

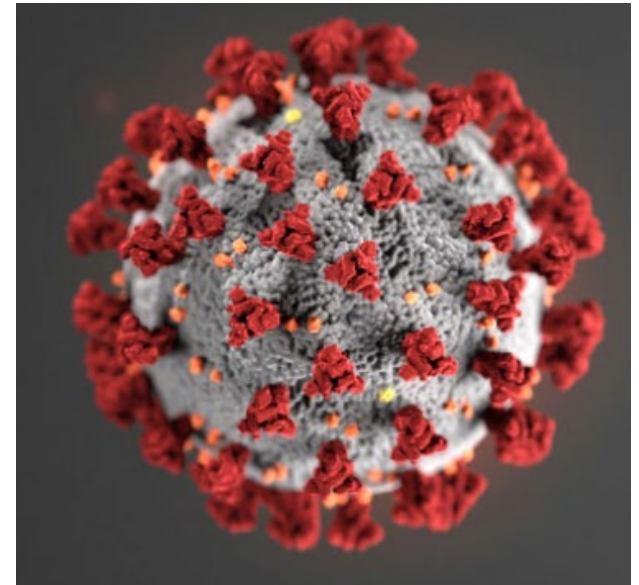
# Respiratory Infection: An Overview for Workers and Employers



## Objectives

Describe...

- ☑ Types of infectious agents that can cause respiratory infections/ illness.
- ☑ How respiratory agents are transmitted from people, animals, insects, and other vectors or sources.
- ☑ Common respiratory infections and illnesses that occur in workplaces.
- ☑ How to prevent the spread of infectious agents and how to protect yourself.



## Overview

The guidance will:

- Inform workers and employers about the infectious agents in workplaces that can cause respiratory infections and illnesses.
  - Many of these infectious agents occur regularly in places where people live and work.
- Allow workers and employers to better understand what causes respiratory infections.
- Provide an overview of how infections can be spread and what measures can be undertaken to protect workers.



## This Guidance is Not...

- For workplaces that deal directly with infected persons, animals, or other contaminated sources (e.g., water).
- For public health and medical guidance for pandemics or other significant infectious disease outbreaks; those events require frequent updates specific to the nature of the event.
  - Specific guidance for these environments can be found on the WTP website:  
<https://tools.niehs.nih.gov/wetp/index.cfm?id=2554>



## Notice

- **This guidance does not take the place of formal worker training** that includes familiarity with workplace policies and procedures, including decontamination and sanitation procedures.
- **This training also does not take the place of hands-on training** for putting on and taking off personal protective equipment (PPE), including respirators, face covering, and other protective equipment.
  - Safe and competent use of PPE must be demonstrated and documented by employers prior to employees working on a task in an environment where there is a risk of exposure to infectious agents.

## Key Points

Respiratory illnesses are a common cause of absenteeism and loss of workplace productivity.

Basic public health interventions can prevent transmission of infections.

Pre-existing or comorbidities also impact the prevalence or risk of health impacts.

Some viral diseases are more transmissible than others including variants for specific viral agents.

Face protection, including respirators and/or masks, physical distancing, and vaccination can help prevent spread of infections.

Viruses cause many of the infections, but bacteria and fungi are also responsible for serious infections.

Seasonality and geography impact exposure to some infections. Different actions are appropriate for those times and locations.

Infectious agents can have different transmission factors, some can become worse with mutations (variants).

You have a right to a safe workplace, including procedures and practices to limit exposure to infectious agents and prevent transmission.



## Respiratory Infection: An Overview for Workers and Employers

# MODULE 1

## The Basics of Respiratory Infection



## Scope of the Problem

- Respiratory infections are common, affecting almost every adult annually.
  - Common colds and seasonal influenza account for a significant amount of time away from work and impact overall productivity.
  - While symptoms are generally mild, influenza places hundreds of thousands of persons at high risk in the hospital and at risk of death.
- If proper precautions are not taken, these infections spread easily to others, resulting in additional work-days lost and decreased productivity.
  - Most precautions are basic public health interventions, easy to implement, and have no/low cost.





## Most Common Respiratory Infections

**The common cold, COVID-19, and seasonal influenza are the top three infectious agents that can cause respiratory infections in working adults.**

*Additional infections of concern include tuberculosis and pneumococcal diseases. These are caused by bacteria. They can be hard to treat in people with compromised immune systems.*



### Absenteeism

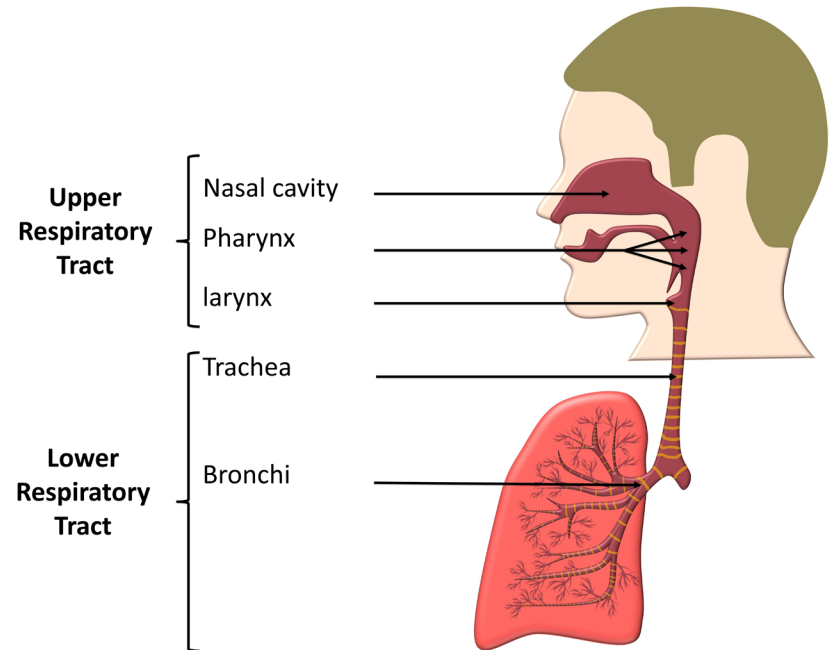
- **Influenza**—1.5-4.9 workdays lost per episode
  - 75 - 111 million workdays lost annually
  - \$21 billion lost
- **Common cold**—8.7 work hours lost per episode
  - 2 episodes each year
  - 20 million lost workdays
  - \$17 billion lost in direct costs

### Deaths

- **Influenza**—12-52,000 deaths annually since 2010
- **COVID-19**—1 million deaths and counting since 2020
- **Tuberculosis**—7,100 deaths in 2020

## Respiratory Tract Anatomy

- From nose to the bottom of lungs.
- Upper airway normally clears infectious agents in larger particles through hairs and secretions (mucus); either coughed out or swallowed.
- Smaller particles ( $<10\mu\text{m}$ ) can penetrate to the bronchi and alveoli.
- Lungs also have protective immune cells that kill infectious agents before the dose increase to harmful levels.
  - Some microbes get past those defenses and cause illness.
  - In some cases, they can spread throughout the lungs and into other organs which can cause more serious disease.



