

Save Your Breath:

Respiratory Health in Agriculture

3rd Edition



UNIVERSITY OF SASKATCHEWAN
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DID YOU KNOW THERE ARE NUMEROUS RESPIRATORY HAZARDS IN AGRICULTURE THAT CAN IMPACT YOUR LUNGS?

This resource will help you better understand respiratory hazards that exist in agriculture, while also equipping you with a combination of controls to help protect your respiratory health.

- Recognize respiratory hazards in agriculture
- Prevent chronic lung disease
- Understand the Hierarchy of Control
- Understand respiratory protection selection
- Creating a respiratory health program

RESPIRATORY DISEASES
DUE TO AGRICULTURAL
EXPOSURES ARE
PREVENTABLE!

An average person can go...

Weeks without food, days without water, but only minutes without breathing.

Take Care of Your Respiratory Health!

Respiratory health is important in the agricultural industry as the exposures to hazards can be very high.

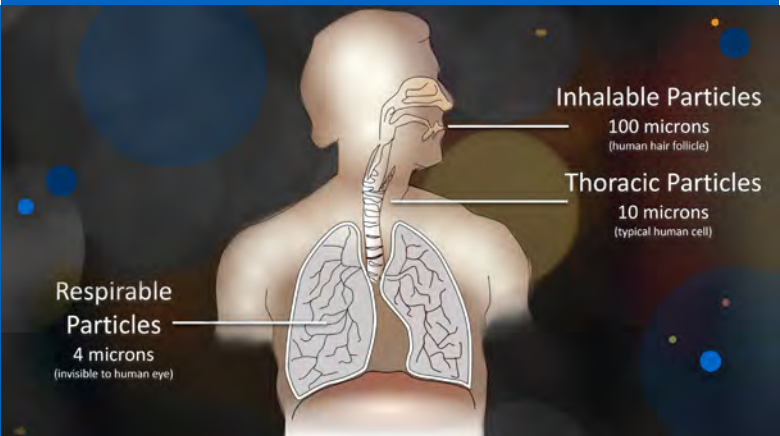
Up to one third of young adults working in agriculture in Gear Up for Ag™ programs have experienced cough, shortness of breath, or flu-like symptoms after working in dusty environments.

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UNDERSTANDING
The
Respiratory
System



The Respiratory System: You inhale about 20,000 liters of air every 24 hours. If you are completing strenuous tasks, you can inhale up to 10,000 liters of air within 8-hour work day. Your lungs work hard every day! There are defense mechanisms in place to clean the air you breathe but some of these may be bypassed when you work strenuously.

What happens when you breathe?

- Air is inhaled through the nose.
- Small bones and cartilage cause the air to swirl.
- Air enters the throat which then divides into 2 tubes, the esophagus and the windpipe (trachea). The esophagus carries food and drink to the stomach.
- The windpipe divides into 2 tubes called bronchi. The bronchi each enter the lungs and divide into smaller tubes called bronchioles. These bronchioles end in tiny little air sacs called alveoli (approximately 300 million!) with walls thin enough to allow gases to be absorbed and released from the blood stream.

Your normal defense mechanisms:

- Nasal hairs filter out large particles.
- Mucus traps some of the particles found in dust, fumes and smoke.
- Some vapors and mists may be dissolved in the mucus.
- A sneeze is a reflex action that rids your nose of irritating substances.
- Tiny hair like structures sweep mucus to the back of the throat where you swallow it and any substances dissolved in it.
- A cough is a reflex action that rids your windpipe and bronchi of mucus and dissolved or attached substances.

PARTICLE SIZE Why does it matter?

Particles in the air can be all shapes and sizes. Size matters because it is closely related to how deep the particles can enter into your respiratory system.

When talking about particles, many health and safety specialists refer to them as “dusts”:







Nuisance Dust: This type of dust is made up of very large particles that typically fall to the floor and surrounding surfaces. This dust is easy to see and can often make places look “dirty”. However, most of these particles are not inhaled into the respiratory system.

Inhalable Dust: This type of dust is small enough to be inhaled into the nose and throat areas. Most of these particles are filtered out via the normal defense mechanisms. However, they can still cause irritation.

Respirable Dust: These particles are so small they can be inhaled deep into the lungs where they will stay or be absorbed by the body.

DID YOU KNOW? Many hazardous particles are not visible to the human eye. These particles can easily bypass defenses and end up deep into your lungs, where they can then be carried to all parts of your body.

What are the Respiratory Hazards in Agriculture?

HAZARD	EXAMPLE	HEALTH IMPACT
 <div>DUSTS</div>	Loading/unloading and shoveling grain. Grinding feed, hauling bales, feeding animals. Operating and cleaning farm equipment, sweeping the shop floor, working around dry fertilizer.	Symptoms such as cough, phlegm and shortness of breath, and allergies/asthma, and have also been linked with lowered breathing capacity.
 <div>MOLDS & FUNGI</div>	Cleaning out bins with moldy grain. Moldy feed or hay.	Allergic reactions, asthma, airway or throat irritation & non-specific symptoms like headache and poor appetite. Rarer conditions include Organic Dust Toxic Syndrome and Farmer's Lung.
 <div>GASES</div>	Silo gases (Nitrogen dioxide). Combustion or motors in confined spaces (Carbon Monoxide and Carbon Dioxide). Animals and manure pits (Ammonia, Hydrogen Sulfide- H2S and methane).	Can cause immediate and delayed reactions, and sometimes both. Specific types of symptoms depend on gas. Some can be fatal with brief exposures.
 <div>METAL FUMES</div>	Welding brazing, cutting, torching and other metal fume exposures.	Respiratory, eye and throat irritation, cough, wheeze, asthma, as well as flu-like condition known as metal fume fever in some circumstances. Long term exposure is associated with respiratory decline, bronchitis and loss of smell.
 <div>CHEMICALS</div>	Inhalation during preparation or application of pesticides such as herbicides, insecticides, pesticides and anhydrous ammonia. Disinfectants used during power washing in animal housing buildings.	Symptoms vary with the type of chemical from mild (eye and airway irritation) to severe (suffocation from swelling of the airways).
 <div>ZOO NOTIC DISEASES</div>	Sources of disease are viruses and bacteria. Some include: Hantavirus, Anthrax, Brucellosis, Rabies, Lyme Disease and Influenza.	Symptoms vary with type of Zoonotic disease. Some zoonotic diseases can be spread through the air between humans and animals. See page 16 for more information.

