

# All About Asthma Triggers

*A PRACTICAL GUIDE FOR HEALTH CARE PROVIDERS*

B R E A T H E  
the lung association

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## Authors

The Lung Association - Ontario would like to thank the following authors for their contribution to the development of this resource.

Madonna Ferrone RRT, CRE  
Ana MacPherson RRT, CRE, MASc  
Pamela Wilton RN, CAE  
Janice Woychyshyn RRT, CRE, RDMS

## Reviewers

The Lung Association - Ontario gratefully acknowledges the following people who reviewed the booklet.

Dr. Lisa Cicutto RN PhD CAE  
Dr. Harold Kim MD FRCPC  
Dr. Thomas Kovesi MD FRCP(C)  
Dr. Christopher Lieskai BSc MD FRCPC  
Dr. Diane Loughheed MD MSc FRCP(C)  
Dr Susan M Tarlo MB BS FRCP(C)  
Jennifer Olajos-Clow RN(EC) MSc APN CAE

# Introduction

*All About Asthma Triggers* was written by health care providers for health care providers. The idea for this guide started when a group of asthma educators, working in the Primary Care Asthma Program (PCAP), identified a need for a practical resource to quickly identify potential triggers and to help their patients with asthma learn how to avoid and/or limit exposures. Subsequently, a needs assessment revealed that other health care providers, working in many different settings, often feel overwhelmed by the amount of information available and need a better way to consolidate information and make recommendations based on the best available evidence. We have done that for you.

This guide is intended to provide you with a quick reference for trigger identification and management, enabling you to help your patient identify possible irritants and allergens that could be contributing factors. *Irritants* are inhaled substances that irritate the airways, causing asthma symptoms, but do not cause an allergic reaction. Examples of irritants include smoke, chemical fumes and cold air. *Allergens* are inhaled substances that cause an allergic reaction. Examples of allergens are pollens, animal dander and mould. Repeated exposure over a long period of time is often necessary before asthma symptoms occur in response to an allergen.

Once you and your patient have identified potential triggers, you will be able to recommend some ways to avoid or limit exposure. It is important that these avoidance strategies complement appropriate medication use in each individual patient, with a goal to achieve optimal asthma control. In some cases this will be only a start and you will need to refer your patient to a specialist or specialty centre for more testing and advice.

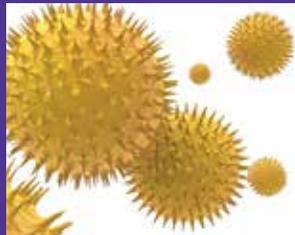
This booklet is organized so information about common triggers (irritants and allergens) that are found across settings is presented first, followed by information about triggers found in specific settings such as schools, workplaces and farms/ranches. The final section includes more general information for your consideration. All of the information must be applied based on the needs and goals of the patient, as well as the specific needs of the health care provider and practice setting. This guide should be used as a tool to assist in decision-making for patient care, while ensuring that appropriate supports are in place to provide the best care possible. Medical information and evidence are constantly changing. As new research and experience broaden our knowledge, changes in asthma management will be necessary and appropriate.

## **Disclaimer:**

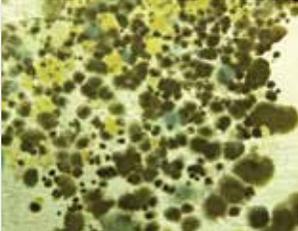
*The content of this guide is based on current available evidence and has been reviewed by medical experts. It is provided for informational purposes only. The views set out in this guide are those of the authors and do not necessarily reflect those of the Government of Ontario or the Ministry of Health and Long-Term Care. The information is general in nature and is not intended to be a substitute for sound clinical judgment. Seek the advice and expertise of your health care provider with any questions you may have about your health.*

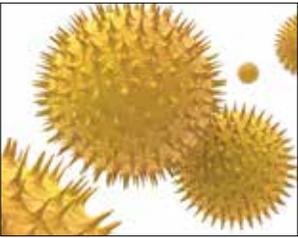
## Common Asthma Triggers

In this section, *Common Asthma Triggers*, we have included the most common triggers found almost anywhere and everywhere. Once an individual has identified the irritants and allergens that can worsen his or her asthma symptoms, it will gradually become second nature to anticipate and recognize the presence of triggers in various environments encountered in everyday living. Allergy skin testing is often very helpful to identify allergens and the results can be a useful tool to facilitate change. Your advice and support can help your patient learn what avoidance and management strategies work best for him or her. Knowledge and experience will guide your patient's decisions. Know that this is a process that takes time, but patience and perseverance will lead to greater awareness and better controlled asthma.



| TRIGGERS   | WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES   |
|--|--|---|
| <p><b>Animal Secretions</b> (Allergen)<br/>Allergen from animal saliva and dander becomes airborne and can adhere to soft materials. Symptoms can occur even when the animal is not present.</p>  | <p>Allergens are found in secretions from saliva, feces, urine and skin of cats (most common), dogs, rabbits, horses, other furry animals and birds. They are commonly found in indoor air and in and in upholstery, carpets and clothing.</p>   | <p><b>Note: Removal of the animal from the home/ environment is the only effective way to avoid exposure. It can take many months before the allergen level decreases once the pet has been removed from the environment.</b></p> <ul style="list-style-type: none"> <li>• Remove pet from the home.</li> <li>• Limit exposure to the pet.</li> <li>• Bathe pet frequently; delegate when possible.</li> <li>• Vacuum floor and furniture thoroughly.</li> <li>• Remove carpets if possible. (Solid surface flooring preferred.)</li> </ul>   |
| <p><b>Cockroaches</b> (Allergen)<br/>Common insects that can be found anywhere in the home, school or work-place. They thrive in wet areas, where food waste has not been removed. They are common in inner city areas.</p>  | <p>Allergen is found in decaying cockroach body parts and feces mostly in kitchens and bathrooms, especially near: taps, water pipes, cupboards, appliances, toilets, garbage containers and cardboard.</p>  | <ul style="list-style-type: none"> <li>• Remove garbage from kitchens and bathrooms.</li> <li>• Clean up all food crumbs or spilled liquids immediately.</li> <li>• Wash dishes, cooking equipment and counters promptly after use.</li> <li>• Keep counters, sinks, tables and floors clean and clear of debris.</li> <li>• Seal cracks and openings around or inside cabinets.</li> <li>• Store garbage in covered containers.</li> <li>• Employ professional eradication service.</li> </ul>   |
| <p><b>Dust</b> (Irritant)<br/>Indoor dust, unlike outdoor dust, consists of a combination of materials.</p> <p><b>Dust mites</b> (Allergen)<br/>Tiny microscopic creatures that feed on the flakes of skin that people and pets shed daily.</p>                                    | <p>Dust is found almost everywhere indoors. It is airborne, but settles on surfaces such as open shelving, window ledges, curtains, blinds, upholstery, carpets and can be carried in many ways, including: human hair, animal dander, dead insect bodies, food scraps, chalk dust and talcum powder.</p> <p>Dust mites are found in humid, warm areas. There are large concentrations in bedrooms (pillows, blankets, carpets/ rugs, mattresses, stuffed animals, upholstered furniture, duvets, sheets).</p> | <p><b>Note: Dust and dust mites cannot be totally eliminated, however, the number of mites can be reduced by following prevention strategies. Focus initial reduction strategies in the bedroom.</b></p> <ul style="list-style-type: none"> <li>• Minimize objects that accumulate dust.</li> <li>• Delegate weekly vacuuming, if possible or wear a mask.</li> <li>• Wait 20 minutes for dust to resettle before using the room, after vacuuming.</li> <li>• Dust surfaces frequently with a damp cloth.</li> <li>• Maintain relative humidity level &lt;50%. (A hygrometer is a useful, inexpensive device for measuring and monitoring indoor humidity levels.)</li> <li>• Use vacuum with HEPA filter.</li> <li>• Encase mattresses and pillows in dust-mite resistant covers.</li> </ul> |

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|    |  | <ul style="list-style-type: none"> <li>• Wash all bedding in hot water (55-60°C) weekly.</li> <li>• Freeze non-washable items (quilts, stuffed animals) in freezer or leave outside overnight in freezing temperatures.</li> <li>• Remove stuffed animals from bedroom.</li> <li>• Replace (if possible) carpets, rugs, heavy draperies and upholstered furniture.</li> </ul> <p><b>Note:</b> A favourite stuffed animal can be washed and placed in the drier, followed by an overnight stay in the freezer. This will reduce the mites, while keeping a little one happy!</p>  |
| <p><b>Exercise</b> (Irritant)</p> <p>Physical activity can trigger asthma symptoms and may be a sign of uncontrolled asthma. Physical activity can be the <b>only</b> trigger for asthma symptoms and is known as <i>Exercise Induced Asthma (EIA)</i> or <i>Exercise Induced Bronchospasm (EIB)</i>.</p>   | <p>Symptoms or EIA can occur with any physical exertion, but increased symptoms are more likely to occur during extreme temperatures (hot and humid or cold and dry) and/or when the person is recovering from a respiratory tract infection. Some people may experience more symptoms on poor air quality days.</p> | <ul style="list-style-type: none"> <li>• Consider venue, time of day and weather conditions when planning activities.</li> <li>• Warm-up exercise before and after physical activity. (5-10 minutes warm up to 60% of maximal heart rate)</li> <li>• Prophylactic use of bronchodilator medication 10-30 minutes prior to activity.</li> <li>• Elite level athletes should be referred to a specialist for testing and advice.</li> </ul>  |
| <p><b>Mould Spores</b> (Allergen)</p> <p>Tiny structures produced by moulds for reproduction purposes.</p> <p>Common spores:</p> <ul style="list-style-type: none"> <li>Alternaria</li> <li>Aspergillus</li> <li>Bipolaris</li> <li>Cladosporium</li> <li>Epicoccum</li> <li>Fusarium</li> <li>Penicillium</li> </ul>  | <p>Spores are airborne and are found in places where mould grows.</p> <p>Common indoor areas include: showers, bathrooms, window sills, laundry rooms, kitchens, refrigerators, garbage containers, carpets, upholstery, attics and basements.</p>   | <ul style="list-style-type: none"> <li>• Maintain relative humidity level &lt;50%. (A hygrometer is a useful and inexpensive device for measuring and monitoring indoor humidity levels.)</li> <li>• Promote air circulation with and use of vents and fans.</li> <li>• Clean showers/bathtubs after each use to prevent mildew.</li> <li>• Clean mouldy surfaces with a water and bleach-based product.</li> <li>• Wear mask and gloves to limit exposure when cleaning.</li> <li>• Remove carpet from humid areas.</li> <li>• Discard any mouldy items when possible.</li> <li>• Repair any leaks and moisture problems promptly.</li> <li>• Use dehumidifier in basements and crawl spaces.</li> <li>• Avoid musty smelling areas (cottages, basements, garages, attics, etc.).</li> <li>• Consult professional service for removal.</li> </ul> <p><b>Note:</b> There is no practical way to eliminate all moulds indoors. The best way to control indoor mould growth is to control moisture. Prevention is key.</p> |

