



Infectious Disease Risk-Based Response

Focus on SARS-CoV-2 (COVID-19)

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What Do You Need to Know?

- COVID-19 exposure is via Inhalation and Contact of droplets, aerosols, and fomites
 - It is not a skin hazard
- Protection Priorities (Minimize Dose)
 - Airway
 - Mucous Membranes
 - Hands
 - Body
- COVID-19 survives on some surfaces for up to 17 days
 - But, it's easy to destroy!
- Incubation period for infected people can be up to 12.5 days
 - Guidance is 14 days
- US now leads in total number of confirmed cases

This is a manageable situation – Follow a Risk-Based Response



BIOHAZARD

B1L3

Module 1

What is SARS-CoV-2?





What is SARS-CoV-2

- Severe Acute Respiratory Syndrome Coronavirus 2
 - SARS-CoV-2
 - Formerly known as 2019 novel coronavirus
 - Also know as:
 - The virus responsible for COVID-19
 - The COVID-19 virus
- Causative agent for coronavirus 2019 disease
 - COVID-19



Severity of COVID-19

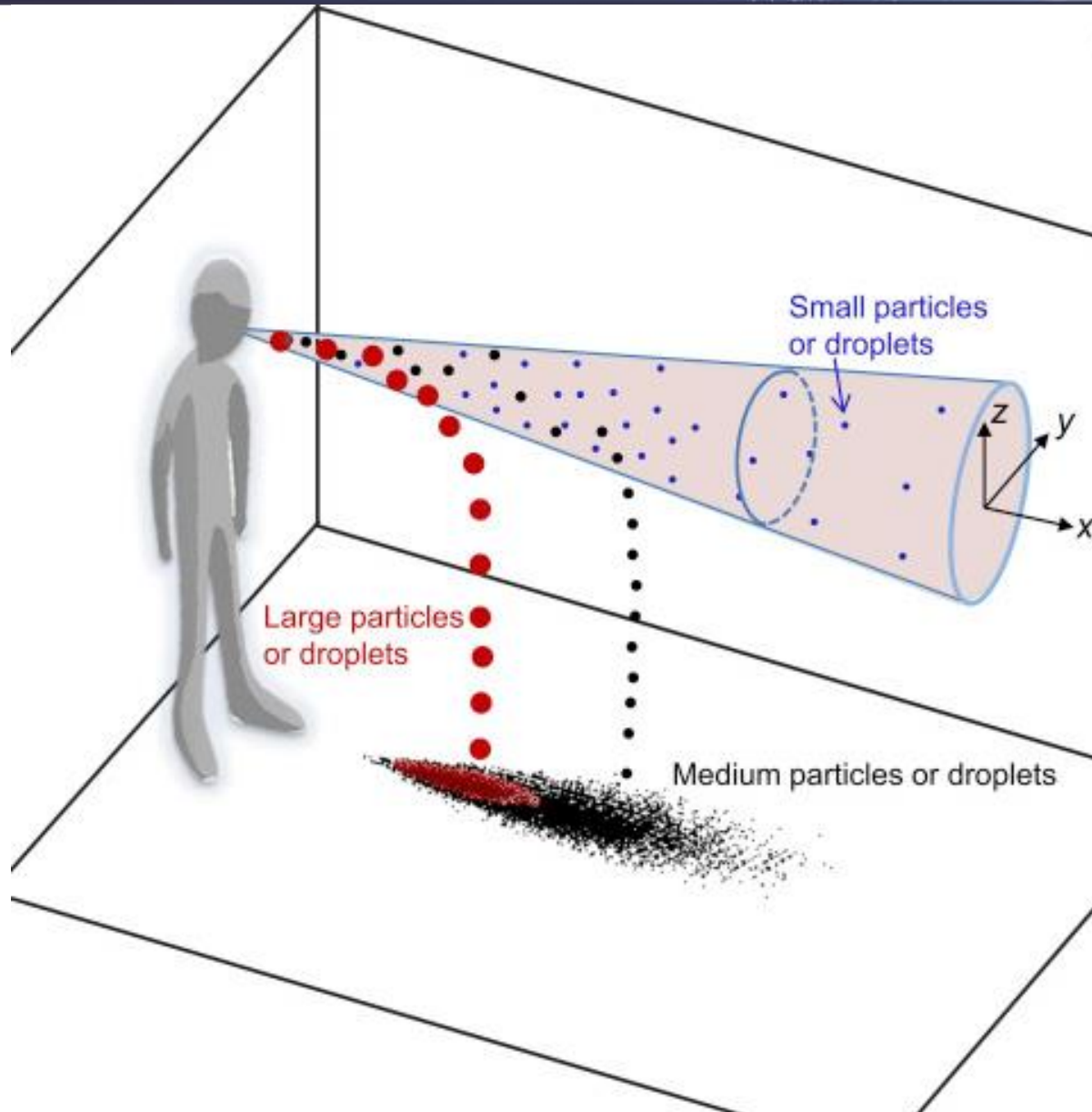
- Patients present with fever, cough, shortness of breath, muscle pain, confusion, and/ or headache
- Severity ranges from mild to severe disease resulting in death
- Fatal cases in China were strongly associated with older age
 - Comorbidities common in older patients, may not be an independent risk factor
 - Cause of death due to progressive respiratory and multi-organ failure
 - Most deaths occur after prolonged course (7-10 days)
- True case-fatality ratio is difficult to assess as the number of infections is unknown
 - Limited testing available



Transmission of SARS-CoV-2

- Zoonotic virus
 - Epidemiological evidence of exposures in some initial cases
 - Environmental sampling in Huanan Seafood and live animal market
 - Animal source not yet identified
- Human-to-Human transmission
 - Transmission via droplet, contact, fomites
 - Occurring amongst close contacts, including families and health care workers
 - Incubation period estimated range of 1 – 12.5 days, therefore guidance is for 14 days

