duty on a person conducting a business or undertaking to ensure, so far as is reasonably practicable, the health of workers is monitored to prevent illness or injury.

The WHS Regulations place specific duties on a person conducting a business or undertaking to provide health monitoring to workers who use hazardous chemicals and asbestos, with additional health monitoring requirements for workers who are exposed to lead.

The WHS Regulations require that health monitoring is carried out, or supervised by, a registered medical practitioner with experience in health monitoring.

This Guide provides information for registered medical practitioners undertaking or supervising the health monitoring for workers exposed to hazardous chemicals, lead and asbestos.

1.1 What is health monitoring?

Health monitoring means monitoring of a person to identify changes in the person's health status because of exposure to certain substances. There are different types of health monitoring procedures used to assess exposure to hazardous chemicals, including:

Interview questions	This involves asking the worker questions about the presence of symptoms related to exposure, previous occupational history, medical history or lifestyle, for example dietary, smoking and drinking habits. It may also involve simple questions about how workers carry out their work, their personal hygiene at work or where they eat in the workplace. All of these questions provide information to assess current or previous exposure to hazardous chemicals.
Medical examination	This involves the use of standard clinical and medical assessments, tests and techniques to assess the presence of early or long term health effects, often at set intervals by a registered medical practitioner. It can include an assessment of medical history, occupational and previous exposure history, and a clinical examination. This can also include tests like spirometry (lung function) and radiography, for example chest X-ray.
Biological effect monitoring	This is the measurement and assessment of early biological effects before health impairment occurs in exposed workers, for example measurement of the reduction of cholinesterase activity levels in workers exposed to organophosphate pesticides.
Biological exposure monitoring	This involves measurement and evaluation of the levels of a hazardous chemical or its metabolites (break-down products) in body tissues, body fluids like urine or blood—for example, blood lead levels, urinary cadmium—or in exhaled breath of an exposed person.

Choosing the most appropriate health monitoring method will depend on the type of chemical involved, the way the worker is exposed, the level of exposure, and if it is possible to use a proactive method, like biological exposure monitoring, rather than reactive, like a medical examination. In many cases, more than one monitoring method may be used.

Health monitoring procedures should be safe, easy to perform, acceptable to workers and, where possible, non-invasive.

Actual exposures can be determined using some of the above methods, but it is important to understand the limitations of results. The level of a hazardous chemical or its metabolites in the body does not necessarily correlate with exposure to the hazardous chemicals, symptoms or damage to health.

1.2 Experience needed to carry out health monitoring

The WHS Regulations state health monitoring must be carried out or supervised by a registered medical practitioner *with experience in health monitoring*. Before agreeing to participate in a health monitoring program the medical practitioner should ensure they have the necessary experience and competence for this work. The medical practitioner needs the following competencies in order to effectively carry out or supervise health monitoring. Further detail for each competency is provided in Appendix A to this Guide.

COMPETENCY 1	The registered medical practitioner is able to plan a health monitoring program.
COMPETENCY 2	The registered medical practitioner is able to implement a health monitoring program.
COMPETENCY 3	The registered medical practitioner is able to evaluate a health monitoring program.
COMPETENCY 4	The registered medical practitioner is able to recognise his/her limitations and seek specialist help on any facet of a health monitoring program from occupational physicians and other appropriate occupational health and safety specialists.
COMPETENCY 5	The registered medical practitioner who is an occupational physician, in addition, is able to plan, implement, evaluate and advise on health monitoring programs for any hazardous chemicals revealed by the assessment processes, including those for which there are no existing Guidelines.
COMPETENCY 6	The registered medical practitioner who is an occupational physician, in addition, is able to interpret the medical, toxicological and epidemiological literature and apply this knowledge in order to adopt best practice in health monitoring.
COMPETENCY 7	The registered medical practitioner who is an occupational physician, in addition, is able to provide advice to other registered medical practitioners, workplaces and other health professionals on the appropriateness, planning, implementation and evaluation of health monitoring programs.

2. WHEN IS HEALTH MONITORING NEEDED?

2.1 Health monitoring for scheduled and unscheduled chemicals

A person conducting a business or undertaking (PCBU) must ensure health monitoring is provided to a worker if the worker:

- is carrying out ongoing work using, handling, generating or storing hazardous chemicals and there is a *significant risk to the worker's health* because of exposure to a scheduled chemical or asbestos, see Appendix B.

There are specific requirements for lead, see *Hazardous Chemicals Requiring Health Monitoring.*

Health monitoring must also be provided if the worker:

- is using, handling, generating or storing hazardous chemicals and there is *a significant risk* the worker will be exposed to hazardous chemicals other than scheduled chemicals and either:
  - valid techniques are available to detect the effect on the worker's health, or
  - a valid way of determining exposure is available and it is uncertain on reasonable grounds whether exposure has resulted in the biological exposure standard being exceeded.

This means the need to provide health monitoring to workers is not restricted to those chemicals listed in Schedule 14 of the WHS Regulations or asbestos. The PCBU must determine the likelihood of exposure to a chemical, in conjunction with the known health effects of the chemical and decide if a program of health monitoring is necessary. Consultation with the registered medical practitioner may be needed to determine if testing, for example biological monitoring, for the chemical being used is available to monitor potential effects on a worker's health status.

The PCBU, in consultation with the registered medical practitioner, should consider instigating a health monitoring program for chemicals with severe known health effects, for example chemicals which are known, or are presumed to be, carcinogenic, mutagenic or toxic to human reproduction, respiratory or skin sensitisers or those with other known severe toxic effects.

Some examples of chemicals which are not in Schedule 14 of the WHS Regulations but that should be considered for health monitoring are given in Appendix C of this guide.

2.2 Significant risk

It is the responsibility of the PCBU to determine whether the risk to workers is significant and whether health monitoring is required, since the PCBU has the best understanding of the work that is or will be carried out at the workplace. However, in some instances the PCBU may seek expert advice, for example from a medical practitioner, to assist in determining the level of risk. In determining whether the risk is significant, the PCBU will have regard to:

- the nature and severity of the hazard for each hazardous chemical. This information should be available from the label and the safety data sheet (SDS) in most cases. However, in some instances the hazardous chemical that triggers health monitoring will be generated in the workplace, so a label and SDS may not always be available
- the degree of exposure of people in the workplace. This should be determined for each workplace, taking account of:
  - actual processes and practices in the workplace where the chemicals are used
  - the quantities of chemicals being handled
  - work practices and procedures and the way individual workers carry out their daily tasks
  - whether existing control measures adequately control exposure
  - results of air monitoring for airborne contaminant levels.

If the PCBU has determined there is significant risk, the information leading to this decision should be provided to the medical practitioner, see section 3.2 – Information to be provided by the PCBU.

2.3 Determine valid test methods for detecting health effects

The medical practitioner, in consultation with the PCBU, should determine appropriate test methods to use as part of the health monitoring program. This is described in detail in section 3.3 of this Guide.

3. HEALTH MONITORING PROCESS

3.1 Commencing the health monitoring program

The practitioner engaged by the PCBU to undertake the health monitoring should prepare a program of health monitoring and either carry out the health monitoring program themselves or supervise the program to be undertaken by another suitably qualified person like an occupational health nurse.

The practitioner has the overall responsibility for health monitoring, however, they may need to seek advice from other professionals like an occupational physician or consult with workplace health and safety professionals.

When discussing the health monitoring program with the worker for the first time, the medical practitioner should explain:

- possible health effects from exposure
- what the program of health monitoring aims to achieve and its benefits
- what is involved in the health monitoring program, for example the frequency of testing and which tests, like blood and respiratory tests, may be needed
- requirements for the worker to see another doctor or specialist
- how to recognise and report symptoms
- how health monitoring results may affect their work tasks, for example explaining circumstances where the worker may need to move to other tasks.

