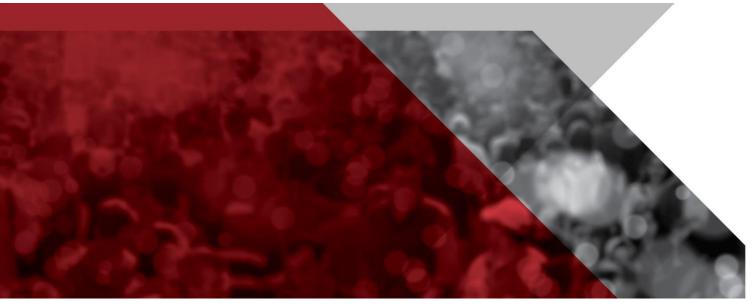


## **Health monitoring**

Guide for MIBK (4-methylpentan-2-one, methyl isobutyl ketone)





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## Introduction

This guide is intended to be read by a registered medical practitioner with experience in health monitoring who is engaged by person conducting a business or undertaking (PCBU) to carry out or supervise health monitoring. It provides practical guidance to registered medical practitioners about requirements under the work health and safety (WHS) laws for health monitoring.

This guide applies to all workplaces covered by the WHS Regulations where health monitoring is required.

#### How to use this guide

This guide includes references to the legal requirements under the WHS Act and WHS Regulations. These are included for convenience only and should not be relied on in place of the full text of the WHS Act or WHS Regulations.

The words 'must', 'requires' or 'mandatory' indicate a legal requirement exists that must be complied with. The word 'should' is used in this guide to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This guide provides information for those registered medical practitioners engaged by a PCBU to carry out or supervise health monitoring for workers. This guidance should be read in conjunction with the following:

- Health monitoring guide for registered medical practitioners
- Health monitoring guides for hazardous chemicals
- Health monitoring guide for workers
- Health monitoring guide for persons conducting business or undertakings (PCBUs).

#### Health monitoring under the WHS Regulations

In certain circumstances, the model WHS Regulations place duties on a PCBU to provide health monitoring to workers. These requirements arise if the worker is carrying out work with hazardous chemicals including lead and asbestos. In addition, the work being carried out must be the kind of work specified in the WHS Regulations. A PCBU has the duty to determine if health monitoring is required.

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

# MIBK (4-methylpentan-2-one, methyl isobutyl ketone)

Methyl isobutyl ketone (MIBK) (CAS 108-10-1) is a colourless, flammable liquid with a sweet odour that is moderately soluble in water.

Synonyms: isobutyl methyl ketone, 4-methyl 2-pentanone and isopropyl acetone.

#### Work activities that may represent a high risk exposure

MIBK is used in the manufacturing of paints, rubbers, pharmaceuticals and cleaners. It is used in the semiconductor industry and is effective at dissolving resins and surface coatings.

The major uses of MIBK are:

- solvent for gums, resins, paints, varnishes, lacquers and nitrocellulose
- alcohol denaturant
- extraction of rare metals
- synthetic flavouring adjuvant
- viscosity adjuster, and
- extraction solvent in the synthesis and purification of drugs.

#### Sources of non-occupational exposure

Exposure to MIBK can occur outside the workplace including from use or handling of:

- paints, lacquers, varnishes (arts and crafts, home maintenance, aerosol)
- insulating materials and corrosion inhibitors
- adhesives and binding agents
- cleaning/washing agents
- fillers
- anti-condensation agents
- surface treatment, and
- non industrial pesticides and preservatives.

## 1. Health monitoring for MIBK under the Work Health and Safety (WHS) Regulations

Collection of demographic, medical and occupational history

Physical examination with emphasis on the respiratory system and skin

Urinary MIBK level

#### Health monitoring before starting work in an MIBK process

Health monitoring for MIBK exposure may be required before the worker starts work so that changes to the worker's health can be detected.