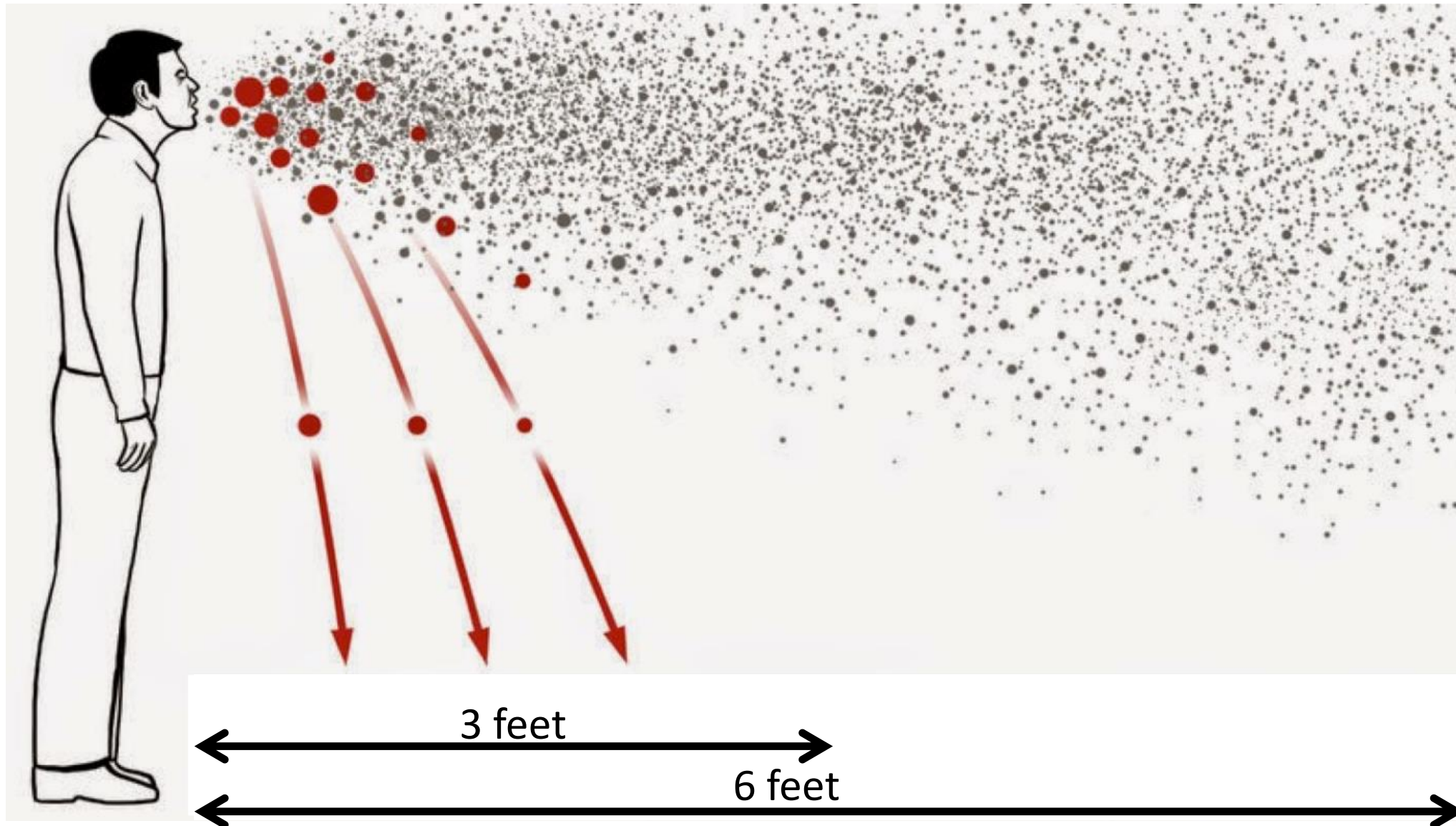
Transmission – Airborne



REF: Wei, J. and Li, Y. (2015) Enhanced spread of expiratory droplets by turbulence in a cough jet. 93(2): 86-96.



Transmission – Airborne



REF: Image adapted from NPR.org, Ebola in the Air: What Science Says About How the Virus Spreads (Dec 1, 2014)