## Risk of Agent → Infection → Illness

- Workers can be exposed to all kinds of infectious agents where they live and work.
- The amount of an agent a worker can be exposed to changes depending on the kind of work and number of people a worker comes into contact with.
  - For example, the risk of exposure to a person working in a small office is different than a person working in a concert venue or hospital.
- A healthy person can usually “fight” off agents before an infection starts.
- For the sake of this presentation, the word *infection* will be used interchangeably with illness and disease.

## Risk of Infection and Long-Term Illness/ Disease

- If a person cannot naturally fight off the agent and it develops into an infection, it could spread throughout the body, especially the lungs and cause an illness with more severe and longer lasting symptoms like coughing and trouble breathing.
- Vaccinations or previous infection provide your body with a recognition system that plays a strong role in mounting defenses to an infectious agent “invasion.”
- Not all infections turn into more severe illnesses or diseases, especially in healthy people. This is described more in “At Risk Populations” on slide 19.
- A good example of this is COVID-19. If you’ve taken a home test, and test positive, it might surprise you if you have no symptoms.
  - This is because you’ve been exposed to COVID-19 (agent), had it long enough for it to stay in your body for a few days (infection), and your body is fighting to the point that symptoms do not occur. This is why those who are vaccinated or have previously been infected have less severe symptoms.

# Types of Infectious Agents that Cause Respiratory Illnesses

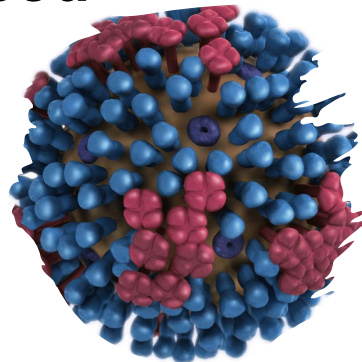


- **Respiratory Agents**

- Viruses
- Bacteria
- Fungi (Mold)

- **Illness caused**

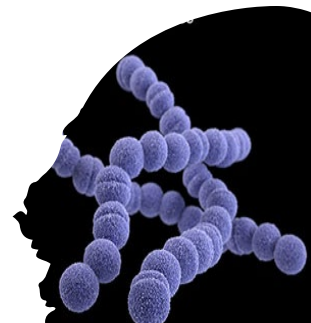
- Tonsillitis
- Sinusitis
- Laryngitis
- Pneumonia
- Influenza
- Common Cold
- COVID-19



**Viruses** cause most of the infections because they are so easily spread from person to person.

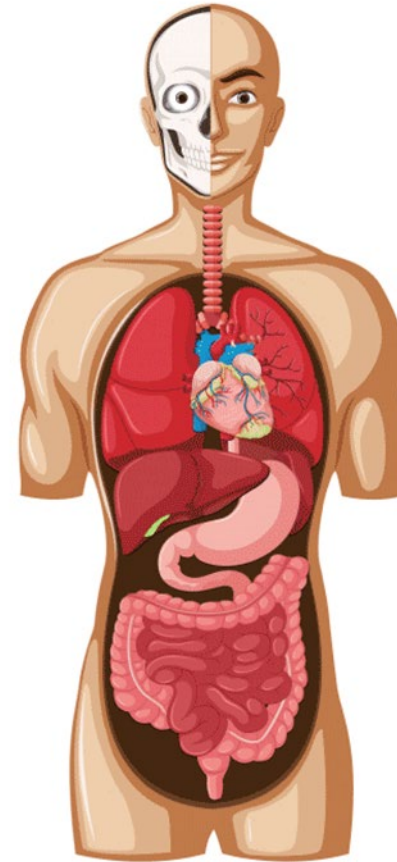
**Molds** can cause serious respiratory illness, but are not typically spread person to person, rather because the person was exposed to it in their environment.

**Bacteria** can also cause serious infections like pneumonia. Many times, they require antibiotics. They can also be transmitted from person to person.



## Transmission Pathways

- Respiratory
  - Tuberculosis
  - COVID-19
- Oral (via ingestion)
  - Norovirus
- Contact
  - Ebola
  - Monkeypox
- Penetration
- Vectors (via insect bite)
  - Zika





## Modes of Transmission

### Person to Person or Animal to Person

- **Airborne**—inhaling droplets from an infected person.
- **Direct contact-physical contact** with an infected person.
  - Normally this is bodily fluid transfer

### Environmental and Other Vectors

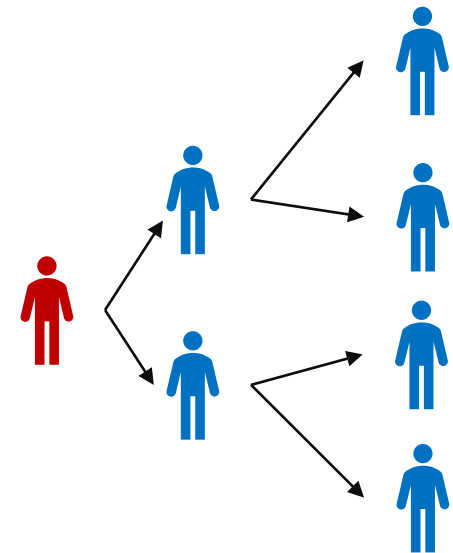
- **Surface contamination**—touching contaminated surfaces then touching your eyes, nose, mouth, wounds. Especially common in healthcare settings.
- **Environment**—direct contact with agents in soil, water, insects. Especially common in agriculture and outdoor work.

**Some respiratory agents are more easily spread than others based on the characteristics of the agent.**

*Additionally, some are easily spread person to person, and some are not.*

## Replication Rate (Reproductive Number)

- Basic **reproduction number ( $R_0$ )**
  - Defines how many people each person infects
- Varies by environment (e.g., indoors vs outdoors; crowded city vs countryside)
- Estimates of the COVID-19 Delta variant were around 3.2 to 8
  - Comparison to other diseases
    - Seasonal influenza  $R_0 = 0.9 - 2.1$ , with a mean of 1.3
    - Spanish influenza  $R_0 = 1.4 - 2.8$ , with a mean of 2
    - Measles  $R_0 = 12 - 18$
    - COVID-19 Omicron  $R_0$  is 3.2 times greater than Delta or 10.2 to 25.6

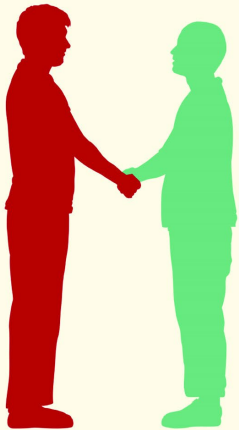


## How Infectious Respiratory Particles Spread Between People

- **Aerosols**—small particles that float in the air for a long period of time.
  - Respirable versus inhalable.
  - Respirable aerosols can penetrate to the deep lung.
- **Droplets**—larger particles that release from person to air to the ground or other surfaces, where they can remain infectious.
- **Mucus/Saliva**—large drops of mucus that contain infectious agents



## ROUTES OF TRANSMISSION OF RESPIRATORY VIRUSES



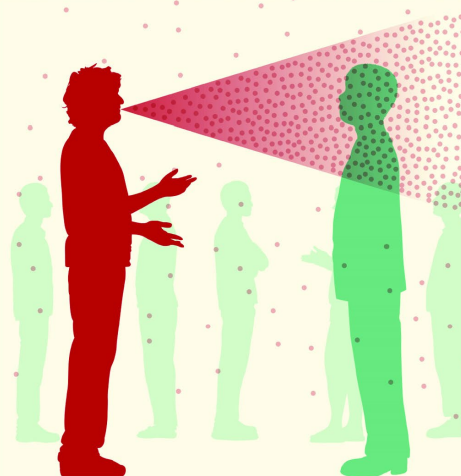
### A Direct contact transmission:

A susceptible individual is exposed to infectious viruses by direct physical contact with the infected patient.