Initial discussions about a health monitoring program should include:

- possible health effects from exposure to MIBK
- how to recognise and report symptoms, and
- what is involved in the health monitoring program, for example the frequency of testing and the tests that may be needed.

An initial physical examination by the registered medical practitioner should place emphasis on the skin, eyes and respiratory system if work and medical history indicates this is necessary, for example through the presence of symptoms.

MIBK is a respiratory irritant and it is important to investigate respiratory symptoms. However, spirometry may not be required at this stage.

#### During exposure to an MIBK process

#### 2. Monitoring exposure to MIBK

Where workers are exposed, suspected of being exposed or are concerned about exposure to MIBK, the person conducting the business or undertaking (PCBU) has a duty to arrange a health monitoring appointment for the worker(s) with the registered medical practitioner. For example, an appointment should be arranged following spills or loss of containment of MIBK resulting in excessive exposure to workers or when workers develop symptoms of MIBK exposure.

While less than 0.5 per cent of absorbed MIBK is excreted in urine, this parameter is generally considered a reliable and specific measure of MIBK exposure. Urinary excretion of MIBK has apparent half-lives of 40 minutes and 6.9 hours. Due to the rapid metabolism and clearance of MIBK from the body, sampling time is critical. Urine samples should be collected at the end of the shift.

The following tests may be used to test the worker's MIBK exposure levels:

urinary MIBK levels. •

Where urinalysis is performed, the following values should be used as a guide for assessing exposure to MIBK:

#### Biological exposure standard for MIBK<sup>1</sup>

Urinary MIBK:

0.02 mmol/L

#### Workplace exposure standard

The workplace exposure standard for MIBK is:

- eight hour time weighted average (TWA) of 50 ppm (205 mg/m<sup>3</sup>), and
- short term (15 minute time weighted average) exposure limit (STEL) of 75 ppm  $(307 \text{ mg/m}^3)$ .

A physical examination and urinary test may be indicated if the results of air monitoring indicate frequent or potentially high exposure (half of the TWA or above).

#### **Removal from work**

Where a medical examination indicates the worker is displaying symptoms of exposure to MIBK or where results of biological monitoring indicate exposure that may cause adverse health effects, the registered medical practitioner should consider recommending the worker be removed from MIBK-related work.

When removal from MIBK-related work is indicated, the registered medical practitioner must provide the PCBU with the following recommendations:

<sup>&</sup>lt;sup>1</sup> See <u>Chemical analysis branch handbook, 9th Edition, Workplace and biological monitoring exposure analysis</u>, WorkCover NSW (PDF 3.39MB) for more details

- the worker should be removed from work with MIBK, and
- the PCBU should review control measures and carry out recommended remedial action.

The worker must be informed of the results of health monitoring.

#### Return to work

Should a worker be removed from MIBK-related work, they must not return until the registered medical practitioner has:

- assessed them as medically fit, and
- made a recommendation to PCBU that the worker can return to remediated MIBKrelated work.

This assessment should take into consideration the clinical condition of the worker, the resolution of symptoms, the worker's urinary MIBK levels and remediation of the circumstances that led to the symptoms if possible.

#### At termination of work in an MIBK process

#### 3. Final medical examination

A final medical examination should be carried out by the registered medical practitioner on the last day the worker is working with MIBK, at the end of the last shift.

Workers with health conditions or continuing symptoms due to MIBK exposure should be advised to seek continuing medical examinations as organised by the registered medical practitioner supervising the health monitoring program.

A health monitoring report from the registered medical practitioner should be provided to the PCBU as soon as practicable after the completion of the monitoring program, and at regular intervals for longer term or ongoing health monitoring processes. The report must include:

- the name and date of birth of the worker
- the name and registration number of the registered medical practitioner
- the name and address of the PCBU who commissioned the health monitoring
- the date of the health monitoring
- any test results that indicate whether or not the worker has been exposed to a hazardous chemical
- any advice that test results indicate that the worker may have contracted an injury, illness or disease as a result of carrying out the work that triggered the requirement for health monitoring
- any recommendation that the PCBU take remedial measures, including whether the worker can continue to carry out the type of work that triggered the requirement for health monitoring, and
- whether medical counselling is required for the worker in relation to the work that triggered the requirement for health monitoring.