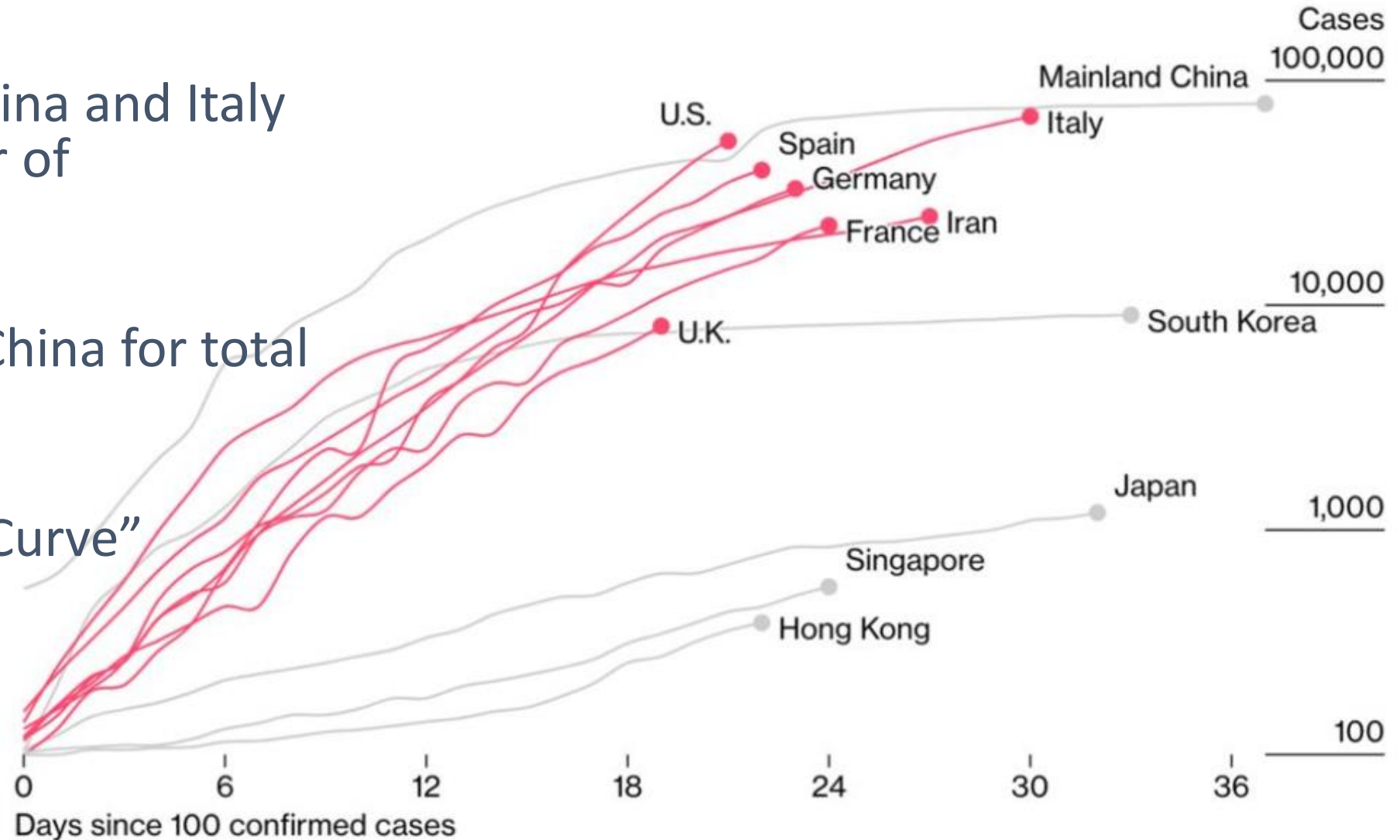
Transmission – Contact





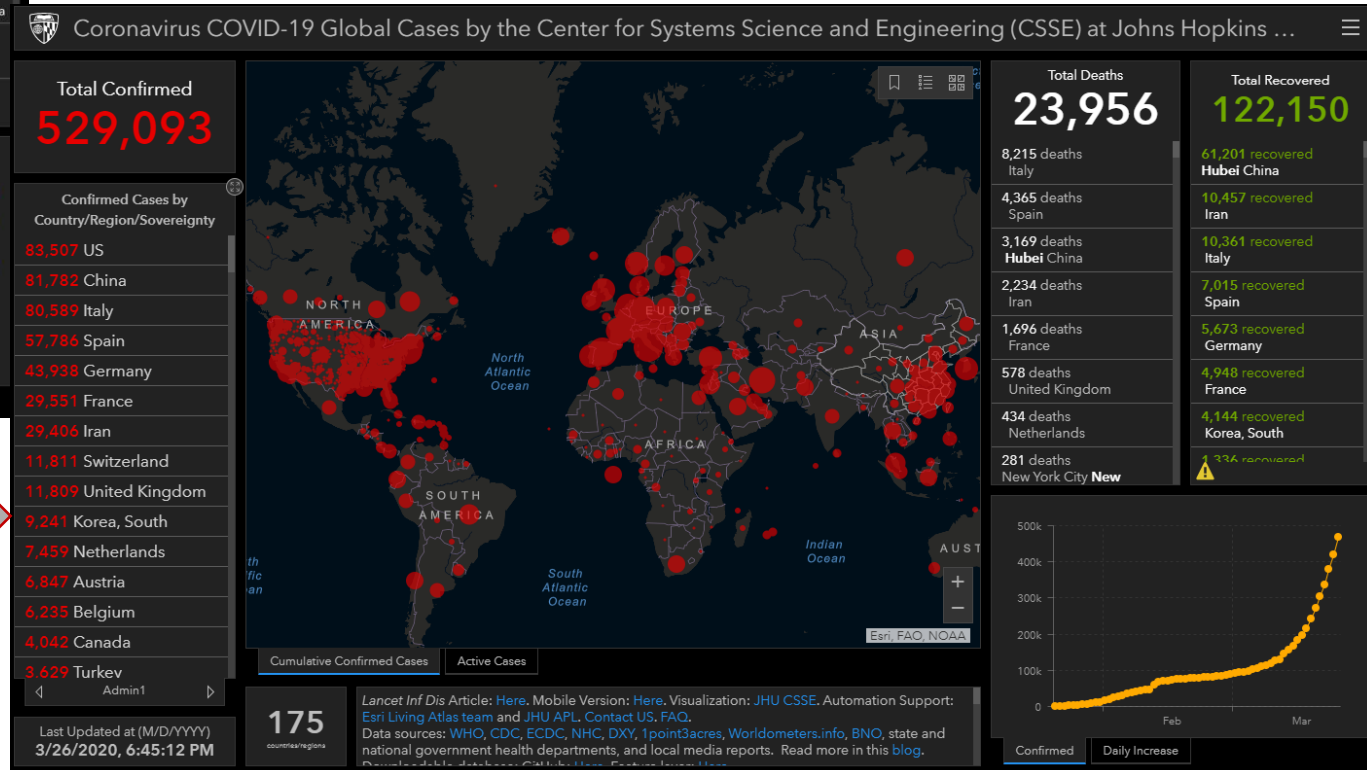
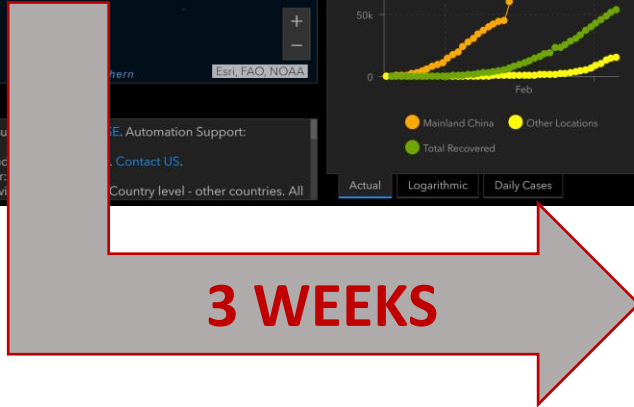
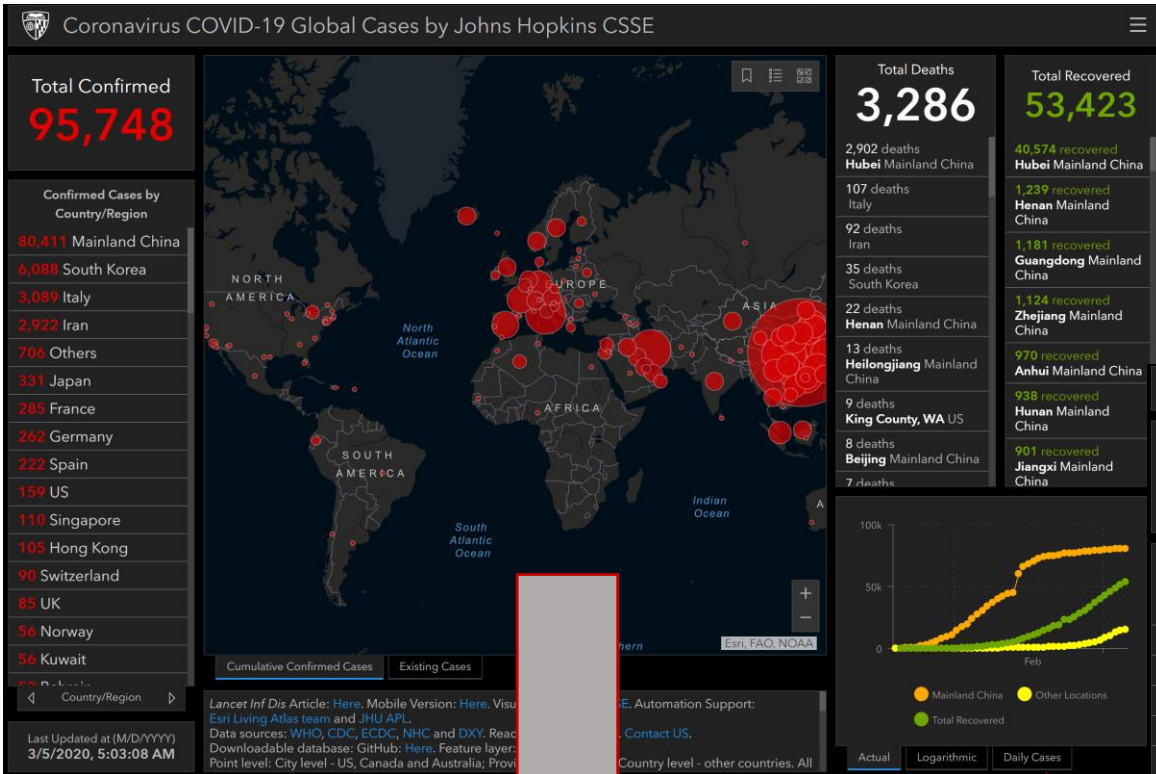
How Are We Doing?

- US surpasses China and Italy for total number of confirmed cases
 - 26 March 2020
- Italy surpasses China for total deaths
 - 19 March 2020
- “Flattening the Curve”
 - South Korea
 - Japan
 - Singapore
 - Hong Kong



How Are We Doing?

Between 3/5/2020 & 3/26/2020
 > 550% increase in confirmed cases
 > 729% increase in total deaths
 Italy has a 9.8% mortality rate (0.13% population infected)





Module 2

Risk-Based Response Protocols



Risk-Based Response Protocols



- Standard Precautions (**S**)
- Contact Precautions (**C**)
- Droplet Precautions (**D**)
- Airborne Precautions (**A/A+**)
- Viral Pathogen Precautions (**V**)





Known Threat Pathway

RESPONSE GUIDE # IDR-01 Infectious Disease Risk-Based Response



Infectious Disease	Precautions	Infectious Disease	Precautions
Acquired immune deficiency syndrome (AIDS)	S	Measles	A
Adenovirus	C	Meningococcal disease	A+
Anthrax (cutaneous or pulmonary)	S	MERS	A+
Aspergillosis	S	Monkeypox	A
Avian influenza	A+	MRSA	C
Bacterial meningitis	D	Mumps	D
Botulism	S	Mycoplasma	D
C. difficile	C	Neisseria meningitidis	D
Cellulitis	S	Norovirus	C
Chickenpox (Varicella)	A	Novel coronavirus	A+
Coxsackie	D	Novel influenza strains (eg H7N9)	A+
Dengue	S	Parainfluenza	C (plus mask)
Diarrhea - suspected infectious	C	Parvovirus	D
Diphtheria	A+	Pertussis	D
E. coli 0157	C	Pneumonic plague	D
Enterovirus	C	Respiratory syncytial virus (RSV)	C (plus mask)
EVD/VHF - Dry Patient	V	Rhinovirus	D
EVD/VHF - Wet Patient	V	Rotavirus	C
Hepatitis A (HAV)	C	Rubella	D
Hepatitis B (HBV)	S	Salmonella	C
Hepatitis C (HCV)	S	Severe acute respiratory syndrome (SARS)	A+
Herpes Zoster (shingles, disseminated)	A	Shigella	C
Herpes Zoster (shingles, localized)	C	Smallpox	A+
Herpes Simplex	C	Streptococcal and other causes of pneumonia	D
Human immunodeficiency (HIV)	S	Streptococcal pharyngitis	D
Influenza - Seasonal	D	Tuberculosis (suspected or confirmed pulmonary or laryngeal)	A
Lassa Fever	V	Upper respiratory infection – non-specific	S
Lice / Scabies	C	Vancomycin-resistant enterococci (VRE)	C
Marburg Virus	V	Wound - excessive drainage	C
		Wound infection including abscess	S





Known Threat Pathway

RESPONSE GUIDE # IDR-01 Infectious Disease Risk-Based Response



Infectious Disease	Precautions	Infectious Disease	Precautions
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Anthrax (cutaneous or pulmonary)	S	MERS	A+
Aspergillosis	S	Monkeypox	A
Avian influenza	S	MRSA	C
Bacterial meningitis	S	Neisseria meningitidis	D
Botulism	S	Norovirus	C
C. difficile	S	Novel coronavirus	A+
Cellulitis	S	Novel influenza strains (eg H7N9)	A+
Chickenpox (Varicella)	S	Parainfluenza	C (plus mask)
Coxsackie	S	Parvovirus	D
Dengue	S	Respiratory syncytial virus (RSV)	C (plus mask)
Diarrhea - suspected infectious	S	Rhinovirus	D
Diphtheria	S	Rotavirus	C
E. coli O157	C	Rubella	D
Enterovirus	C	Salmonella	C
EVD/VHF - Dry Patient	V	Severe acute respiratory syndrome (SARS)	A+
EVD/VHF - Wet Patient	V	Shigella	C
Hepatitis A (HAV)	C	Smallpox	A+
Hepatitis B (HBV)	S	Streptococcal and other causes of pneumonia	D
Hepatitis C (HCV)	S	Streptococcal pharyngitis	D
Herpes Zoster (shingles, disseminated)	A	Tuberculosis (suspected or confirmed pulmonary or laryngeal)	A
Herpes Zoster (shingles, localized)	C	Upper respiratory infection – non-specific	S
Herpes Simplex	C	Vancomycin-resistant enterococci (VRE)	C
Human immunodeficiency (HIV)	S	Wound - excessive drainage	C
Influenza - Seasonal	D	Wound infection including abscess	S
Lassa Fever	V		
Lice / Scabies	C		
Marburg Virus	V		