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|---|--|--|
| <p>Outdoor moulds are usually at their peak in late summer and early fall, but are present whenever there is no snow.</p>   | <p>Common outdoor sources include: decaying fallen leaves, soil, vegetation, rotting wood and grass of lawns.</p>  | <ul style="list-style-type: none"> <li>• Avoid walking, running or playing in fallen leaves.</li> <li>• Avoid raking leaves and cutting grass.</li> <li>• Remove piles of raked leaves and grass; delegate if possible.</li> <li>• Avoid proximity to hay and straw.</li> <li>• Avoid areas of heavy vegetation, especially where it is not exposed to adequate air circulation.</li> <li>• Stack firewood to promote adequate drying and air circulation.</li> <li>• Stay indoors after a rainstorm, as moulds may be stirred up.</li> </ul>  |
| <p><b>Pollen</b> (Allergen)</p> <p>Pollens are tiny, invisible particles given off by trees, grass, flowers and certain weeds such as ragweed.</p> <p>Pollens are at their peak at various times from early spring until the first fall frost. It can be helpful to identify which pollen(s) is the allergen.</p>  | <p>Pollens are found outdoors, but are easily wafted or carried indoors on clothing. There will be more of them where trees, grasses, flowers and/or weeds grow.</p> | <ul style="list-style-type: none"> <li>• Close windows overnight to prevent pollens from drifting into the home.</li> <li>• Use air conditioning to cool, dry and clean the air in the home.</li> <li>• Minimize early morning outdoor activity when pollen levels are highest (0400-1100 h).</li> <li>• Close vehicle windows when travelling.</li> <li>• Avoid outdoor activities on windy, dry days when pollen and dust are blowing around.</li> <li>• Dry laundry indoors to prevent pollens from adhering to linens and clothing.</li> </ul> <p><b>Note:</b> Many people who are bothered by pollens find it helpful to check pollen counts when planning outdoor activities. Check pollen counts at <a href="http://www.theweathernetwork.com">www.theweathernetwork.com</a> and air quality levels at <a href="http://www.airqualityontario.com">www.airqualityontario.com</a></p> |
| <p><b>Rodents</b> (Allergen)</p>  | <p>The allergen is found in the feces, dander and saliva of rodent animals (mice, rats, squirrels, gophers, hamsters, gerbils, guinea pigs, chinchillas).</p>        | <ul style="list-style-type: none"> <li>• Remove animal from the environment.</li> <li>• Isolate pet from bedroom and main living areas of the home.</li> <li>• Limit exposure to the pet or pest.</li> <li>• Wash hands with soap and water after handling the animal.</li> <li>• Seek expert service and advice to remove animals and clean up any areas infested by unwanted rodents.</li> </ul> <p><b>Note:</b> It can take many months before the allergen level decreases after the pet or pest has been removed from the environment.</p>  |

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|---|--|---|
| <p><b>Smoke</b> (Irritant)<br/><b>Environmental Tobacco Smoke (ETS)</b></p>  <p><b>Second-hand smoke</b> From burning products (e.g., cigarettes, pipes, cannabis, cigars) and is also blown into the air by the person who is smoking</p> <p><b>Third-hand smoke</b> is the residual tobacco smoke that lingers long after second-hand smoke has cleared from a room.</p> | <p>ETS is found in any area where people smoke cigars, cigarettes, pipes or marijuana.</p> <p>Second-hand smoke is noticeable on clothing, hair, upholstered furniture and carpet.</p>   | <ul style="list-style-type: none"> <li>• Promote, encourage and support smoking cessation (Level 1).</li> <li>• Avoid second-hand smoke and active smoking.</li> <li>• Prohibit smoking in the home of the affected person.</li> <li>• Smoke outdoors, away from others.</li> <li>• Prohibit smoking in vehicles.</li> <li>• Avoid travelling in vehicles where smoking is or has been permitted.</li> </ul>  |
| <p><b>Other Smoke</b> (Irritant)</p>  | <p>Smoke from fireplaces, grills, wood heaters, chimneys and campfires can be irritating.</p>  | <ul style="list-style-type: none"> <li>• Avoid outdoor fires, chimneys and other open burning flames.</li> <li>• Close windows as necessary when smoke is in the air outdoors.</li> <li>• Properly seal wood stoves.</li> </ul>   |
| <p><b>Strong Scents</b> (Irritant)</p> <p>Some scented products contain several chemicals that constantly turn into vapour in the air and attach themselves to hair, clothing, and surroundings.</p>   | <p>Areas where any of the following are used: air fresheners, scented candles, shampoos, hair sprays, soaps, perfume, cologne, after shave, personal care products, fabric softener, laundry detergent, bleach, cleaning products, building materials, paints, cooking oils, gases from wood-burning stoves, fireplaces or campfires, clothing, upholstery and carpets can be problematic.</p> | <ul style="list-style-type: none"> <li>• Choose unscented products.</li> <li>• Limit time spent in any area that has an irritating scent.</li> <li>• Substitute less volatile products for cleaning, building and repairs.</li> <li>• Open windows and use fans to remove scents/smoky odours.</li> <li>• Maintain adequate ventilation when using any product that is an irritant.</li> <li>• Read product labels before opening containers.</li> <li>• Wear a mask when irritants cannot be completely eliminated.</li> </ul> |

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| <p><b>Viral Infections</b> (Irritant)</p> <p><b>Common viruses:</b><br/>           Rhinoviruses (common cold)<br/>           Respiratory Syncytial Virus (RSV)<br/>           Parainfluenza<br/>           Influenza<br/>           Adenovirus</p>   | <p>Viruses are difficult to completely avoid. They enter the body through the nose, mouth or breaks in the skin.</p> <p>Rhinoviruses can survive on surfaces (telephones, railings, keyboards) for three hours, including on your skin (hands).</p> | <ul style="list-style-type: none"> <li>• Wash hands frequently, and before touching nose and mouth.</li> <li>• Use alcohol-based, waterless cleansers for cleaning your hands when they are not visibly soiled and/or soap and water are not available. (Recommendation: Centre for Disease Control)</li> <li>• Avoid social gatherings/visits when people are known to be sick.</li> <li>• Discuss vaccination with health care provider.</li> <li>• Do not share food, drink glasses or eating utensils.</li> </ul> <p><b>Note: Hand washing is the most effective way to prevent the spread of viruses.</b></p>   |
| <p><b>Weather</b> (Irritant)</p> <p>Common weather triggers include: cold air, dry air, wind, humidity, extreme heat and thunderstorms. Changes in barometric pressure, wind direction and/or intensity can also trigger symptoms.</p>  | <p>People may be more affected when outdoors, but weather changes can and do alter indoor environments.</p>   | <ul style="list-style-type: none"> <li>• Warm and humidify cold air before breathing in through the nose. (Use a scarf or hand over the nose and mouth to create a pocket of warm, humid air.)</li> <li>• Limit or adjust intensity level of outdoor activity during extreme weather conditions (cold, humid, hot, stormy or windy days).</li> <li>• Use air conditioners, dehumidifiers, fans and other appliances to maintain comfortable indoor environments.</li> <li>• Move scheduled activities indoors or substitute with another to maintain exercise routines when necessary.</li> <li>• Schedule daily activities to take advantage of best weather conditions.</li> </ul> <p><b>Note: Not all people with asthma will be adversely affected by weather conditions, but it is important to explore the role, if any, that weather plays in their management. General media weather alerts may not be applicable and may unduly limit activities.</b></p> |

## Asthma Triggers in Schools

The school environment can present many challenges to students, teachers, other personnel and parents/guardians. For children and youth with asthma, school is probably the most important environment apart from their home. Exposures at school can lead to worsening asthma, social isolation and increased absenteeism. Asthma is the leading cause of school absenteeism attributable to a chronic disease.

In this section, *Asthma Triggers in Schools*, we have included the most common triggers of asthma in the school environment and suggested some avoidance strategies. Since asthma can be triggered by allergens or irritants indoors and/or outdoors at school, we have organized the section in two parts.

Asthma management is improved when health-care providers, students, parents and school personnel work together to identify, eliminate and control triggers. “Ensuring Asthma Friendly Schools” is now required by Ontario legislation. For more information, go to <http://lungontario.ca/we-can-help/asthma-support/schools/ryans-law/> where you can download the “Individual Student Asthma Management Plan” and other resources.



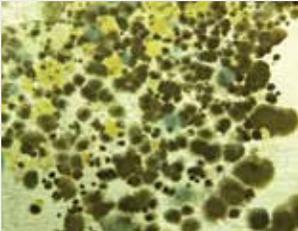
| OUTDOOR TRIGGERS  | WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES   |
|---|--|---|
| <p><b>Animal Secretions</b> (Allergen)</p> <p>Allergen from saliva and dander becomes airborne and can adhere to soft materials. Symptoms can occur even if the animal is not present, therefore indirect contact is also a problem.</p>  | <p>Allergen is found in secretions from saliva, feces, urine and skin of: cats (most common), dogs, rabbits, horses, other furry animals and birds.</p>  | <ul style="list-style-type: none"> <li>• In most outdoor school settings this will be less of a problem, but should be considered in special circumstances (field trips, veterinary colleges, etc.). Take appropriate measures to avoid or limit exposure as much as possible.</li> </ul>   |
| <p><b>Criteria Air Contaminants</b> (Irritant)</p> <p><b>Sulphur Oxide (SO<sub>x</sub>)</b><br/>is a gas formed from the sulphur contained in raw materials.</p>  <p><b>Nitrogen Oxides (NO<sub>x</sub>), (NO&amp;NO<sub>2</sub>)</b><br/>are compounds that include the gases nitric oxide and nitrogen dioxide. Produced mostly by burning fossil fuels, these are the cause of the reddish brown layer hanging over urban areas.</p> <p><b>Particulate Matter</b><br/>is a “mixture of mixtures” that consists of airborne particles in solid or liquid form. Particles smaller than 10 µm can penetrate into the lungs.</p> <p><b>Carbon Monoxide (CO)</b><br/>is a gas that forms from burning fuel propane, natural gas, gasoline, oil, coal and wood.</p> <p><b>Ground-level Ozone (O<sub>3</sub>)</b><br/>is a colourless and highly irritating gas that forms just above the Earth’s surface. It is produced when NO and volatile organic compounds (VOCs) react in sunlight and stagnant air.</p> | <p>Contaminants are found in emissions from coal, oil and metal-containing ore combustion and refining processes.</p> <p>Contaminants are found in emissions from motor vehicles, diesel emissions, lawn and garden equipment, forest fires, lightning and decaying vegetation.</p> <p>Contaminants are found in emissions from fuel combustion (including oil, diesel, coal, gas), electricity generation (combustion turbines, industrial boilers, power plants), wood stoves, forest fires and fireplace soot.</p> <p>CO is found in emissions from vehicles, propane barbeques, gas grills and forest fires.</p> <p>Ground level ozone is found in smog.</p> | <ul style="list-style-type: none"> <li>• Limit or reduce intensity of outdoor activities on days with high ozone levels or other air pollutants, if necessary.</li> <li>• Prohibit buses, cars and other vehicles from idling on or adjacent to school property.</li> <li>• Avoid grass cutting during school hours (reduce exhaust emissions and fumes).</li> <li>• Advocate for Air Quality Monitoring and Improvement programs.</li> <li>• Encourage anti-idling policies for all vehicles and non-road engines on the school property.</li> <li>• Carefully consider grill and barbeque use and location when planning events.</li> <li>• Encourage children to play in areas away from traffic and parking lots.</li> </ul> <p><b>Note:</b> Some patients may find it helpful to check the following sites for information to help guide their management strategies: <a href="http://www.ec.gc.ca">www.ec.gc.ca</a> and the Air Quality Health Index (AQHI) at <a href="http://www.airqualityontario.com/aqi/index.php">www.airqualityontario.com/aqi/index.php</a></p> |