RESPIRATORY DISEASES THAT CAN RESULT FROM AGRICULTURAL EXPOSURES



THESE RECOMMENDATIONS ARE IMPORTANT AND HELP PREVENT ALL OF THE RESPIRATORY DISEASES BELOW

- Store grain at recommended moisture content levels to reduce the growth of mold spores.
- Ventilate animal housing areas to decrease the accumulation of ammonia and other gases.
- Identify high dust hazards around the farmstead and reduce dust exposure by cleaning these areas.
- When cleaning a barn or stable, lightly water areas to reduce the risk for airborne dust.
- Wash hands after coming into contact with livestock.
- Examine your feeding system to identify ways to decrease the release of airborne dust.
- Wear an NIOSH Approved properly fitted N-95 or N-100 disposable particulate respirator or a reusable elastomeric respirator with P100 cartridges when completing work tasks.

Numerous studies have demonstrated a significantly increased risk of respiratory health concerns among farmers and farm workers.

Respiratory Diseases due to Agricultural Exposures are PREVENTABLE!

Many respiratory diseases take years to develop and the symptoms are not immediately apparent.

FARMER'S LUNG

Farmer's lung, or farmer's hypersensitivity pneumonitis (FHP), is a non-infectious allergic disease that affects normal lung function. It results from the inhalation of mold spores from moldy hay, straw, or grain. Symptoms usually begin four to six hours after exposure to mold spores and can include increased coughing, coughs that bring up mucus, fever, chills, shortness of breath, discomfort in the lungs, and a tightness and/or pain in the chest. Symptoms may become most severe from 12 to 48 hours after exposure.

UPPER AIRWAY RESPIRATORY DISEASES

Upper airway respiratory diseases are a spectrum of airway diseases associated with farming which include rhinitis, sinusitis, and mucous membrane inflammation syndrome. Symptoms include sneezing, runny nose, itchy throat, tiredness, nasal inflammation. Associated agents include hay, grain dust, molds, storage mites and dander. Components of organic dusts, disinfectants, and pesticides are irritants, and can cause non-allergic upper airways inflammation.

ORGANIC DUST TOXIC SYNDROME (ODTS)

This is also called **grain fever, toxic alveolitis, or pulmonary mycotoxicosis**. ODTS is an acute inflammatory reaction in the airways and small air spaces of the lungs which is caused by exposure to very large amounts of organic dust (e.g. grain dust, barns, etc). The onset of ODTS can occur four to six hours after exposure, and symptoms may include cough, fever, chills, fatigue, muscle pain, and loss of appetite. Usually, the person recovers quickly from ODTS (usually within 36 hours) without the need for treatment.

BRONCHITIS

Bronchitis can be **acute or chronic**, and includes symptoms of cough with or without mucus, sore throat and soreness in the chest. Bronchitis affects farm production workers exposed to organic dust containing allergens and microbial matter including alive microorganisms and viruses, endotoxins and other factors like irritant gases such as ammonia and disinfectants.

ASTHMA

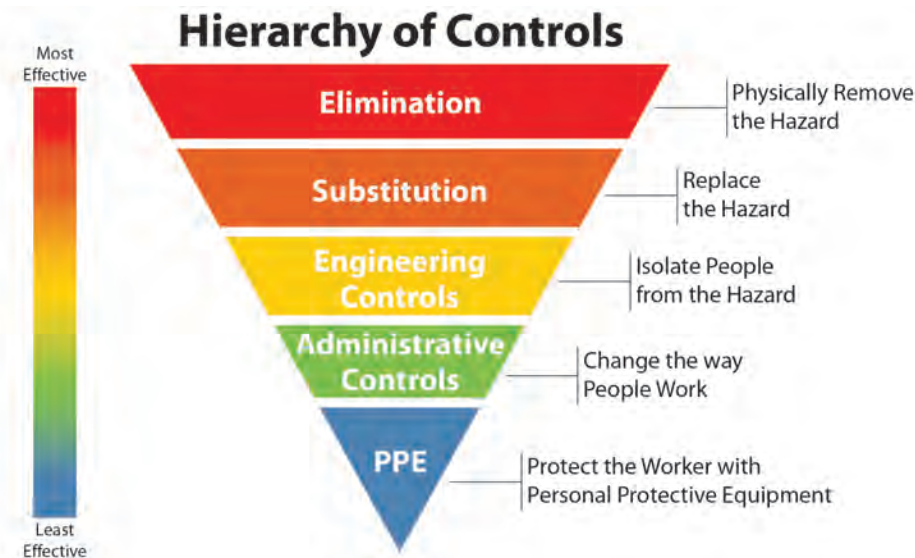
Asthma symptoms can include episodes of wheezing, chest tightness, shortness of breath and coughing. Some of the triggering agents associated with asthma in agriculture include grain dust, bacteria and fungi, insects, pesticides, animal products, pollen, tobacco leaves, chemicals and wood smoke.

ALLERGENS

Allergens are defined as agents capable of inducing an exaggerated immune response thereby provoking allergic reactions in sensitized subjects. In farming, examples of agents that have been shown to cause allergic reactions include animal dander, pollens, insect fragments, storage mites and fungal molds. These agents can cause allergic respiratory diseases in farm workers.

How to Reduce your Exposure to Respiratory Hazards

The "Hierarchy of Control" outlines a series of control measures ranking them in order of effectiveness. Controlling hazards and risk can include a combination of the following measures.