### B Indirect contact transmission:

A susceptible individual is exposed to infectious viruses by physical contact with objects contaminated with infectious viruses (fomites) released by an infected patient.



### C Droplet and airborne transmission:

The infected patient releases infectious agents via droplets to susceptible individuals in close proximity and via droplet nuclei suspended in air to other individuals who are farther away.

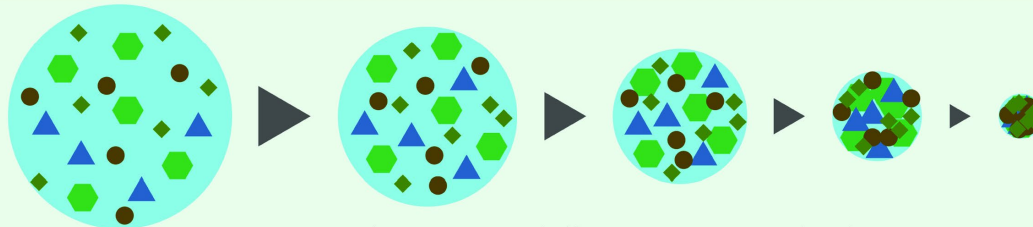


**D Aerosol transmission during aerosol-generating procedures (AGPs).** During AGPs, infectious virus-laden aerosols are released into the environment with the potential to cause infection if inhaled by a susceptible individual.

## FORMATION OF AIRBORNE DROPLET NUCLEI

Airborne viral droplets are coughed, sneezed, or expelled by humans.

This illustration shows how the mucus droplets filled with viruses eventually evaporate to create microscopic masses of viruses, salt, and protein called droplet nuclei.



*Evaporation of a liquid droplet (left) to a droplet nucleus (right). As the liquid evaporates, the non-evaporative content concentrates until a droplet nucleus is obtained. Such droplet nuclei could remain suspended in air for longer periods than liquid droplets.*

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7462404/#>

## Break the Chain of Infection

### BREAK THE CHAIN!

- ✓ Immunizations
- ✓ Treatment of underlying disease
- ✓ Health insurance
- ✓ Patient education

### BREAK THE CHAIN!

- ✓ Diagnosis and treatment
- ✓ Antimicrobial stewardship

### BREAK THE CHAIN!

- ✓ Cleaning, disinfection, sterilization
- ✓ Infection prevention policies
- ✓ Pest control



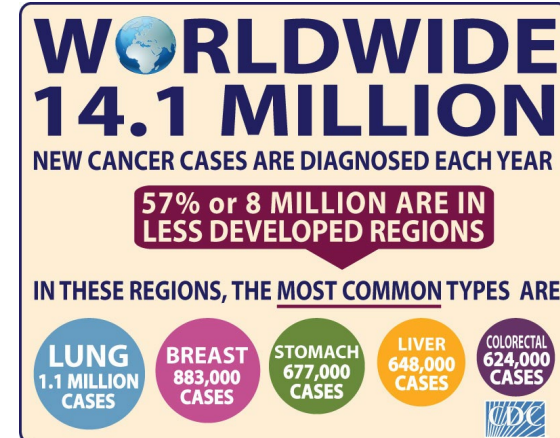
## How Many Infectious Particles Are Released?

Activity	Infectious Particles released
Normal breathing	135/minute
Talking	270/minute
Singing/Loud talking	1480/980/minute
Cough	3000/cough
Sneeze	40,000/sneeze
Exercising	76,000/minute
	<a href="https://doi.org/10.1080/02786826.2020.1812502">https://doi.org/10.1080/02786826.2020.1812502</a>



## At Risk Populations

- **Extremes of Age**—old and young
  - Multigenerational households
  - Important for workers that live or work with these populations of people
- **Immunocompromised**
  - Transplant patients
  - Taking immunosuppressive medications
  - HIV, HCV positive persons
- **Concurrent Diseases** (underlying conditions)
  - Respiratory, cardiac, cancer, autoimmune, endocrine and stress
- **Health Inequities**—limited access to care, language barriers, lack of health insurance, no workers' compensation, lack of economic and educational resources, working while ill as many only get paid when they work



## Infectious Disease Terms

- **Exposure**—having the infectious agent come in contact with one's body through direct contact, inhalation, or ingestion
- **Infection**—development of symptoms after being exposed to an infectious agent. The terms illness and disease can also be used, but those are typically longer-term and can be more severe.
- **Contagious**—the period of time in which an exposed and infected person can transmit the disease to other people.
  - In some diseases you may be contagious before you have symptoms like COVID-19, in other diseases you are only contagious after symptoms develop.
- **Clinical vs. Subclinical or Asymptomatic**—The outward sign of symptoms to observers. Asymptomatic means no observable symptoms but the infected person could still transmit the virus to others.
- **Quarantine**—separating exposed patients from unexposed patients for the period of an incubation time or until symptoms develop, at which time they are placed in isolation.
- **Isolation**—separating infected persons from non-infected persons until they are no longer contagious (usually determined by the absence of symptoms and/or a negative test).
- **Opportunistic Infections** – infections that occur more often or are more severe in people with weakened immune systems than in people with healthy immune systems

## Infectious Disease Terms (cont.)

### What's the difference between quarantine and isolation?

If you might have been exposed to COVID-19, you should stay home. This is called **quarantine**.



[cdc.gov/coronavirus](https://cdc.gov/coronavirus)

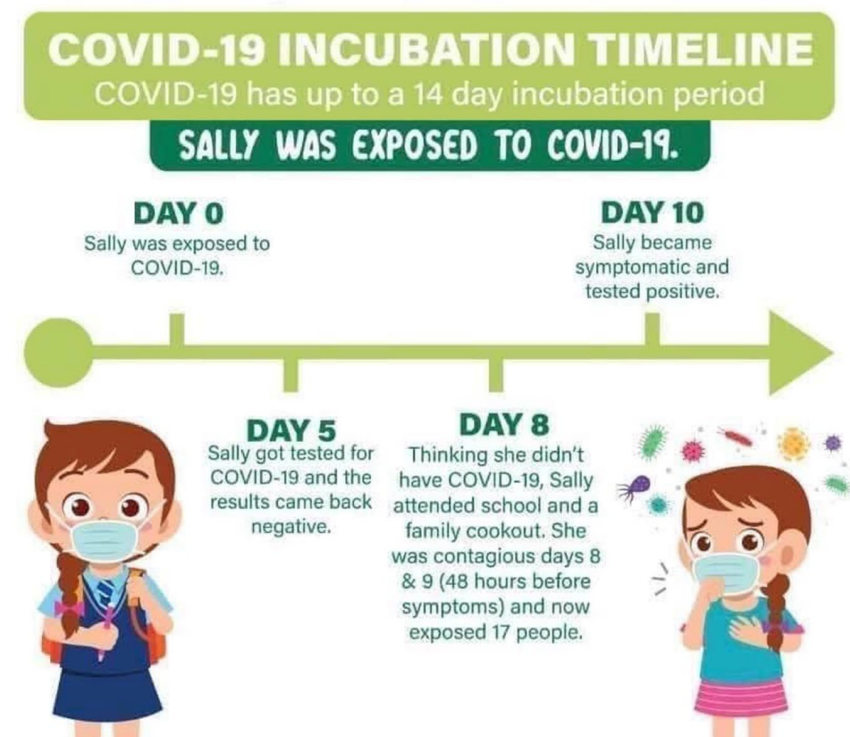
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# Infectious Disease Term, Incubation Period