3.2 Information to be provided by the PCBU

The PCBU must provide the registered medical practitioner with certain information about the business or undertaking, the worker and the work to be performed that has triggered the requirement for health monitoring. The PCBU should provide the following information:

ABOUT THE BUSINESS OR UNDERTAKING AND THE WORKER

- name and address of the person conducting the business or undertaking
  - the name, date of birth, gender and current residential address of the worker

ABOUT THE WORK

- a list of the hazardous chemicals that the worker is or will be exposed to and the dates that the worker last used the chemicals
- the work the worker is, or will be, carrying out that has triggered the requirement for health monitoring
- if the worker has started that work, how long the worker has been carrying it out
- the SDS for the chemical(s)
- relevant risk assessments reports, details of workplace exposure standards and results of air monitoring carried out at the workplace. This information is critical for the practitioner to understand all of the situations where workplace exposure could occur. Risk assessment reports should contain information about likely exposures at the workplace, including control measures that are in place to reduce exposure and investigations of results where workplace exposure standards have been exceeded.

3.3 Decide what health monitoring procedure to use

Deciding what health monitoring procedure to use involves making decisions about the entire health monitoring program, as well as individual test methods to use. For example it includes details like the frequency of testing needed during the health monitoring program.

SCHEDULED CHEMICALS

Valid test methods for scheduled chemicals are known and provided in Schedule 14 of the WHS Regulations. These are reproduced in Appendix B. Other monitoring tests and methods may be used, for example where new technology or equipment becomes available, but an alternative must be:

- equal to or better than the one listed in Appendix B, and
- recommended by a medical practitioner with experience in health monitoring.

For example, for monitoring workers exposed to organophosphate pesticides, the urinary organophosphate metabolite level could be measured rather than red cell and plasma cholinesterase levels, if there is concern about recent exposure within the last few days.

Specific information, including detailed information on the health monitoring tests and procedures, and the information required for the preparation of a health monitoring program, can be found in the separate guidelines on health monitoring for each scheduled chemical and asbestos.

The decision to use test methods other than those prescribed in the WHS Regulations should be done in consultation with the PCBU and the worker.

CHEMICALS THAT ARE NOT SCHEDULED

The determination of an appropriate test method for chemicals not included in Schedule 14 of the WHS Regulations is a matter for both the PCBU and the medical practitioner. Techniques and test methods used should be practical, accurate and safe. Health monitoring should assess the risk of adverse health effects or detect adverse health effects at an early stage.

Researching and understanding the known health effects of a hazardous chemical and the known symptoms of exposure can help make informed decisions about what an appropriate test method might be. This type of information should be available on the SDS for the chemical.

The following examples are provided to illustrate how a test method may be chosen:

Situation or type of chemical	Test method
For a chemical that is known to cause respiratory irritation or reduction in respiratory function	Spirometry (lung function) test may be used to assess exposure to the hazardous chemical.
For a chemical that is known to cause specific observable health effects like skin irritation or a rash	Health monitoring may involve simple observation of the worker's skin by an occupational nurse or through self-observation and reporting.

Situation or type of chemical	Test method
Where exposure to the chemical is known to cause that chemical or a metabolite to be present in urine or blood	Urine or blood analysis for that chemical or metabolite may be used to assess exposure, for example urine analysis for presence of heavy metals, see section 3.4. For this type of monitoring to be useful, the correlation between urine or blood levels and health effects needs to be understood. For example, if a level of 50 µg/L of the chemical in urine correlates with known health effects, this may be used in health monitoring. Validated analytical test methods must also be available. The analytical method needs to be specific to the chemical, does not deliver false positive results and be reproducible and accurate.

Further information on techniques and test methods is available from the following sources.

- WorkCover, NSW Chemical Analysis Branch Handbook, 8th Edition available at http://www.workcover.nsw.gov.au/formspublications/publications/Documents/chemical-analysis-branch-handbook-edition-eight-3516.pdf
- Workplace Health and Safety Queensland, Health Surveillance guidelines and designated doctor program at: http://www.deir.qld.gov.au/workplace/businesses/healthpros/surveillance/index.html
- UK Health and Safety Laboratory available at http://www.hsl.gov.uk/online-ordering/analytical-services-and-assays/biological-monitoring.aspx
- The Australasian Faculty of Occupational and Environmental Medicine's brochure entitled *Guidelines for Health Assessment at Work.*
- Specific Medical Tests or Examinations Published in the Literature for OSHA-Regulated Substances available at http://www.cdc.gov/niosh/docs/2005-110/nmedname.html

  This database lists the specific medical tests, published in the literature for US Occupational Safety and Health Administration (OSHA) regulated substances, for example chest X-ray, blood gas analysis, blood plasma, pulmonary function tests and sputum cytology.
- American Conference of Governmental Industrial Hygienists (ACGIH), Documentation of the Biological Exposure Indices, 7th Ed, Cincinnati, 2011.
- American Conference of Governmental Industrial Hygienists (ACGIH), Documentation of the Threshold Limit Values for Chemical Substances, 7th Ed, Cincinnati, 2011.

Note: Where there are no valid ways to detect illness or the link between work and illness is uncertain, health monitoring carried out by the PCBU may take the form of an overview of sickness records and symptom-reporting. Health monitoring also includes self-checks, for example skin checks for redness, itching or other symptoms. Self-checking will only work if workers are told what to look for and they know how to report symptoms.

3.4 Biological exposure monitoring

For some chemicals, it may be possible to determine whether the worker has been exposed to unsafe levels of a chemical by measuring and evaluating biological levels of the chemical or its metabolites (break-down products) in body tissues, body fluids (for example, urine or blood), or in exhaled breath of an exposed person. This is known as biological exposure monitoring.

Preferred tests for biological exposure monitoring are those that are less invasive if they are appropriate and provide the same degree of accuracy and reliability. For example, collection and analysis of urine samples is preferable to taking blood samples.

3.5 Respiratory questionnaires

To assist medical practitioners to carry out health monitoring for chemicals that affect the respiratory system, two respiratory questionnaires are provided in Appendix D.

3.6 Before work starts – baseline monitoring

Baseline health monitoring of the worker is required before the worker starts work with a chemical identified as requiring health monitoring, so that changes to the worker's health during that work can be detected.

For chemicals for which health monitoring is required, the following information should be collected and included on the health monitoring report. A template health monitoring report is available for each of the scheduled chemicals in *Hazardous Chemicals Requiring Health Monitoring*. Some of this information will be provided by the PCBU, see section 3.2 above.

DEMOGRAPHIC DATA—PROVIDED BY THE PCBU OR THE WORKER:

- name, gender and date of birth of the worker
- current residential address of the worker.

DETAILS OF THE WORK—PROVIDED BY THE PCBU:

- a description of the work which triggered the requirement for health monitoring
- details of control measures used in current work, including whether suitable personal protective equipment is used for that specific process
- if the worker has started that work, how long the worker has been carrying it out—date of starting current job.

PREVIOUS WORK HISTORY—COLLECTED BY THE MEDICAL PRACTITIONER:

- past work history, including previous known or suspected exposures
- potential for exposure in current work.

MEDICAL HISTORY—COLLECTED BY THE MEDICAL PRACTITIONER:

- presence of symptoms that may be due to exposure; see symptoms listed in *Hazardous Chemicals Requiring Health Monitoring* for each hazardous chemical
- relevant medical conditions that increase health risk from exposure
- other relevant information, for example smoking history.

PHYSICAL EXAMINATION—PERFORMED BY THE MEDICAL PRACTITIONER:

- Results of a physical examination will be collected. Details of physical examinations required are provided in *Hazardous Chemicals Requiring Health Monitoring*. For some chemicals specific issues will be examined. For example for acrylonitrile the physical examination will include emphasis on central nervous system, respiratory system and skin, but only if work and medical history indicates this is necessary, such as where symptoms are present. In other cases, collection and analysis of biological samples, for example urine or blood may be required.

3.7 During health monitoring

The medical practitioner should ensure that the health monitoring program, test methods and procedures are followed throughout the program. Details of the health monitoring tests for each of the 16 scheduled chemicals and asbestos are provided in Appendix B.

Regular feedback should be provided to both the PCBU and the worker where results indicate the worker has been exposed or is showing adverse health effects as a result of exposure to hazardous chemicals.

SAMPLE COLLECTION

If the collection of biological samples is needed, any instructions from the laboratory providing the test service regarding the collection, storage and transport of the samples should be followed to help ensure results are accurate.

QUALITY ASSURANCE

The registered medical practitioner should ensure the quality of the program through acceptable quality assurance practices. Where specific tests are required, the analytical laboratory providing the test service should preferably be accredited for the procedure with the National Association of Testing Authorities, www.nata.asn.au.