- ✓ **Identify the hazard.**
- ✓ **Determine the risk.**
- ✓ **Follow the Hierarchy of Controls** to reduce the hazardous exposure if possible.
- ✓ **If substitution, engineering controls, and administrative controls are not an option or effective, use appropriate personal protective equipment.**



IT IS IMPORTANT THAT PRODUCERS ASK THEMSELVES THESE QUESTIONS WHEN EXPOSED TO HAZARDS ON THE FARM.

ASK YOURSELF THESE QUESTIONS

01

ELIMINATION: Can the hazard be eliminated? Decide to eliminate an exposure such as not growing a specific crop on your farm, not using a certain herbicide, or remove specific animal productions that impact your health.

02

SUBSTITUTION: Is there a different product or process that I can do on my farm to decrease the risk to my health? Make a choice to control hazards by choosing an alternative product. For example, a less toxic chemical may be used rather than one with a high hazard rating.

03

ENGINEERING/ DESIGN: Consider how a process, building, or machine can be altered to reduce the risk by creating a physical barrier around the hazard. Examples include: Ventilation systems, using remote controls to operate equipment, installing safety switches, and installing guards.

04

ADMINISTRATIVE CONTROLS: Is there a different way you can perform a task to reduce the health hazard? For example, there is better ventilation for most farmers when they are able to weld outdoors.

05

PERSONAL PROTECTIVE EQUIPMENT (PPE): PPE is the last line of defense. All other controls should be attempted, and **PPE when possible should be used in combination with the above controls.** For example, use a P100 respirator in combination with good ventilation (engineering/design) when in an area where there is mouse droppings and you suspect a risk of Hantavirus.

How do I know which type of respirator to use?

There are two types of respirators available:



Half-Face Reusable Respirator

1 Air Purifying Respirators

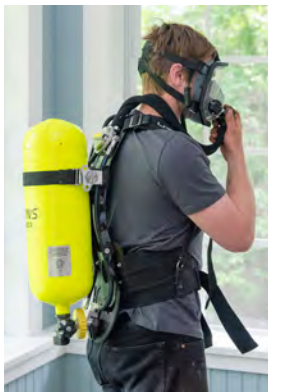
These respirators work by removing gases, vapors and aerosols (droplets and solid particles) or a combination of contaminants from the air through the use of filters, cartridges, or canisters.

Examples:
N95 disposable respirator, half face reusable respirator, full face reusable respirator, powered air-purifying respirator (PAPR), self-contained breathing apparatus SCBA

2 Air Supplying Respirators

These respirators provide clean breathing air from a source independent of the work area.

Examples:
Self contained breathing apparatus (SCBA), supplied air respirators (SARs), and a combination of SARs/SCBAs



Self-Contained Breathing Apparatus (SCBA)

The appropriate respirator for a particular situation will depend on the environmental contaminant(s).

Use certified respirators and filters only. These respirators will display the National Institute for Occupational Safety and Health (NIOSH) certification emblem. Do not use respirators without this certification or with efficiency ratings less than N95.

Scan this QR code to learn more or visit: cdc.gov/niosh/topics/respirators



SCAN ME

What do the letters N, R and P mean on a respirator rating?

- ▶ **N** series = **N**ot resistant to oil
- ▶ **R** series = **R**esistant to oil (can be used once with oil based exposures)
- ▶ **P** series = Oil **P**roof (can be used more than once with oil based exposures)

```

graph TD
    A[Choose filter efficiency*  
(i.e. 95%, 99% or 99.97%)] --> B{Does the aerosol contain oil?}
    B -- No --> C[Use N-series*, R-series* or P-series* filters]
    B -- Yes or Unknown --> D{Will the filter be used more than 8 hours?}
    D -- No --> E[Use R-series* or P-series* filter]
    D -- Yes or Unknown --> F[Use P-series filter*]
        
```

There are 3 levels of filter efficiency:
95%, 99% and 99.97%

The higher the number, the larger percentage of particulates the filter will remove.

Ensure that you know how to put on and take off a respirator as well as how to conduct a seal check. You should fit check a respirator every time you use it, as well as inspect it for damage or worn parts.

MASKS AND RESPIRATORS USED IN AGRICULTURE

MASKS	ASSIGNED PROTECTION FACTOR	EXAMPLE USES AND BENEFITS
1-STRAP MASK	PROTECTION FACTOR 0	Example Uses: One strap masks are NOT the same as N95 masks, nor are they respirators. Although readily available, we do not recommend the use of these masks, since they are often mistaken for an N95 respirator. Benefits: NA.
CLOTH FACE COVERINGS	PROTECTION FACTOR 0	Example Uses: Cloth face coverings are NOT the same as N95 masks, nor are they respirators. These are appropriate for limiting transmission of large aerosols or droplets, such as droplets containing influenza or coronavirus. Cloth masks do not provide an airtight fit across the face, so it is important to choose masks that have 2 or more layers of washable, breathable fabric, completely cover your nose and mouth, fit snugly against the sides of your face and do not have gaps, have a nose wire to prevent air from leaking out of the top of the mask. Benefits: Can prevent disease by limiting transmission of large droplets and aerosols. Cloth face coverings are low-cost and easy to purchase.
SURGICAL MASK	PROTECTION FACTOR 0	Example Uses: Surgical masks are NOT the same as N95 masks, nor are they respirators. These are more appropriate for limiting transmission of large aerosols or droplets, such as droplets containing influenza or coronavirus. For example, surgical masks are used by large animal veterinarians when assisting with deliveries, since it helps shield fecal matter and other biological materials. Wear disposable masks with a proper fit over your nose and mouth to prevent leaks, multiple layers of non-woven material and a nose wire. Do NOT wear disposable masks with gaps around the sides of the face or nose or a mask with wet or dirty material. Benefits: Can prevent disease by limiting transmission of large droplets and aerosols. Surgical masks are low-cost and easy to purchase.

OSHA definition: Assigned Protection Factor (APF) means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by this section.