#### Potential health effects following use of MIBK

#### 4. Route of occupational exposure

The potential routes of exposure are via inhalation, accidental ingestion, skin and eye contact.

#### 5. Target organ/effect

The target organs and potential effects of MIBK exposure include:

 Table 1 Target organs and potential effects of MIBK exposure

Target organ	Effect
Central nervous system	<ul> <li>Headache</li> <li>Dizziness</li> <li>Loss of coordination</li> <li>Narcosis</li> <li>Vertigo</li> </ul>
Skin	Irritation
Respiratory tract	Irritation
Eyes	Irritation

#### 6. Acute effects

Acute effects that have been reported after occupational exposure to MIBK include:

- irritation of the eyes, skin, mucous membrane, and respiratory tract
- headache
- light-headedness
- vertigo
- weakness
- nausea
- vomiting
- transient sensory irritation
- transient anaesthetic effects
- neurological effects
- strong odour sensation
- incoordination
- coma, and
- narcosis.

#### 7. Chronic effects

Chronic effects of exposure to MIBK that have been reported include:

- burning in the eyes
- weakness
- insomnia
- intestinal pain
- slight enlargement of the liver, and
- flaking and drying of the skin.

Repeated oral exposure may result in adverse effects on the liver and kidneys.

#### 8. Carcinogenicity

MIBK has been classified as a Category 2 Carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as it is suspected of causing cancer in humans.

#### 9. GHS classification

The following GHS health hazard classification for MIBK has been taken from Safe Work Australia's Hazardous Chemicals Information System.

#### Hazard category

Acute toxicity - category 4 (harmful if inhaled)

Carcinogenicity - category 2

Eye irritation - category 2A

Specific target organ toxicity (single exposure) – category 3 (may cause respiratory irritation)

#### Source documents

American Conference of Governmental Industrial Hygienists (ACGIH) (2011) Documentation of the Biological Exposure Indices, 7th Ed, Cincinnati.

<u>Chemical analysis branch handbook, 9th Edition, Workplace and biological monitoring</u> <u>exposure analysis</u>, WorkCover NSW (PDF 3.39MB).

Lauwerys, R.R. and Hoet, P. (2001) *Industrial Chemical Exposure Guidelines for Biological Monitoring*, 3rd Ed, Lewis Publishers, Boca Raton.

National Industrial Chemicals Notification and Assessment Scheme; Human Health Tier II Assessment for <u>2-Pentanone</u>, <u>4-methyl-.</u>

Safe Work Australia (2013); <u>Workplace Exposure Standards for Airborne Contaminants</u> (PDF 873KB).

Safe Work Australia; Hazardous Chemicals Information System.



# Health monitoring report



#### Health monitoring report – MIBK

This health monitoring report is a confidential health record and must not be disclosed to another person except in accordance with the Work Health and Safety (WHS) Regulations or with the consent of the worker.

There are two sections. Complete both sections and all questions as applicable.

**Section 1** A copy of this section should be forwarded to the person conducting the business or undertaking (PCBU) who has engaged your services.

**Section 2** may contain confidential health information. Information that is required to be given to the PCBU should be summarised in Section 1.

#### Section 1 – A copy of this section to be provided to the PCBU

#### Person conducting a business or undertaking

Company/organisation name: Click here to enter text.

Site address: Click here to enter text.

Suburb: Click here to enter text.	Postcode: Click here to enter text.
Site Tel: Click here to enter text.	Site Fax: Click here to enter text.

Contact Name: Click here to enter text.

## Other businesses or undertakings engaging the worker (include a separate section for each PCBU)

□ N/A

Company/organisation name: Click here to enter text.

Site address: Click here to enter text. Suburb: Click here to enter text. Site Tel: Click here to enter text. Contact Name: Click here to enter text.