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|---|--|--|
| <p><b>Exercise</b> (Irritant)</p> <p>Physical activity can trigger asthma symptoms and may be a sign of uncontrolled asthma. Physical activity can be the <b>only</b> trigger for asthma symptoms and is known as <i>Exercise Induced Asthma (EIA)</i> or <i>Exercise Induced Bronchospasm (EIB)</i>.</p>    | <p>Symptoms or EIA can occur with any physical exertion, but increased symptoms are more likely to occur during extreme temperatures (hot and humid or cold and dry) and/or when the person is recovering from a respiratory tract infection. Some people may experience more symptoms on poor air quality days.</p> | <ul style="list-style-type: none"> <li>• Warm-up activity before and after physical activity.</li> <li>• Prophylactic use of bronchodilator medication 10-30 minutes prior to activity.</li> <li>• Elite level athletes should be referred to a specialist for testing and advice.</li> <li>• Collaborate with guardian, coach/teacher to support and facilitate optimum participation.</li> </ul>   |
| <p><b>Mould Spores</b> (Allergen)</p> <p>Tiny structures produced by moulds for reproduction purposes.</p> <p>Common spores:</p> <ul style="list-style-type: none"> <li>Alternaria</li> <li>Aspergillus</li> <li>Bipolaris</li> <li>Cladosporium</li> <li>Epicoccum</li> <li>Fusarium</li> <li>Penicillium</li> </ul> <p>Outdoor moulds are usually at their peak in late summer and early fall, but are present whenever there is no snow.</p> | <p>Common outdoor sources of spores include: decaying fallen leaves, soil, vegetation, rotting wood and grass of lawns.</p>  | <ul style="list-style-type: none"> <li>• Avoid walking, running or playing in fallen leaves.</li> <li>• Avoid areas of heavy vegetation, especially where it is not exposed to adequate air circulation.</li> <li>• Stay indoors after a rainstorm, as moulds may be stirred up.</li> <li>• Schedule landscape work, yard clean-up and portable building installation/removal on weekends or holidays.</li> <li>• Repair water damage as quickly as possible.</li> <li>• Consult professional service for removal.</li> </ul>  |
| <p><b>Pollen</b> (Allergen)</p> <p>Pollens are tiny, invisible particles given off by trees, grass, flowers and certain weeds such as ragweed. Pollens are at their peak at various times from early spring until the first fall frost. It can be helpful to identify which pollen(s) is the allergen.</p>   | <p>Increased pollen counts are found where trees, grasses, flowers and/or weeds grow and will be worse on dry, windy days.</p>   | <ul style="list-style-type: none"> <li>• Limit outdoor activities on dry, windy days.</li> <li>• Schedule outdoor activities and work during the afternoon when counts are lower.</li> <li>• Limit outdoor activities on days with high ozone levels or other air pollutants.</li> </ul> <p><b>Note:</b> Many people who are bothered by pollens find it helpful to check pollen counts when planning outdoor activities. Check pollen counts at <a href="http://www.theweathernetwork.com">www.theweathernetwork.com</a>.</p> |

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| <p><b>Rodents</b> (Allergen)</p>    | <p>The allergen is found in the feces, dander and saliva of rodent animals (mice, rats, squirrels, gophers, hamsters, gerbils, guinea pigs, chinchillas).</p> | <ul style="list-style-type: none"> <li>• Limit exposure to the animal.</li> <li>• Seek expert service and advice to remove unwanted pests and complete clean-up on school property.</li> <li>• Schedule removal and clean-up activities on weekends or holidays.</li> </ul>  |
| <p><b>Weather</b> (Irritant)</p> <p>Common weather triggers include: cold air, dry air, wind, humidity, extreme heat and thunderstorms. Changes in barometric pressure, wind direction and/or intensity can also trigger symptoms.</p> |   | <ul style="list-style-type: none"> <li>• Warm and humidify cold air before breathing in through the nose. (Use a scarf or hand over the nose and mouth to create a pocket of warm, humid air.)</li> <li>• Limit or adjust intensity level of outdoor activity during extreme weather conditions (cold, humid, hot, stormy or windy days).</li> <li>• Limit outdoor activity during extreme weather conditions.</li> <li>• Move scheduled activities indoors or substitute with another to maintain exercise routines when necessary.</li> <li>• Schedule daily activities to take advantage of best weather conditions.</li> </ul> <p><b>Note: Not all people with asthma will be adversely affected by weather conditions, but it is important to explore the role, if any, that weather plays in their management.</b></p> |

| INDOOR TRIGGERS   | WHERE THEY ARE FOUND  | AVOIDANCE/MANAGEMENT STRATEGIES  |
|---|---|--|
| <p><b>Animal Secretions</b> (Allergen)<br/>(Direct or Indirect Contact)<br/>Allergen from saliva and dander becomes airborne and can adhere to soft materials. Symptoms can occur even if the animal is not present.</p>  | <p>Allergen is found in secretions from saliva, feces, urine and skin of: cats (most common), dogs, rabbits, horses, other furry animals and birds. These are commonly found on upholstery, rugs/ carpets and clothing.</p>   | <ul style="list-style-type: none"> <li>• Remove classroom animals from the school.</li> <li>• Students and personnel should wash hands with soap and water after handling animals.</li> <li>• Clean cage/remove litter away from students and staff.</li> <li>• Careful consideration and collaboration is necessary when service dogs are present.</li> <li>• Avoid upholstered chairs and carpets in schools.</li> </ul>   |
| <p><b>Chemicals/Agents</b> (Irritant)<br/>Solvents, acids, flammables, biological and microbiological agents, caustics, and compressed gases.</p>   | <p>The chemicals/agents are found in science rooms/laboratory, industrial shops, vocational classrooms and greenhouses. Activities that may involve these are soldering, welding and baking. Chemicals are found in machining solvents, fuels, paint and adhesives.</p> | <ul style="list-style-type: none"> <li>• Conduct science experiments in properly designed, ventilated rooms.</li> <li>• Use fume hoods and local exhaust systems as appropriate.</li> <li>• Read labels and heed precautions.</li> <li>• Use personal protective equipment.</li> <li>• Follow safety precautions to prevent air contamination through spills.</li> <li>• Request safety data sheets from suppliers.</li> <li>• Comply with WHMIS legislation.</li> </ul>   |
| <p><b>Cockroaches</b> (Allergen)<br/>Common insects that can be found anywhere in schools. They thrive where water and food are improperly stored. Predominant in inner city areas.</p>  | <p>Allergen is found anywhere there are decaying cockroach body parts and feces. They are found mostly in kitchens and bathrooms near taps, water pipes, cupboards, appliances, toilets, garbage containers and cardboard.</p>  | <ul style="list-style-type: none"> <li>• Remove garbage from washrooms and kitchen areas.</li> <li>• Clean up all food crumbs or spilled liquids immediately.</li> <li>• Wash dishes, cooking equipment and work tops promptly after use.</li> <li>• Keep sinks, tables and floors clean and clear of debris.</li> <li>• Seal cracks and openings around or inside cabinets.</li> <li>• Store garbage in covered containers.</li> <li>• Schedule any extermination processes on weekends or holidays.</li> </ul> |

| INDOOR TRIGGERS   | WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES  |
|---|--|--|
| <p><b>Dust</b> (Irritant)<br/>Indoor dust, unlike outdoor dust, consists of a combination of materials.</p>  <p><b>Dust mites</b> (Allergen)<br/>Tiny microscopic creatures that feed on the flakes of skin that people and pets shed daily. They thrive in warm and humid environments.</p> | <p>Dust is found almost everywhere indoors. It is airborne, but settles on surfaces such as open shelving, window ledges, curtains, blinds, upholstery, carpets and can be carried in many ways, including: human hair, animal dander, dead insect bodies, food scraps, chalk dust and talcum powder.</p> <p>Dust mites can be carried in many ways, including on human hair, animal dander, dead insect bodies, food scraps, stuffed toys and chalk dust.</p> | <ul style="list-style-type: none"> <li>• Dust and mop with a damp cloth.</li> <li>• Remove carpets.</li> <li>• Reduce classroom clutter.</li> <li>• Use of HEPA filters in vacuum equipment.</li> <li>• Use dustless chalk.</li> </ul> <p><b>Note: It is very difficult to avoid exposures to dust, especially in schools. Collaboration will be required.</b></p> <ul style="list-style-type: none"> <li>• Maintain relative humidity level &lt;50%. (A hygrometer is a useful, inexpensive device for measuring and monitoring indoor humidity levels.)</li> <li>• Minimize objects that accumulate dust.</li> <li>• Vacuum (HEPA filter) carpets daily.</li> <li>• Wear a mask while vacuuming.</li> <li>• Wait 20 minutes for dust to resettle before using the room, after vacuuming.</li> <li>• Dust surfaces frequently with a damp cloth.</li> <li>• Replace (if possible) upholstered furniture.</li> </ul> |
| <p><b>Exercise</b> (Irritant)<br/>Physical activity can trigger asthma symptoms and may be a sign of uncontrolled asthma. Physical activity can be the <b>only</b> trigger for asthma symptoms and is known as <i>Exercise Induced Asthma (EIA)</i> or <i>Exercise Induced Bronchospasm (EIB)</i>.</p>  | <p>Symptoms or EIA can be caused by any physical exertion, but increased symptoms are more likely to occur during extreme temperatures (hot and humid or cold and dry) and/or when the person is recovering from a respiratory tract infection. Some people may experience more symptoms on poor air quality days.</p>   | <ul style="list-style-type: none"> <li>• Warm-up activity before and after physical activity.</li> <li>• Prophylactic use of bronchodilator medication 10-30 minutes prior to activity, as appropriate.</li> <li>• Elite level athletes should be referred to a specialist.</li> </ul>   |
| <p><b>Indoor Air Quality</b> (Irritant)<br/><b>Nitrogen Oxides (NO&amp;NO<sub>2</sub>)</b> of fuel-burning appliances.</p> <p><b>Carbon Monoxide (CO)</b> is gas that forms from burning fuel propane, natural gas, gasoline, oil, coal and wood.</p>   | <p>Nitrogen oxides are given off by gas stoves, gas or oil furnaces.</p> <p>CO is given off by furnaces, fireplaces, gas stoves, grills, space heaters, water heaters and engine exhaust (auto mechanic shop).</p>   | <ul style="list-style-type: none"> <li>• Promote adequate ventilation and air circulation.</li> <li>• Ensure qualified installation and maintenance of appliances and heating systems.</li> <li>• Install CO detector/alarm.</li> <li>• Never operate gas-powered engines in confined areas.</li> <li>• Promote adequate ventilation and air circulation.</li> <li>• Ensure qualified installation and maintenance of appliances and heating systems.</li> </ul>   |

| INDOOR TRIGGERS  | WHERE THEY ARE FOUND  | AVOIDANCE/MANAGEMENT STRATEGIES  |
|--|---|--|
| <p><b>Mould Spores</b> (Allergen)<br/>Tiny airborne structures produced by moulds for reproduction purposes.</p>                | <p>Spores are found in portable classrooms, showers, washrooms, window sills, kitchens areas, garbage containers, carpets, upholstered furniture and near plumbing.</p> | <ul style="list-style-type: none"> <li>• Maintain relative humidity level &lt;50%.</li> <li>• Collaborate to move students or staff from portable classrooms.</li> <li>• Promote air circulation with use of vents and fans.</li> <li>• Clean shower areas daily.</li> <li>• Clean mouldy surfaces with a water and bleach-based product.</li> <li>• Wear mask and gloves to limit exposure when cleaning.</li> <li>• Remove carpet from humid areas.</li> <li>• Discard any mouldy items.</li> <li>• Repair any leaks and moisture problems promptly.</li> <li>• Consult professional service for removal.</li> </ul> <p><b>Note: There is no practical way to eliminate all moulds indoors. The best way to control indoor mould growth is to control moisture. Prevention is key.</b></p> |
| <p><b>Pollen</b> (Allergen)<br/>Tiny invisible particles given off by trees, grass, flowers and certain weeds such as ragweed. Pollens are usually at their peak in early spring until the first fall frost.</p> | <p>Pollens are found outdoors, but are easily wafted or carried indoors on clothing. There will be more of them where trees, grasses, flowers and/or weeds grow.</p>    | <ul style="list-style-type: none"> <li>• Close windows to prevent pollens from wafting into the school.</li> <li>• Use air conditioning to clean, cool and dry the air.</li> </ul>   |
| <p><b>Rodents</b> (Allergens)</p>  | <p>The allergen is found in the feces, dander and saliva of rodent animals (mice, rats, squirrels, gophers, hamsters, gerbils, guinea pigs, chinchillas).</p>           | <ul style="list-style-type: none"> <li>• Remove animal from the classroom.</li> <li>• Wash hands with soap and water after handling the animal.</li> <li>• Seek expert service and advice to remove animals and clean up any areas infested by unwanted rodents.</li> <li>• Schedule any clean-up or removal on weekends or holidays.</li> </ul> <p><b>Note: It can take many months before the allergen level decreases after the pet or pest has been removed from the environment.</b></p>  |