AIR PURIFYING RESPIRATORS	ASSIGNED PROTECTION FACTOR	EXAMPLE USES AND BENEFITS
N95	PROTECTION FACTOR 10	Example Uses: Cleaning out grain bins, working with hay, in dusty livestock buildings, in livestock buildings where biosecurity is prioritized, shop work (grinding, cutting), power washing, pesticide handling (if label specifies). Benefits: N95s are easy to use and wear. There are fewer sizes to fit. You can simply throw them away and get a new one when dirty or saturated. Like cloth face coverings and surgical masks, they can also reduce transmission of influenza-type viruses, which is helpful for biosecurity issues.
N95 WITH VALVE	PROTECTION FACTOR 10	Example Uses: Cleaning out grain bins, working with hay, in dusty livestock buildings, shop work (grinding, cutting), power washing, pesticide handling (if label specifies). Benefits: N95s with valves are easy to use and easy to put on and take off. There are fewer sizes to fit. You can simply throw them away and get a new one when dirty or saturated. Some people believe they are more comfortable due to the reduced pressure of the exhalation through the valve. Please note that the N95 with valve is not recommended for biosecurity reasons, since the valve allows the departure of expired particles.

RESPIRATORS USED IN AGRICULTURE

AIR PURIFYING	ASSIGNED PROTECTION FACTOR	EXAMPLE USES AND BENEFITS
HALF FACE REUSABLE RESPIRATOR	PROTECTION FACTOR 10	Example Uses: The uses of this type of respirator will depend on what type of filter is paired with the respirator. For example, there are filters and cartridges for organic dusts such as grain, feed, and hay; pesticides; paints and paint fumes; disinfectants and cleaning chemicals; and anhydrous ammonia. Benefits: If fitted properly, the half face particulate filtering respirator provides a tight seal around the face. It is reusable since all parts can be washed, dried, and put back together. Agricultural workers performing a variety of tasks may appreciate this type of respirator since it is so versatile.
FULL FACE REUSABLE RESPIRATOR	PROTECTION FACTOR 50	Example Uses: The uses of this type of respirator will depend on what type of filter is paired with the respirator. For example, there are filters and cartridges for organic dusts such as grain, feed, and hay; pesticides; paints and paint fumes; disinfectants and cleaning chemicals; and anhydrous ammonia. Benefits: If fitted properly, the full-face particulate filtering respirator provides a tight seal around the face. It is reusable since all parts can be washed, dried, and put back together. Agricultural workers performing a variety of tasks may appreciate this type of respirator since it is so versatile. This type of respirator also has built in eye-protection and is great for handling agrochemicals. Workers handling pesticides may prefer using a single respirator instead of having to pair a respirator with splash-resistant goggles.

AIR PURIFYING & AIR SUPPLIED RESPIRATORS	ASSIGNED PROTECTION FACTOR	EXAMPLE USES AND BENEFITS
POWERED AIR-PURIFYING RESPIRATOR (PAPR)	PROTECTION FACTOR 25 - 1000	Example Uses: Same as the N95 style masks. Cleaning out grain bins, working with hay, in dusty livestock buildings, shop work (grinding, cutting), power washing, pesticide handling (if label specifies). Benefits: Although this type of respirator is costly and requires more training for use, it is the only type that can be used with a beard or other types of facial hair. In addition, some workers prefer to use it in hot environments because the blower provides comfort. <small>NOTE: the protection factor of 25-1000 depends on the type of facepiece. Loose fitting facepieces have a lower protection factor than tight fitting facepiece PAPRs.</small>
SELF-CONTAINED BREATHING APPARATUS (SCBA)	PROTECTION FACTOR 1000	Example Uses: Inside confined spaces (storage bins, tanks) that may be oxygen deficient, areas with high levels of hydrogen sulfide, methane, ammonia, and carbon dioxide present (such as manure storage areas). Benefits: Although this type of respirator is costly and requires more training for use, it is the only type that can be used in agricultural situations where airborne hazards are immediately threatening to life. That is why it is often used in emergency rescue situations.

The Importance of Respirator Fit Testing, User Seal Checks and Maintenance

RESPIRATOR FIT TESTING

There are two basic types of fit testing, qualitative and quantitative. A fit test should be ideally conducted by qualified personnel before an individual wears a respirator in a hazardous environment.



QUANTITATIVE FIT TEST

The quantitative fit test (QNFT) method can be used for any tight-fitting respirator and involves a machine that is used to measure the amount of leakage into the face piece. Particles are counted outside and inside the respirator to determine if the respirator has an acceptable fit.

Fit Testing each model of respirator used for agricultural tasks is important!

- Everyone has unique face sizes and shapes. Ensure you are trying to fit the correct size of respirator for your face.
- Everyone's face structure is a bit different, just because you wear a size XL t-shirt doesn't mean your face piece size is XL.
- Respirators that do not fit correctly allow hazardous particles to leak into the facepiece.

QUALITATIVE FIT TEST

The qualitative fit test (QLFT) method relies on senses, such as taste and smell, which provides a pass or fail result based on the wearer detecting a test agent. This is a pass/fail method that relies on whether you detect leakage of the test substance into your face piece.



USER SEAL CHECKS

Do not confuse a fit test with a user seal check. Once you have identified a respirator that fits you, a "user seal check" can be performed to make sure the respirator is positioned correctly on the face or if it needs adjusted.

FOLLOW THESE SIMPLE STEPS TO PERFORM YOUR USER SEAL CHECK FOR A DISPOSABLE RESPIRATOR.

1. Cover front of the respirator with both hands taking care not to disturb its fit.
2. When using a non-valved respirator, exhale sharply. If the respirator bulges slightly and no air leaks are detected between the face and the respirator, a proper seal has been obtained. Then work may proceed. If you cannot achieve a proper seal, do not enter the contaminated area.
3. When using a valved respirator, inhale sharply. The respirator should collapse slightly indicating a proper seal has been obtained. Then work may proceed. If you cannot achieve a proper seal, do not enter the contaminated area.

