



VERSION 2.0

CLINICAL ISSUES

Smoking

This PDF is a print-friendly reproduction of the content included in the *Clinical Issues - Smoking* section of the *Australian Asthma Handbook* at astmahandbook.org.au/clinical-issues/smoking

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ABBREVIATIONS

CFC	chlorofluorocarbon	LTRA	leukotriene receptor antagonist
COPD	chronic obstructive pulmonary disease	MBS	Medical Benefits Scheme
COX	cyclo-oxygenase	NHMRC	National Health and Medical Research Council
DXA	dual-energy X-ray absorptiometry	NIPPV	non-invasive positive pressure ventilation
ED	emergency department	NSAIDs	nonsteroidal anti-inflammatory drugs
EIB	exercise-induced bronchoconstriction	OCS	oral corticosteroids
FEV₁	forced expiratory volume over one second	OSA	obstructive sleep apnoea
FEV₆	forced expiratory volume over six seconds	PaCO	carbon dioxide partial pressure on blood gas analysis
FSANZ	Food Standards Australia and New Zealand	PaO	oxygen partial pressure on blood gas analysis
FVC	forced vital capacity	PBS	Pharmaceutical Benefits Scheme
GORD	gastro-oesophageal reflux disease	PEF	peak expiratory flow
HFA	formulated with hydrofluoroalkane propellant	pMDI	pressurised metered-dose inhaler or 'puffer'
ICS	inhaled corticosteroid	PPE	personal protective equipment
ICU	intensive care unit	SABA	short-acting beta ₂ -adrenergic receptor agonist
IgE	Immunoglobulin E	SAMA	short-acting muscarinic antagonist
IL	interleukin	SaO₂	oxygen saturation
IU	international units	SpO₂	peripheral capillary oxygen saturation measured by pulse oximetry
IV	intravenous	TGA	Therapeutic Goods Administration
LABA	long-acting beta ₂ -adrenergic receptor agonist		
LAMA	long-acting muscarinic antagonist		

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Smoking and asthma

Overview

If a person smokes, or is exposed to other people's tobacco smoke, this factor must be taken into account when investigating respiratory symptoms, assessing asthma control, and managing asthma.

Smoking:

- increases the risk of asthma flare-ups in people with asthma
- increases the risk of COPD
- reduces the probability of achieving good asthma control
- reduces therapeutic response to inhaled corticosteroid
- accelerates long-term decline in lung function.

Exposure to environmental tobacco smoke during gestation or early childhood increases the risk of early childhood wheezing and adversely affects lung function, as well increasing the risk of other congenital and childhood conditions.

The use of electronic cigarettes by people with asthma should not be encouraged until more evidence is available about short-term and long-term safety of all ingredients, including flavouring chemicals.

In this section

Assessment considerations

Smoking and asthma assessment

<http://www.asthmahandbook.org.au/clinical-issues/smoking/assessment>

Management considerations

Smoking and asthma management

<http://www.asthmahandbook.org.au/clinical-issues/smoking/management>

Asthma prevention


Asthma prevention and smoking

<http://www.asthmahandbook.org.au/clinical-issues/smoking/asthma-prevention>

Smoking and asthma assessment

Recommendations

Take a smoking history for all patients. Ask patients about exposure to environmental tobacco smoke as well as smoking.

 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹

Consider scheduling planned asthma check-ups every 6 months for people who smoke to assess recent asthma symptom control and frequency of flare-ups. Explain that this is necessary because smoking increases a person's risk of asthma flare-ups even if they have few symptoms, and because their lungs may be deteriorating faster than for a person who does not smoke.