| INDOOR TRIGGERS   | WHERE THEY ARE FOUND  | AVOIDANCE/MANAGEMENT STRATEGIES  |
|---|---|--|
| <p><b>Strong Scents</b> (Irritant)</p> <p>Scented products can contain several chemicals that constantly turn into vapour in the air and attach themselves to hair, clothing and other soft surfaces.</p>   | <p>Irritating scents can come from air fresheners, candles, shampoos, soaps, perfume, cologne, fabric softener, personal care products, cleaning products, building materials, paints and smoky-smelling fabrics.</p>   | <ul style="list-style-type: none"> <li>• Discourage use of strongly scented products.</li> <li>• Advocate for the use of less volatile cleaning products.</li> </ul>   |
| <p><b>Viral Infections</b> (Irritant)</p> <p>Rhinoviruses (common cold)<br/>Respiratory Syncytial Virus (RSV)<br/>Parainfluenza<br/>Influenza<br/>Adenovirus<br/>Conovirus</p>  | <p>Viruses thrive in most environments and are difficult to completely avoid. They enter the body through the nose, mouth or breaks in the skin.</p> <p>Rhinoviruses can survive on surfaces (telephones, railings, keyboards) for three hours, including skin (hands).</p>   | <ul style="list-style-type: none"> <li>• Wash hands frequently. (Always after bathroom use, before food handling, before eating and before touching nose or mouth.)</li> <li>• Use alcohol-based, waterless cleansers for cleaning your hands when they are not visibly soiled and/or soap and water are not available. (Recommendation: Centre for Disease Control)</li> <li>• Arrange for children or personnel to stay home when sick.</li> <li>• Discuss vaccination with health care provider.</li> <li>• Do not share food, drink glasses or eating utensils.</li> </ul> <p><b>Note: Hand washing is the most effective way to prevent the spread of viruses.</b></p>  |
| <p><b>Volatile Organic Compounds</b> (VOC) (Irritant)</p> <p>Volatile organic compounds (VOC) are carbon-containing gases and vapours that participate in atmospheric photochemical reactions, such as gasoline fumes and solvents.</p>  | <p>VOCs are found in solvents, inks, adhesives, glues, waxes, varnishes, lacquers, powdered pigments, acid clays, plaster, paper, paints, firing kilns, spilled liquids, paint strippers, cleaning supplies, pesticides, building materials (formaldehyde), furnishings, office equipment (copiers, printers) correction fluids, carbonless copy paper, permanent markers and photographic solutions.</p> | <ul style="list-style-type: none"> <li>• Substitute safer products as often as possible.</li> <li>• Store and use potentially toxic school supplies as directed on labels.</li> <li>• Remove opened containers of paint and other products to a storage area away from students and staff.</li> <li>• Comply with WHMIS legislation.</li> <li>• Utilize integrated pest management techniques to reduce the need for pesticides.</li> <li>• Use the least toxic compounds (labelled low VOC or zero VOC).</li> </ul> <p><b>Note: Schedule potential asthma-triggering activities (maintenance, intensive clean-up, repairs and renovations) on weekends or holidays. Notify parents and employees of potential asthma triggering activities in advance to reduce accidental exposures.</b></p> |

## Work-Related Asthma

Work-Related Asthma (WRA) is the most common *chronic* work-related respiratory disease in Canada and is responsible for an estimated ten to fifteen per cent of new onset adult asthma. Work-related asthma is defined as: asthma caused by exposure to an agent found in the workplace according to the Canadian Thoracic Society Guidelines. WRA can be classified into two categories:

- true “occupational asthma” which is a term reserved for asthma caused by an exposure in the workplace.
- “work exacerbated” asthma which is a term used to describe pre-existing asthma worsened by workplace exposure.

Identifying and diagnosing WRA can be a challenging experience for health care providers. *It is important to identify if asthma symptoms are worse during working weeks than during periods off work such as holidays. If so, then a physician assessment is needed to start investigations for possible work-related asthma.* In this section, *Work-Related Asthma*, we have organized the information in a simple format. There is no way to avoid long lists of agents that most of us cannot pronounce or begin to understand, but we think you will find it easy to use this guide by first identifying the occupation and/or industry where your patient works. From there the lists are narrowed down to include the most common triggers in that workplace environment. You and your patient can do some initial work to see if any of the listed agents are known to be present in his or her workplace.

Once WRA is suspected, there are many tools and programs in the workplace and community to assist you. Workplace Hazardous Materials Information System (WHMIS) is a legislated program that requires labelling of containers of controlled products and the provision of a safety data sheet (SDS) with each product. Patients should be encouraged to refer to the SDS information to assist in the identification of potential triggers. *The most important management recommendation is to have an early and thorough medical assessment to confirm or exclude a diagnosis of work-related asthma if this is suspected. This almost always involves a referral to a specialist in work-related asthma.* Early identification of occupational sensitizers and the removal of sensitized patients from any further exposure are also important aspects to the management of work-related asthma. Your patient can facilitate the process of identification and diagnosis by providing as much information as possible.

## AVOIDANCE/MANAGEMENT STRATEGIES

In this section, general guidelines are provided to facilitate prevention or limit exposure to an asthma-causing agent and to give guidance to control the level of exposure.

In work-related asthma, there are four strategies that apply in all situations:

- **Identify** asthma-causing agents in the workplace.
- **Eliminate** asthma-causing agents in the workplace.
- **Substitute** a safer agent in the workplace if the asthma-causing agent cannot be eliminated.
- **Control** using engineering, administrative controls and respiratory personal protective devices (PPD).

You and your patient can collaborate with personnel in the workplace to:

- Request workplace reassignment.
- Improve ventilation with installation of an exhaust ventilation system to capture emissions and vent away from work area or enclose the industrial process.
- Use respiratory PPD (Will not completely prevent WRA and requires worker adherence as well as professional guidance to assure correct device selection and user training.)
- Use of industrial hygiene techniques as appropriate for the agent.
- Schedule regular preventative maintenance of equipment to avoid spills and other accidents.
- Seek assistance from an occupational clinic such as Occupational Health Clinics for Ontario Workers (OHCOW), or a respiratory physician. (Check other province-specific resources.)
- Monitor ongoing exposure levels, compare industry standards and develop exposure profiles. Consultants of Health and Safety Associations including Workplace Safety and Prevention Services ([www.wsps.ca](http://www.wsps.ca)), Infrastructure Health and Safety Association ([www.ihsa.ca](http://www.ihsa.ca)), Public Services Health and Safety Association ([www.pshsa.ca](http://www.pshsa.ca)) and Workplace Safety North ([www.workplacesafetynorth.ca](http://www.workplacesafetynorth.ca)) can assist with a monitoring process
- Seek medical assessment and maintain medical surveillance and follow-up (pulmonary function testing, health evaluation) for the worker.

| OCCUPATION/INDUSTRY   | AGENTS  |
|---|---|
| <p><b>Aircraft Manufacturing Industry</b></p>   | <ul style="list-style-type: none"> <li>• Cobalt, vanadium, chromium, platinum, nickel, metal-working fluids</li> <li>• Amines: triethanolamine (TEA), diethanolamine (DEA), triethylene tetramine (TETA)</li> </ul>   |
| <p><b>Adhesive Industry</b></p>  | <ul style="list-style-type: none"> <li>• Aliphatic amines, ethanolamine, polycyclic compounds</li> <li>• Colophony-fluxes (rosin), abiatic acid</li> <li>• Diisocyanates: (TDI-toluene diisocyanate, HDI-hexamethylene diisocyanate, MDI-methylene diphenyl diisocyanate, NDI-naphthalene diisocyanate, IPDI-isophorone diisocyanate, BIC-1,3-bis cyclohexane pre-polymer)</li> <li>• Acrylates: methyl methacrylate, cyanoacrylate, alkylcyanoacrylate, diacrylate</li> <li>• Pyrolysis aldehydes</li> <li>• Acid anhydrides: maleic anhydride, phthalic anhydride, trimethyl anhydride, TCPA (tetrachlorophthalic anhydride), HHPA (hexahydrophthalic anhydride), himic anhydride, pyromellitic anhydride</li> <li>• Styrene</li> </ul> |
| <p><b>Animal Breeder</b></p>  | <ul style="list-style-type: none"> <li>• Birds, cow (bovine) dander, cat, crab, deer, dog, fish-based glues, goats, guinea pig, hamster, horses, mink, mouse, rabbit, rat, rodents, sheep</li> </ul>  |
| <p><b>Animal Foodstuffs Industry</b></p>  | <ul style="list-style-type: none"> <li>• Aquatic/microscopic organisms: crab allergens, arctic snow crab, lobster, clam, shrimp meal, powdered marine sponge, cuttlefish bone dust, red soft coral, prawns, mussels, fish, fishmeal products, sea squirts</li> </ul>  |

| OCCUPATION/INDUSTRY   | AGENTS   |
|---|--|
| <h3>Automotive Industry</h3>  | <ul style="list-style-type: none"> <li>• Cobalt, vanadium, chromium, platinum, nickel, metal working fluids</li> <li>• Diisocyanates: (TDI-toluene diisocyanate, HDI-hexamethylene diisocyanate, MDI-methylene diphenyl diisocyanate, NDI-naphthalene diisocyanate, IPDI-isophorone diisocyanate, BIC-1,3-bis cyclohexane pre-polymer)</li> <li>• Amines: triethanolamine (TEA), diethanolamine (DEA), dimethylethanolamine</li> <li>• Tetrachlorophthalic anhydride</li> <li>• Acrylates: methyl methacrylate, cyanoacrylate, diacrylate</li> <li>• Polyurethanes</li> <li>• Polyvinyl chloride (PVC)</li> </ul>  |
| <h3>Baker/Bakeries</h3>  | <ul style="list-style-type: none"> <li>• Flour and grains (wheat, rye, barley, rice, maize, soy, buckwheat, lupin seed, pea)</li> <li>• Spices (paprika, coriander, mace-shell of nutmeg, Myristica fragrans, garlic dust, sesame seed)</li> <li>• Nuts</li> <li>• Eggs, egg powder, ovalbumine, vitellus, yolk</li> <li>• Lactalbumin (found in milk), milk powder</li> <li>• Colour (camine red), gluten</li> <li>• Lathyrus sativus (grass pea), soybean lecithin</li> <li>• Yeast (<i>Saccharomyces cerevisiae</i>)</li> <li>• Enzymes (alpha amylase, cellulose, xylanase, papain, proteases, glucose oxidase glucoamylase, fungal amylase, hemicellulase, amyloglucosidase)</li> <li>• Moulds: <i>alternaria</i>, <i>aspergillus</i></li> <li>• Insects: flour beetle, flour moth, cockroach, granary weevil</li> <li>• Flour handler: konjac flour, white pea flour (<i>Lathyrus sativus</i>), mites, parasites</li> <li>• Crustacea</li> </ul> |
| <h3>Breeder</h3>  | <ul style="list-style-type: none"> <li>• Pigeon, dove, cockatiel, parakeet, duck, turkey (feathers and droppings)</li> </ul>   |
| <h3>Brewing Trade</h3>  | <ul style="list-style-type: none"> <li>• <i>Aspergillus</i> (mould), chloramine (sterilizing agent)</li> </ul>   |
| <h3>Carpenter/Woodworker<br/>Furniture Making</h3>  | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Diisocyanates (toluene diisocyanate)</li> <li>• Ethylene diamine (shellac/lacquer)</li> <li>• Hexamethylene tetramine (lacquer)</li> <li>• 3-carene dust</li> <li>• Insects: <i>Chrysonilla sitophila</i>, grass pea (<i>Lathyrus sativus</i>)</li> <li>• Wood: abiruana, acacia, african maple, african zebrawood, antiaris, ash, australian blackwood, beech, box tree, brazilian walnut, cabreuva, california redwood, cedar of lebanon, cocabolla, coniferes, ebony, gaboon/okoume, imbuia, iroko, kotibe, mahogany, makoré, mansonia, maple, mukali, neurospora, oak, obeche (<i>Triplochiton scleroxylon</i>), okoumé (marine plywood), pau, perbora, samba, sequoia, spruce, teak, western red cedar, eastern white cedar</li> </ul>   |
| <h3>Carpet Manufacturing</h3>   | <ul style="list-style-type: none"> <li>• Guar gum</li> <li>• Tributyl tin oxide (fungicide)</li> <li>• Trimethylhexanediamine, isophorondiamine (coating)</li> </ul>   |
| <h3>Cellarman</h3>  | <ul style="list-style-type: none"> <li>• Sulphites</li> </ul>  |