**Incubation Period:** the time from the moment you are exposed to an infectious agent until the first onset of symptoms

- **Common cold**—1-3 days
- **Influenza**—1-4 days
- **Pneumonia** (bacterial) —1-5 days
- **COVID**—2-14 days (Omicron 1-4 days)
- **Aspergillosis** (fungus)—1.5 months
- **Tuberculosis**—3 weeks to 9 weeks

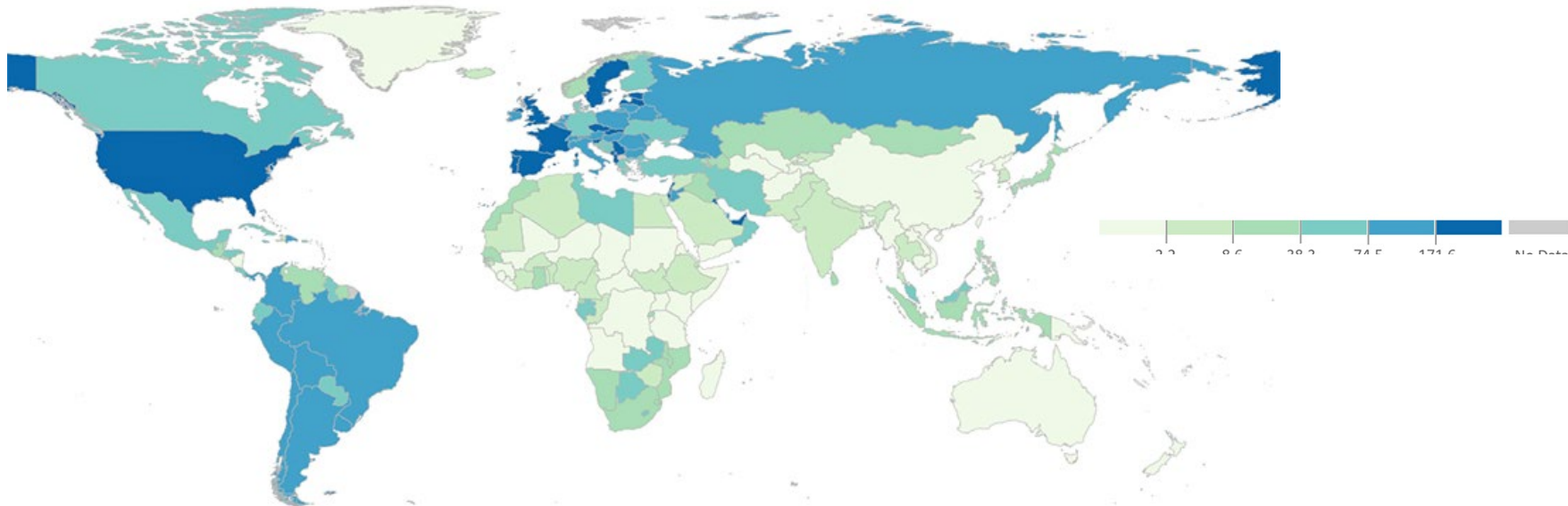
***For some respiratory infections, you may be contagious before you have symptoms***





## Infectious Disease Terms & Definitions

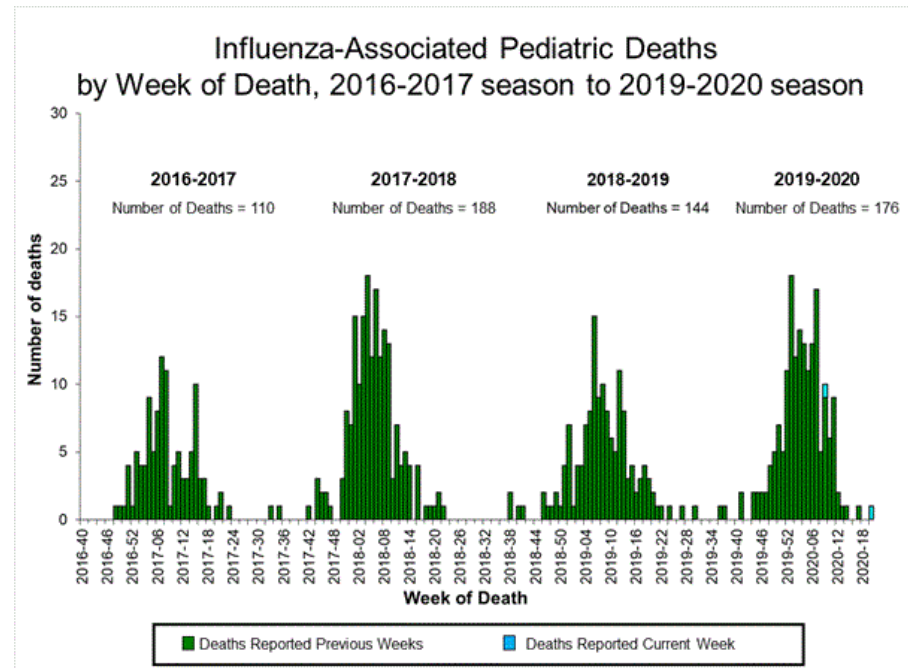
- **Endemic**—infectious agent or disease consistently present but limited to one defined region, like the common cold.
- **Epidemic**—number of cases rises above the historic levels for that time of year for that defined geographic area, like the seasonal flu.
- **Pandemic**—an epidemic that spreads to multiple continents or worldwide, like COVID-19.