[read more... >](#)

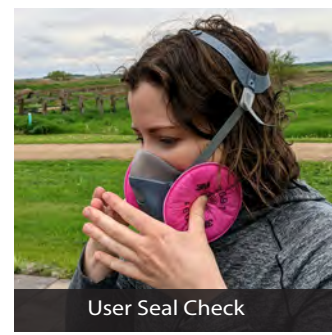


Develop a habit of seal checking your respirator every time you put on your respirator and throughout the day as needed.

The **right** respirator with the **right** fit is important!

FOLLOW THESE SIMPLE STEPS TO PERFORM YOUR USER SEAL CHECK FOR A REUSABLE RESPIRATOR.

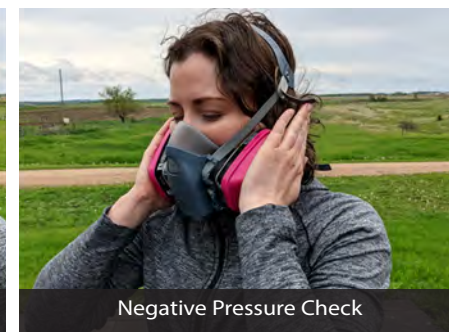
1. Put the respirator on and adjust straps to a comfortable position.
2. Be careful not to disturb the position of the respirator during the fit check.
3. **Positive** Pressure Check:
 - a. Exhale gently. Breathe out and hold for 10 seconds.
 - b. If the facepiece bulges slightly and no air leaks are detecting between your face and the facepiece, a proper seal has been obtained.



User Seal Check

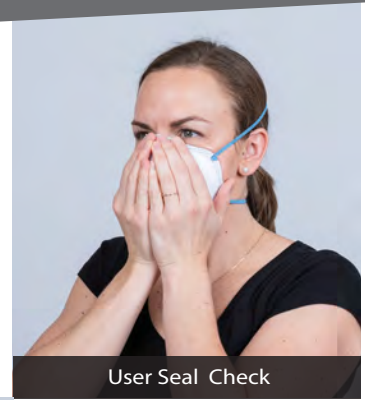


Positive Pressure Check



Negative Pressure Check

4. **Negative** Pressure Check:
 - a. For particulate filters (disc style), place your thumbs onto the center portion of the filters. For cartridges, place palms of hands to cover the cartridge or open area of the filter.
 - b. Place hands over cartridges. Breathe in gently. If you feel the facepiece collapse slightly and pull closer to your face with no leaks between your face and the facepiece, a proper seal has been obtained.
5. If there is a leak, readjust the respirator on your face and tighten up the straps.
6. Try the *User Seal Check* again.
7. If there is still a leak, try a new respirator size or brand since you may need a different respirator to achieve a proper fit.



User Seal Check

THINGS THAT CAN IMPACT THE WAY YOUR RESPIRATOR FITS

Facial hair can affect your seal, which affects your level of protection, so it is important to be clean shaven to achieve the best possible fit. Other things that can impact the way your respirator fits are changes in body weight, an injury to your face, crack in seal on the respirator or a damaged respirator. These can all alter your ability to achieve a seal that will provide your best protection.

MAINTENANCE OF RESPIRATORS

If your respirator can be re-used, develop a habit of cleaning all the parts after use. Clean with soap and water and dry before storing. Do not put your reusable respirator in the dishwasher. There is a shelf life for respirators and the use-by date can be found on the storage box.

Respirators must be stored properly, or they may not function properly.

UV rays may damage the respirator and extreme temperatures lead to degraded parts. Store respirators indoors where the temperature stays between 0-30°C or 32-85°F.

Like most safety equipment, the sun's UV rays may damage your respirator. It is best stored indoors.

Protect the respirators from dust, contamination, and humidity by storing in sturdy, dust-free containers, like a plastic bag or the bag provided by the manufacturer.

Keep the respirator in a location where it is not crushed by heavier equipment or items.

RESPIRATOR STORAGE - Motion Graphic



This video provides information on proper storage and care of respirators. Scan this QR code to watch it or visit: youtube.com/watch?v=V3GK4ru96vg



WHEN DO I KNOW IT IS TIME TO REPLACE MY RESPIRATOR OR FILTER?

- Replace a mask or filter when it is visibly dirty or damaged or when you experience difficulty breathing through it.
- Replace respirator cartridges when you can smell or taste chemical/dusts while or after using the respirator, or according to the manufacturer's recommendations.



Respirator Selection Quick Reference Guide

In agriculture, you may encounter hazardous particles in the air while you are working.
A respirator can protect you from breathing in these particles.

To select and use the appropriate respirator:







- ✓ Identify the hazard
- ✓ Understand the hazard and reduce exposure
- ✓ Select the appropriate respirator
- ✓ Use NIOSH approved respirators
- ✓ Have your respirator fit tested
- ✓ Do a user seal check

NIOSH Approved: A respirator must be certified by the National Institute for Occupational Health and Safety (NIOSH) and worn properly to provide appropriate protection. NIOSH's classification ratings describe the ability of the device to protect the wearer from dust and liquid droplets in the air.

Disposable Respirators

Generally single use but repurposing may be appropriate in some situations.

N95 filtering facepiece respirators are the most common types of disposable respirators. They are used in agriculture for working with hay, handling grain, in livestock housing, with infected livestock, and while welding or doing shop work. They are also recommended for use when working with moldy materials. Certain types of pesticide labels will recommend the use of N95 respirators.