3.8 Termination of health monitoring – data to be collected

The following data should be collected at the termination of the health monitoring process or termination of work with the chemical:

- date of termination
- reason for termination:
  - ill-health, if ‘yes’, give details
  - other reasons
  - date and cause of death if in service.

FINAL MEDICAL EXAMINATION

A final medical examination should also be conducted. As with baseline monitoring, the focus of the final medical examination varies for individual chemicals and may involve collection of biological samples.

4. HEALTH MONITORING REPORT

You should provide the health monitoring report to the PCBU as soon as practicable after the completion of the monitoring program, or at regular intervals for longer term or ongoing health monitoring processes.

Templates of health monitoring reports are provided in *Hazardous Chemicals Requiring Health Monitoring* for each of the 17 hazardous chemicals and asbestos to assist medical practitioners. Other templates, forms and formats of health monitoring reports are acceptable and may also be used.

The templates provided contain separate sections for inclusion of confidential and non-confidential information. Confidential information about a worker, which has no bearing or relevance to their work, must not be disclosed to another person without their written consent, including to the PCBU. Further information on confidentiality is included in section 4.2 below.

4.1 Content of health monitoring report

The health monitoring report must contain:

- the name and date of birth of the worker
- the name and registration number of the registered medical practitioner
- name and address of the business or undertaking
- the date of health monitoring
- any test results that indicate whether or not the worker has been exposed to a hazardous chemical, including:
  - for lead – any test results that indicate the worker has reached or exceeded the relevant blood lead level for that worker under regulation 415 of the WHS Regulations, the date blood sampling was done and details of the pathology service used.
  - results of air or personal monitoring
  - investigations of results that exceed the workplace exposure standard.
- any advice that test results indicate the worker may have contracted a disease, injury or illness as a result of carrying out the work that triggered the requirement for health monitoring
- any recommendation that remedial measures are taken, including whether the worker can continue to carry out the type of work that triggered the requirement for health monitoring
- whether medical counselling is required for the worker in relation to the work that triggered the requirement for health monitoring.

The report should also contain:

- assessments carried out to determine the level of risk to the worker
- the date of sampling if blood or urine samples are taken
- results of biological monitoring and other tests carried out.

When the report is complete it should be signed by the medical practitioner responsible for the health monitoring program and a copy sent to the PCBU who has engaged your services. The PCBU will provide a copy of the report and any recommendations to the worker. The medical practitioner may provide a copy of the report to the worker at the conclusion of the examination.

CONSIDERATIONS FOR WORK INVOLVING LEAD

There are specific additional requirements for lead risk work that must be considered when preparing the health monitoring report for workers involved in lead risk work, including:

- the frequency of biological monitoring and the circumstances when the frequency of monitoring *must* be increased
- when workers *must* be removed from and returned to lead risk work
- the requirement to arrange a medical examination for the worker within seven days after the worker is removed from the lead risk work.

Refer to the additional information on lead in *Hazardous Chemicals Requiring Health Monitoring* and the WHS Regulations, Part 7.2 for further details.

4.2 Confidentiality of health monitoring records

Health monitoring records must be kept confidential. The report and results must not be disclosed to another person without the worker's written consent unless the records are required to be given under the WHS Regulations to:

- the regulator
- another PCBU who has a duty to provide health monitoring for the worker
- a person who must keep the record confidential under a duty of professional confidentiality.

The report must not be used for any purpose other than providing the PCBU with information on the results of the health monitoring program. For example, the report should not contain details of medical conditions disclosed during the health monitoring program if these have no relevance or bearing on the work being performed.

Similarly, blood or tissue samples, X-rays, questionnaires or other materials taken for health monitoring must not be used for any other purpose.

Note: health monitoring includes longer-term epidemiological studies.

4.3 Requirements for ongoing medical treatment

Where the health monitoring report identifies further medical treatment is necessary the PCBU will arrange this. Treatment programs for adverse health effects should only be discussed between the worker and the medical practitioner.

APPENDIX A: COMPETENCIES FOR HEALTH MONITORING

The WHS Regulations require the person conducting a business or undertaking to ensure health monitoring is carried out by, or under the supervision of, a registered medical practitioner with relevant experience. The registered medical practitioner should be adequately trained in the appropriate medical examinations and tests for the chemical in question.

This set of competencies and process criteria provide guidance on the level of knowledge, skill and experience required by the medical practitioner to provide health monitoring under the WHS Regulations. They represent a minimum standard for the performance of health monitoring.

COMPETENCY 1: THE REGISTERED MEDICAL PRACTITIONER IS ABLE TO PLAN A HEALTH MONITORING PROGRAM.

Element	Process Criteria
1.1 Establish and maintain participative arrangements for the development of a health monitoring program.	1.1.1 Consultation is carried out with the person conducting a business or undertaking and workers which establishes the relationship of the health monitoring program to the risk assessment process. 1.1.2 A mechanism is established to consider worker concerns.
1.2 Establish an information base for the performance of the health monitoring program.	1.2.1 Guidelines for health monitoring for the hazardous chemical of concern are obtained from the Safe Work Australia website. 1.2.2 Other sources of relevant information are identified and are readily available including but not limited to safety data sheets (SDS).
1.3 Establish the chemical(s) to which the workplace population is exposed and the appropriate type of health monitoring.	1.3.1 Information from the risk assessment process which identified the hazardous chemical is reviewed, and advice obtained if necessary, to estimate the degree of likely worker exposure. 1.3.2 The appropriate type of health monitoring is established. 1.3.3 Specialist advice is obtained concerning the necessity for health monitoring for any other hazardous chemical.
1.4 Identify the target workplace population.	1.4.1 Information from the risk assessment process which identified the hazardous chemical is reviewed, and advice obtained if necessary, to identify the target population.
1.5 Identify a protocol for the timing and frequency of routine health monitoring.	1.5.1 Protocol for the timing and frequency of health monitoring is identified in the Guidelines.
1.6 Establish a protocol for additional health monitoring required in the case of possible higher exposure to the hazardous chemicals.	1.6.1 Protocol for any additional health monitoring is identified in the Guidelines. 1.6.2 Specialist advice is sought to establish a protocol for health monitoring for exposure to hazardous chemicals, which have no Guidelines.

Element	Process Criteria
1.7 Establish mechanisms for specimen collection, transport and analysis.	1.7.1 A laboratory accredited to carry out the specified tests is identified. 1.7.2 A protocol approved by the accredited laboratory for specimen collection, which specifies appropriate collection techniques, specimen containers and specimen transport conditions prior to receipt for analysis, is available and is implemented. 1.7.3 A protocol specifying measures to prevent specimen contamination, control infection and dispose of biological wastes is available and has been implemented. 1.7.4 A service agreement, which specifies the timeliness of laboratory reporting, is made with the accredited laboratory.
1.8 Establish standardised lung function testing procedures when required.	1.8.1 Spirometry[1] is conducted according to the Thoracic Society of Australia and New Zealand Guidelines. 1.8.2 Where instrumentation or training is not available arrange referral to a provider.
1.9 Establish delegation in the performance of health monitoring.	1.9.1 The competencies relevant to health monitoring of nursing and other staff involved in the performance of health monitoring are determined in consultation with the person performing those activities. 1.9.2 Where the supervised person has specialised training the competencies of that training are recognised in delegating the performance of health monitoring. 1.9.3 A protocol is developed to define the roles and responsibilities of all persons involved in health monitoring based on skills relevant to activities to be performed.
1.10 Ensure that all staff required to perform health monitoring activities are adequately trained to perform the activities assigned to them.	1.10.1 Sufficient instruction is provided to all staff required to perform health monitoring activities to enable them to competently perform the activities assigned to them.

1 **Further Reading:** Pierce, R and Johns DP, *Spirometry: The Measurement and Interpretation of Ventilatory Function in Clinical Practice*, commissioned by the Thoracic Society of Australia and New Zealand. First published 1995, revised July 2004.