## Seasonality of Some Infectious Diseases

**Some respiratory infectious diseases occur more frequently in late Fall, Winter, and early Spring. Why?**

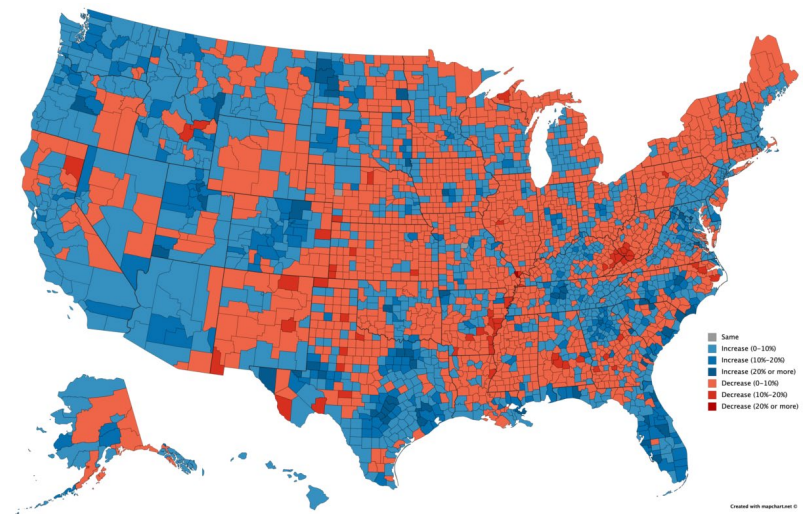
- More indoor activities/less outdoor gatherings
- More indoor crowding
- Less ventilation than outdoors
- Less UV light disinfection
- Schools start classes
- Holiday gatherings where people travel to/from areas of high/low community spread
- Some viruses are known to survive better in less humid and cooler environments





## Geography of Some Infectious Agents

- Geography and climate can affect not only the spread of infectious agents that can cause respiratory infections, but also how long they can continue to spread.
- Where a person lives also impacts resources they have, including access to health and medical care, vaccines, and information.
- Humid locations tend to have longer periods of bacterial, fungal, and insect-spread infections because agents can live in the environment.
- Colder locations tend to have more flu as more people stay inside and some viruses survive better in colder and less humid environments.
- High tourist locations, tend to have higher transmission rates that can affect global spread.
- High populations areas and cities have higher transmission rates.



# Symptoms of Respiratory Infections

## Typical symptoms

- Headache
- Nasal congestion/discharge
- Sore throat
- Hoarseness
- Cough—dry, mucus, blood
- Difficulty breathing
- Fever
- Chills
- Shortness of breath

## May also develop

- Fatigue
- Diarrhea, stomach aches, constipation
- Muscle, body aches
- Loss of smell/taste\*

*\* A feature that may occur with respiratory infections most frequently associated with COVID-19, is one way to distinguish COVID from influenza and the common cold.*

*Many respiratory infections present with flu-like symptoms which can make it difficult to distinguish COVID-19 disease based solely on symptoms.*



## Respiratory Infection: An Overview for Workers and Employers

# MODULE 2

## Assessing the Risk of Exposure in the Workplace



# Employer Responsibility and Workers' Rights

## What are employers' responsibilities?

- ✓ The Occupational Safety and Health Act (OSHA) requires employers to **provide a safe and healthful workplace** free of recognized hazards and to follow OSHA standards.
- ✓ Employers' responsibilities also include providing personal protective equipment, training, and record keeping.
- ✓ For more information about OSHA, go to [www.osha.gov](http://www.osha.gov) or call 1-800-321-OSHA (6742).



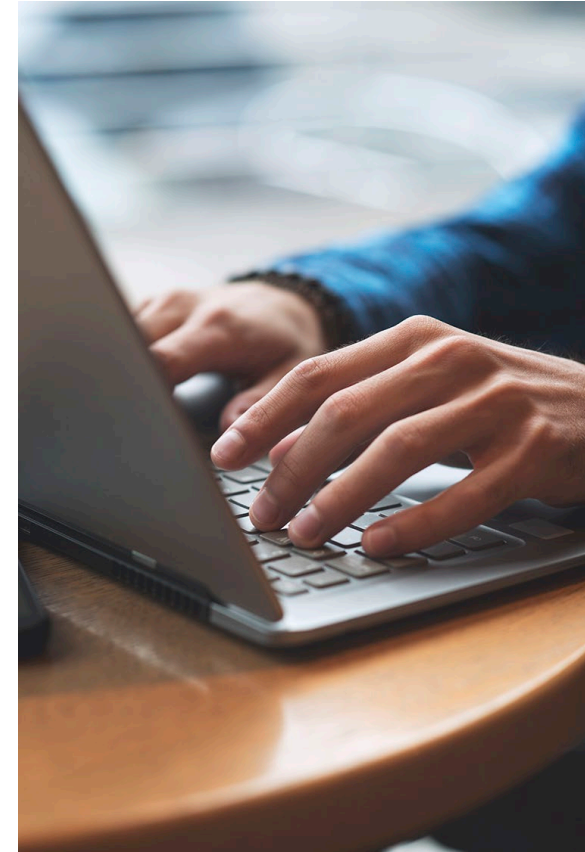
## Responsibility and Rights (continued)

### What are workers' responsibilities?

- ✓ Follow the employer's safety and health rules, policies, and procedures and wear or use all required PPE, gear and equipment
- ✓ Follow safe work practices for your job tasks, as directed by your employer.
- ✓ Report hazardous conditions to a supervisor.
- ✓ Report hazardous conditions to OSHA. This can be done by phone (1-800-321-OSHA) and online ([www.osha.gov](http://www.osha.gov)) using your name or leaving it out.

## Workplace Sources of Infection

- **Sharing common indoor space with infected persons, co-workers, or environment**
- **Contact with infectious persons**
  - Co-workers
  - Patients
  - Community
  - Others (clients, customers, vendors)
- **Contact with contaminated and environmental surfaces**
  - Keyboards
  - Tables
  - Water, soil
- **Contact with infected animals, insects, processes**
  - Culling operations
  - Meat and animal processing
  - Agriculture (farming or ranching)





## Knowing the Risk of Illness in the Workplace

- ✓ Be aware of the time of year when common cold and influenza are spreading in your community.
- ✓ Know when community spread of COVID-19 is moderate to high.
  - This is available on the CDC website.
  - Follow local public health guidance.
- ✓ Pay attention to others in the workplace who show signs and symptoms of a respiratory illness and know your employer's policies for sharing your concerns.
- ✓ Know your rights, including the opportunity to file an OSHA complaint if you feel your employer has not provided a safe and healthy workplace.