**Postcode:** Click here to enter text. **Site Fax:** Click here to enter text.

#### Worker details (tick all relevant boxes)

Surname: Click here to enter text.	Given names: Click here to enter text.			
Date of birth: Click here to enter a date.	Sex:  Male  Female			
Address: Click here to enter text.				
Suburb: Click here to enter text.	Postcode: Click here to enter text.			
Current job: Click here to enter text.				
Tel (H): Click here to enter text.	Mob: Click here to enter text.			
Date started employment: Click here to enter a date.				

## **Employment in MIBK risk work** (tick all relevant boxes) (information provided by the PCBU)

 $\hfill\square$  New to MIBK work

- □ New worker but not new to MIBK work
- □ Current worker continuing in MIBK work

Worked with MIBK since: Click here to enter a date.

**Risk assessment completed:** 
Q Yes 
No

## **Work environment assessment** (tick all relevant boxes) (information provided by the PCBU)

Date of assessment: Click here to enter a date.

#### **MIBK industry/use**

- □ Solvent for gums, resins, paints, varnishes, lacquers and nitrocellulose
- □ Alcohol denaturant
- □ Extraction of rare metals
- □ Synthetic flavouring adjuvant
- □ Viscosity adjuster
- Extraction solvent in the synthesis and purification of drugs
- $\Box$  Other (specify):

Other chemicals the worker may be exposed to: Click here to enter text.

#### Controls Wear gloves □ Yes 🗆 No Respirator use □ Yes □ No Respirator type Click here to enter text. Local exhaust ventilation □ No □ Yes Overalls/work clothing □ Yes □ No Laundering by employer □ Yes 🗆 No Wash basins and showers (with hot and cold water) □ Yes 🗆 No Other please specify

#### Health monitoring results

#### **Biological monitoring results**

#### Include/attach test results that indicate whether or not the worker has been exposed

Date	Tests performed	Recommended action or comment
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

Comments about health monitoring results (for example any early indications or diagnosis of injury, illness or disease): Click here to enter text.

Recommendations (by registered medical practitioner) (tick all relevant boxes)

#### Further/additional health monitoring for worker

 $\Box$  This is the final health monitoring report

- □ Repeat health assessment in Click here to enter text. month(s) / Click here to enter text. week(s)
- $\Box$  Counselling required
- □ Medical examination by registered medical practitioner. On Click here to enter a date.
- □ Referred to Medical Specialist (respiratory/dermatology/other). On Click here to enter a date.

#### Recommendations to PCBU

- $\Box$  The worker is suitable for work with MIBK
- □ Review workplace controls
- □ The worker should be removed from work with MIBK. On Click here to enter a date.
- □ The worker is fit to resume work. On Click here to enter a date.
- Biological monitoring results indicate unacceptably high exposure levels

Specialist's name: Click here to enter text.

Additional comments or recommendations: Click here to enter text.

#### Registered medical practitioner (responsible for supervising health monitoring)

Name: Click here to enter text.

#### Signature:

Date: Click here to enter a date.

Tel: Click here to enter text.

Fax: Click here to enter text.

Registration Number: Click here to enter text.

Medical Practice: Click here to enter text.

Address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.

## Section 2 – This section to be retained by the registered medical practitioner

Person conducting a business or undertaking					
Company/organisation name: Click here to enter Site address: Click here to enter text. Suburb: Click here to enter text. Site Tel: Click here to enter text. Contact Name: Click here to enter text.	Postcode: Click here to enter text. Site Fax: Click here to enter text.				
Other businesses or undertakings engaging the worker $\Box$ N/A					
Company/organisation name: Click here to enter Site address: Click here to enter text. Suburb: Click here to enter text. Site Tel: Click here to enter text. Contact Name:	Postcode: Click here to enter text. Site Fax: Click here to enter text.				
Worker details (tick all relevant boxes)					
Surname: Click here to enter text.Given names: Click here to enter text.Date of birth: Click here to enter a date.					
Sex:  Male  Female  Pregnant/breastfeeding					
<ul> <li>Address: Click here to enter text.</li> <li>Suburb: Click here to enter text.</li> <li>Current job: Click here to enter text.</li> <li>Tel (H): Click here to enter text.</li> </ul>	<b>Postcode:</b> Click here to enter text. <b>Mob:</b> Click here to enter text.				
Date started employment: Click here to enter a date.					
Past employment and exposure details (tick all relevant boxes)					