| OCCUPATION/INDUSTRY                  | AGENTS   |
|--------------------------------------|--|
| Cheese Finer/Maker/<br>Washer        | <ul style="list-style-type: none"> <li>• Mites: <i>Acarus siro</i> (flour mites), <i>Blonia kulagini</i>, house dust mites</li> <li>• <i>Penicillium casei</i></li> <li>• Enzymes: pepsin, lysozyme</li> <li>• Enzymes in rennet production: proteases, pepsine, chymosines</li> </ul>   |
| Chemical Industry                    | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Ethanolamine</li> <li>• Diisocyanates: (TDI-toluene diisocyanate, HDI-hexamethylene diisocyanate, MDI-methylene diphenyl diisocyanate, NDI-naphthalene diisocyanate, IPDI-isophorone diisocyanate, BIC-1,3-bis cyclohexane pre-polymer)</li> <li>• Piperazine</li> <li>• Aliphatic polyamine</li> <li>• Acrylates: methyl methacrylate, cyanoacrylate</li> <li>• 1,2-benzisotiazoline-3, lasamide</li> <li>• Chloramine</li> <li>• Methylchloro-isothiazolinone</li> <li>• Captafol (fungicides)</li> <li>• Chloramine T, chlorine, acid/alkaline gas, vapours, aerosols.</li> <li>• Sulphites</li> </ul> |
| Chemist/Chemical<br>Laboratory Staff | <ul style="list-style-type: none"> <li>• Diazomethane (TDI, MDI, HDI)</li> <li>• Enzymes: papain</li> <li>• Amines, aliphatic amines, polycyclic compounds</li> <li>• Piperazine</li> <li>• 1,2-benzisotiazoline-3, 3-tetramethyluronium, hexafluorophosphate (TBTU)</li> </ul>  |
| Coffee Industry                      | <ul style="list-style-type: none"> <li>• Green and roasted coffee, coffee leaves, <i>Hemileia vastatrix</i> (mould)</li> </ul>   |
| Construction/Restoration             | <ul style="list-style-type: none"> <li>• Isocyanates/diisocyanates</li> <li>• Metalworking fluids/ metal fumes</li> <li>• Fungi, moulds and their toxins</li> <li>• Mineral Fibers</li> <li>• PVC dust and fume</li> <li>• Wood dusts</li> <li>• Methyl methacrylate</li> <li>• Chromium</li> <li>• Anhydrides</li> <li>• Colophony/Rosin</li> </ul>   |
| Cook/Chef                            | <ul style="list-style-type: none"> <li>• Spices: coriander, fennel, fenugreek</li> <li>• Maiko (Japanese cooking)</li> <li>• Carrot (<i>Daucus carota</i> L)</li> <li>• Green bean (<i>Phaseolus multiflorus</i>)</li> <li>• Mushroom (<i>Boletus edulis</i>)</li> <li>• Eggs, valbumine, vitellus, yolk</li> <li>• Crustacea</li> </ul>   |
| Cosmetic Industry                    | <ul style="list-style-type: none"> <li>• Enzyme: papain</li> <li>• Formaldehyde</li> <li>• Ethanolamine, aliphatic amines, polycyclic compounds</li> <li>• Cosmetician: chamomile</li> </ul>   |

| OCCUPATION/INDUSTRY                          | AGENTS  |
|--|---|
| Dentist/Dental Assistant<br>Dental Hygienist | <ul style="list-style-type: none"> <li>• Acrylates</li> <li>• Gutta-percha</li> <li>• Palladium salts</li> <li>• Latex</li> </ul>   |
| Detergent Manufacturer                       | <ul style="list-style-type: none"> <li>• Enzymes: amylase, cellulose, Esperase, Subtilisins, lipase, Bacillus subtilis</li> </ul>   |
| Diamond Worker                               | <ul style="list-style-type: none"> <li>• Cobalt, nickel, tungsten</li> </ul>  |
| Dyeing Industry                              | <ul style="list-style-type: none"> <li>• Reactive dyes</li> <li>• Diisocyanates</li> <li>• Acid anhydrides</li> <li>• Sulphites</li> </ul>  |
| Educator, teacher, professor                 | <ul style="list-style-type: none"> <li>• refer to the previous section called Asthma Triggers in Schools.</li> </ul>  |
| Electronics/Electronic<br>Component Industry | <ul style="list-style-type: none"> <li>• Colophony-fluxes (rosin), rosin core solder</li> <li>• Nickel, nickel salts</li> <li>• Acid anhydrides</li> <li>• Aliphatic amines, polycyclic compounds</li> <li>• Palladium salts</li> </ul>   |
| Electrical Industry                          | <ul style="list-style-type: none"> <li>• Colophony-fluxes (rosin)</li> <li>• Acid anhydrides: hexahydrophthalic anhydride(HHPA), methyl tetrahydrophthalic anhydride (MTHPA)</li> <li>• Polyethylene</li> </ul>   |
| Electroplating Industry                      | <ul style="list-style-type: none"> <li>• Chromium, nickel, nickel salts, potassium dichromate</li> </ul>  |
| Entomologist                                 | <ul style="list-style-type: none"> <li>• Gypsy moth, butterfly, lesser mealworm</li> </ul>  |
| Epoxy Resin Industry                         | <ul style="list-style-type: none"> <li>• Urea formaldehyde</li> <li>• 4-Methylmorpholine</li> <li>• Acid anhydrides: maleic anhydride, phthalic anhydride, trimethyl anhydride, TCPA (tetrachlorophthalic anhydride), HHPA (hexahydrophthalic anhydride), himic anhydride, pyromellitic anhydride</li> <li>• Acrylates: methacrylates, methyl 2-cyanoacrylate</li> <li>• Styrene</li> </ul> |
| Factory Worker (general)                     | <ul style="list-style-type: none"> <li>• Plexiglass (dust), palladium</li> </ul>  |
| Fertilizer Maker                             | <ul style="list-style-type: none"> <li>• Chlorine, acid/alkaline gas, vapours, aerosols</li> </ul>  |

| OCCUPATION/INDUSTRY  | AGENTS  |
|--|---|
| <p><b>Fishing Industry</b></p>  | <ul style="list-style-type: none"> <li>• Aquatic/microscopic organisms: crab allergens, arctic snow crab, lobster, clam, shrimp meal, powdered marine sponge, cuttlefish bone dust, red soft coral, prawns, mussels, fish, fishmeal products, sea squirts (hoya), nacre (mother of pearl)</li> <li>• Insects: anisakis simplex, beetles (tenebrio monitor, alphitobius, diaperinus domestica), ech inodorus plamosus (larvae), chironomid midges, green bottle, moths, butterflies (galleria mellonella), caddis fly, mealworm, larvae, insect larvae (galleria mellonella), mealworm larvae (tenibrio molitor), herring worm (anisakis simplex)</li> <li>• Fish store: daphnia (water flea)(fish food store), chironimid midges (fish food), echinodorus larva (fish food)</li> </ul>  |
| <p><b>Flame Retardant / Fire</b></p>   | <ul style="list-style-type: none"> <li>• Himic anhydride</li> </ul>   |
| <p><b>Flight Crew</b></p>  | <ul style="list-style-type: none"> <li>• Screw worm fly (Cochliomyia homnivorax)</li> </ul>   |
| <p><b>Florist</b></p>  | <ul style="list-style-type: none"> <li>• Latex (balloons)</li> <li>• Leafy plants (Bells of Ireland, ficus, albilfloxia)</li> <li>• Flowers (baby's breath, carnation, chrysanthemum, limonium (statice), marianne thistle, mimosa, cyclamen, roses, rose oil, safflower, spathe, yarrow)</li> <li>• Mites</li> <li>• Entada gigas (cacoon seed used for decorating), decorative flowers</li> </ul>   |
| <p><b>Foam Producer/Installer</b></p>  | <ul style="list-style-type: none"> <li>• Diisocyanates: TDI (toluene diisocyanate), HDI (hexamethylene diisocyanate), MDI (methylene diphenyl diisocyanate), NDI (naphthalene diisocyanate), IPDI (isophorone diisocyanate), BIC (1,3-bis cyclohexane pre-polymer)</li> <li>• Aliphatic amines: 4-methylmorpholine, N,N dimethylethanolamine</li> </ul>   |
| <p><b>Food Industry</b></p>   | <ul style="list-style-type: none"> <li>• Aquatic/microscopic organisms: crab allergens, arctic snow crab, lobster, clam, shrimp meal, powdered marine sponge, cuttlefish bone dust, red soft coral, prawns, mussels, fish, fishmeal products, sea squirts</li> <li>• Enzymes: bromelain, papain, trypsin, fungal pectinase &amp; glucanase (food processing)</li> <li>• Plants: maiko (Japanese cooking), aniseed, fenugreek</li> <li>• Shark cartilage</li> <li>• Pectin (christmas candy maker), carob bean (jam factory), acacia gum</li> <li>• Raspberry (freeze-dried)</li> <li>• Carmine (food dye)</li> <li>• Artichoke, asparagus, cacao, cabbage, chicory, courgette (zucchini)</li> <li>• Egg, valbumine, vitellus, yolk</li> <li>• Dairy: lactoalbumin (milk protein), lactoserum</li> <li>• Spices: coriander, fennel, fenugreek, nutmeg, paprika, sesame, saffron, onion seed, garlic dust, aromatic spices</li> <li>• Flour: mites and parasites</li> <li>• Antibiotics: betalactoglobuline, sulfamide</li> <li>• Sulphites</li> <li>• Pancreatin from pig</li> </ul> |