## Respiratory Infection: An Overview for Workers and Employers

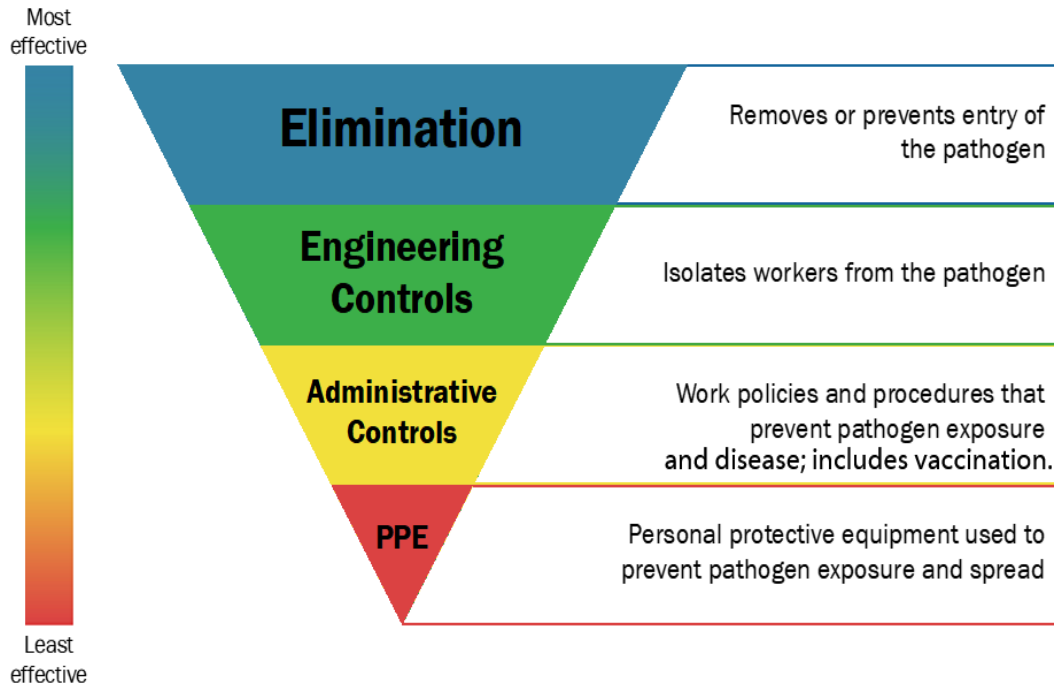
# MODULE 3

## Methods to Prevent Exposures and Infections in the Workplace



# Importance of the Hierarchy of Controls

## Hierarchy of Controls



- COVID-19 vaccination will not be 100% protective.
- At first, there will be much uncertainty about the level and duration of protection provided by vaccination.
- In view of this, it will be important to continue the range of protective workplace interventions from across the hierarchy of COVID-19 controls.

## Prevention

- Ventilation.
  - Outdoors sites are less risky than indoors.
  - Well ventilated indoor spaces are less risky than poorly ventilated indoor spaces.
    - Open windows when possible, however consult facilities to understand HVAC impacts.
    - Use fans.
    - Air purifiers may or may not be of benefit.
- Mask up in indoor public places when transmission is high and local health officials recommend masks.
- Recommended Vaccination
  - Influenza—seasonal vaccines offered from early Fall through Spring.
  - COVID-19—vaccine available at local clinics and pharmacies.
  - Pneumococcal vaccine where indicated.





# Masks and Respirators

## Respirators

N95/KN95—tight fitting masks with electrostatically charged material that filters out small particles.

When properly fitted, respirators are extremely effective in removing infectious materials from being inhaled.

**Wear a mask with the best fit, protection, and comfort for you.**

 <b>N95 Respirator</b> NIOSH-approved	 <b>KN95 Respirator</b>	 <b>Disposable Mask</b> Sometimes referred to as "surgical masks" or "medical procedure masks"	 <b>Cloth Mask</b> Non-medical, made of fabric
When worn correctly, respirators offer the highest level of protection and filter 95% of particles.	Filtration varies depending on standard. When worn correctly, KN95s provide more protection than disposable masks.	Disposable masks offer more protection than cloth masks.	Layered finely woven cloth masks offer more protection. Loosely woven cloth masks provide the least protection.

 Masks and respirators should not be worn by children younger than 2 years old.

[cdc.gov/coronavirus](https://www.cdc.gov/coronavirus)

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## Masks

- May protect uninfected persons from infected persons by filtering infected particles from inhaled air.
- In order to function properly, they must be tight fitting and free of defects.

### Types of masks:

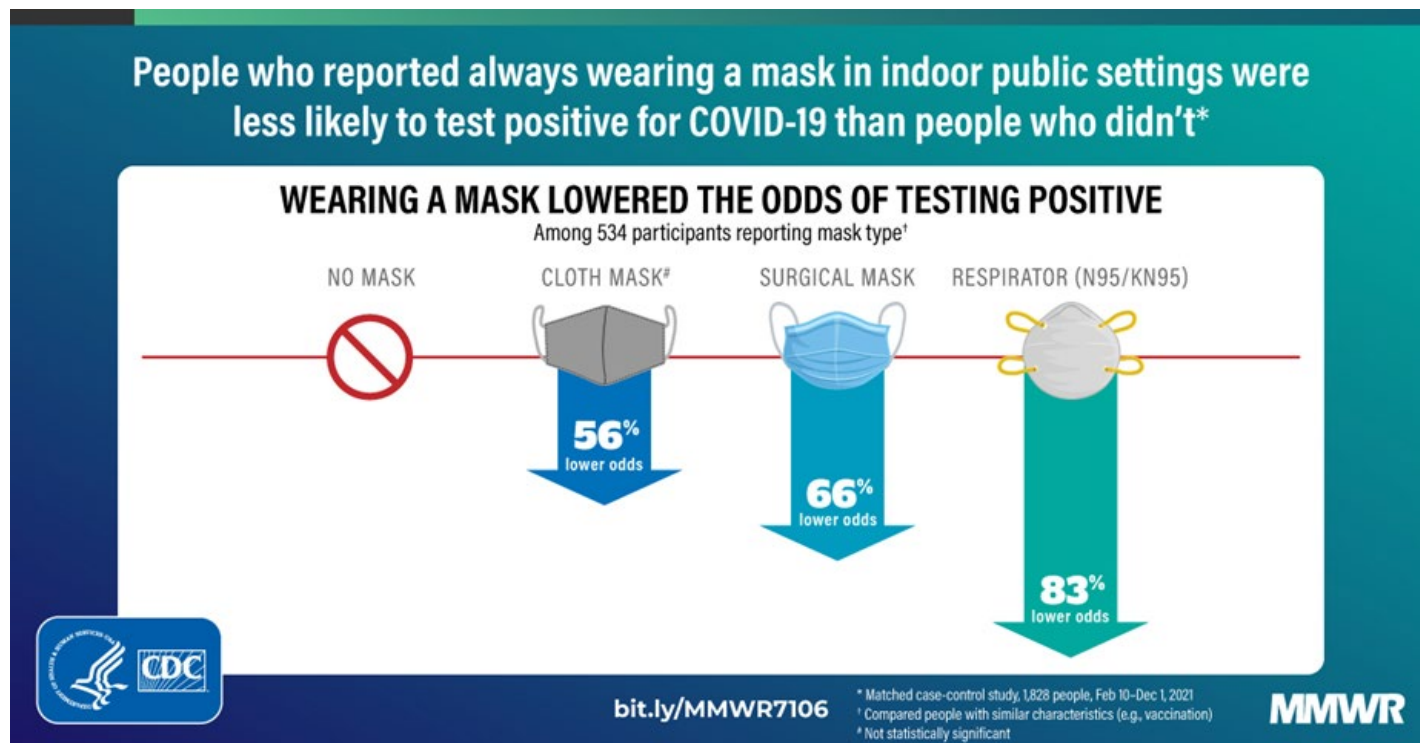
- **Surgical mask**—meant to block large particles from entering the respiratory tract. Because they are not tight fitting and lack appropriate filter material, they are not effective in preventing inhalation of small infectious particles.
- **Cloth mask**—meant to keep out large particles.



## Do Masks and Respirators Work?

### In a word, Yes!

Properly fitted and used face coverings like respirators can protect the wearer from exposure to respiratory particles and eliminate the risk of infection.