Disposable Respirator Examples						
	8210-N95	9211-N95	8511-N95	8271-P95	8233-N100	8515-N95
Uses	Organic Dust, Mold, Livestock, Poultry, Hogs, Cattle, Hay, Grain, Woodworking, Pesticide Handling (refer to label), Zoonotic Disease Prevention, Wildfire Smoke					Welding Soldering Metal Fumes
Benefits	<ul style="list-style-type: none">• Least expensive• Easy to use• Durable	<ul style="list-style-type: none">• Exhalation valve• Small face shape• Packaged individually	<ul style="list-style-type: none">• Exhalation valve• Good for long periods of wear• Good for large face shapes	<ul style="list-style-type: none">• Exhalation valve• Good for use with oil mist• Good seal	<ul style="list-style-type: none">• Exhalation valve• Good straps• Longer use• Good seal• 100% efficient	<ul style="list-style-type: none">• Exhalation valve• Economical option for welders• Flame resistant per modified ASTM D2859
Particulate Filter Types: NIOSH-approved filters are rated as N95, R95, P95, N99, R99, P99, N100, R100 or P100. The number 95, 99 or 100 (99.97%) indicates the percent NIOSH filtration efficiency. N Series: Used in particulate environments free of oil aerosols. R Series: Used for oil and non-oil particles with time use limitations specified by NIOSH. P Series: Used for oil and non-oil particles with time use limitations specified by manufacturer.						
Exhalation valves are designed to improve breathability by releasing hot, humid exhaled breath quickly, helping to reduce heat build-up and moisture inside the facepiece. This can help prevent fogging of glasses. An exhalation valve can also permit the exhalation of viruses and should not be worn for protection during a pandemic.						

Non-Respirator

These mask types are not certified by NIOSH for use as a respirator and will not provide protection from occupational or agricultural hazards. They are only effective for nuisance dusts and can help prevent the spread of viruses.



Reusable Respirators

Reusable Respirators are cost effective options that offer protection from hazardous gases, vapors, and particles found in many agricultural environments.

Half Facepiece
Different sizes available, can add cartridges.



Full Facepiece
Includes eye protection and provides more protection.



Cartridge Options

P100 Pink or White		Organic Dust, Grain, Feed, Hogs, Poultry, Welding, Mold, Woodworking, Shopwork
Particulate Pre-Filter		Can be used with the gas cartridges below to also filter particulates.
Organic Vapor Black		Pesticides, Paints Use Pre-Filter/Filter Cover
Ammonia Green		Anhydrous Ammonia (rescue or exit situations), Hogs, Poultry Use Pre-Filter/Filter Cover
Organic Vapor Acid Gas Yellow		Paints, Disinfectants, Bleach Use Pre-Filter/Filter Cover
Multi Gas Olive		Paints, Disinfectants, Bleach Use Pre-Filter/Filter Cover

Remember: Always refer to safety data sheets or supplier labels for a recommended cartridge. Schedule times to change your cartridges based on a) the outdate on the product label, b) when it becomes difficult to breathe, or c) when you can taste or smell the hazard.

Advanced Respirators

Powered Air Purifying Respirator (PAPR):

Use for cleaning out grain bins, working with hay, in dusty livestock buildings, shop work (grinding, cutting), power washing, pesticide handling (with cartridges if label specifies). Can be used with a beard or medical condition such as asthma, claustrophobia, heart, or lung conditions.



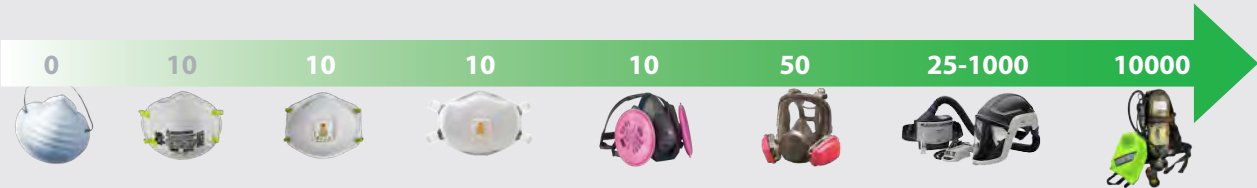
Self Contained Breathing Apparatus (SCBA):

Use in confined spaces that may be low in oxygen such as storage bins, tankers, and manure pits with high levels of hydrogen sulfide. An SCBA should be used in situations where airborne hazards are immediately dangerous to life and health.



Assigned Protection Factor

The assigned protection factor (APF) describes the decrease of harmful substances in inhaled air. It is used to describe how well a respirator can protect someone. The higher the number the higher the APF. The protection factor is only valid if the respirator fits the wearer and is being used properly.



Respirator Fit Test: Everyone has a unique face size and shape. A fit test should be conducted by qualified personnel before an individual wears the respirator in a hazardous environment.

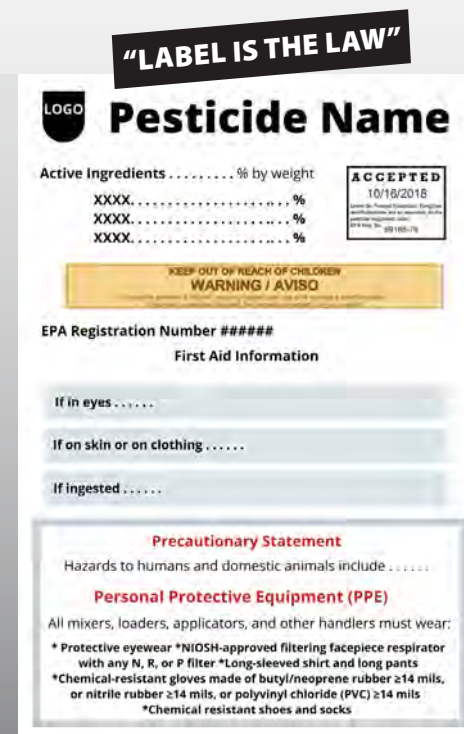
User Seal Check: Do not confuse a fit test with a user seal check. Once you have identified a fitting respirator, a "seal check" should be performed each time you wear the respirator to make sure it is properly on the face and adjust as needed.

DUSTS & CHEMICALS:

Organic Dust, Mold, Pesticides, Fumigants



- Application of pre- or post-emergent pesticides; loading or cleaning pesticide tanks, mixing pesticides.
- Since there are multiple pesticide products, manufacturers are required to include information about proper personal protective equipment (PPE) on the pesticide label. This includes the suggested respiratory protection.
- Even if respiratory protection is not specified on the label, the worker may use an N95 filtering face-piece respirator during pesticide handling tasks.
- Agricultural workers handling pesticides should be trained on the specific compounds that they are working on.
- It is important for workers to be looking at the pesticide labels.