| OCCUPATION/INDUSTRY   | AGENTS  |
|---|---|
| Food Packaging/Packer   | <ul style="list-style-type: none"> <li>• Acid anhydrides</li> <li>• Garlic dust</li> <li>• Polyvinylchloride (heated)</li> <li>• Fungal lactase (enzyme)</li> </ul>   |
| Foundry Worker  | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Furfural</li> <li>• Diisocyanates (diphenylmethane)</li> <li>• Aluminum, fluorides, nickel, chromium, iron oxides</li> <li>• Fumes and gases from molten metals and bonding resins</li> </ul>  |
| Furrier   | <ul style="list-style-type: none"> <li>• Paraphenylene diamine, methylmorpholine (dyeing process)</li> </ul>  |
| Gardener  | <ul style="list-style-type: none"> <li>• Grass, copperleaf (<i>acalypha wikesiana</i>)</li> </ul>   |
| Grain Handler   | Refer to agriculture  |
| Greenhouse Worker   | Refer to agriculture  |
| Groomer   | <ul style="list-style-type: none"> <li>• Secretions from saliva, feces, urine and skin/dander of cats (most common), dogs, horses, and other furry animals</li> </ul>   |
| Hair, Nail and Beauty Salons  | <ul style="list-style-type: none"> <li>• Persulfate salts</li> <li>• Henna (found in hair bleaches and hair-colouring preparations)</li> <li>• Sericin (hair lacquer spray)</li> <li>• Formaldehyde</li> <li>• Monoethanolamine</li> <li>• Karaya</li> </ul>  |
| <p data-bbox="142 1461 488 1497">Health Care Provider</p>  | <ul style="list-style-type: none"> <li>• Ispaghula/psyllium (bulk laxative), Sulfathiazole</li> <li>• Sevoflurane, isoflurane</li> <li>• Aerosolized medications: pentamidine, ribavirin</li> <li>• Latex</li> <li>• Adhesives: methacrylate, cyanoacrylates</li> <li>• Sterilizing agents: formaldehyde, gluteraldehyde, ortho-phthalaldehyde (endoscopy), ethylene oxide</li> <li>• Proteolytic enzymes, subtilisins (enzymatic cleaner)</li> <li>• Disinfectants: amine compounds (amino alcohols and aliphatic polyamines), pine products (colophony, tall oil), tributyltin oxide (fungicide and disinfectant), cleaning products that contain chlorine bleach with ammonia, acetic acid, ammonium compounds (benzalkonium chloride), chlorhexidine, hexachlorophene, chloramine</li> <li>• Sulfur dioxide (SO<sub>2</sub>), isononanoyl oxybenzene sulfonate (laboratory), proteases, amylase, ninhydrin</li> <li>• Moulds and dust</li> <li>• Nurses: who crush tablets, mix powders or prepare lyophilized solutions</li> </ul> |

| OCCUPATION/INDUSTRY                   | AGENTS  |
|---------------------------------------|---|
| Herbalist/Horticulturist              | <ul style="list-style-type: none"> <li>• Please refer to pharmacist section</li> <li>• Chukung (Cnidii rhizoma), banha (Pinellia ternata) and sanyak (Dioscorea radix), chamomile tea dust (Matricaria chamomilla)</li> </ul>   |
| Jeweler                               | <ul style="list-style-type: none"> <li>• Palladium salts, platinum</li> </ul>   |
| Laboratory Staff/<br>Laboratory       | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Insects: locust, cricket, fruit fly, grasshopper, cockroach, sheep blowfly</li> <li>• Enzymes: amylase, bromelain, papain, fungal xylanase, bovine serum albumin</li> <li>• Dander: rat, mouse, guinea pig, rabbit, gerbil, hamster, cat, dog, monkey</li> <li>• Urine: lab animals</li> <li>• Ninhydrin (detergent ingredient)</li> <li>• Mould: aspergillus niger</li> </ul> |
| Lifeguards<br>(Indoor swimming pools) | <ul style="list-style-type: none"> <li>• Chloramines, nitrogen chloride</li> </ul>  |
| Logging                               | <ul style="list-style-type: none"> <li>• Mould: chrysonilia sitophila</li> </ul>  |
| Machinist                             | <ul style="list-style-type: none"> <li>• Cobalt, vanadium, chromium, platinum, nickel, metal-working fluids</li> <li>• Amines: triethanolamine (TEA), diethanolamine (DEA)</li> </ul>   |
| Manicurist                            | <ul style="list-style-type: none"> <li>• Ethyl methacrylate</li> </ul>  |
| Mechanic                              | <ul style="list-style-type: none"> <li>• Diisocyanates</li> <li>• Chlorendic anhydride</li> <li>• Cobalt, vanadium, chromium, platinum, nickel</li> </ul>   |
| Metallurgist                          | <ul style="list-style-type: none"> <li>• Nickel, nickel salts</li> <li>• Aluminum</li> <li>• Furfural</li> <li>• Diisocyanates</li> <li>• Amines: aliphatic amines, polycyclic compounds</li> <li>• Chromic acid</li> <li>• Palladium salts</li> </ul>  |
| Metal Workers/<br>Fabricating         | <ul style="list-style-type: none"> <li>• Cobalt, vanadium, chromium and compounds, platinum, nickel, metal-working fluids (MWF),</li> <li>• Amines: triethanolamine (TEA), diethanolamine (DEA), tungsten chloride,</li> <li>• Plastic chemical (epoxy resins, polyamines, carboxylic anhydride derivatives)</li> <li>• EPO 60 (mould making)</li> <li>• Chrome plater: chromic acid, chromium oxide</li> </ul>                                 |

| OCCUPATION/INDUSTRY               | AGENTS  |
|-----------------------------------|---|
| Miller                            | <ul style="list-style-type: none"> <li>• Flour and grains (wheat, rye, barley, rice, maize, soy, buckwheat)</li> <li>• Enzymes (alpha amylase, cellulose, xylanase, papain, proteases, glucose oxidase glucoamylase, fungal amylase)</li> <li>• Insects: Beetles, moths, butterflies, grain weevil, book louse, lesser mealworm, grain mite</li> </ul>  |
| Miner/Mining                      | <ul style="list-style-type: none"> <li>• Nickel, nickel salts</li> <li>• Mould: rhizopus nigricans</li> </ul>   |
| Mortician                         | <ul style="list-style-type: none"> <li>• Formaldehyde</li> </ul>  |
| Mould Makers                      | <ul style="list-style-type: none"> <li>• Metal dust and fumes</li> <li>• Diisocyanates: TDI (toluene diisocyanate), HDI (hexamethylene diisocyanate), MDI (methylene diphenyl diisocyanate), NDI (naphthalene diisocyanate), IPDI (isophorone diisocyanate), BIC (1,3-bis cyclohexane pre-polymer)</li> </ul>   |
| Museum Curator                    | <ul style="list-style-type: none"> <li>• Beetles (coleopera)</li> </ul>   |
| Oil Industry                      | <ul style="list-style-type: none"> <li>• Castor bean, olive oil cake, flax, rapeseed oil</li> </ul>   |
| Painter (Spray)<br>Paint Industry | <ul style="list-style-type: none"> <li>• Latex</li> <li>• Diisocyanates (TDI, MDI, HDI, PPI, hexamethylene, isophorone)</li> <li>• Amines: ethylene diamine (shellac), hexamethylene tetramine (lacquer), dimethylethanolamine, ethanolamine, triethylene tetramine</li> <li>• Chromium, chromic acid</li> <li>• Acrylate</li> </ul>  |
| Paper Industry/Pulping Industry   | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Chlorine, acid/alkaline gas, vapours, aerosols</li> <li>• Sulphites</li> </ul>   |
| Pet Shop Employee                 | <ul style="list-style-type: none"> <li>• Birds, cat, crab, deer, dog, fish-based glues, guinea pig, hamster, mink, mouse, rabbit, rat, rodents, shellfish</li> </ul>  |
| Petrochemical Industry            | <ul style="list-style-type: none"> <li>• Nickel, nickel salt</li> <li>• Amines</li> </ul>   |
| Pharmaceutical Industry           | <ul style="list-style-type: none"> <li>• Ispaghula/psyllium (bulk laxative)</li> <li>• Antibiotics: tylosin (used in animal health and growth agent), spiramycine, erythromycine, oleandomycine, amoxicillin, piperacillin sodium, cephalosporins, penicillins, ciprofloxacin, chloroquine, thiamine, cimetidine, ampicilline (phenylglycine), isoniazid, tetracyclines, thiamphenicol</li> <li>• Opiate compounds (codeine, morphine)</li> <li>• Anti-hypertensives: hydralazine, methyl dopa, aescin</li> </ul> |

| OCCUPATION/INDUSTRY  | AGENTS   |
|--|--|
|                             | <ul style="list-style-type: none"> <li>• Glycine (manufacturing of salbutamol)</li> <li>• Pancreatic extracts, endocrine glands</li> <li>• Sulphonechloramides</li> <li>• Chloramine-T, phosdrin sulphathiazole</li> <li>• Enzymes: bromelin, papain, flaviastase, egg lysosyme, pepsin, trypsin, pancreatin, chymotrypsin, serratial, lysozyme chloride, peptidase</li> <li>• Piperazine</li> <li>• Rose hip (plant), Brazil ginseng, Korean ginseng (sanyak), voacanga africana (small tropical African tree used to produce drugs)</li> <li>• Acid anhydrides: phthalic anhydride (PA)</li> <li>• Aliphatic amines, polycyclic compounds, ethanolamine</li> <li>• Diisocyanates</li> <li>• Sulphites</li> <li>• Lactase</li> <li>• Henna</li> <li>• Alage chorella (algae)</li> </ul> |
| <p>Photographer/<br/>Photographic Processor</p>  | <ul style="list-style-type: none"> <li>• Aliphatic amines, polycyclic compounds, ethanolamine, ethylene diamine</li> <li>• Pyrazolon</li> <li>• Chromic acid, chromium oxide</li> </ul>  |
| <p>Plastics Industry</p>  | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Diisocyanates, (diphenylmethane, toluene diisocyanate)</li> <li>• Acid anhydrides, phthalate anhydride(PA), tetrachlorophthalic anhydride (TPCA), trimellitic anhydride (TMA), maleic anhydride, trimethyl anhydride, hexahydrophthalic anhydride (HHPA), himic anhydride, pyromellitic anhydride</li> <li>• Ethanolamine, aliphatic amines, polycyclic compounds</li> <li>• Styrene</li> <li>• Azodicarbonamide, diazonium, tetrafluoroborate</li> <li>• Polypropylene</li> <li>• Enzyme: trypsin</li> <li>• Acrylates and methacrylates: methyl 2-cyanoacrylate</li> </ul>  |
| <p>Plastic Bottles/<br/>Bottling Industry</p>  | <ul style="list-style-type: none"> <li>• Ground bugs (Lygaeidae)</li> <li>• Polyvinyl chloride (dust)</li> <li>• Diethyl phtalate</li> </ul>   |
| <p>Platinum Refinery</p>   | <ul style="list-style-type: none"> <li>• Platinum, ammonium hexachloroplatinate, chloroplatinum, potassium hexachloroplatinate</li> </ul>  |
| <p>Plywood Factory Worker</p>  | <p>Neurospora</p>  |
| <p>Pottery / Stain Glass</p>   | <p>Cobalt</p>  |

| TRIGGER  | AGENTS  |
|--|---|
| Printing Industry  | <ul style="list-style-type: none"> <li>• Acacia gum, diazonium, chromium and compounds</li> </ul>   |
| Potroom  | <ul style="list-style-type: none"> <li>• Aluminum</li> </ul>  |
| Roofer   | <ul style="list-style-type: none"> <li>• Chromium</li> </ul>  |
| Rubber Industry  | <ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Aliphatic amines, polycyclic compounds, ethanolamine</li> <li>• Azodicarbonamide, diazonium, tetrafluoroborate</li> <li>• Diisocyanates: methylene diphenyl diisocyanate, naphthalene diisocyanate</li> <li>• Latex</li> </ul>   |
| Sawmill Employee   | <ul style="list-style-type: none"> <li>• Wood: abiruana, acacia, african maple, african zebrawood, antiaris, ash, australian blackwood, beech, box tree, brazilian walnut, cabreuva, california redwood, cedar of lebanon, cocabolla, coniferes, ebony, gaboon/okoume, imbuia, iroko, kotibe, mahogany, makoré, mansonia, maple, mukali, neurospora, oak, obeche, okoumé (marine plywood), pau, perbora, samba, sequoia, spruce, teak, western red cedar, eastern white cedar</li> <li>• Mould: Trichoderma koningii</li> </ul>   |
| Service Personnel /<br>Janitor  | <ul style="list-style-type: none"> <li>• Chloramines, benzalkonium chloride,</li> <li>• Quaternary amine</li> <li>• Dictyostelium discoideum (slime mould)</li> <li>• Lauryl dimethyl benzyl ammonium chloride (floor cleaner)</li> <li>• Toluene diisocyanate (floor varnisher)</li> <li>• Bis(tri-n-butyltin)oxide (carpet deodoriser)</li> <li>• Amine compounds: amino alcohols and aliphatic polyamines</li> <li>• Pine products (colophony, tall oil)</li> <li>• Tributyltin oxide (fungicide and disinfectant)</li> <li>• Mixing cleaning products that contain chlorine bleach with ammonia</li> <li>• Acetic acid</li> </ul> |
| Sewage Worker  | <ul style="list-style-type: none"> <li>• Sewage filter fly</li> </ul>   |
| Ski Manufacturer   | <ul style="list-style-type: none"> <li>• N,N-Dimethyl-1,3-propanediamine</li> </ul>   |
| Smelter  | <ul style="list-style-type: none"> <li>• Aluminum, nickel, nickel salts</li> </ul>  |
| Solderers  | <ul style="list-style-type: none"> <li>• Aluminum fumes, zinc chloride fumes</li> <li>• Colophony-fluxes (rosin)</li> <li>• Ethanolamine, aminoethylethanolamine</li> </ul>   |
| Steel Industry   | <ul style="list-style-type: none"> <li>• Vanadium</li> </ul>  |