#### Have you ever worked in any of the following jobs?

If you answered 'yes' to any of the questions, please advise if you experienced any symptoms such as cough or wheeze or asthma when working.

			Comments (all 'yes' answers)
Solvent for gums, resins, paints, varnishes, lacquers and nitrocellulose	□ No	□ Yes	Click here to enter text.
Alcohol denaturant	□ No	□ Yes	Click here to enter text.
Extraction of rare metals	🗆 No	□ Yes	Click here to enter text.
Synthetic flavouring adjuvant	🗆 No	□ Yes	Click here to enter text.

			Comments (all 'yes' answers)
Viscosity adjuster	🗆 No	□ Yes	Click here to enter text.
Extraction solvent in the synthesis and purification of drugs	□ No	□ Yes	Click here to enter text.
Other (please specify)	🗆 No	□ Yes	Click here to enter text.

#### General health questionnaire (tick all relevant boxes)

			Comments (all 'yes' answers)
Did you suffer any incapacity lasting two weeks or longer in the last two years	□ No	□ Yes	Click here to enter text.
Have you ever had any operations or accidents or been hospitalised for any reason	□ No	□ Yes	Click here to enter text.
Are you currently being treated by a doctor or other health professional for any illness or injury	□ No	□ Yes	Click here to enter text.
Are you currently receiving any medical treatment or taking any medications. Please detail.	□ No	□ Yes	Click here to enter text.
Do you currently smoke	🗆 No	□ Yes	Click here to enter text.
Do you practice personal hygiene at work, for example nail biting, frequency of hand washing, eating or smoking, clean shaven, shower and change into clean clothes at end of shift	□ No	□ Yes	

#### Specific health questions (tick all relevant boxes)

Do you have or have you ever had:			Comments (all 'yes' answers)
Blurred vision or other vision problems	□ No	□ Yes	Click here to enter text.
Itchy or reddened eyes	🗆 No	□ Yes	Click here to enter text.
Runny or congested nose	□ No	□ Yes	Click here to enter text.
Cough	□ No	□ Yes	Click here to enter text.
Shortness of breath on exertion	□ No	□ Yes	Click here to enter text.
Wheezing, bronchitis or asthma now or in the past	🗆 No	□ Yes	Click here to enter text.
Any other lung or respiratory conditions (emphysema, pneumonia or sinusitis)	□ No	□ Yes	Click here to enter text.
Abdominal pain, loss of appetite	🗆 No	□ Yes	Click here to enter text.

Do you have or have you ever had:			Comments (all 'yes' answers)
Severe stomach pain or peptic ulcers	🗆 No	□ Yes	Click here to enter text.
Dizziness, balance problems	🗆 No	□ Yes	Click here to enter text.
Problems with memory and concentration	□ No	□ Yes	Click here to enter text.
Sleep disturbance	□ No	□ Yes	Click here to enter text.
Psychiatric or nervous condition (including anxiety, depression or severe or abnormal stress reaction) that has or does require professional counselling or medication	□ No	□ Yes	Click here to enter text.
Skin disorders or dermatitis	🗆 No	□ Yes	Click here to enter text.
Any other significant health conditions	🗆 No	□ Yes	Click here to enter text.

## Registered medical practitioner to provide comments for any 'Yes' responses (reference Question number):

Click here to enter text.