Figure. Lung function decline in smokers and non-smokers with or without asthma

Please view and print this figure separately: <http://www.astmahandbook.org.au/figure/show/7>


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Dijkstra *et al.* 2006²
- James *et al.* 2005³
- O'Byrne *et al.* 2009⁴
- Osborne *et al.* 2007⁵
- Pedersen *et al.* 2007⁶


Check the patient's smoking status at regular intervals.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Consider the possibility of coexisting COPD and asthma in people who smoke.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source:

- Abramson *et al.* 2012⁷

More information

Effects of smoking on lung health

Smokers with asthma show changes in airway epithelium, which are associated with increased asthma symptoms, such as shortness of breath and mucus production.⁸ Exposure to cigarette smoke in people with asthma alters the inflammatory disease mechanism to become more like that seen in people with chronic obstructive pulmonary disease (COPD).⁹

Smoking reduces lung function in people with or without asthma. In those with asthma, smoking accelerates decline in lung function over a lifetime.^{4, 2, 3}

Figure. Lung function decline in smokers and non-smokers with or without asthma

Please view and print this figure separately: <http://www.asthmahandbook.org.au/figure/show/7>

However, treatment with inhaled corticosteroids helps prevent lung function decline in smokers with asthma.⁴

Smoking home-grown or illegally produced loose tobacco ('chop-chop') is likely to be at least as harmful as smoking branded cigarettes.¹⁰ Smoking any substance is likely to damage lungs.

Effects of exposure to environmental tobacco smoke on asthma

Among adults with asthma, exposure to cigarette smoke (smoking or regular exposure to environmental tobacco smoke within the previous 12 months) has been associated with a significantly increased risk of needing acute asthma care within the next 2–3 years.⁵

Effects of smoking on asthma control and medicines

Smoking reduces the probability of achieving good asthma control.⁶ Among adults with asthma, exposure to cigarette smoke (smoking or regular exposure to environmental tobacco smoke within the previous 12 months) has been associated with a significantly increased risk of needing acute asthma care within the next 2–3 years.⁵

Smoking reduces response to inhaled corticosteroids and oral corticosteroids in people with asthma.^{11, 12, 13, 14, 15} People who smoke may need higher doses of inhaled corticosteroids to receive the same benefits (improvement in lung function and reduction in flare-ups) as non-smokers.¹⁵

Therapeutic response to montelukast appears to be unchanged by smoking.¹³ Therefore, montelukast may be useful in smokers with mild asthma.^{9, 16}

Note: PBS status as at March 2019: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for DVA gold card holders, or white card holders with approval for asthma treatments.

Electronic cigarettes (e-cigarettes)

Electronic cigarettes (e-cigarettes) are battery powered devices that create a mist, allowing people to simulate cigarette smoking. Most deliver nicotine in a vapour. Many also contain flavouring chemicals.

Safety concerns

E-cigarettes produce fewer toxins than conventional cigarettes, but there is very little evidence about their long-term safety,¹⁷ and effects on lung function are unclear.¹⁸

Concerns have been raised about the potential adverse effects on airway health:

- In a small controlled study conducted among healthy smokers, short-term use of e-cigarettes was associated with increase in respiratory flow resistance, increase in impedance, and decrease in exhaled nitric oxide, compared with use of the device after removal of the cartridge containing the vapourisable liquid.¹⁹
- Some e-cigarettes may contain potentially harmful chemicals such as propylene glycol (a respiratory irritant), formaldehyde, formaldehyde-forming hemiacetals, and potentially toxic particulate matter.^{18, 20, 21}
- A study reported that inhalation of e-cigarette solutions was associated with airway inflammation and airway hyperresponsiveness in a mouse model.²²
- An *in vitro* study reported that some constituents of liquid flavourings in e-cigarettes evoked a cellular physiological response in mouse tracheal epithelial cells, which suggests that flavourings in e-cigarettes could harm airways.²³
- A study using a mouse model reported that neonatal exposure to e-cigarette emissions impaired lung growth.²⁴

Very few studies have assessed potential benefits and harms in people with asthma. A small cohort study reported improvements in respiratory symptoms, lung function, airway hyperresponsiveness, and asthma control (measured by ACQ score) in people with asthma who switched from smoking conventional cigarettes to e-cigarettes.²⁵

Positions and guidance by Australian organisations

The National Health and Medical Research Council (NHMRC) statement on e-cigarettes concludes: *There is currently insufficient evidence to conclude whether e-cigarettes can benefit smokers in quitting, or about the extent of their potential harms. It is recommended that health authorities act to minimise harm until evidence of safety, quality and efficacy can be produced.*²⁰

NHMRC advises that studies show that e-cigarettes expose both users and bystanders to particulate matter (very small particles) that may worsen existing illnesses, or increase the risk of developing diseases such as cardiovascular or respiratory disease.²⁰