Unknown Threat Pathway

See ID 02

Signs/
Symptoms

GI

Consider

Vomiting – S
Acute Diarrhea with likely infectious cause – C
Water or explosive stools, with or without blood – C
Otherwise - S

Fever, flu-like

Consider

Cough, runny nose, water eyes – D
Fever (>101.1°F) and cough in adults – D
Fever (>101.1°F) and cough in children – C and D
Otherwise - S

Cough/
respiratory

Consider

Fever (>101.1°F) and cough with bloody sputum, and weight loss or with upper pulmonary infiltrate in an HIV-negative patient or any lobe in an HIV-positive patient – A
Fever (>101.1°F), cough, and pulmonary infiltrate in a patient with travel history in country with active cases of corona virus/avian influenza in past 10 – 21 days – A+
Otherwise - S

Skin

Consider

Large, open wounds, drainage – C
Itchy rash with no fever – C
Vesicular rashes, especially if in centrifugal pattern – A and C
Fever (>101.1°F) and rash – A
Fever (>101.1°F) and petechial/ecchymotic bruising – D
Fever (>101.1°F), cough, runny nose, and raised red, bumpy rash – A
Fever (>101.1°F), upper chest rash, and stiff/sore neck – D
Eye infections (drainage from eye) - S

Prior
antibiotic-
resistant
infection

Consider

MRSA – C
Vancomycin-resistant enterococci - C

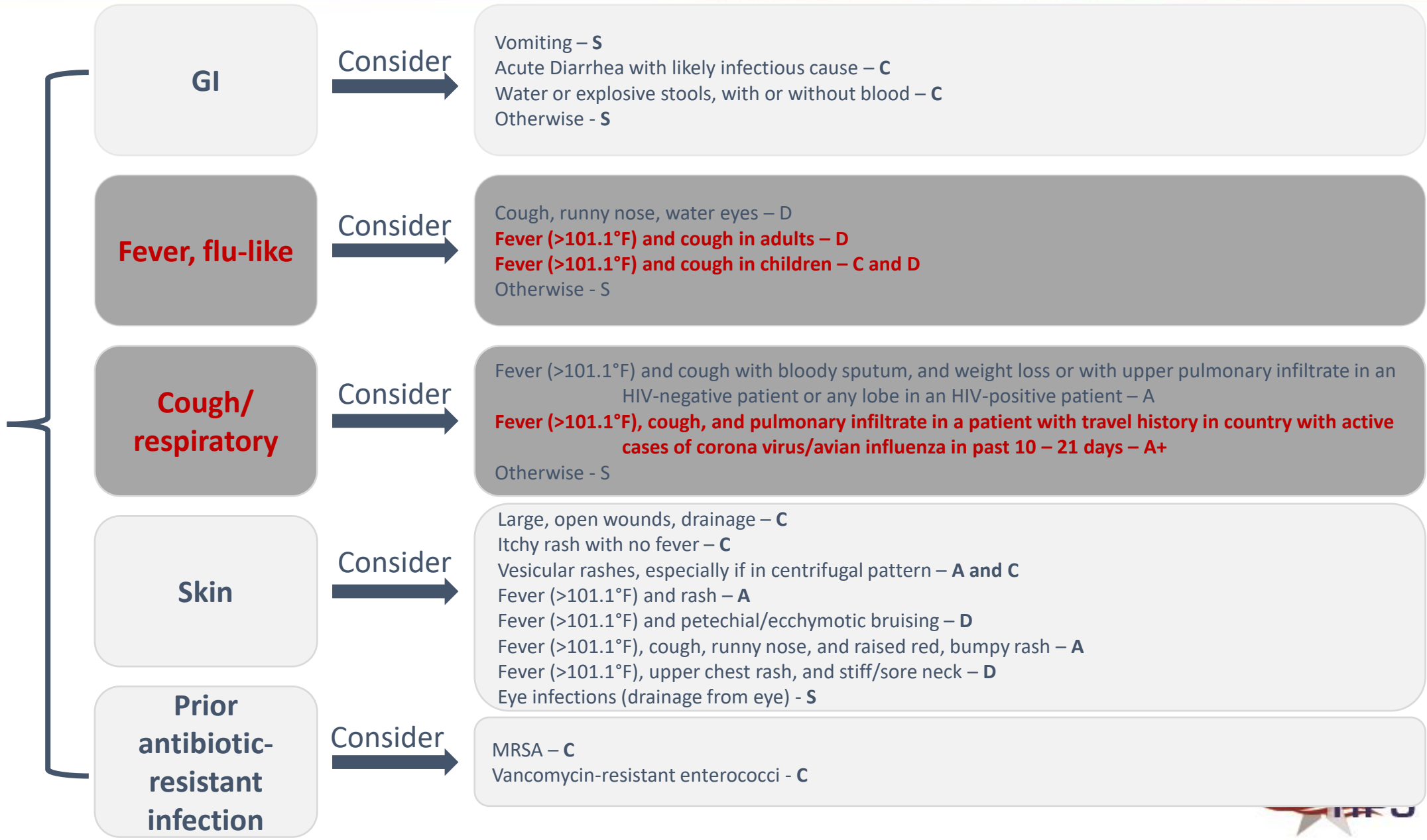




Unknown Threat Pathway

See ID 02

Signs/
Symptoms





Risk-Base Response – PPE Escalation



Risk-Base Response – EMS Considerations

STANDARD	CONTACT	DROPLET	AIRBORNE	VIRAL PATHOGEN
<p>Assess patient from 6', if possible</p> <p>Provide patient with mask (if exhibiting respiratory symptoms)</p> <p>Adjust level of precaution as necessary</p> <p>Utilize Exhaust fan in EMS transport unit</p>	<p>ALL STANDARD PLUS:</p> <p>Consider plastic sheets (between patient and stretcher)</p> <p>Not all GI illnesses require droplet precautions (assume C. diff, norovirus, or others until ruled out)</p>	<p>ALL STANDARD AND CONTACT PLUS:</p> <p>Consider isolating the driver compartment if performing aerosol producing procedures (airway suction, intubation, aerosolized medication administration)</p> <p>Increase ventilation in patient compartment (place air or heat on non-recirculating cycle and/or open windows)</p>	<p>ALL STANDARD, CONTACT, AND DROPLET PLUS:</p> <p>Isolate immediate area & minimize personnel</p> <p>Minimize personnel exposed to infectious persons</p> <p>Isolate driver from patient OR driver dons N95 (minimum)</p> <p>Consider Portable Isolation Units or Ambulance Draping</p>	<p>ALL STANDARD, CONTACT, DROPLET, and AIRBORNE</p>

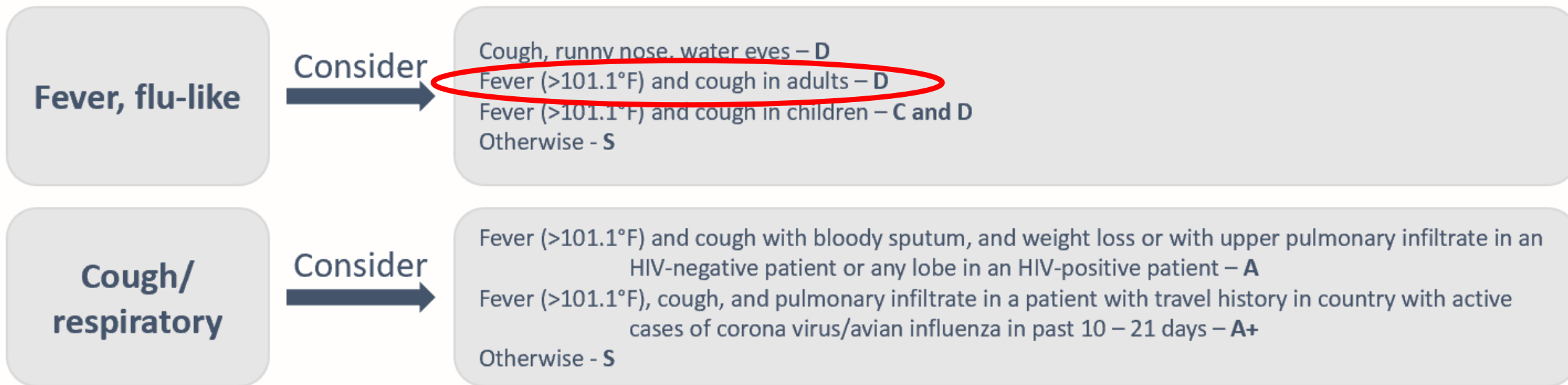
Risk-Base Response – Decontamination Escalation