- Grain handling tasks (cleaning out storage, loading/unloading); working with hay; working inside of animal housing buildings
- N95 filtering face-piece respirator, Half/Full Face Particulate Filtering Respirator, or PAPR.
- Remember, particulate filtering respirators are not effective with most facial hair styles (beards, goatees). If the worker wishes to maintain facial hair, then a PAPR style respirator is best.
- Just because you cannot see organic dust, does not mean it isn't there. It is best to develop a habit of always wearing a particulate filtering respirator when performing specific tasks--rather than looking for visible dust.



- Grain handling tasks (cleaning out storage, loading/unloading) when working with moldy product, shoveling moldy hay, flood response (cleaning out items with water damage)
- N95 filtering face-piece respirator, Half/Full Face Particulate Filtering Respirator, or PAPR.
- Just because you cannot see mold or mildew, does not mean it isn't there. Mold and mildew are often associated with a "musty" smell. It is best to always wear a respirator when handling materials that have experienced water damage.

GASES:

H2S, Anhydrous Ammonia, Welding



- Welding is often done when performing maintenance on agricultural equipment, repairing storage bins, or as a hobby.
- The type of respiratory protection worn while welding will depend on the types of welding being performed. For most fumes produced by basic welding of iron or steel--an N95 welding particulate mask, or Half/Full Face Particulate Filtering Respirator with a particular/organic vapor filter should be worn.



- Example: Fertilizer that is a toxic and highly corrosive gas and needs to be treated with care.
- Anhydrous ammonia is a hazardous material under the U.S. Department of Transportation regulations. Individuals that work with anhydrous ammonia are required to undergo annual safety training. Those who transport anhydrous ammonia also have to hold a hazardous materials endorsement on their commercial drivers licenses.
- Many workers cleaning out or performing maintenance on anhydrous tanks are at risk for ammonia exposure.
- Workers should be adequately trained specifically on the hazards of working with this chemical and able to recognize the signs and symptoms of early exposure.
- The Half face or Full face Particulate Filtering Respirator may be provided for escape purposes only. These respirator should be fitted with the appropriate ammonia cartridge.



- Examples: Storage tanks, silos grain bins, pits
- Never enter a confined space without first checking the air quality for dangerous gases and oxygen levels. Work with a buddy.
- Prior to entering a confined space prepare for a sudden lack of oxygen and identify an exit route. Most jurisdictions have regulations around confined space entry. If hazardous gases are present in the air, the space should be ventilated until safe.
- If you are working in areas where the air quality is lacking oxygen or contains gases that are immediately threatening to your health (such as rescue situations), you should be using a Self-Contained Breathing Apparatus (SCBA).



- Examples: Manure storage (pits, lagoons), manure pumping, pressure washing, gas-fired heaters or dryers (in combustion by-products)
- Many workers performing tasks at risk for H2S exposure wear gas monitors. There are many affordable options for H2S monitors. These may be clipped on the shirt, or lapel. When the levels become higher than expected and dangerous, the monitor will alarm the wearer, so they can leave the area or take necessary steps to lowering the levels. Steps to lowering H2S may include stopping the pumping or increasing ventilation to the area.
- If you are working in areas where H2S is immediately threatening to your health or involved in an H2S rescue, you should be using Self-Contained Breathing Apparatus (SCBA).

ZOONOTIC DISEASES: PREVENTING THE SPREAD



Zoonotic diseases are a broad category of pathogenic diseases that can be spread between animals and humans. Zoonotic diseases are spread by coming in contact with saliva, urine, blood, feces and other bodily fluids from infected animals. Some zoonotic diseases, such as Hantavirus, Influenza and Anthrax may be spread through airborne particles. Many of the symptoms of these diseases are like that of flu in humans (e.g., upper respiratory issues, fever, joint pain).

It is important to contact your medical provider if you are feeling sick after a lot of potential contact with animals, especially if the animals are also ill. Controlling and preventing the spread the diseases can help to maintain the health of producers and keep your animals healthy.

HOW TO REDUCE THE SPREAD OF ZOONOTIC DISEASES

Washing the hands before and after handling or administering pharmaceuticals to animals, and promoting good hand hygiene with your staff.

Wearing PPE when suggested (coveralls, gowns, N95 masks/respirators, gloves, eye protection, footwear with toe protection). Some common procedures where PPE may be necessary would be while assisting with birthing, gathering diagnostic lab samples for your veterinarian, or disposing of the carcass of a suspected sick animal.

Posting good work practices and detailed operating procedures for animal handling and administering pharmaceuticals.

Using engineering controls, such as chutes and head gates, when performing invasive procedures on livestock.

Knowing when to contact the veterinarian or your medical provider when signs or symptoms are observed in you or your animals.

Talking to your veterinarian or producer's association to learn when antibiotic use is necessary and when it may be substituted. Overuse of antibiotics may lead to antimicrobial resistant strains of disease. These diseases can become more difficult to treat if you are infected.

Promoting good animal and staff health, overall. This includes providing or promoting vaccinations for both livestock and workers, as necessary.



For more information scan QR code or visit: cdc.gov/onehealth



RESPIRATORY PROTECTION DURING A SHORTAGE OF PPE

Best Practices for the Agricultural Community



Situations like the COVID-19 (Coronavirus) pandemic can lead to a high demand for all types of respirators and other **personal protective equipment (PPE)**. Despite shortages, farmers and agricultural workers still need respiratory protection for many tasks in agriculture. Consider the following tips for conserving your respirator inventory while supplies are limited.