Miller MR, Hankinson J, Brusasco V, Burgos F, Casaburi R, Coates A, Crapo R, Enright P, van der Grinten CPM, Gustafsson P, Jensen R, Johnson DC, MacIntyre N, McKay R, Navajas D, Pedersen OF, Pellegrino R, Viegi G, Wanger J, 'Standardisation of spirometry', Series "ATS/ERS Task Force: Standardisation of Lung Function Testing", Brusasco V, Crapo R, Viegi G (eds), Number 2 in this series, *Eur Respir J*, vol 26, pp 319-338, 2005. http://www.thoracic.org/statements/resources/pfet/PFT2.pdf.

COMPETENCY 2: THE REGISTERED MEDICAL PRACTITIONER IS ABLE TO IMPLEMENT A HEALTH MONITORING PROGRAM.

Element	Process Criteria
2.1 Undertake the prescribed history, examination and testing with reference to the Guidelines.	2.1.1 The essential elements required in the occupational history are listed. 2.1.2 The essential elements required in the medical history are listed. 2.1.3 The appropriate physical examination is performed and recorded. 2.1.4 The appropriate tests to monitor exposure are ordered
2.2 Ensure specified procedures for collection, transport and storage of biological specimens are followed in order to reduce the sources of error.	2.2.1 The correct procedure for the collection of the specimens is performed. 2.2.2 Special requirements for transport of the specimens are observed. 2.2.3 Special conditions for storage of the specimens while awaiting analysis are available. 2.2.4 Likely sources of error for each test procedure are recognised and minimised.
2.3 Advise workers of potential health effects of chemicals used in the workplace.	2.3.1 The potential health effects related to the hazardous chemicals are recognised and explained. 2.3.2 Any symptoms or signs, which suggest exposure to hazardous chemicals, are explained in lay terms. 2.3.3 The routes of entry into the body and the most likely route of exposure for the work conditions for the hazardous chemicals are explained.
2.4 Recognise the limitations of tests.	2.4.1 Limitations to routine tests used to monitor worker exposure to hazardous chemicals are recognised and taken into account. 2.4.2 A repeat test or an additional test is arranged when indicated.
2.5 Interpret the results of tests in the light of the individual's general state of health	2.5.1 The results of tests are interpreted by reference to appropriate standards and the clinical findings. 2.5.2 Serial results are assessed to establish the significance of any trend, which suggests an adverse reaction caused by exposure to a hazardous chemical. 2.5.3 Individual or group results requiring corrective action at the workplace are identified.

Element	Process Criteria
2.6 Notify person conducting a business or undertaking of results and implications of health monitoring.	2.6.1 A report which clearly explains the results of health monitoring, is provided to the person conducting a business or undertaking. 2.6.2 Reports of health monitoring clearly indicate elevated levels of exposure or abnormal results and the possible association with workplace exposures are explained. 2.6.3 Reports of health monitoring clearly indicate workers who are advised to have further tests or medical counselling. 2.6.4 Reports of health monitoring are written with appropriate safeguards on worker confidentiality. 2.6.5 Results of health monitoring, including any trends, are interpreted with regard to implications for the workplace. 2.6.6 Appropriate preventive and remedial action at the workplace is advised in the report. 2.6.7 Further investigations and/or referral indicated by the results of health monitoring are recommended.
2.7 Arrange appropriate management of the worker.	2.7.1 Appropriate treatment or referral for workers with abnormal findings is arranged. 2.7.2 Rehabilitation of a worker with a clinical abnormality related to hazardous chemicals affecting work capability is arranged. 2.7.3 Workers are advised of any additional preventive measures necessary at the workplace. 2.7.4 Workers are referred to their treating doctor for management of incidental findings.
2.8 Decide on action in relation to removal from or return to work.	2.8.1 Determine when removal from working with a hazardous chemical is indicated by the results of health monitoring. 2.8.2 Determine when return to work with hazardous chemicals is permitted by the results of health monitoring.

COMPETENCY 3: THE REGISTERED MEDICAL PRACTITIONER IS ABLE TO EVALUATE A HEALTH MONITORING PROGRAM.

Element	Process Criteria
3.1 Ensure that the health monitoring procedures follow the health monitoring requirements of the WHS Regulations and these Guidelines.	3.1.1 The WHS Regulations and these Guidelines are consulted and followed.
3.2 Ensure that health monitoring procedures are developed in consultation with the person conducting a business or undertaking and workers.	3.2.1 Procedures are developed in consultation with the person conducting a business or undertaking and workers.
3.3 Ensure that examination and testing procedures used for health monitoring are appropriate and adequate.	3.3.1 Appropriate and consistent examination technique is demonstrated. 3.3.2 The ability to differentiate abnormal clinical signs is demonstrated. 3.3.3 Ability to assess clinical and testing competencies of any delegated person involved in health monitoring is demonstrated. 3.3.4 Knowledge of the appropriate tests for a given hazardous chemical is demonstrated. 3.3.5 All samples are collected, transported and analysed in accordance with the laboratory protocol.
3.4 Ensure correct interpretation of individual test results.	3.4.1 Interpretation of individual test results is based on the Health Monitoring Guidelines where relevant. 3.4.2 Knowledge of the implications of cumulative exposure is demonstrated. 3.4.3 Knowledge of potential actions in response to individual health monitoring results is demonstrated. 3.4.4 Selection of appropriate diagnostic testing and/or referral for confirmation of test results is demonstrated. 3.4.5 A random sample of decisions is audited by peer review.
3.5 Interpret group data to identify adverse trends in health monitoring.	3.5.1 Knowledge of the importance of determining adverse health monitoring trends is demonstrated. 3.5.2 Group results are referred for specialist advice where appropriate. 3.5.3 Knowledge of potential actions in response to individual health monitoring results is demonstrated.

Element	Process Criteria
3.6 Communicate with person conducting a business or undertaking.	3.6.1 All health monitoring results, and actions from those results, are communicated in a form and language (written and/or oral) understandable to the person conducting a business or undertaking in a timely manner. 3.6.2 The person conducting a business or undertaking is informed in writing of appropriate action to modify individual and/or group exposures. 3.6.3 Follow-up to ascertain person conducting a business or undertaking compliance with advice is undertaken. 3.6.4 Knowledge of the information that the person conducting a business or undertaking should provide is demonstrated.
3.7 Ensure that the practitioner's decisions concerning actions based on health monitoring are correct.	3.7.1 A random sample of cases is audited by peer review. 3.7.2 The decisions and recommendations made are consistent with these Guidelines and the WHS Regulations.
3.8 Ensure that the practitioner assesses dissatisfaction expressed by person conducting a business or undertaking or worker.	3.8.1 Information is sought as to the reasons for dissatisfaction. 3.8.2 Corrective action is taken where possible.

COMPETENCY 4: THE REGISTERED MEDICAL PRACTITIONER IS ABLE TO RECOGNISE HIS/HER LIMITATIONS AND SEEK SPECIALIST HELP ON ANY FACET OF A HEALTH MONITORING PROGRAM FROM OCCUPATIONAL PHYSICIANS AND OTHER APPROPRIATE OCCUPATIONAL HEALTH AND SAFETY SPECIALISTS.

Element	Process Criteria
4.1 Recognise when to seek advice regarding health monitoring from health and safety specialists.	4.1.1 Advice is sought to implement a program of health monitoring. 4.1.2 Advice is sought to interpret results of health monitoring. 4.1.3 Advice is sought to review individual results and aggregate data. 4.1.4 Advice is sought in order to explain the meaning of results to persons conducting a business or undertaking or workers in the context of the workplace. 4.1.5 Advice is sought to assess the need for a review of hazard controls.

Element	Process Criteria
4.2 Consult with the person who is conducting a business or undertaking where the involvement of other professionals is recommended.	4.2.1 The reasons for further specialist advice are discussed with the person who is conducting a business or undertaking.
4.3 Recognise when to seek advice from an occupational physician on the requirements for health monitoring for chemical(s) not listed in Appendix B.	4.3.1 Advice is sought where workers may be exposed to undesirable levels of chemical(s) not listed in Appendix B.

COMPETENCY 5: THE REGISTERED MEDICAL PRACTITIONER WHO IS AN OCCUPATIONAL PHYSICIAN, IN ADDITION, IS ABLE TO PLAN, IMPLEMENT, EVALUATE AND ADVISE ON HEALTH MONITORING PROGRAMS FOR ANY HAZARDOUS CHEMICALS REVEALED BY THE ASSESSMENT PROCESSES, INCLUDING THOSE FOR WHICH THERE ARE NO EXISTING GUIDELINES.