STANDARD	CONTACT	DROPLET	AIRBORNE	VIRAL PATHOGEN
Wash hands	Wash hands	Wash hands	Wash hands	Wash hands
Clean surfaces	Clean surfaces	Clean surfaces	Clean surfaces	Clean surfaces
Disinfect surfaces (EPA-registered)	Disinfect surfaces (EPA-registered)	Disinfect all impacted areas (EPA-registered)	Disinfect all impacted areas* (EPA-registered)	Disinfect all impacted areas* (Peracetic acid-based decontamination)
		Inspect PPE for visible contamination (decon prior to doffing)	Inspect PPE for visible contamination (decon prior to doffing)	Inspect PPE for visible contamination (decon prior to doffing)

*Remember, adjacent areas could also be impacted

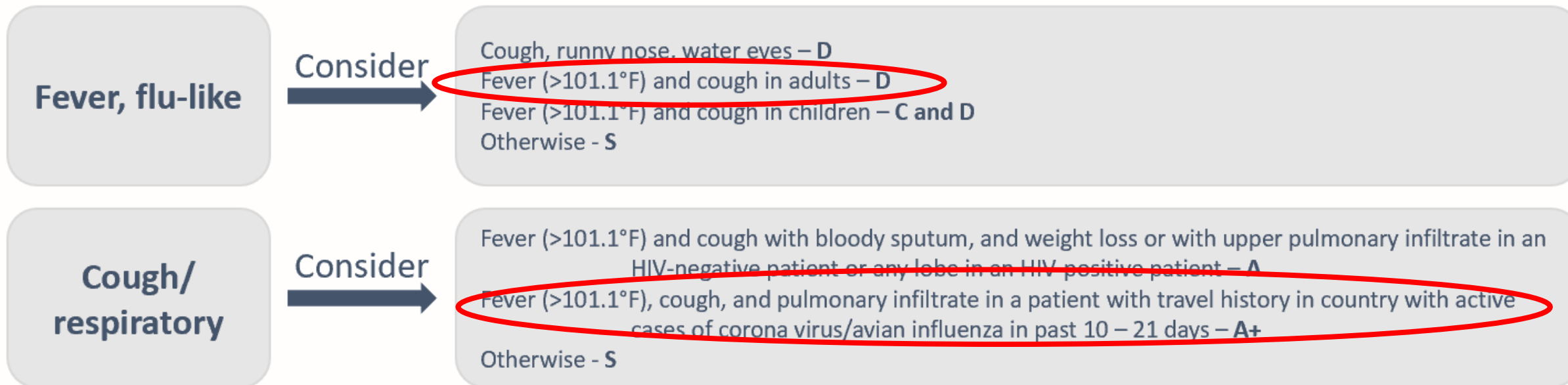
Case Study

- On January 19, 2020, a 35-year-old man presented to an urgent care clinic in Snohomish County, Washington, with a 4-day history of cough and subjective fever.