## Do Masks and Respirators Work? (continued)

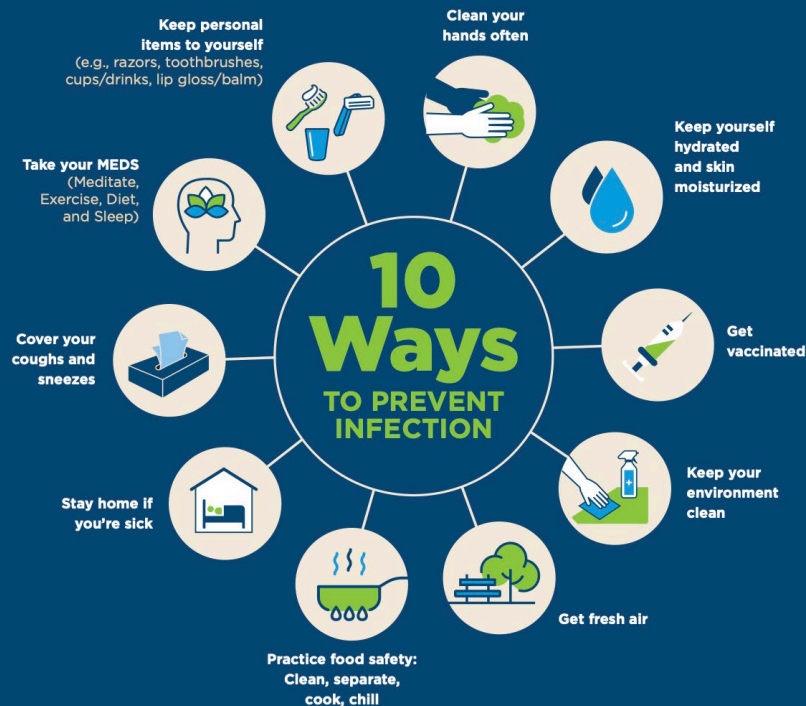
- In mask wearing studies conducted during the pandemic, cities and schools with mask mandates have lower levels of community spread of COVID.
  - If masks or other face coverings are recommended in your community, CDC has more information.  
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html>
- Properly fitted and worn respirators – like N95s - prevent workers from getting respiratory illnesses. Wearing them is considered part of a personal protective equipment ensemble that reduces the risk of exposure.
  - If respirators are required at work, you must be properly fit tested. OSHA has more information. <https://www.osha.gov/respiratory-protection/training>.

## Protect Yourself from Infection

- Handwashing:
  - Soap and water for at least **20 seconds**.
  - Hand sanitizer is an alternative when there is no soap/water available or practical.
- Keep hands away from nose, mouth, eyes.
- Disinfect surfaces frequently with approved cleaning, disinfection agents.



## Protect Yourself and Others from Infection



## REMEMBER THE 3 W'S

to protect yourself and others this season:



**WASH**  
your hands



**WEAR**  
your mask



**WATCH**  
your distance



**GET YOUR FLU SHOT**



The Association for Professionals in Infection Control and Epidemiology (APIC) is creating a safer world through the prevention of infection. APIC's nearly 16,000 members develop and direct infection prevention and control programs that save lives and improve the bottom line for healthcare facilities. APIC advances its mission through patient safety, education, implementation science, competencies and certification, advocacy, and data standardization. Visit us at [apic.org](http://apic.org).

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Arlington, VA 22202  
[www.apic.org](http://www.apic.org)

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## If You Become Infected or Feel Sick

- **Stay home** when you have symptoms of a respiratory tract infection.
  - Follow local public health guidance for how long you should remain at home, but at a minimum you should remain at home until you are symptom free.
  - If you must work:
    - Wear a mask.
    - Keep at least 6 feet away from others when practical.
    - Wash your hand frequently.
- If you are able, **get tested for Influenza and COVID-19** at local testing clinics or do a home test for COVID .
- **Treat symptoms** with over-the-counter non-prescription medications.
- **Seek medical care** if you have moderate or severe symptoms or if they are lasting for more than a few days.

## Is it Influenza, COVID-19, or the Common Cold?

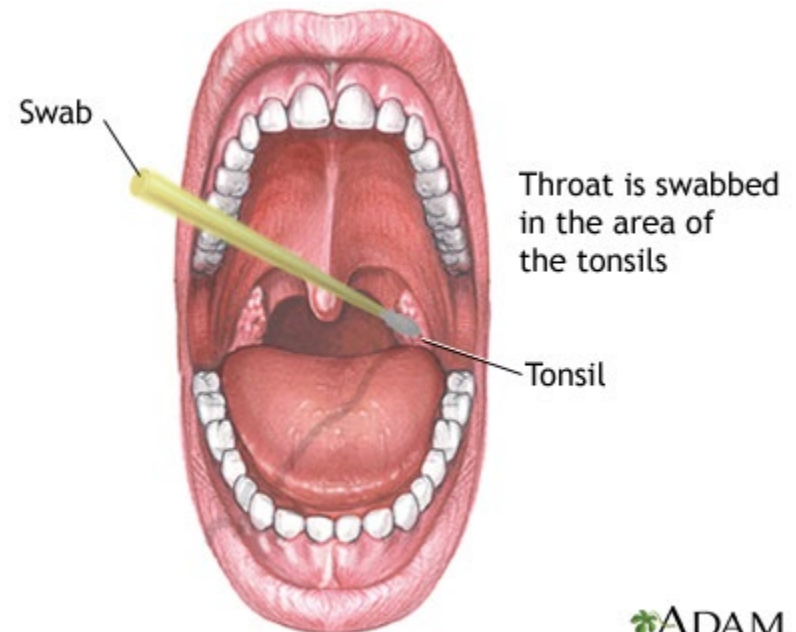
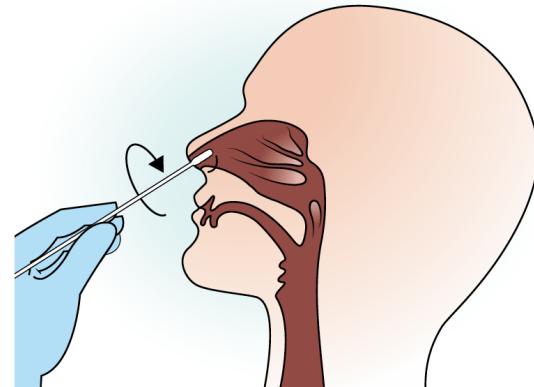
Symptom	Influenza	COVID-19*	Common Cold
Fever	+++	+++	+
Cough	+++	+++	+++
Sore Throat	++	+	+++
Nasal Congestion	+	+	++
Diarrhea	++	++	-
Loss of Taste/Smell	No	Sometimes	No
Vaccine	Yes, Annual	Yes	No
Treatment	Antiviral taken upon onset of symptoms	Antivirals taken upon onset of symptoms for persons at high risk of hospitalization	Symptomatic
Testing	Yes	Yes	No

\*Note: People who have been vaccinated or have had COVID-19 previously may present with less severe or not all the symptoms.