Element	Process Criteria
5.1 Develop a program of health monitoring for those chemicals, which do not have existing Guidelines	5.1.1 Protocols are developed for health monitoring for any hazardous chemical. 5.1.2 The program of health monitoring is implemented where required. 5.1.3 The effectiveness of any health monitoring protocol is evaluated. 5.1.4 Health effects of specific hazardous chemicals are identified and appropriate health examinations are carried out. 5.1.5 Biological monitoring tests suitable to assess exposure to specific hazardous chemicals are identified. 5.1.6 Biological effects of specific hazardous chemicals are identified. 5.1.7 The limitations of any investigation selected to monitor exposure to a specific hazardous chemical are identified.
5.2 Advise on special sub-groups and individuals who may have characteristics that increase their susceptibility to hazardous chemicals.	5.2.1 Individuals likely to be more susceptible to adverse health effects of hazardous chemicals are identified. 5.2.2 Subgroups having increased susceptibility to particular adverse health effects of hazardous chemicals are identified. 5.2.3 Existing and prospective workers with identified increased susceptibility to hazardous chemicals are advised. 5.2.4 The person conducting a business or undertaking is advised about the fitness for work in specific processes of individuals with increased susceptibility.

Element	Process Criteria
5.3 Consult with the person who is conducting a business or undertaking on the need for review of hazard controls.	5.3.1 The appropriate personnel in the workplace are identified and consulted. 5.3.2 The person who is conducting a business or undertaking is advised on appropriate procedures to control exposure to hazardous chemicals. 5.3.3 The person who is conducting a business or undertaking is advised when there is a need to review the control of hazardous chemicals when indicated by the results of health monitoring.

COMPETENCY 6: THE REGISTERED MEDICAL PRACTITIONER WHO IS AN OCCUPATIONAL PHYSICIAN, IN ADDITION, IS ABLE TO INTERPRET THE MEDICAL, TOXICOLOGICAL AND EPIDEMIOLOGICAL LITERATURE AND APPLY THIS KNOWLEDGE IN ORDER TO ADOPT BEST PRACTICE IN HEALTH MONITORING.

Element	Process Criteria
6.1 Review new information and testing techniques to ensure the most appropriate current health monitoring.	6.1.1 The peer reviewed literature is regularly perused. 6.1.2 Relevant computerised data base searches are conducted. 6.1.3 The significance of literature reports is interpreted in the light of the particular workplace.
6.2 Review the assessment documents for changes to technology and usage of hazardous chemicals in the workplace.	6.2.1 The workplace assessment documents and reports are regularly accessed. 6.2.2 The health monitoring program is reviewed when changes occur in technology and usage of hazardous chemicals in the workplace.

COMPETENCY 7: THE REGISTERED MEDICAL PRACTITIONER WHO IS AN OCCUPATIONAL PHYSICIAN, IN ADDITION, IS ABLE TO PROVIDE ADVICE TO OTHER REGISTERED MEDICAL PRACTITIONERS, WORKPLACES AND OTHER HEALTH PROFESSIONALS ON THE APPROPRIATENESS, PLANNING, IMPLEMENTATION AND EVALUATION OF HEALTH MONITORING PROGRAMS.

Element	Process Criteria
7.1 Advise on the appropriateness of proposed or existing health monitoring programs.	7.1.1 The proposed or existing program of health monitoring is reviewed. 7.1.2 Appropriate advice in the context of the given workplace is provided.
7.2 Advise on the interpretation of individual and aggregate data.	7.2.1 Advice on the interpretation of individual or aggregate health monitoring data is provided. 7.2.2 The particular workplace processes and hazard controls are considered when interpreting data.
7.3 Advise on the appropriate consultation with the workplace concerning health monitoring results.	7.3.1 Advice on adverse results in the context of the particular workplace is provided. 7.3.2 Advice on the need for a review of hazard controls is provided.

APPENDIX B: HAZARDOUS CHEMICALS REQUIRING HEALTH MONITORING

The information in this Appendix is taken from Schedule 14 of the WHS Regulations and Regulation 436 (asbestos).

HAZARDOUS CHEMICALS REQUIRING HEALTH MONITORING

	Hazardous chemical	Type of health monitoring
1	**Acrylonitrile**	Demographic, medical and occupational history Records of personal exposure Physical examination
2	**Arsenic (inorganic)**	Demographic, medical and occupational history Records of personal exposure Physical examination with emphasis on the peripheral nervous system and skin Urinary inorganic arsenic
3	**Asbestos**	Demographic, medical and occupational history Records of personal exposure Physical examination
4	**Benzene**	Demographic, medical and occupational history Records of personal exposure Physical examination Baseline blood sample for haematological profile
5	**Cadmium**	Demographic, medical and occupational history Records of personal exposure Physical examination with emphasis on the respiratory system Standard respiratory questionnaire to be completed Standard respiratory function tests including for example, FEV_1, FVC and FEV_1/FVC Urinary cadmium and β2-microglobulin Health advice, including counselling on the effect of smoking on cadmium exposure

	Hazardous chemical	Type of health monitoring
6	**Chromium (inorganic)**	Demographic, medical and occupational history Physical examination with emphasis on the respiratory system and skin Weekly skin inspection of hands and forearms by a competent person
7	**Creosote**	Demographic, medical and occupational history Health advice, including recognition of photosensitivity and skin changes Physical examination with emphasis on the neurological system and skin, noting any abnormal lesions and evidence of skin sensitisation Records of personal exposure, including photosensitivity
8	**Crystalline silica**	Demographic, medical and occupational history Records of personal exposure Completion of a standardised respiratory questionnaire Standardised respiratory function test, for example, FEV_1, FVC and FEV_1/FVC Chest X-ray full size PA view
9	**Isocyanates**	Demographic, medical and occupational history Completion of a standardised respiratory questionnaire Physical examination of the respiratory system and skin Standardised respiratory function tests, FEV_1, FVC and FEV_1/FVC
10	**Lead (inorganic)**	Demographic, medical and occupational history Physical examination Biological monitoring
11	**Mercury (inorganic)**	Demographic, medical and occupational history Physical examination with emphasis on dermatological, gastrointestinal, neurological and renal systems Urinary inorganic mercury

	Hazardous chemical	Type of health monitoring
12	**4,4'-Methylene bis(2-chloroaniline) (MOCA)**	Demographic, medical and occupational history Physical examination Urinary total MOCA Dipstick analysis of urine for haematuria Urine cytology
13	**Organophosphate pesticides**	Demographic, medical and occupational history including pattern of use Physical examination Baseline estimation of red cell and plasma cholinesterase activity levels by the Ellman or equivalent method Estimation of red cell and plasma cholinesterase activity towards the end of the working day on which organophosphate pesticides have been used
14	**Pentachlorophenol (PCP)**	Demographic, medical and occupational history Records of personal exposure Physical examination with emphasis on the skin, noting any abnormal lesions or effects of irritancy Urinary total pentachlorophenol Dipstick urinalysis for haematuria and proteinuria
15	**Polycyclic aromatic hydrocarbons (PAH)**	Demographic, medical and occupational history Physical examination Records of personal exposure, including photosensitivity Health advice, including recognition of photosensitivity and skin changes
16	**Thallium**	Demographic, medical and occupational history Physical examination Urinary thallium
17	**Vinyl chloride**	Demographic, medical and occupational history Physical examination Records of personal exposure

APPENDIX C: ADDITIONAL EXAMPLES OF CHEMICALS TO CONSIDER FOR HEALTH MONITORING

Health monitoring requirements are not limited to chemicals in Schedule 14 or asbestos and health monitoring must be carried out where there is significant risk of exposure to any hazardous chemical where a valid technique is available to detect the effect on a worker's health. Below are some examples of hazardous chemicals and testing methods which are not listed in Schedule 14 of the WHS Regulations where a PCBU may consider implementing a health monitoring program for their workers.