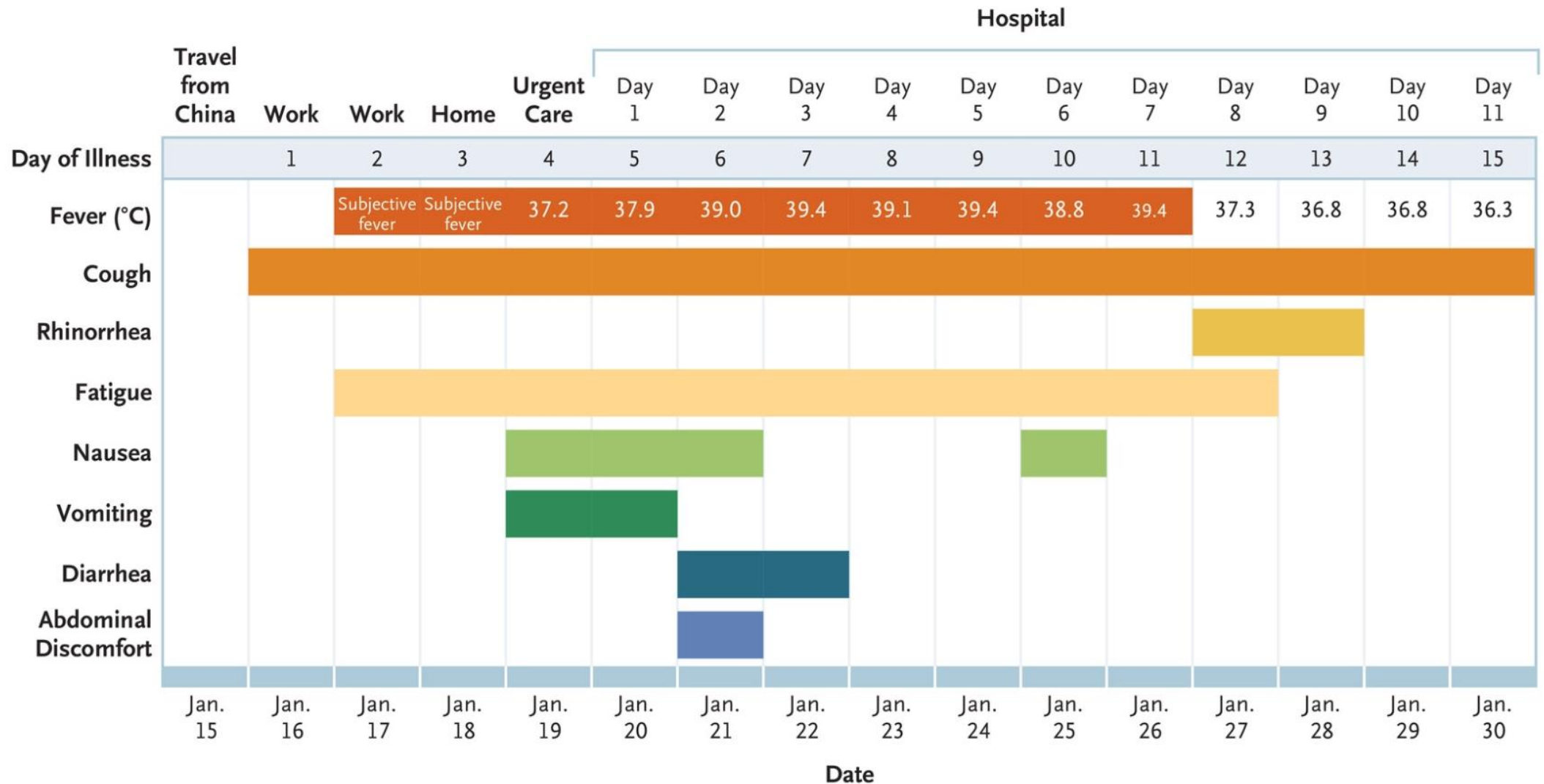


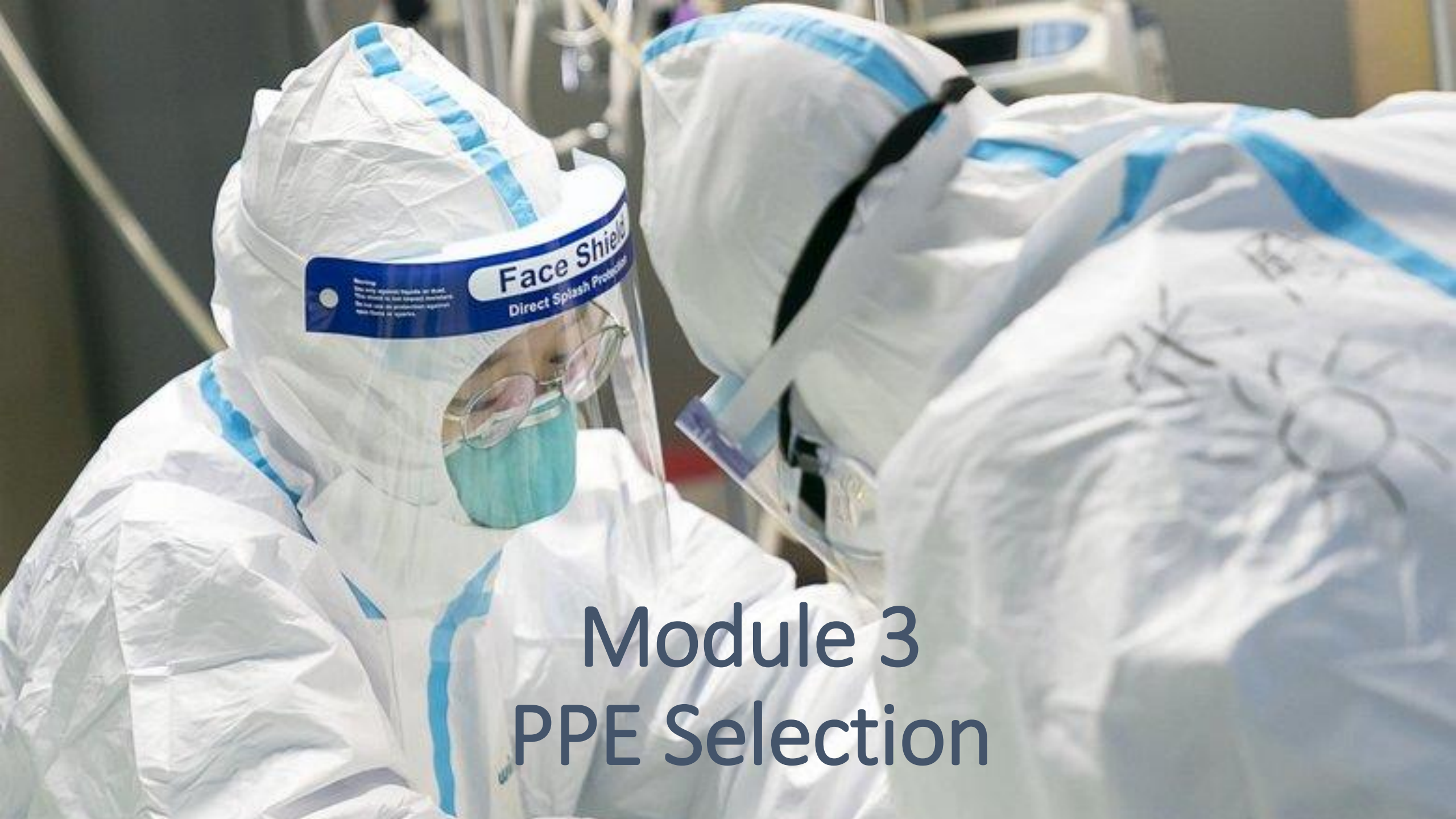
Case Study

- On January 19, 2020, a 35-year-old man presented to an urgent care clinic in Snohomish County, Washington, with a 4-day history of **cough** and **subjective fever**.
- He disclosed that he had returned to Washington State on January 15 after traveling to visit family in **Wuhan, China**. The patient stated that he had seen a health alert from the U.S. Centers for Disease Control and Prevention (CDC) about the novel coronavirus outbreak in China and, because of his symptoms and recent travel, decided to see a health care provider.



Case Study





Module 3 PPE Selection



PPE Considerations – COVID-19

Type of Protection	Preferred or Ideal	Minimum	Other Factors
Respiratory	<ul style="list-style-type: none"> • NIOSH approved P100 filtering facepiece respirator; or • Reusable elastomeric facepiece with P100 filters; or • PAPR with HEPA filters 	<ul style="list-style-type: none"> • NIOSH approved N95 filtering facepiece 	<ul style="list-style-type: none"> • If surgical/procedure mask used (should meet ASTM F2100) Level 2 or 3. • Europe equivalents: <ul style="list-style-type: none"> • FFP2 ≈ N95 • FFP3 ≈ P100
Ocular	<ul style="list-style-type: none"> • ANSI Z87.1 N3 or N5 rated goggles; or • Full facepiece respirator 	<ul style="list-style-type: none"> • ANSI Z87.1 compliant disposable or reusable faceshield; or • Safety glasses 	<ul style="list-style-type: none"> • Attached shields on surgical or procedure masks are not effective by themselves (wear with safety glasses)
Dermal – Hand	<ul style="list-style-type: none"> • Examination gloves meeting ASTM D6319 (nitrile), ASTM D6977, or NFPA 1999; • Double gloving offers additional physical protection 	<ul style="list-style-type: none"> • Examination gloves meeting ASTM D3578 (latex); or cleaning elastomeric or coated work gloves 	<ul style="list-style-type: none"> • Avoid glove liners or cloth-based gloves. • Always thoroughly clean hands with soap and water or hand sanitizer after use
Dermal – Body	<ul style="list-style-type: none"> • Isolation gowns that meet Level 4 criteria in AAMI PB70 and ASTM F3352; or • Single use garments or ensembles certified to NFPA 1999 	<ul style="list-style-type: none"> • Any protective garments offering passing viral penetration resistance per ASTM F1671 with adequate integrity, strength, and durability for intended use 	<ul style="list-style-type: none"> • Lesser barrier clothing may result in contamination of underlying uniform or work clothing but may be suitable for light exposures. • European equivalent: <ul style="list-style-type: none"> • ISO 16604 at 3.5 kPa per EN 14126 ≈ ASTM F1671 and NFPA 1999



Balancing the Risk

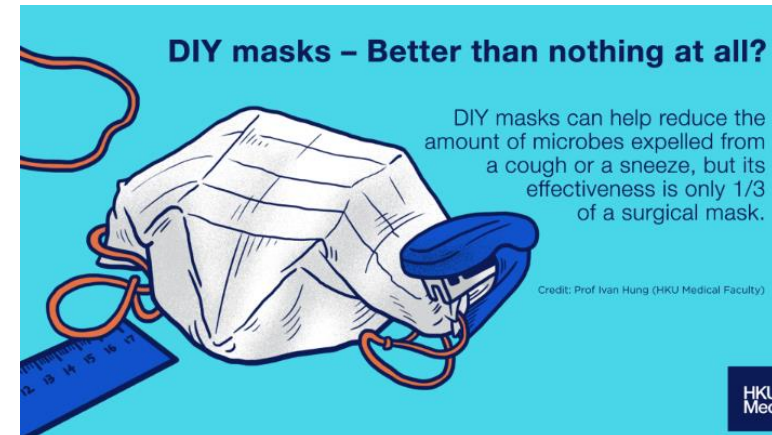
	Recommended Best Practice	Minimum Acceptable Protection	Last Resort
Phase 1 When Respirator Supplies are Available	<ul style="list-style-type: none"> N/R/P-100 filtering facepiece respirator (FFR) OR air purifying respirator (APR) or powered air purifying respirator (PAPR) with P100 canister Filters used once and replaced between patients 	<ul style="list-style-type: none"> N/R/P-95 filtering facepiece respirator APR or PAPR with chemical adsorption canister using a P100 pre-filter Interchange of filters and masks that are not certified together is not approved. 	Not Applicable
Phase 2 When Respirator Supplies are Low	<ul style="list-style-type: none"> Use a medical mask OVER the N95 to extend its use. Replace the medical mask between patients. Utilize emergency rule to allow for APR/PAPR canister interchangeability Use masks beyond their “expiration date” 	<ul style="list-style-type: none"> Consider reusing your FFR (store in non-plastic bag between uses) Consider reusing your APR/PAPR canisters (wipe (not spray) down with disinfectant and store in humidity-free environment) <p>DO NOT SPRAY FILTER MEDIA</p>	<ul style="list-style-type: none"> Prioritize protection by exposure risk: <ul style="list-style-type: none"> > 6’ from patient = no mask 3’-6’ = medical mask < 3’ = N95 or greater
Phase 3 When Respirator Supplies are Depleted	<ul style="list-style-type: none"> Decontaminate FFPs and reuse (do not share FFPs and APR/PAPR filters between people – maintain individual issue) <ul style="list-style-type: none"> Microwave for 2 minutes at 1100W (dry heat disinfection) Soak in bleach solution (1/2 cup bleach for gallon water) for 10 minutes, followed by water rinse, and air dry (utilize methods to increase air flow during drying, if possible) 	<ul style="list-style-type: none"> Utilize medical/surgical face masks with priority given to those meeting ASTM F2100 Level 3 (then Level 2, Level 1, Surgical molded utility masks, and finally, utility masks) Consider adding reusable and cleanable faceshield to minimize direct exposure with droplets 	<ul style="list-style-type: none"> Consider homemade respiratory products using common fabric materials (note that the protection level will be minimal, at best) Requires the use of a reusable and cleanable faceshield to minimize direct exposure with droplets

Selecting a Medical Mask

- Purpose of the Medical Mask
 - A medical mask is NOT considered respiratory protection
 - There are many types available
 - Absorb vs. repel body fluids
 - Is it for patient or practitioner?
 - Close fit vs. loose fit
- Filtration of submicron-sized airborne particles by a single surgical mask is minimal.¹
 - 1 mask: 2.7
 - 2 masks: 3.8
 - 3 masks: 4.6
 - 5 masks: 5.5

- Homemade Masks

- Only useful as a cover for your N95 masks to extend the useful life
- Do not wear as a means of protection








Even if you wear 5 surgical masks on top of one another, the protection would be 20% of that provided by one properly-fitted N95!