Lung Foundation Australia recommends people quit smoking rather than try e-cigarettes.¹⁷

Quit Victoria warns that the short- and long-term health impacts of using e-cigarettes remain unknown, noting that e-cigarettes currently on the market have not passed through the extensive safety and efficacy evaluation required for products involving delivery of chemicals to the lung. Quit Victoria recommends that people use quitting aids approved by the Therapeutic Goods Administration, which have good safety profiles and have been shown to increase long-term quitting rates.²⁶

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Smoking and asthma management

Recommendations


Advise all patients with asthma to avoid tobacco smoke.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

For those who smoke, advise quitting and support them to quit.


 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹

Repeatedly offer help to quit smoking, whether or not the person shows interest in quitting.

 *How this recommendation was developed*


Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹

Follow the national smoking cessation guidelines for health professionals, including prescribing nicotine-replacement therapy and other pharmacotherapy as indicated.

► **Go to:** The Royal Australian College of General Practitioners' [Supporting smoking cessation: a guide for health professionals](#)


 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹

Advise and support older patients to quit smoking; explain that quitting has health benefits at any age and discuss all quitting options, considering any potential drug-to-drug interactions.


 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹

If prescribing smoking cessation therapies, check for potential drug–drug interactions with asthma medicines and other medicines.


 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹


Consider using the person's spirometry readings to motivate them to quit.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Do not encourage the use of electronic cigarettes, even for the purpose of smoking cessation.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

For people with asthma who continue to smoke or are exposed to tobacco smoke, consider:

- prescribing an inhaled corticosteroid, even if the person experiences few or 'mild' symptoms
- whether the person is experiencing a reduced response to their prescribed inhaled corticosteroids
- whether the person may benefit from regular treatment with montelukast.


Table. Steps for conducting a treatment trial

1. Document baseline lung function.
2. Document baseline asthma control using a validated standardised tool such as the Asthma Score.
3. Discuss treatment goals and potential adverse effects with the person.
4. Run treatment trial for agreed period (e.g. 4–8 weeks, depending on the treatment and clinical circumstances, including urgency).
5. At an agreed interval, measure asthma control and lung function again and document any adverse effects.
6. If asthma control has not improved despite correct inhaler technique and good adherence, resume previous treatment and consider referral for specialist consultation.

► See: [Asthma Score \(Asthma Control Test\)](#)

Asset ID: 36

Note: PBS status as at March 2019: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for DVA gold card holders, or white card holders with approval for asthma treatments.


 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Chaudhuri *et al.* 2003²
- Chaudhuri *et al.* 2006³
- Lazarus *et al.* 2007⁴
- Pedersen *et al.* 1996⁵
- Tamimi *et al.* 2012⁶
- Thomson and Chaudhuri, 2009⁷
- Tomlinson *et al.* 2005⁸

After a person with asthma quits smoking, review preventer dose requirements and step down, if possible.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Arrange follow-up to maximise the person's chance of staying smoke-free, based on the individual's needs and according to the national smoking cessation guidelines.

► Go to: The Royal Australian College of General Practitioners' [Supporting smoking cessation: a guide for health professionals](#)

 *How this recommendation was developed*

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Zwar *et al.* 2011¹

More information

Benefits of quitting smoking for people with asthma

Evidence from cohort studies suggests that smoking cessation can reverse the effects of smoking on airways of people with asthma. Epithelial characteristics in ex-smokers with asthma are similar to those in people with asthma who have never smoked.⁹

Within 6 weeks of quitting smoking, people with asthma show improvement in lung function and a reduction in airway inflammation, compared with people with asthma who continue to smoke, based on evidence from a nonrandomised comparative cohort study.²

Supporting patients to quit smoking

In the past, health professionals were sometimes advised to attempt to identify patients who are ready to quit smoking and focus interventions on these people. However, recent evidence suggests that offering *all* smokers help to quit is more effective than offering help only to those who express interest quitting.¹⁰

People with asthma may find it very difficult to quit, even compared with other smokers,^{7, 11} so they may need extra support and encouragement from health professionals.

Some health professionals use graphs showing the rate of smoking-associated lung function decline to motivate people with asthma to quit.