SOME OF HAZARDOUS CHEMICALS WHICH MAY REQUIRE HEALTH MONITORING

	Hazardous chemical	Type of health monitoring
1	**Antimony**	Demographic, medical and occupational history Records of personal exposure Physical examination with emphasis on the respiratory system and skin Urinary antimony level
2	**Beryllium**	Demographic, medical and occupational history Records of personal exposure Physical examination with emphasis on respiratory and dermatological systems Urinary beryllium
3	**Carbon disulphide**	Demographic, medical and occupational history Physical examination with emphasis on the respiratory system and skin Urinary 2-thiothiazolidine-4-carboxylic acid level
4	**Cobalt**	Demographic, medical and occupational history Physical examination with emphasis on respiratory systems and skin Urinary cobalt level
5	**Cyclophosphamide**	Demographic, medical and occupational history Urinary cyclophosphamide
6	**Ethyl benzene**	Demographic, medical and occupational history Records of personal exposure Physical examination Baseline blood sample for haematological profile Urinary mandelic acid

APPENDIX C: ADDITIONAL EXAMPLES OF CHEMICALS TO CONSIDER FOR HEALTH MONITORING

	Hazardous chemical	Type of health monitoring
7	**Nickel**	Demographic, medical and occupational history Physical examination with emphasis on dermatological and respiratory systems Urinary nickel
8	**Styrene**	Demographic, medical and occupational history Records of personal exposure Physical examination Baseline blood sample for haematological profile Urinary mandelic acid
9	**Toluene**	Demographic, medical and occupational history Records of personal exposure Physical examination Baseline blood sample for haematological profile Urinary hippuric acid or o-cresol or *s*-toluylmercapturic acid
10	**Xylene**	Demographic, medical and occupational history Records of personal exposure Physical examination Baseline blood sample for haematological profile Urinary toluric acid

APPENDIX D: RESPIRATORY QUESTIONNAIRES

This appendix contains two examples of internationally accepted standardised respiratory questionnaires. The questionnaires may be used by medical practitioners as a tool for assessing if there are health effects.

These questionnaires are for certain scheduled chemicals where assessment of the respiratory system has been recommended.

Example 1: Medical Research Council (MRC) Questionnaire on Respiratory Symptoms (1986)[2]

INSTRUCTIONS TO INTERVIEWERS

The diagnosis of chronic bronchitis and other respiratory disorders during life is at present largely based on symptoms, together with other features of the clinical history, X-rays and/or lung function tests. It is well known, however, that the symptoms to which an individual admits may be influenced to some extent by the exact phrasing of the questions and by the person who asks them. To overcome some of these difficulties, this questionnaire provides a set of standard questions for inquiring about the presence or absence of common respiratory symptoms. The aim in completing it is to elicit the facts and to avoid bias due to different techniques of questioning. Provision is made for the inclusion of some basic ventilatory capacity measurements, but additional tests may be incorporated as appropriate to each investigation.

TRAINING

Before embarking on a survey, the questionnaire and instructions should be studied and any difficulties discussed. Interviewers should apply the questionnaire to 10 or more subjects (such as hospital patients) who have at least some chest symptoms (since no difficulty arises with subjects who answer all questions with a confident 'no'). These interviews should be either witnessed by an experienced colleague or, better, tape-recorded so that any mistakes or doubtful points can be corrected and clarified at leisure afterwards. Tape-recordings of a series of interviews based on the questionnaire are available and should be listened to if possible. These tapes are designed to illustrate difficulties arising in the interpretation of answers to the standard questionnaire during field surveys. A series of interviews is also provided which a potential interviewer can use to compare his own ratings of the responses given with those of the group of British workers responsible for the production of the tapes.

GENERAL INSTRUCTIONS

Before starting to ask questions an interviewer should instruct subjects to answer simply 'yes' or 'no' to the questions. The actual printed wording should be used for each question. In most cases this should lead to a simple 'yes' or 'no' answer, which should be accepted and recorded. Occasionally the subject will express doubt about the meaning of the question or the appropriate reply. When this happens further probing will be needed. Repetition of the question is usually sufficient. Some guidance for dealing with the more common difficulties is given below. When, after a brief explanation, doubt remains about whether the answer is 'yes' or 'no', the answer should be recorded as 'no'.

2 This questionnaire is based on the MRC (UK) Respiratory Questionnaire 1986 and is reproduced with the kind permission of the Medical Research Council, UK.

RECORDING THE REPLIES TO THE QUESTIONS

The questionnaire has been set out to facilitate transfer of the data to punched cards. Most of the questions are of the 'yes'/'no' type and replies to these questions may be guidance material directly in the boxes provided. Instructions for coding responses need to be defined by the survey planner before the survey begins. (Suggested coding: yes = 1, no = 2, not applicable = 8). Where the answer to a question is a number, for example, the number of cigarettes smoked (Q. 17b), the number may be recorded directly in the boxes provided. Where the question is of a more 'open' type, for example, occupation, or brand of cigarettes smoked, the reply may be recorded in full and the coding performed later. In some studies, however, a coding schedule for these factors may be drawn up before the study begins (for example, marital status*: 1 = single, 2 = married, 3 = widowed, 4 = divorced, 5 = other) and replies may be recorded directly in the boxes provided.

COMMENTS ON INDIVIDUAL ITEMS

Ethnic group: This should be defined in a way that is appropriate for the study, as reporting of respiratory symptoms depends to some extent on cultural and ethnic background.

Occupation and industry: Details of occupation that need to be recorded may vary with each survey before interviewing begins.

COUGH AND PHLEGM:

Question 1 Count a cough with first smoke or on first going out of doors. Exclude clearing the throat or a single cough.

Question 4 Count phlegm with first smoke or on first going out of doors. Exclude phlegm from the nose, count phlegm swallowed.

In those parts of the world where respiratory symptoms are most common at some other time of the year, the appropriate word should be substituted for 'winter'. Where there is no seasonal variation in respiratory symptoms the word 'winter' should be omitted. When night shift workers are interviewed, the words 'on getting up' should be used instead of 'first thing in the morning' in questions 1 and 4.

With regard to coughing during the day, in question 2, an 'occasional' cough may be considered normal and the answer should then be recorded as 'no'. It is impossible to define the limits of 'occasional' accurately, but to provide a rough guide it is suggested that single coughs of a frequency of less than six per day are 'occasional'. On the other hand, in question 5, 'occasional' phlegm production from the chest is considered abnormal if it occurs twice or more per day. The interviewer may use any suitable word that accords with local usage provided that it distinguishes phlegm from the chest or throat from pure nasal discharge. Some subjects admit to bringing up phlegm without admitting to coughing. This should be accepted without changing the replies to the questions about cough. A claim that phlegm is coughed from the chest but swallowed counts as a positive reply.

In questions 1, 2, 4 and 5 the word 'usually' should be emphasised. If one of the first two questions about cough (1-2) or one of those on phlegm (4-5) is answered clearly 'yes', questions 3 and 6 should be asked as confirmatory questions, and they should be asked at the point at which they are printed in the questionnaire (as in Example 1, questions 4 and 5).

Example 1

Q4 Interviewer:	Do you usually bring up any phlegm from your chest first thing in the morning in the winter?
Subject:	Yes
Q5 Interviewer:	Do you **usually** bring up any phlegm from your chest during the day, or at night, in the winter?
Subject:	Yes, but only a little bit.
Q6 Interviewer:	Do you bring up phlegm like this on most days for as much as three months each year?
Subject:	No, not as often as that.

The interviewer should record these answers as follows:

Question 4: Yes, Question 5: Yes, Question 6: No.

If, however, a doubtful answer to question 1 or 2 or to question 4 or 5 is obtained (for example, 'yes, sometimes') question 3 or 6 should be asked immediately as a probing question. If the answer to the probing question is 'no' the answer to the basic question should be recorded as if it had been 'no'. If a subsequent question in the same set receives a definite 'yes' the probing question should be repeated (see Example 2),

Example 2

Q1 Interviewer:	Do you **usually** cough first thing in the morning in the winter?
Subject;	Yes, sometimes.
Q3 Interviewer:	Do you cough like this on most days for as much as three months each year?
Subject:	Oh, no, not most days.
Q2 Interviewer:	Do you usually cough during the day, or at night, in the winter?
Subject:	Well from time to time.
Interviewer:	Do you cough as much as six times a day?
Subject:	Yes, more than that I'd say.
Q3 Interviewer:	Do you cough like this on most days for as much as three months each year?
Subject:	Well, not every day.
Interviewer:	More often than not?
Subject:	Yes, I'd say so.