Selecting a Medical Mask

Understanding ASTM levels of protection is Key

ASTM F2100-11 Levels



	Characteristics	 Resistance to penetration by synthetic blood, minimum pressure in mm Hg for pass result	 Differential pressure, mm H2O/cm2 (Breathability)	 Bacterial filtration efficiency	 Sub-micron particulates filtration efficient at 0.1 micron	 Flame spread
Level 1: low barrier protection General use for short procedures and exams that don't involve aerosols, spray or fluids		80 mm Hg	<4.0	≥95%	≥95%	Class1
Level 2: moderate barrier protection For low to moderate levels of aerosols, spray and/or fluids		120 mm Hg	<5.0	≥98%	≥98%	Class1
Level 3: maximum barrier protection For heavy levels of aerosols, spray and/or fluids		160 mm Hg	<5.0	≥98%	≥98%	Class1



Respiratory Protection



Filtering Facepiece
Respirator (FFR)

APF = 10



Half Mask
Air Purifying
Respirator (APR)

APF = 10



Full Facepiece
APR

APF = 50



Loose-Fitting
Powered Air-
Purifying Respirator
(PAPR)

APF = 25*



Hooded
PAPR

APF = 25*



Self-Contained
Breathing Apparatus
(SCBA)

APF = 10,000

*The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000.

Selecting Respiratory Protection



NIOSH RESPIRATOR FILTER CLASSES

NIOSH classifies the filtering media in respirators based on its resistance to oil and its particle filtering efficiency. The resistance to oil is designated as "N", "R", or "P". Particle filtering efficiency is designated "95", "99", or "99.97".



NOT RESISTANT TO OIL

N95, N99, N100
Filters at least

95%, 99%, or 99.97% of airborne particles

SOMEWHAT RESISTANT TO OIL

R95, R99, R100
Filters at least

95%, 99%, or 99.97% of airborne particles

STRONGLY RESISTANT TO OIL/OIL PROOF

P95, P99, P100
Filters at least

95%, 99%, or 99.97% of airborne particles

OILS

When products containing oil (like fuel, lubricating or hydraulic oils, solvents, paints, and pesticides) are sprayed or used in processes producing aerosols or droplets, the oil component may become airborne.



Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

NIOSH Respirator Trusted-Source:
https://www.cdc.gov/niosh/rppt/topics/respirators/disp_part/RespSource.html
NIOSH Respirator Selection Logic:
<https://www.cdc.gov/niosh/docs/2005-100/pdfs/2005-100.pdf>

NIOSH Particulate Filter Classification

Respirator filters (such as disposable respirators and reusable respirator filters) must meet filtration standards from the National Institute for Occupational Safety and Health. The nine filtration classifications are shown in the chart below.

	FILTER EFFICIENCY		
	95 (≥95%)	99 (≥99%)	100 (≥99.97%)
OIL RESISTANCE			
N (Not resistant to oil)	N95	N99	N100
R (Resistant to oil; time-use limitations)	R95	R99	R100
P (Oil proof; time-use limitations)	P95	P99	P100



Eye/Face Protection

- Limited medical evidence suggests transmission is possible to the eye
- Additional purpose of eye protection is to limit individuals touching their face
- Preferred protection are goggles that meet D3 or D5 criteria of ANSI Z87.1
 - Other eye protection such as safety glasses or faceshields can help but are not primary eye protection
 - Full facepiece respirators already provide eye protection
- All eye and face protection should be disinfected following use with EPA-registered disinfectants
 - Certain components vulnerable to repeated use of bleach



Non-ventilated Goggles



Ventilated Goggles



Safety Glasses

Face Masks / Face Shields

- Bulkier than goggles or safety glasses, but cover the entire face
 - Fit better over glasses or respirators
 - Used to reduce the surface contamination of respirators (thereby extending respirator life)
- The amount of virus inhaled is substantially reduced by a face shield.
 - Most pronounced for the large-particle cough aerosol
 - Can reduce contamination on mask up to 96% for first 5 minutes of exposure
 - Only reduces total by 81% after 30 minutes as smaller particles flow around it and accumulate over time.
 - Less effective for small-particle cough aerosols
 - Virus deposition reduced by 68%
 - Smaller particles travel around the face shield
 - Major Findings:
 - Useful adjunct to respiratory protection for workers caring for patients with respiratory infections
 - Cannot be used as a substitute for respiratory protection



Disposable Faceshield

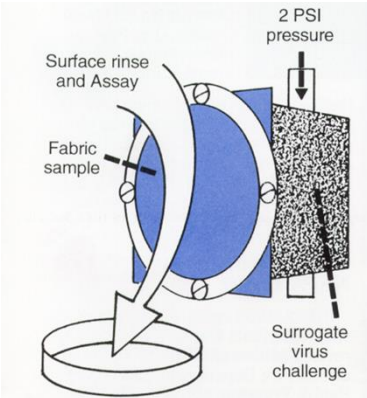


Industrial Faceshield

Dermal Protection

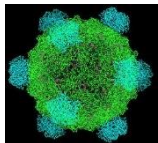


Nitrile Examination Glove



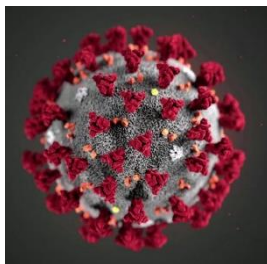
Viral Penetration Test

Phi-X174
Bacteriophage



←27 nm→

SARS-CoV-2



←60 to 140 nm→

- Examination gloves meeting ASTM standards or NFPA 1999 should be used
 - Use of gloves does not eliminate the need for frequent hand washing or use of hand sanitizer
- Any protective clothing tested for viral penetration resistance per ASTM F1671 provides protection from coronavirus
 - Includes turnout clothing, EMS clothing, some forms of chemical protective clothing
 - Clothing primarily for shield to protection against contamination of skin and underlying clothing
 - Lesser barrier clothing can mitigate exposure to bioaerosols; work uniforms have limited barrier qualities

Selection of Fluid Resistant Coveralls/Gowns

Levels of Barrier Protection–AAMI PB70:2012¹

	LEVEL 1	LEVEL 2	LEVEL 3
Test	AATCC 42:2000	AATCC 42:2000 AATCC 127:1998	AATCC 42:2000 AATCC 127:1998
Requirements at 4% AQL	Water Impact ≤ 4.5 g	Spray Impact ≤ 1.0 g Hydrostatic Pressure ≥ 20 cm	Spray Impact ≤ 1.0 g Hydrostatic Pressure ≥ 50 cm
Anticipated Risk of Exposure	Low	Moderate	Moderate to High

¹Also includes Level 4 based on ASTM F1671 passing performance

CDC/NIOSH Guidance for Gowns and Coveralls

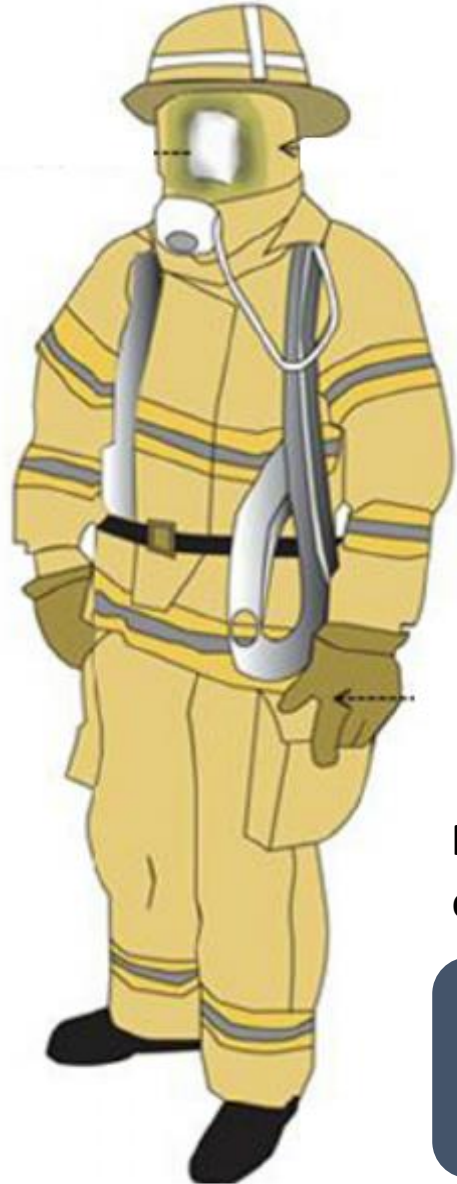
Categories	Gown	Coverall
Impermeable	Surgical or isolation gown that passes: <ul style="list-style-type: none"> ● ANSI/AAMI PB70 Level 4 clothing requirements 	Coverall made with fabric and seams/closures that passes: <ul style="list-style-type: none"> ● ASTM F1671 (13.8kPa) or ● ISO 16604 ≥ 14 kPa
Fluid-resistant	Surgical or isolation gown that passes: <ul style="list-style-type: none"> ● ANSI/AAMI PB70 Level 3 requirements or ● EN 13795 high performance surgical gown requirements 	Coverall made of fabric that passes: <ul style="list-style-type: none"> ● AATCC 42 ≤ 1 g and AATCC 127 ≥ 50 cm H₂O or EN 20811 ≥ 50 cm H₂O or ● ASTM F1670 (13.8kPa) or ● ISO 16603 ≥ 3.5 kPa