#### General health assessment (if applicable)

Height: Click here to enter text. cm	Weight: Click here to enter text. kg
--------------------------------------	--------------------------------------

BP: Click here to enter text. / Click here to enter text. mmHg

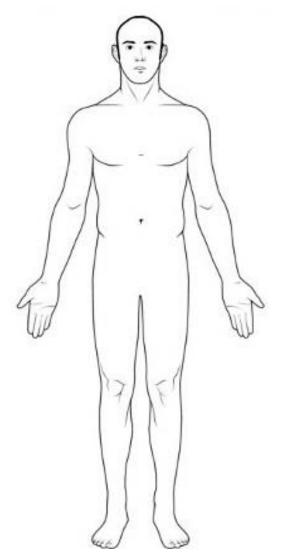
#### Urinalysis

Blood:	Normal 🗆	Abnormal
--------	----------	----------

Protein: Click here to enter text.	Referred for further testing
Sugar: Click here to enter text.	□ No □ Yes

		Medical comments (for all yes/abnormal)	
Normal	Abnormal	Click here to enter text.	
Normal	□ Abnormal	Click here to enter text.	
Normal	□ Abnormal	Click here to enter text.	
□ No	□ Yes	Click here to enter text.	
□ No	□ Yes	Click here to enter text.	
□ Ye	es 🗆 No	Click here to enter text.	
🗆 Ye	es 🗆 No	Click here to enter text.	
□ No	o □ Yes	Click here to enter text.	
	<ul> <li>Normal</li> <li>Normal</li> <li>No</li> <li>No</li> <li>Ye</li> <li>Ye</li> </ul>	<ul> <li>Normal</li> <li>Normal</li> <li>Abnormal</li> <li>Abnormal</li> <li>No</li> <li>Yes</li> <li>No</li> <li>Yes</li> <li>No</li> <li>Yes</li> <li>No</li> </ul>	Image: Normal       Abnormal       Click here to enter text.         Image: Normal       Yes       Click here to enter text.         Image: No       Yes       Click here to enter text.         Image: No       Yes       Click here to enter text.         Image: Yes       Image: No       Click here to enter text.         Image: Yes       Image: No       Click here to enter text.

Cardiovascular system			Medical comments (for all yes/abnormal)
Nervous system			
Muscular tone, co-ordination	Normal	Abnormal	Click here to enter text.
Tremor	□ No	□ Yes	Click here to enter text.
Skin			Medical comments (for all abnormal)
Eczema, dermatitis or allergy	🗆 No	□ Yes	Click here to enter text.
Skin cancer or other abnorma	lity 🗆 No	□ Yes	Click here to enter text.
Evidence of nail biting	🗆 No	□ Yes	Click here to enter text.
Other	🗆 No	□ Yes	Click here to enter text.



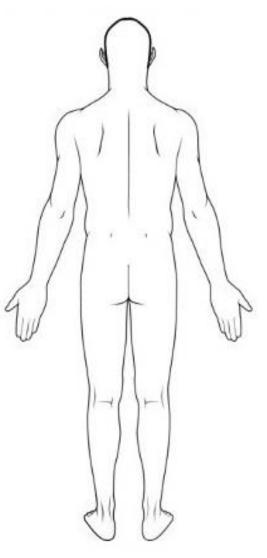


Figure 1 Template of the human body to indicate the location of abnormalities

Eye			Medical comments (for all abnormal)
Evidence of eye irritation	□ No	□ Yes	Click here to enter text.

#### **Biological monitoring results**

Include/attach at least the previous two test results (if available)

Date	Tests performed	Recommended action or comment
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.

Other medical history, family medical history, current medication, comments, tests or recommendations (use separate sheet if necessary)

Click here to enter text.

#### Registered medical practitioner (responsible for supervising health monitoring)

Name: Click here to enter text.

#### Signature:

Date: Click here to enter a date.

Tel: Click here to enter text.

Fax: Click here to enter text.

Registration Number: Click here to enter text.

Medical Practice: Click here to enter text.

Address: Click here to enter text.

Suburb: Click here to enter text.

Postcode: Click here to enter text.