Figure. Lung function decline in smokers and non-smokers with or without asthma

Please view and print this figure separately: <http://www.asthmahandbook.org.au/figure/show/7>

When prescribing smoking cessation medicines for patients taking any other medicines, consider potential drug–drug interactions (e.g. bupropion toxicity may be increased when taken concomitantly with aminophylline or corticosteroids).

► Go to: The Royal Australian College of General Practitioners' [Supporting smoking cessation: a guide for health professionals](#)

Electronic cigarettes (e-cigarettes)

Electronic cigarettes (e-cigarettes) are battery powered devices that create a mist, allowing people to simulate cigarette smoking. Most deliver nicotine in a vapour. Many also contain flavouring chemicals.

Safety concerns

E-cigarettes produce fewer toxins than conventional cigarettes, but there is very little evidence about their long-term safety,¹² and effects on lung function are unclear.¹³

Concerns have been raised about the potential adverse effects on airway health:

- In a small controlled study conducted among healthy smokers, short-term use of e-cigarettes was associated with increase in respiratory flow resistance, increase in impedance, and decrease in exhaled nitric oxide, compared with use of the device after removal of the cartridge containing the vapourisable liquid.¹⁴
- Some e-cigarettes may contain potentially harmful chemicals such as propylene glycol (a respiratory irritant), formaldehyde, formaldehyde-forming hemiacetals, and potentially toxic particulate matter.^{13, 15, 16}
- A study reported that inhalation of e-cigarette solutions was associated with airway inflammation and airway hyperresponsiveness in a mouse model.¹⁷
- An *in vitro* study reported that some constituents of liquid flavourings in e-cigarettes evoked a cellular physiological response in mouse tracheal epithelial cells, which suggests that flavourings in e-cigarettes could harm airways.¹⁸
- A study using a mouse model reported that neonatal exposure to e-cigarette emissions impaired lung growth.¹⁹

Very few studies have assessed potential benefits and harms in people with asthma. A small cohort study reported improvements in respiratory symptoms, lung function, airway hyperresponsiveness, and asthma control (measured by ACQ score) in people with asthma who switched from smoking conventional cigarettes to e-cigarettes.²⁰

Positions and guidance by Australian organisations

The National Health and Medical Research Council (NHMRC) statement on e-cigarettes concludes: *There is currently insufficient evidence to conclude whether e-cigarettes can benefit smokers in quitting, or about the extent of their potential harms. It is recommended that health authorities act to minimise harm until evidence of safety, quality and efficacy can be produced.*¹⁵

NHMRC advises that studies show that e-cigarettes expose both users and bystanders to particulate matter (very small particles) that may worsen existing illnesses, or increase the risk of developing diseases such as cardiovascular or respiratory disease.¹⁵

Lung Foundation Australia recommends people quit smoking rather than try e-cigarettes.¹²

Quit Victoria warns that the short- and long-term health impacts of using e-cigarettes remain unknown, noting that e-cigarettes

currently on the market have not passed through the extensive safety and efficacy evaluation required for products involving delivery of chemicals to the lung. Quit Victoria recommends that people use quitting aids approved by the Therapeutic Goods Administration, which have good safety profiles and have been shown to increase long-term quitting rates.²¹

Smoking and older adults

Older people who smoke may believe that the damage has already been done and therefore there is no benefit in attempting to quit, or believe that smoking is less risky in older people.²²

However, older people can successfully quit smoking, and may even be less likely to relapse than younger adults.²²

Effects of smoking on asthma control and medicines

Smoking reduces the probability of achieving good asthma control.²³ Among adults with asthma, exposure to cigarette smoke (smoking or regular exposure to environmental tobacco smoke within the previous 12 months) has been associated with a significantly increased risk of needing acute asthma care within the next 2–3 years.²⁴

Smoking reduces response to inhaled corticosteroids and oral corticosteroids in people with asthma.^{2, 3, 4, 5, 8} People who smoke may need higher doses of inhaled corticosteroids to receive the same benefits (improvement in lung function and reduction in flare-ups) as non-smokers.⁸

Therapeutic response to montelukast appears to be unchanged by smoking.⁴ Therefore, montelukast may be useful in smokers with mild asthma.^{6, 7}

Note: PBS status as at March 2019: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for DVA gold card holders, or white card holders with approval for asthma treatments.