| TRIGGER  | AGENTS  |
|--|---|
| <p><b>Tanner (Leather Worker)</b></p>  | <ul style="list-style-type: none"> <li>• Vinylsulfone</li> <li>• Formaldehyde</li> <li>• Aliphatic amines, polycyclic compounds, acrylamine</li> <li>• Casein</li> <li>• Chromium and compounds, nickel</li> <li>• Potassium dichromate</li> <li>• Sulphites</li> </ul>   |
| <p><b>Textile Industry</b></p>  | <ul style="list-style-type: none"> <li>• Reactive dyes</li> <li>• Sericin</li> <li>• Acrylamine</li> <li>• Vinylsulfone</li> <li>• Latex</li> <li>• Chromium and compounds</li> <li>• Sulphites</li> <li>• Dermestidae spp (wool), furfuryl (wool)</li> <li>• Synthetic textile fibres (rayon, nylon)</li> <li>• Polyester (orlon, terylene)</li> <li>• Cotton, flax, hemp, jute, kapok, sisal (natural fibres)</li> <li>• Carmine (colouring)</li> <li>• Methylmorpholine (fur dyeing)</li> <li>• Insect (silkworm)</li> </ul> |
| <p><b>Tinsmith</b></p>   | <ul style="list-style-type: none"> <li>• Diisocyanates</li> </ul>   |
| <p><b>Tobacco Industry</b></p>   | <ul style="list-style-type: none"> <li>• Leaf</li> </ul>  |
| <p><b>Toy Manufacturer</b></p>   | <ul style="list-style-type: none"> <li>• Latex</li> </ul>   |
| <p><b>Veterinarian/<br/>Veterinarian Assistant</b></p>   | <ul style="list-style-type: none"> <li>• Antibiotics: tylosin (used in animal health and growth agent), spiramycin, erythromycin, oleandomycin</li> <li>• Piperazine</li> <li>• Birds, cow (bovine) dander, cat, crab, deer, dog, fish-based glues, goats, guinea pig, hamster, horses, mink, monkey, mouse, rabbit, rat, rodents, sheep, shellfish</li> </ul>  |
| <p><b>Water Plant</b></p>  | <ul style="list-style-type: none"> <li>• Sulfites</li> </ul>  |
| <p><b>Welder</b></p>          | <ul style="list-style-type: none"> <li>• Abietic acid, metal working fluids</li> <li>• Chromium and compounds, nickel, nickel salts, aluminum, zinc, vanadium</li> <li>• Potassium dichromate</li> <li>• Aminoethanolamine</li> <li>• Alkyl aryl polyether alcohol, polypropylene glycol</li> </ul>   |

## Agricultural Asthma Triggers

Farming exposes farmers, farm workers and others involved in agricultural processes to many irritants and allergens that may trigger asthma symptoms. Agricultural asthma is a form of work-related asthma. The incidence of occupational asthma in Ontario farm workers is estimated to be from four to thirty per cent. This estimate may be low, as many cases go unreported.

In this section, *Agricultural Asthma Triggers*, we have organized the information according to the most common types of farming in Canada. Work with your patient to identify potential triggers. It is also important to consider common triggers (listed in other sections) and seasonal variables that could be contributing to symptoms.

Helping your patient to manage agricultural asthma will have special challenges in many cases. While some of the avoidance strategies are fairly simple, many are costly and involve the hiring of expert services for consultation, installation and training. For the most part, the work is time-sensitive and cannot be delayed or delegated to others. Often farmers and farm workers do not have the same resources that workers in other sectors have to facilitate and support change. Help your patient to identify community agencies and associations that can provide information and assistance.



| FARM TYPE  | TRIGGERS & WHERE THEY ARE FOUND  | AVOIDANCE/MANAGEMENT STRATEGIES   |
|--|--|---|
| <p><b>General</b></p> <p>Includes the most common triggers generally found in most farm environments, with the potential to affect any of the workers and/or visitors to the site.</p> | <p><b>Mites:</b><br/>                     Barn mite (Acarus siro, Acarus farris, Blomia Kulagini, Euroglyphus)<br/>                     Two spotted spider mite (Tetranychus urticae)</p> <p><b>Mould Spores</b></p> <p><b>Feed enhancer:</b><br/>                     Phytase<br/>                     Betaglucanase<br/>                     Amprolium hydrochloride</p> <p><b>Common antibiotics in feeds:</b><br/>                     Tetracyclines, sulphas, neomycin, bacitracin, lincomycin, apramytin, tylosin, lasalocid, spiramycin, amprolium.</p> <p><b>Fodder or animal feed:</b><br/>                     Vetch (Vicia sativa) (grows in a cultivated grain field)</p> <p><b>Inorganic dust:</b><br/>                     Metal cages and steel gratings</p> <p><b>Nitrogen Fertilizers:</b><br/>                     Anhydrous ammonia (82-0-0)<br/>                     Aqua ammonia (20-0-0)<br/>                     Ammonia nitrate (34-0-0)<br/>                     Ammonia nitrate-lime (26-0-0)<br/>                     Ammonia sulfate (21-0-0-243)<br/>                     Calcium nitrate (15.5-0-0-19Ca)<br/>                     Nitrate of soda (16-0-0)<br/>                     Urea (46-0-0)</p> <p><b>Phosphate Fertilizers:</b><br/>                     Normal superphosphate (0-20-0)<br/>                     Concentrated superphosphate (0-45-0)</p> | <p>There are four basic strategies that should be applied in an agricultural/farm environment:</p> <ul style="list-style-type: none"> <li>• <b>Identify</b> asthma-causing agents.</li> <li>• <b>Eliminate</b> asthma-causing agents.</li> <li>• <b>Substitute</b> a safer agent if the asthma-causing agent cannot be eliminated.</li> <li>• <b>Control</b> exposure by using engineering, administrative-controls and respiratory protection eg. respirators</li> </ul> <p><b>Note: Respirators can reduce but do not offer complete protection from work exposures.</b></p> <ul style="list-style-type: none"> <li>• Use respiratory protection when spraying, harvesting, weeding, tilling or working in animal confinement buildings.</li> <li>• Wet feed or bedding prior to distribution to lower levels of airborne endotoxins.</li> <li>• Fit all openings to manure pits with substantial metal grill covers to provide natural ventilation and to prevent accidental falls or entries into the pits.</li> <li>• Strictly enforce worker re-entry intervals to work areas to reduce exposures to hazardous materials and triggers.</li> </ul> |

| FARM TYPE | TRIGGERS & WHERE THEY ARE FOUND  | AVOIDANCE/MANAGEMENT STRATEGIES |
|-----------|--|---------------------------------|
|           | <p><b><i>Nitrogen/Phosphate Fertilizers:</i></b><br/>                     Monoammonium phosphate (11-52-0)<br/>                     Ammonium phosphate sulfate (16-20-0-153)</p>  <p><b><i>Potassium Fertilizers:</i></b><br/>                     Potassium chloride<br/>                     Potassium sulfate<br/>                     Potassium nitrate</p> <p>Fertilizer Content: Sulfur, calcium, magnesium, borates, sulfates of copper, iron, manganese, and zinc.</p> <p><b><i>Anhydrous ammonia</i></b><br/>                     (injected into soil)</p> <p><b><i>Insecticides</i></b><br/>                     (chemicals used to control insects)<br/>                     Organophosphate</p> <p><b><i>Miticides/Acaricides</i></b><br/>                     (chemicals used to control mites)</p> <p><b><i>Fungicides</i></b><br/>                     (chemicals used to control moulds)<br/>                     Chlorothalonil</p> <p><b><i>Herbicides</i></b><br/>                     (chemicals used to control unwanted plants)</p> <p><b><i>Rodenticides</i></b><br/>                     (chemicals used to control rodents)</p> <p><b><i>Nematicides</i></b><br/>                     (chemicals used to control nematodes)</p> <p><b><i>Disinfectants:</i></b> Chloramine-T, ammonium, aldehydes.</p> |                                 |

| FARM TYPE  | TRIGGERS & WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES   |
|--|---|---|
| <p><b>Livestock</b><br/>Cattle/Dairy/Other</p>  <p>Dairy cattle/milk production<br/>Beef cattle/ranching, Sheep, Goat<br/>Horse, Rabbit, Other livestock,<br/>Honey Bees.</p> | <p><b>Endotoxin is present from contaminating bacteria of:</b><br/>Cow dander<br/>Cow urine<br/>Sheep epithelium<br/>Goat epithelium<br/>Horse hair<br/>Rabbit hair<br/>Rabbit epithelium<br/>Mink urine<br/>Deer dander</p>  | <ul style="list-style-type: none"> <li>• Increase ventilation in confinement buildings.</li> <li>• Reduce number of animals per unit area.</li> <li>• Increase frequency of manure removal.</li> <li>• Install ammonia level sensors.</li> <li>• Use respirators that remove ammonia.</li> <li>• Use ventilated hoods or safety cabinets during animal manipulations.</li> <li>• Avoid wearing street clothes.</li> <li>• Store work clothes at the workplace and wash separately in hot water.</li> <li>• Keep cages and animal areas clean.</li> <li>• Wear gloves, aprons, coveralls.</li> <li>• Install ventilated animal cage racks or filter-top cages.</li> <li>• Replace sawdust bedding with absorbent pads or corncob bedding.</li> </ul> |
| <p><b>Poultry</b></p>   | <p><b>Endotoxin is present from contaminating bacteria of:</b><br/>Egg proteins<br/>Poultry mites<br/>Poultry dander</p> <p><b>Feathers and feather tips:</b><br/>Chicken, duck, goose, turkey.</p> <p><b>Confinement Units:</b> mixtures of organic poultry dust, skin debris, feathers, insect parts, aerosolized feed, poultry excreta, bacteria, high levels of ammonia in poultry urine, and Anisakis Simplex (microscopic worms).</p> | <ul style="list-style-type: none"> <li>• Increase ventilation in confinement buildings.</li> <li>• Reduce number of animals per unit area.</li> <li>• Increase the frequency of manure removal.</li> <li>• Substitute alternative litter materials in poultry confinement.</li> <li>• Install ammonia level sensors.</li> <li>• Use respirators that remove ammonia.</li> </ul> <p><b>Note: Full face respirators capable of removing ammonia and 95% or more of particulate matter are available.</b></p>  |