CONSERVING RESPIRATOR SUPPLIES: GUIDANCE ON REUSE

Two-Strap Disposable Respirator: N95, N100, P100 (Filtering Facepiece Respirator)

Reuse of two-strap disposable respirators is not a recommended practice, but in a time of limited availability, it may need to be considered. This type of respirator should only be reused within the guidelines below:

- A disposable respirator can be worn more than once, but it cannot be shared with another person.
- Store respirator in a clean, dry place between uses, such as inside a plastic, seal-able bag within a closet or cupboard.
- Conduct seal checks each time you put on or adjust the respirator.
- Do not attempt to clean the respirator with disinfectants, wipes, soap and water, or an air compressor.
- Avoid putting on, taking off or adjusting the mask with contaminated hands. Wash your hands before and after adjusting or removal.
- Discontinue use and throw away when it is splashed on, becomes dirty, becomes difficult to breathe, or when a seal cannot be obtained.

Reusable Respirators: Half-Facepiece, Full-Facepiece and Powered Air Purifying Respirators (Elastomeric Respirator)

- Clean and sanitize the respirator after each use. This type of respirator can be shared only if it is cleaned and sanitized properly.
- Store respirator in a clean, dry place between uses.
- Avoid putting on, taking off or adjusting the mask with contaminated hands. Wash your hands before and after adjusting or removing.
- Change P100 filters after 8 hours or 30 days (whichever comes first). If there is a shortage, continue to wear the P100 filter until it becomes dirty or difficult to breathe comfortably.
- Change cartridges according to manufactures' recommendations. If there is a shortage, change the cartridge when you can smell or taste what you are protecting yourself against.
- To prolong the life of the cartridge, add pre-filters to cartridges that do not have built-in pre-filters.
- Check and replace valves and the head cradle as needed to ensure the respirator is in good working order.

OTHER WAYS OF REDUCING RESPIRATORY EXPOSURES

Consider alternative controls that reduce exposure to respiratory hazards and thus reduce reliance on PPE. Examples include:

- Eliminate the process/task that creates hazardous dusts or gases.
- Use an alternative pesticide product that requires less PPE or the PPE that you have available.
- Ventilate and control dust at its source to reduce exposure in confined spaces.
- Hire an applicator or other contractor who has the required PPE.

When applying pesticides, the label is still the law. You must wear the PPE required by the product labels. If the label required respirator is not available, consider using a respirator that provides greater respiratory protection than what is required.

KEY POINTS

- To conserve respirator supplies, disposable respirators (such as N95s) can be reused by the same person, in a limited fashion.
- Reusable respirators (such as half-facepiece respirators) can be reused after proper cleaning and sanitizing.
- Document any changes you make to respiratory protection for you and/or your employees, including changes in types of respirators used and employee training.

Children's Respiratory Health: Asthma & Allergies

The farm is a great place for a child to grow up! Studies have shown that children one year and younger who live on farms are less likely to have respiratory allergies or asthma as older children. However, living on a farm does not protect all children from having allergies and asthma. Being both a home and a work environment, the farm poses many challenges to families who have children with respiratory issues.



ASTHMA: A flare-up, commonly called an asthma episode, results in inflammation and bronchospasm of the lungs, and requires treatment.

HOW IS ASTHMA CONTROLLED?

You are in charge of controlling your asthma through **MEE**: Medication Use, Education and Environmental Control.

Medication

- a) Preventers - inhaled corticosteroids
- b) Rescuers - inhaled bronchodilators
- c) Combinations - preventer and rescuer medication together

>> Take as prescribed by your health professional.



Education

- a) Triggers of an asthma episode or allergies differ between children and most children will have more than one trigger. Know your own triggers and avoid them as much as possible.
- b) Know your medications and when to use preventer and rescue medication.
- c) Use an Asthma Action Plan so you know what to do when there is a flare-up. If you do not have an Asthma Action Plan, see your doctor or nurse practitioner.

Environment

- a) Common triggers for asthma and allergies are moldy places; grain dust; dust in animal pens; animal dander from dogs, cats, rabbits, horses, or cows; pollens found in hay; pollens found in some flowering crops, trees, or plants.
- b) Bacteria in solid animal waste products, when broken down into smaller parts called endotoxin or lipopolysaccharides, can become airborne and cause irritation of the lungs leading to inflammation and bronchospasm.
- c) Diesel exhaust from tractors or trucks has been shown to trigger coughing and irritation.
- d) If you are around dust, animals or plants that are your known trigger, it is best to change clothing, wash hands and face or shower as soon as possible.
- e) If you can not avoid exposure, such as when dust is blowing during harvest and seeding, pollen season or stubble burning, stay indoors.

More Information about asthma and allergies for both families and health professionals can be found at these websites:

Asthma US CDC:
www.cdc.gov/vitalsigns/asthma
American Lung Association: www.lung.org

What do we know about asthma and allergies?

- Both asthma and allergies are conditions that are caused by the body's immune response to substances in the environment
- Both have a high heredity component and if not well controlled, result in intermittent flare-ups or episodes.
- Asthma symptoms during episodes include cough, wheeze, and phlegm. Rhinitis or hay fever due to allergies results in a runny nose, sneezing, and itchy watery eyes.
- There are two types of asthma:
 - 1) asthma that is associated with allergies (atopic asthma);
 - 2) asthma associated with respiratory infections (usually viruses)

RESOURCES

Respiratory Resources are available from several sources including but not limited to QR codes in this document and listed here.

Ag Health and Safety Alliance Respiratory Resources
aghealthandsafety.com/respiratory

Central States Center for Agricultural Health and Safety (CS-CASH) Respiratory Resources
unmc.edu/publichealth/cscash/resources/index.html

Canadian Centre for Health and Safety in Agriculture (CCHSA) Respiratory Resources
cchsa-ccssma.usask.ca/aghealth/resources/resources-by-theme.php

Pesticide Educational Resources Collaborative (PERC)
pesticideresources.org

PERC Respiratory Guide
pesticideresources.org/wps/hosted/PERC-WPS-Respirator-Guide.pdf

National Ag Safety Database (NASD)
nasdonline.org

Centers for Disease Control (CDC):
cdc.gov / cdc.gov/onehealth / cdc.gov/niosh/topics/respirators

NIOSH AG Centers
cdc.gov/niosh/oep/agctrhom.html

American Lung Association
lung.org

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