Stepping down regular asthma medicines in adults

The main aim of medical treatment for asthma is to achieve good asthma control and minimise the risks of asthma with the lowest effective dose of preventer medicines for each individual.

Stepping down is considered when the patient has experienced good asthma control for 2–3 months and is at low risk of flare-ups.

Figure. Stepped approach to adjusting asthma medication in adults and adolescents

Please view and print this figure separately: <http://www.astmahandbook.org.au/figure/show/31>

General tips

It is important to ascertain the person's actual treatment regimen before stepping down, because many patients may already be taking their preventer only intermittently.

Those who deliberately avoid taking their preventer due to concerns about inhaled corticosteroids may accept regular daily treatment at a lower dose, with an action plan to deal with flare-ups.

Steps down should be planned before the patient has finished their current inhaler, so that the previous dose can be resumed immediately if asthma control deteriorates.

Patients should be advised to step back up if they or their clinician judge that their asthma is worse overall (not just after the first time they experience asthma symptoms after stepping down). Patients and clinicians should agree beforehand on criteria for worsening asthma control.

Some patients are very concerned about reducing their dose (despite the risk of treatment-related adverse effects) and may prefer to stay on high doses for long periods. To enable early detection of deterioration in control during step-down, patients can be asked to monitor their peak flow for 2 weeks before, and 3–4 weeks after, the dose reduction.

Stepping down inhaled corticosteroid dose

For many patients with well-controlled asthma taking inhaled corticosteroid/long-acting beta₂ agonist combinations or inhaled corticosteroids alone, the inhaled corticosteroid dose can be reduced without loss of asthma control if downward dose adjustments are made gradually.^{25, 26}

The dose can be reduced by stepping down through the available formulations.

Note: TGA-registered fluticasone furoate/vilanterol combinations contain moderate-to-high doses of inhaled corticosteroid (100/25 microg and 200/25 microg respectively).

Ceasing inhaled corticosteroid

Patients with well-controlled asthma who stop taking regular low-dose inhaled corticosteroid treatment have an increased risk of flare-

ups, compared with those who continue inhaled corticosteroids.²⁷

It may sometimes be necessary to stop treatment temporarily in order to confirm the diagnosis of asthma in a person taking inhaled corticosteroids. In this situation, close monitoring of symptom control is needed.

Table. Confirming the diagnosis of asthma in a person using preventer treatment

Please view and print this figure separately: <http://www.asthmahandbook.org.au/table/show/9>

Table. Definitions of ICS dose levels in adults

Inhaled corticosteroid	Daily dose (microg)		
	Low	Medium	High
<i>Beclometasone dipropionate</i> †	100–200	250–400	>400
<i>Budesonide</i>	200–400	500–800	>800
<i>Ciclesonide</i>	80–160	240–320	>320
<i>Fluticasone furoate</i> *	–	100	200
<i>Fluticasone propionate</i>	100–200	250–500	>500

† Dose equivalents for *Qvar* (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

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Ceasing long-acting beta₂ agonist

Patients whose asthma is well controlled with an inhaled corticosteroid/long-acting beta₂ agonist combination (either as conventional maintenance treatment plus short-acting beta₂ agonist reliever, or as budesonide/formoterol maintenance-and-reliever therapy) can continue taking this regimen long-term. The dose can be reduced by stepping down through the available formulations.

Alternatively, for patients taking an inhaled corticosteroid/long-acting beta₂ agonist combination as maintenance treatment, the combination can be replaced with an inhaled corticosteroid inhaler at the same dose. However, a meta-analysis of several studies reported deterioration in asthma control after ceasing long-acting beta₂ agonist treatment in patients with asthma previously stabilised on inhaled corticosteroid/long-acting beta₂ agonist combination. Therefore, if inhaled corticosteroid/long-acting beta₂ agonist is replaced by inhaled corticosteroid only, patients should be advised to start taking their old combination inhaler again if asthma worsens within the first few days after switching.