| FARM TYPE   | TRIGGERS & WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES  |
|---|---|--|
| <p><b>Swine</b><br/>Hog, Pig</p>  | <p><b>Endotoxin is present from contaminating bacteria of:</b><br/>Swine epithelium<br/>Pig urine<br/>Pig dander</p> <p><b>Confinement Units:</b> mixtures of organic dust, skin debris, feathers, insect parts, aerosolized feed, bacteria, high levels of ammonia in pig urine, and Anisakis simplex (microscopic worms).</p>   | <ul style="list-style-type: none"> <li>• Increase ventilation in confinement buildings.</li> <li>• Reduce number of animals per unit area.</li> <li>• Increase the frequency of manure removal.</li> <li>• Substitute alternative litter materials in poultry confinement.</li> <li>• Install ammonia level sensors.</li> <li>• Use oil misting systems.</li> <li>• Use respirators that remove ammonia.</li> </ul>  |
| <p><b>Fruit and Vegetable</b></p>   | <p><b>Fruit Mites:</b><br/>Fruit tree red spider mite (Tetranychus urticae), Acarian-mite or tick (Panonychus ulmi), Citrus red mite (Panonychus citri).</p> <p><b>Fruit Mould:</b><br/>Downy Mildew (Plasmopara Viticol).</p> <p><b>Vine grower:</b><br/>Acarian - McDaniel spider mite (Tetranychus macdanieli), Pollen (Diplotaxis erucooides).</p> <p><b>Extracts from fruits:</b><br/>raspberry powder, peach leaf.</p>  | <p><b>Note: Respirators can reduce but do not offer complete protection from work exposures.</b></p> <ul style="list-style-type: none"> <li>• Use respiratory protection when spraying, harvesting, weeding, tilling or working in animal confinement buildings.</li> </ul>  |
| <p><b>Granary Worker</b><br/>Soybean, Oilseed (except soybean)<br/>Dry pea and bean, Wheat, Corn,<br/>Other grain</p>  <p>Hay<br/>All other miscellaneous crops<br/>Other food crops grown under cover</p> | <p><b>Grain dust:</b><br/>Consists of different types of grain, insect parts, mould, bacteria, bird and rodent droppings, pesticides and silica. Includes: wheat, rye, barley, rice, maize, soy, buckwheat.</p> <p><b>Storage mites:</b><br/>Tyrophagus longior, T. putrescentiae, Glycyphagus destructor, G. domesticus, Acarus siro, A. farris, Dermatophagoides pteronyssinus, D. farinae, Ornithonyssus sylviarum.</p> <p><b>Beetles:</b><br/>Tenebrio monitor, Alphitobius, Diaperinus domestica, grain weevil.</p> <p><b>Insects:</b><br/>grain mite, grain pests, Eurygaster and Ephestia, Lesser mealworm, Oilseed rape (canola).</p> | <ul style="list-style-type: none"> <li>• Use oil misting systems.</li> <li>• Use respiratory protection when grain handling.</li> <li>• Ensure adequate drying and conditioning prior to storage.</li> <li>• Store grain at recommended moisture content levels to limit mould growth.</li> <li>• Utilize anti-mould sprays or preparations to reduce mould.</li> <li>• Spray water or canola oil on feed or bedding prior to distribution in enclosed spaces and automatic feeding systems.</li> <li>• Install exhaust fans in all storage areas. Use covers or screen equipment during transfer of grain.</li> <li>• Extend exhaust pipes to higher, faster moving air (above head height).</li> </ul> |

| FARM TYPE   | TRIGGERS & WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES   |
|---|---|---|
| <p><b>Greenhouse Horticulturist Landscape</b></p>  | <p><b>Mites</b><br/>Acarian - Two spotted spider mite (<i>Tetranychus urticae</i>), Cream coloured mite (<i>Amblyseius Cucumeris</i>).</p> <p><b>Insects</b><br/>Includes: predatory, pests, pollinators.</p> <p><b>Mould spores</b></p> <p><b>Pollen and plant oils:</b><br/>Sweet pea, bell pepper pollen, amaryllis, cauliflower and broccoli pollen, sunflower pollen and seeds.</p> <p><b>Chemicals:</b><br/>Includes: fertilizers, pesticides, herbicides, insecticides.</p> <p><b>Vegetable aerosols</b> (inhalation of vapours) Includes: potato, asparagus, carrot, green bean.</p> <p><b>Flowers:</b> Sea lavender, chrysanthemum, solanum melongena, madagascar jasmine, freesia, amaryllis, baby's breath, carnation, limonium (statice), marianne thistle, mimosa, cyclamen, roses, rose oil, safflower, spathe, yarrow.</p> <p><b>Plants:</b> Umbrella tree (<i>schefflera</i>), grass juice, weeping fig (<i>ficus benjamina</i>), Bells of Ireland, <i>albilfloxia</i>.</p> | <p><b>Note: Respirators can reduce but do not offer complete protection from work exposures.</b></p> <ul style="list-style-type: none"> <li>• Use respiratory protection when spraying, harvesting, weeding, tilling or working in animal confinement buildings.</li> </ul> |
| <p><b>Mushroom</b></p>  | <p><b>Mould spores</b><br/>White Mushroom (<i>Agaricus bisporus</i>)</p> <p><b>Mites and other insects</b> (predatory, pests and pollinators)</p> <p><b>Pollen and plant oils</b></p> <p><b>Chemicals including:</b> fertilizers, pesticides, herbicides and insecticides.</p>  | <p><b>Note: Respirators can reduce but do not offer complete protection from work exposures.</b></p> <ul style="list-style-type: none"> <li>• Use respiratory protection when spraying, harvesting, weeding, tilling or working in animal confinement buildings.</li> </ul> |

## Special Considerations

Ideally, by the time you get to this last section of the guide, you and your patient have been able to identify the triggers that are potentially exacerbating his or her asthma symptoms. In this section, *Special Considerations*, we have included some extra information for you to think about. Although limited, this information is intended to remind you that further assessment of any potential contributing factors may be necessary. Again, sometimes the evidence is not compelling and can be controversial; however, it is up to us, as health care providers to make good use of both the scientific data available, as well as the collective wisdom and experience of good practice. We encourage you to seek more information and/or expert advice about any of these *special considerations* that may be pertinent to your patient.

| TRIGGER   | WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES  |
|---|--|--|
| <p><b>Food</b></p> <p>Food allergy is a very uncommon cause of asthma. Typically, food allergy that causes asthma symptoms occurs with episodes of anaphylaxis. Therefore other symptoms such as throat tightness, pruritis, urticaria and/or even symptoms of low blood pressure occur when food allergy is a cause of asthma. A proper assessment and allergy testing must be performed to confirm the existence of a food allergy. If food allergies and asthma coexist, the person is at more risk of life threatening events.</p> <p><b>Food Additives</b></p> <p>While many food additives such as dyes and preservatives have long been suspected of causing increased symptoms, only sulphites have been proven to do so.</p> | <p>The most common foods causing serious allergic reactions include: eggs, fish, milk, peanuts, shellfish, soy, tree nuts (walnuts, cashews), wheat and sesame seeds.</p> <p>Sulphites are commonly found in: dried fruits, wine, bottled lime or lemon juice, prepared potatoes and shrimp.</p> | <p><b>Note: Although caution and good judgement are essential, proper allergy skin testing and assessment are required to confirm a suspected food allergy. Thorough assessment by an allergist is highly recommended.</b></p> <ul style="list-style-type: none"> <li>• Eliminate the identified food(s) from the diet.</li> <li>• Read food labels carefully.</li> <li>• Inform those involved in meal planning/food preparation (family, caregivers, schools, restaurants).</li> <li>• Ask about ingredients <b>always</b>.</li> <li>• Educate children as soon as possible (ask, identify and self-advocate).</li> <li>• Wear a MedicAlert® bracelet.</li> <li>• Discuss/seek expert advice about the need for EpiPen®</li> </ul> <p><b>Note: Food Allergy Canada is a valuable resource for health care providers and patients; <a href="http://foodallergycanada.ca">foodallergycanada.ca</a></b></p> |
| <p><b>Emotions</b></p> <p>Psychological factors, especially stress, can trigger or exacerbate asthma symptoms. Studies have shown that psychological factors can lead to increased airway inflammation.</p>    |  | <ul style="list-style-type: none"> <li>• Initiate discussion about the impact of emotions on health in general and more specifically breathing.</li> <li>• Practise relaxation techniques.</li> <li>• Review and adjust management strategies (Action Plan), as appropriate.</li> </ul>  |
| <p><b>Hormones</b></p> <p>Some women notice that their asthma symptoms are worse just before menstruation begins or during ovulation.</p>   |  | <ul style="list-style-type: none"> <li>• Discuss adjustment to medication routine (Action Plan).</li> </ul>  |

| TRIGGER  | WHERE THEY ARE FOUND   | AVOIDANCE/MANAGEMENT STRATEGIES   |
|--|--|---|
| <p><b>Pregnancy</b></p> <p>Asthma control during pregnancy may remain unchanged, improve or become worse. Generally, control will return to the pre-pregnancy level three months postpartum. Well-controlled asthma increases maternal comfort and improves safety and outcomes for both mother and baby.</p>   |  | <ul style="list-style-type: none"> <li>• Discuss plans for pregnancy with physician in advance, when possible.</li> <li>• Seek advice and guidance from physician once pregnancy is confirmed.</li> <li>• Avoid irritants and allergens as much as possible to decrease need for medication.</li> <li>• Discuss choice, risks and benefits of medications.</li> </ul> |
| <p><b>Rhinitis, Sinusitis</b></p> <p>Research suggests that inflammation of the upper airway from rhinitis and sinusitis results in increased bronchoconstriction of the lower airways. Increasing evidence is suggesting the concept of <i>one airway, one disease</i>. Up to 80% of patients with asthma have rhinitis and about 15% of patients with allergic rhinitis have asthma. Rhinitis and sinusitis are associated with more severe asthma symptoms and increased exacerbations in patients with poorly controlled asthma. Rhinitis and sinusitis must be treated.</p> | <p>Discuss signs and symptoms of rhinitis and sinusitis with every patient who has asthma.</p> | <ul style="list-style-type: none"> <li>• Treat rhinitis and sinusitis.</li> <li>• Discuss management of rhinitis and sinusitis with physician.</li> <li>• Manage allergic triggers as described in other sections.</li> </ul>   |
| <p><b>Aspirin (ASA)</b><br/>Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)<br/>ASA/NSAIDs can induce increased asthma symptoms in about 28% of adults, but rarely affect children.</p>   | <p>Taking a careful history can help to identify this.</p>                                     | <ul style="list-style-type: none"> <li>• Avoid ASA and NSAIDs as well as any medications containing these.</li> <li>• Notify pharmacist and physician for inclusion on records.</li> </ul>  |
| <p><b>Beta Blockers</b></p> <p>Beta Blockers are medications commonly used to manage hypertension, cardiac disease, eye disease and headaches. They will interfere with Beta-agonists (bronchodilators) and patients with asthma will not benefit optimally from their reliever medication.</p>  | <p>Check with pharmacist or other source to accurately identify these medications.</p>         | <ul style="list-style-type: none"> <li>• Discuss potential alternative medication choices with physician.</li> </ul>  |

| TRIGGER  | WHERE THEY ARE FOUND  | AVOIDANCE/MANAGEMENT STRATEGIES   |
|--|---|---|
| <p><b>Gastroesophageal Reflux (GERD)</b></p> <p>The relationship between GERD and asthma is controversial although many studies have shown an interaction between the two diseases. Studies have shown that if you have asthma you have a higher chance of having GERD.</p>                                    | <p>As many as 89% of patients with asthma may have GERD and many of those patients may have “silent” reflux, with no symptoms. Therefore it is important to discuss signs and symptoms of GERD with patients.</p> | <ul style="list-style-type: none"> <li>• Avoid fatty foods, caffeine, chocolate, peppermint, citrus juices, tomato products and alcohol.</li> <li>• Avoid large meals.</li> <li>• Avoid eating before going to bed.</li> <li>• Elevate head of bed.</li> <li>• Stop smoking.</li> <li>• Consider medication.</li> </ul> |
| <p><b>Obesity</b></p> <p>Asthma is thought to be more prevalent in obese people. Obesity is also thought to make asthma more difficult to control and causes increased symptoms. The exact mechanism is not understood.</p>  |   | <ul style="list-style-type: none"> <li>• Discuss weight management strategies.</li> <li>• Increase exercise, as appropriate.</li> <li>• Refer to Canada’s Food Guide: <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a></li> </ul>   |

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