The interviewer should record these answers as follows:

Question 1: No, Question 2: Yes, Question 3: Yes.

In question 7a the word 'increased' should be used only for subjects who have already admitted to some habitual cough and phlegm.

Breathlessness: In order to increase uniformity between surveys carried out at different seasons, it is suggested that the question on breathlessness should refer to the time of the year when breathlessness is at its worst. 'Hurrying' implies walking quickly. If the subject is disabled from walking by any condition other than heart or lung disease this should be recorded.

Wheezing: If this question is not understood, vocal demonstration of wheezing by the interviewer is often helpful. No distinction is made between those who only wheeze during the day and those who only wheeze at night. The word 'asthma' should not be used.

Chest illnesses: Asking about 'usual activities' is designed to avoid biases which are known to arise from sickness benefit considerations if subjects are asked about illnesses interfering with their work.

Smoking: Questions on smoking are essential in any study on respiratory symptoms, yet the reliability of answer has diminished over time. People are more likely to deny that they smoke than in the past and also to underestimate the amount smoked. With the change in cigarette types it is important also to know the tar and nicotine yields of the product. Since subjects are unreliable in reporting such detail, investigators should attempt to collect an empty cigarette pack from the smoker in order to identify the brand positively and thence to obtain tar/nicotine yields from published lists. Although a question on inhaling is retained, this too is not reliably answered. The actual uptake of smoke components is determined by the individual's smoking pattern as well as by the amount and type of product smoked, and investigators are encouraged to use an objective method of assessment, for example, there is a simple test for nicotine metabolites in urine samples (Ellard et al., Thorax 1985, vol. 40, pp. 351-357), and other tests based on blood or saliva samples are available.

Those who smoke cigarettes should also be asked about other forms of smoking. 'Small' cigars are those which are the same size as cigarettes: all cigars larger than cigarettes should be classified as 'other'. Amounts of tobacco (for pipe smoking) or hand-rolled cigarettes should be recorded in units appropriate for each study: the form is laid out for grams (1 ounce = 28g). Specific inquiry is made about smoking habits at weekends because some people smoke more or less at these times than during the week, and if necessary allowances should be made for this when assessing the weekly consumption.

An ex-smoker is defined as anyone who has smoked as much as one cigarette per day (or one large cigar per week or an ounce (= 28g) of tobacco per month) for as long as a year and who at the time of the interview had not smoked for 6 months or more.

Ventilatory capacity: The exact procedure to be adopted varies with the type of instrument used, and training sessions are required before embarking on a survey. Spirometric readings may include the forced expiratory volume in one second (FEV_1) and the forced vital capacity (FVC) from a number of successive blows. The recommended procedure is to obtain and report five technically satisfactory blows from each subject, then using the three highest FEV's and the three highest FVC's (not necessarily from the same blows) for the calculation of mean values, though other criteria may be adopted providing they are specified and adhered to within any given series of studies. The temperature of the instrument or in its surroundings is required to correct the values to BTPS: barometric pressure will normally only be required if measurements are made at a great altitude. Conventions for measuring and recording height and weight should be established carefully: for example, height may be recorded without shoes, to the nearest cm below, and weight with light clothing to the nearest 1/10th kg below.

Peak expiratory flow rates (PEFR) are usually measured on a separate instrument, and they do not require temperature correction. Again the exact procedure will depend on the instrument selected for the survey, but two practice blows should be made, followed by three technically satisfactory ones.

FURTHER INFORMATION ON THE USE OF THE QUESTIONNAIRE

This information sheet provides basic guidance to research workers concerned with the planning and conduct of surveys. The items available are as follows:

- Questionnaire on respiratory symptoms (1986).
- Instructions to Interviewers.

Inquiries about supplies of these items, or about training tapes and other background material related to earlier versions of the questionnaire should be sent to: Medical Research Council, UK.

CONFIDENTIAL

QUESTIONNAIRE ON	
Respiratory Symptoms *Before this questionnaire is used the instruction sheet must be read*	
Surname	
First name(s)	
Address	
	Gender (M=1 F=2) ☐ Day Month Year Date of birth ☐☐ ☐☐ ☐☐☐☐
Name at birth if different from above	
Own doctor Name Address	
Other identifying data	
Marital status	☐
Occupation	☐☐
Industry	☐☐
Ethnic group	☐
Interviewer	☐☐
	Day Month Year Date of Interview ☐☐ ☐☐ ☐☐☐☐
Use the actual wording of each question. Put 1= Yes, 2= No, or other codes as indicated in boxes. **When in doubt record as no.**	
Preamble I am going to ask some questions, mainly about your chest. I should like you to answer **Yes** or **No** whenever possible.	

Cough **1** Do you usually cough first thing in the morning in winter?	☐	**10a** Have you ever had attacks of shortness of breath with wheezing?	☐
		If Yes **10b** Is/was your breathing absolutely normal between attacks?	☐
2 Do you usually cough during the day—or at night—in the winter?	☐	**11** Have you at any time in the last 12 months been woken at night by an attack of shortness of breath?	☐
If Yes to 1 or 2 **3** Do, you cough like this on most days for as much as three months each year?	☐	**Chest illnesses** **12a** During the past three years have you had any chest illness which has kept you from your usual activities for as much as a week?	☐
Phlegm **4** Do you **usually** bring up phlegm from your chest first thing in the morning in the winter?	☐		
5 Do you usually bring up any phlegm from your chest during the day—or at night—in winter?	☐	**If Yes** **12b** Did you bring up more phlegm than usual in any of these illnesses?	☐
If Yes to 4 or 5 **6** Do you bring up phlegm like this on most days for as much as three months each year?	☐	**If Yes** **12c** Have you had more than one illness like this in the past three years?	☐
Periods of cough and phlegm **7a** In the past three years have you had a period of (increased) cough and phlegm lasting for three weeks or more?	☐	**Past illnesses** Have you ever had, or been told that you have had:	☐
If Yes **7b** Have you had more than one such period?	☐	**13a** An injury or operation affecting your chest	☐
Breathlessness If subject is disabled from walking by any condition other than heart or lung disease, omit question 8 and enter 1 here	☐	**13b** Heart trouble	☐
		13c Bronchitis	☐
8a Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill?	☐	**13d** Pneumonia	☐
		13e Pleurisy	☐
If Yes **8b** Do you get short of breath walking with other people of your own age on level ground?	☐	**13f** Pulmonary tuberculosis	☐
		13g Bronchial asthma	☐
If Yes **8c** Do you have to stop for breath when walking at your own pace on level ground?	☐	**13h** Other chest trouble	☐
		13i Hay fever	☐
Wheezing **9** Have you had attacks of wheezing or whistling in your chest at any time in the last 12 months?	☐	**13j** Are your symptoms better a) At weekends (or equivalent if shift worker) (Yes / No)	☐
		b) When you are on holidays (Yes / No)	☐

		Additional observations
Tobacco smoking **14** Do you smoke?	**1 = Yes, 2 = No** ☐	
If No **14a** Have you ever smoked as much as one cigarette a day (or one cigar a week or an ounce of tobacco a month) for as long as a year?	☐	
If No to both parts of question 14, omit remaining questions on smoking		
15a Do (did) you inhale smoke?	☐	
If Yes **15b** Would you say you inhaled the smoke slightly = 1, moderately = 2, or deeply = 3?	☐	
16 How old were you when you started smoking regularly?	☐☐	
17a Do (did) you smoke manufactured cigarettes?	☐	
If yes **17b** How many do (did) you usually smoke per day on weekdays?	☐☐	
17c How many per day at weekends?	☐☐	
17d Do (did) you usually smoke plain (=1) or filter tip (=2) cigarettes?	☐	
17e What brands do (did) you usually smoke?	☐☐☐	
18a Do (did) you smoke hand-rolled cigarettes?	☐	
If Yes **18b** How much tobacco do (did) you usually smoke per week in this way?	☐☐☐	
18c Do (did) you put filters in these cigarettes?	☐	
19a Do (did) you smoke a pipe?	☐	
If Yes **19b** How much pipe tobacco do (did) you usually smoke per week?	☐☐☐	
20a Do (did) you smoke small cigars?	☐	
If Yes **20b** How many of these do (did) you usually smoke per day?	☐☐	