## Testing

- For many of the common respiratory illnesses, there are no tests, however, there are tests for:
  - ✓ Strep throat
  - ✓ Influenza A and B
  - ✓ COVID-19
- Consult a healthcare provider on whether or not a test is needed.
- If you think you have COVID, you can also use a home test if you have one.
- Also note that a test may not turn positive early in the illness as there may not be enough viral particles to show up on a test.

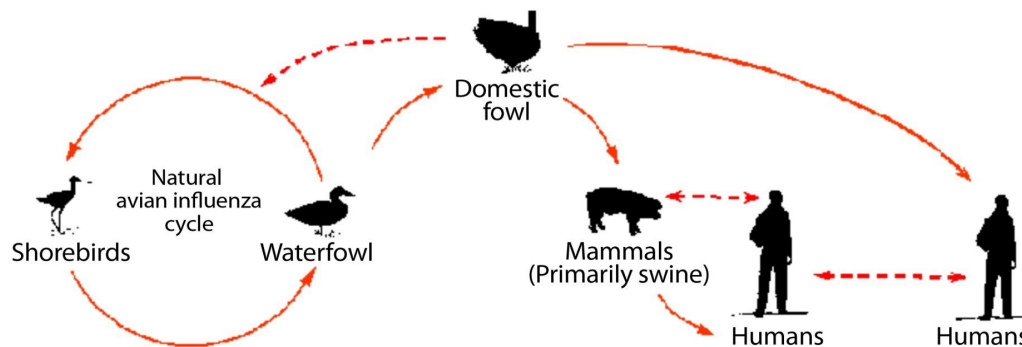


## Special Considerations

### Animal Reservoirs

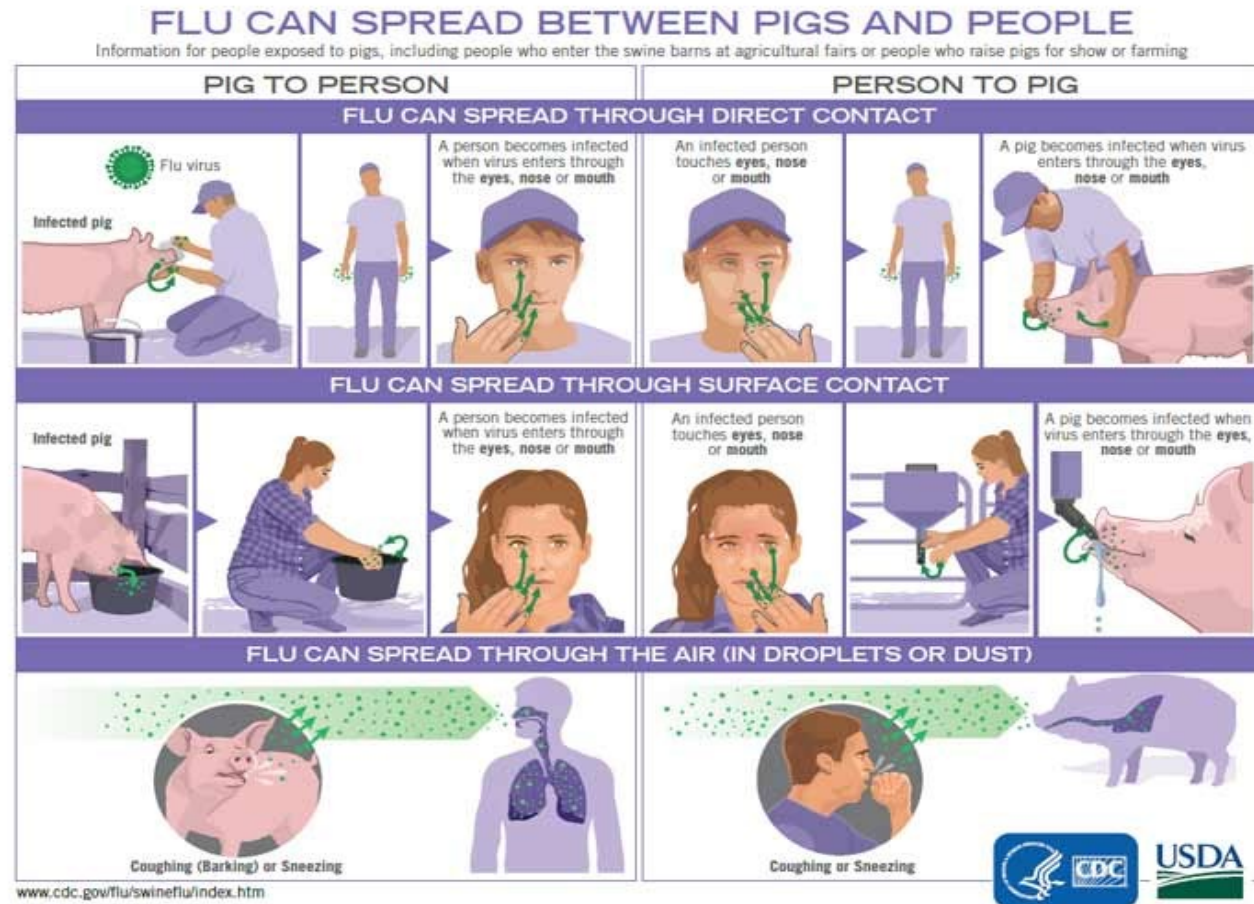
- Some respiratory infectious diseases can be maintained in animals and then spread to humans in a process known as “jumping species”.
- Influenza is an example of one such disease. The influenza virus can infect bird or swine and become capable of jumping species and infecting humans.
- Other such diseases include SARS, MERS, and COVID-19.

**Current and future concerns** about the transmission of avian influenza virus (H5 N1)



## Special Considerations (cont.)

- Insects can also become infected from exposure to animal blood (fleas, ticks, mosquitos) and then transmit it to other animals and people.
- Those working with animals or in agriculture are at a higher risk of exposure.



## References

- **National Institute for Environmental Health Sciences**
  - H5N1 (Swine), Pandemic, and Avian Influenza
    - <https://tools.niehs.nih.gov/wetp/index.cfm?id=538>
  - COVID-19
    - <https://tools.niehs.nih.gov/wetp/index.cfm?id=2591>
  - Infectious Diseases
    - <https://tools.niehs.nih.gov/wetp/index.cfm?id=2554>
- **CDC**
  - [www.cdc.gov](http://www.cdc.gov)
  - <https://www.cdc.gov/coronavirus/2019-ncov/index.html>
  - <https://www.cdc.gov/flu/index.htm>
- **World Health Organization (WHO)**
  - [www.who.int](http://www.who.int)
- **OSHA**
  - [www.osha.gov](http://www.osha.gov)
- **National Institute for Occupational Safety and Health (NIOSH)**
  - [www.cdc.gov/niosh](http://www.cdc.gov/niosh)

# QUESTIONS?

## Summary

- ☒ Infectious agents that cause respiratory illnesses are a major reason for absenteeism and loss of productivity in the workplace.
- ☒ Workplace conditions can facilitate the spread of respiratory illnesses if risk reduction practices and control measures are not implemented.
- ☒ Basic personal and public health interventions such as handwashing, covering coughs and sneezes, ventilation, and physical distancing can prevent their spread.
- ☒ Vaccines and masks can also reduce the risk of spread in addition to the other measures noted in this guidance.