Note: For patients taking fluticasone furoate/vilanterol, no studies are available to guide stepping down. Options include stepping down to inhaled corticosteroid alone (recommended in the TGA-approved Product Information),²⁸ or stepping down to a different inhaled corticosteroid/long-acting beta₂ agonist combination that will achieve a lower inhaled corticosteroid dose. (e.g. Stepping down from treatment with once-daily medium dose

fluticasone furoate/vilanterol [100/25 microg] can be achieved by switching to twice-daily low-dose fluticasone propionate/salmeterol [100/50 microg or 50/25 microg]). With either option, patients need careful explanation, including clear written instructions, to avoid potential confusion when changing between inhaler devices and dosing frequencies.

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Asthma prevention and smoking

Recommendations


Advise women not to smoke while pregnant.

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Advise parents to ensure babies and children are not exposed to cigarette smoke (or to toxins from tobacco smoke that remain in clothing and hair).

 *How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Prenatal and childhood exposure to tobacco smoke

Tobacco smoking by pregnant women damages children's respiratory health. It also increases the risk of stillbirth, spontaneous abortion, reduced foetal growth, preterm birth, low birth weight, placental abruption, sudden infant death, cleft palate, cleft lip and childhood cancers.¹

Risk of developing asthma

Prenatal exposure to tobacco smoke and exposure during infancy increase the risk of wheezing during early childhood.²

► See: [Primary prevention of asthma](#)

Effects on children's asthma

Evidence from an Australian cohort study suggests that children with asthma whose mothers smoked during pregnancy benefit less from treatment with inhaled corticosteroids, and show less improvement in airway hyperresponsiveness over time, than those with asthma but no intrauterine exposure to smoke.³

Electronic cigarettes (e-cigarettes)

Electronic cigarettes (e-cigarettes) are battery powered devices that create a mist, allowing people to simulate cigarette smoking. Most deliver nicotine in a vapour. Many also contain flavouring chemicals.

Safety concerns

E-cigarettes produce fewer toxins than conventional cigarettes, but there is very little evidence about their long-term safety,⁴ and effects on lung function are unclear.⁵

Concerns have been raised about the potential adverse effects on airway health:

- In a small controlled study conducted among healthy smokers, short-term use of e-cigarettes was associated with increase in respiratory flow resistance, increase in impedance, and decrease in exhaled nitric oxide, compared with use of the device after removal of the cartridge containing the vapourisable liquid.⁶

- Some e-cigarettes may contain potentially harmful chemicals such as propylene glycol (a respiratory irritant), formaldehyde, formaldehyde-forming hemiacetals, and potentially toxic particulate matter.^{5, 7, 8}
- A study reported that inhalation of e-cigarette solutions was associated with airway inflammation and airway hyperresponsiveness in a mouse model.⁹
- An *in vitro* study reported that some constituents of liquid flavourings in e-cigarettes evoked a cellular physiological response in mouse tracheal epithelial cells, which suggests that flavourings in e-cigarettes could harm airways.¹⁰
- A study using a mouse model reported that neonatal exposure to e-cigarette emissions impaired lung growth.¹¹

Very few studies have assessed potential benefits and harms in people with asthma. A small cohort study reported improvements in respiratory symptoms, lung function, airway hyperresponsiveness, and asthma control (measured by ACQ score) in people with asthma who switched from smoking conventional cigarettes to e-cigarettes.¹²

Positions and guidance by Australian organisations

The National Health and Medical Research Council (NHMRC) statement on e-cigarettes concludes: *There is currently insufficient evidence to conclude whether e-cigarettes can benefit smokers in quitting, or about the extent of their potential harms. It is recommended that health authorities act to minimise harm until evidence of safety, quality and efficacy can be produced.*⁷

NHMRC advises that studies show that e-cigarettes expose both users and bystanders to particulate matter (very small particles) that may worsen existing illnesses, or increase the risk of developing diseases such as cardiovascular or respiratory disease.⁷

Lung Foundation Australia recommends people quit smoking rather than try e-cigarettes.⁴

Quit Victoria warns that the short- and long-term health impacts of using e-cigarettes remain unknown, noting that e-cigarettes currently on the market have not passed through the extensive safety and efficacy evaluation required for products involving delivery of chemicals to the lung. Quit Victoria recommends that people use quitting aids approved by the Therapeutic Goods Administration, which have good safety profiles and have been shown to increase long-term quitting rates.¹³

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