		Additional observations
21a Do (did) you smoke other cigars?	☐	
If Yes **21b** How many of these do (did) you usually smoke per week?	☐☐	
For present smokers **22a** Have you been cutting down smoking over the past year?	☐	
For ex-smokers **22b** When did you give up smoking altogether?	Month ☐☐ Year ☐☐	
Ventilatory capacity		
Standing height (m)	☐·☐☐	
Weight (kg)	☐☐☐·☐	
Ambient temperature (°C)	☐☐	
Barometric pressure (mm Hg)	☐☐☐	
Time of day (24 h)	☐☐ ☐☐	
Observer	☐☐	
Spirometer		
Instrument number	☐☐☐☐	
Enter readings as made, for subsequent correction to BTPS. If additional readings are made, enter below number 5 and delete the ones they replace.	FEV_1 (litres) / FVC (litres)	
Reading 1	☐·☐☐ / ☐·☐☐	
Reading 2	☐·☐☐ / ☐·☐☐	
Reading 3	☐·☐☐ / ☐·☐☐	
Reading 4	☐·☐☐ / ☐·☐☐	
Reading 5	☐·☐☐ / ☐·☐☐	

		Additional observations
Peak expiratory flow		
Instrument number	☐☐☐☐	
If additional readings are made, enter below number 5 and delete the ones they replace	PEFR (litres/min)	
Reading	1 ☐☐☐	
	2 ☐☐☐	
	3 ☐☐☐	
	4 ☐☐☐	
	5 ☐☐☐	

Example 2: International Union Against Tuberculosis (IUAT) Bronchial Symptoms Questionnaire[3]

ENQUIRIES TO:

IUATLD/UICTMR, 68 BOULEVARDE SAINT MICHEL, 75006 PARIS, FRANCE.	Professor Peter Burney Chair in Respiratory Epidemiology and Public Health National Heart & Lung Institute Faculty of Medicine Imperial College London

NOTES FOR USERS

The IUAT bronchial symptoms questionnaire has been developed for the Respiratory Disease Committee of the IUAT for use in epidemiological studies of asthma in adults. It is a self-administered questionnaire and is based on a program of research undertaken on behalf of the IUAT.

The questionnaire is composed of questions that relate to symptoms of airway disease. Most of these have been shown to be associated with bronchial hyper-responsiveness to inhaled histamine, though this is not true of all questions on cough which are included for the sake of completeness.

In addition to questions on symptoms, there are questions on attacks of asthma, on whether subjects are taking medication for asthma, on smoking habits, age and gender. In any particular survey it may be that there are other questions which need to be added. These should be included at the end of this questionnaire.

CODING OF THE QUESTIONNAIRE

The questionnaire has been provided in a format that can be easily entered on a computer. Each answer has a column number beside it indicating into which column of data the response should be coded. Columns 1-10 have been left blank and should be used for the subject identification number. Subjects are asked to tick ('check') the appropriate box and instruction must be given to the data entry clerks on how to code these ticks when entering the data onto the computer. Where the answer to the question is either 'yes' or 'no' a positive answer should be coded '2' and a negative answer '1'. Questions 9, 15 and 17 should be coded '1', '2' or '3' according to whether the first, second or third box has been ticked. Where there is particular interest in smoking habits, it is possible to code column 27 according to the tar level of the cigarette normally smoked, but if researchers wish to do this, they should probably ask for an empty packet of the subject's cigarettes to be included with the questionnaire. Otherwise columns 27-30 should be coded '2' if ticked and '1' otherwise.

3 **Source:** International Union Against Tuberculosis (IUAT) (now known as International Union Against Tuberculosis and Lung Disease (IUATLD)). This questionnaire is based on the International Union Against Tuberculosis (IUAT) Bronchial Symptoms Questionnaire and is reproduced with the kind permission of Professor Peter Burney.

INTERPRETATION OF THE QUESTIONNAIRE

The questionnaire is currently issued as a collection of relevant questions without prejudice concerning their interpretation. The first question has been shown to be the best single predictor of bronchial hyper-responsiveness. This is so even for the German translation where there is considerable difficulty in translating the term 'wheezing'. As most of the questions are independently related to bronchial hyper-responsiveness it should be possible to devise a predictor of hyper-responsiveness that would improve on this. We are currently searching for the best overall predictor, but as the usefulness of any such predictor will depend on its overall ability to predict hyper-reactivity in different settings, we are not yet in a position to give guidance on this.

IUAT BRONCHIAL SYMPTOMS QUESTIONNAIRE

TO ANSWER THE QUESTIONS, PLEASE TICK THE APPROPRIATE BOX;
IF YOU ARE UNSURE OF THE ANSWER PLEASE TICK "NO".

Wheeze and Tightness in the Chest			
1. Have you had wheezing or whistling in your chest, at any time in the last 12 months?	Yes ☐	No ☐	11
2. Have you woken up with a feeling of tightness in your chest first thing in the morning, at any time in the last 12 months?	Yes ☐	No ☐	12
Shortness of Breath			
3. Have you, at any time in the last 12 months, had an attack of shortness of breath that came on during the day when you were not doing anything strenuous?	Yes ☐	No ☐	13
4. Have you had an attack of shortness of breath that came on after you stopped exercising, at any time in the last 12 months?	Yes ☐	No ☐	14
5. Have you, at any time in the last 12 months, been woken at night by an attack of shortness of breath?	Yes ☐	No ☐	15
Cough and Phlegm from the Chest			
6. Have you, at any time in the last 12 months, been woken at night by an attack of coughing?	Yes ☐	No ☐	16
7. Do you usually cough first thing in the morning?	Yes ☐	No ☐	17
8. Do you usually bring up phlegm from your chest first thing in the morning?	Yes ☐	No ☐	18

Breathing			
9. Which of the following statements best describes your breathing?	tick one box only		
(a) I never or rarely get trouble with my breathing.	☐		
(b) I get regular trouble with my breathing, but it always gets completely better.	☐		
(c) My breathing is never quite right.	☐		19
Animals, dust, feathers			
10. When you are in a dusty part of the house or with animals (for instance, dogs, cats or horses) or near feathers (including pillows, quilts and eiderdowns) do you ever:			
(a) Get a feeling of tightness in your chest?	Yes ☐	No ☐	20
(b) Start to feel short of breath?	Yes ☐	No ☐	21
Illness			
11. Have you ever had an attack of asthma?	Yes ☐	No ☐	22
12. Have you had an attack of asthma at any time in the last 12 months?	Yes ☐	No ☐	23
12a. Are your symptoms better			
At weekends (or equivalent if shift worker) (Yes / No)	Yes ☐	No ☐	
When you are on holidays (Yes / No)	Yes ☐	No ☐	
13. Are you currently taking any medicines, pills or inhalers for asthma?	Yes ☐	No ☐	24

Smoking		
14. Have you ever smoked for as long as a year? (This means at least one or more cigarettes a day (or one or more cigars a week or one or more ounces of pipe tobacco a month) for as long as a year).	Yes ☐ No ☐	25
15. Do you now smoke:	tick one box only	
Not at all	☐	
Occasionally	☐	
Daily	☐	26
IF 'NOT AT ALL' GO TO QUESTION 17, OTHERWISE:		
16. What do (did) you usually smoke?	tick any number of boxes	
Manufactured cigarettes_____ (please give full brand name)	☐	27
Hand rolled cigarettes	☐	28
Pipe	☐	29
Cigar	☐	30
17. If you have given up smoking altogether, how long is it since you last gave up smoking?	tick one box only	
Less than a month ago	☐	
More than a month ago	☐	31
More about yourself		
18. When were you born?	day ☐☐ month ☐☐ year ☐☐☐☐	32-37
19. Are you a male or female?	☐ MALE ☐ FEMALE	38
20. What is today's date?	day ☐☐ month ☐☐ year ☐☐☐☐	39-44
21. How old are you?	☐☐ Years	45-46

THIS GUIDE PROVIDES INFORMATION FOR REGISTERED MEDICAL PRACTITIONERS UNDERTAKING OR SUPERVISING THE HEALTH MONITORING FOR WORKERS EXPOSED TO HAZARDOUS CHEMICALS, LEAD AND ASBESTOS.