International Personnel Protection, Inc.[™]



Turnout Gear – Level of Protection?



Helmet Ear Covers – Consist of at least two material layers but typically do not have barrier layers and likely will only partially attenuate penetration of aerosols.

Hoods – Particulate blocking hoods block 90% or more of the particles ≥ 0.1 micron; ordinary knit hoods do not provide particulate blocking capabilities.

Respiratory Protection – Wear a minimum of N95 protection.

Eye & Face Protection – Any SCBA or other full facepiece already providing coverage to the face and eyes OR goggles rated N3 or N5 per ANSI Z87.1

Wristlets – Unless incorporating a particulate-blocking layer, most do not have barrier layers and likely do not attenuate penetration of aerosols.

Gloves – Wear examination gloves that meet ASTM standards or NFPA 1999 in place of structural or work gloves. Avoid any gloves that have absorptive materials.

Footwear – All footwear certified to NFPA 1971 are tested for viral penetration. Be sure to disinfect entire footwear element following potential exposure.

Turnout clothing ensembles have multiple interfaces and closures that may permit some penetration of bio-aerosols, but likely significantly limit the exposures.



A person wearing a full white protective suit, including a hood, goggles, and a face mask, is holding a black spray nozzle. They are standing outdoors under a shelter with wooden posts and a blue-painted lower section. In the background, there are green trees and a blue bucket on a wooden stand. The text "Module 4 Disinfection Tactics and Considerations" is overlaid in white on the center of the image.

Module 4
Disinfection Tactics and
Considerations

Soaps & Detergents

Germ Farm



**Single most effective
measure!**



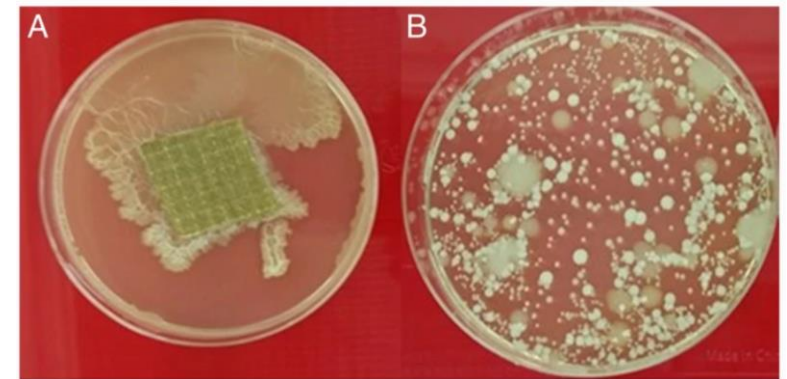
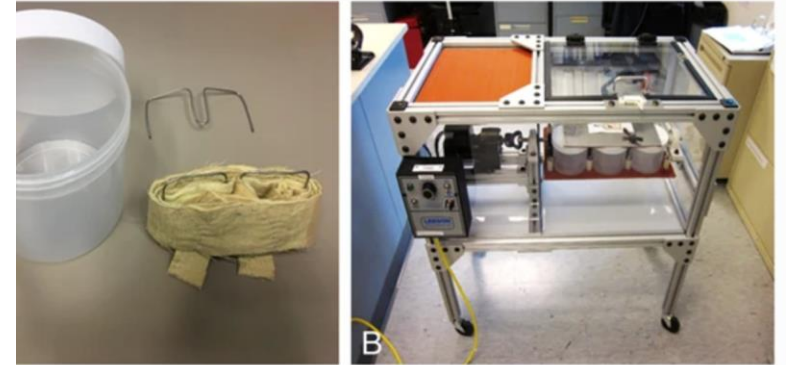
Soaps and detergents provide mechanical removal and act as wetting agents to reduce the surface tension and make disinfectants more effective in spreading over and penetrating surfaces.

Hand Sanitizers & Barrier Creams



Sanitization & Disinfection

- Sanitization applied to textiles, soft goods
 - 99.9% removal of microbial contamination
- Disinfection applied to hard surface items
 - Near complete removal of microbial contamination
 - Sanitizers or disinfectants must be approved and listed by EPA
- Can be separate process or part of cleaning
 - Advanced or specialized cleaning still needed to remove soils associated with biological contaminated fluids





Decontaminating N95 Masks

BLEACH METHOD

Method:

- 30 minutes submersion in 0.6% bleach (1-part Clorox to 9-parts water).
- Rinse masks with water to try and remove any residual bleach.
- FFRs should be hung to dry overnight with assistance from a fan for air movement.

Notes:

- The air movement is very important as you don't want to have residual hypochlorite in the mask as it can release Cl₂ when it gets humid (i.e., person breathing within it)!
- Did not significantly affect FFR filtration performance or airflow resistance.
- Caused slight tarnishing of the metallic nosebands and discoloration of nose cushions.

While not a best practice, during a pandemic it might be necessary to reuse N95 masks due to a limited supply

MICROWAVE METHOD

Method:

- Commercially available, 2 minutes at 1100 W.
- The microwave oven becomes the source for dry heat.

Notes:

- Did not significantly affect FFR filtration performance or airflow resistance in most models.
- Melted components in some models; this appears to correlate with the heat on the glass turntable. Consider putting cardboard on turntable between mask and glass.
- The metal piece at the nose and the staples at the elastics are not problematic with the microwave method

SCBA Cleaning

- Level of disassembly required
 - Specific regulator components
 - Textile straps
- Approach to cleaning different components (e.g., individual facepieces)
 - Changes in types of cleaning agents
- Techniques for ensuring complete cleaning
 - Utility sink washing
 - Emerging machine washing approaches





Sanitization of Garments

- CDC guidelines: washing regular clothing to **warmest possible** temperature
 - Use of EPA-registered laundry sanitizer additives is also recommended
 - EPA has specific list of disinfectants suggested for use against COVID-19 but not all are suitable for clothing materials
- Tychem[®] Garments (from Dupont)¹
 - For cleaning use warm water, mild dishwashing liquid and a soft brush to remove any dirt from exterior surfaces.
 - As per CDC guidelines for disinfection, diluted household bleach solutions, alcohol solutions with at least 70% alcohol, and most common EPA-registered household disinfectants should be effective to disinfect exterior surfaces.
 - Thoroughly rinse the garments with clean, fresh water and allow to air-dry.
 - Retire Tychem[®] garment if it fails to pass inspection or the garment is altered, abraded, cut, torn, punctured or otherwise breached. Follow manufacturers instruction for storage and inspection.

¹REF: https://www.dupont.com/news/dupont-response-novel-coronavirus-prevention-and-control.html?src=HP.html&fbclid=IwAR1jYukRIE1o1b_HHq39nZDxkOzJl7oRz5LRwKBo_C7ID0G8Ea9DVtoAnkQ





Cleaning & Sanitizing Turnout Gear

- Clean and sanitize any element of structural firefighting protective clothing in accordance with procedures established in NFPA 1851:
 - Wear gloves, eyewear, mask and apron when handling garments.
 - Sanitize and launder garments in a programmable, front loading washer/ extractor that has ample capacity for the wash load.
 - Use “sanitization” program of machine in conjunction with specialized cleaning; if not available, use the following steps:
 - Apply initial step of at least 10 minutes with an EPA-registered laundry sanitizer additive (use as directed supplier instructions).
 - Follow the sanitizing by draining the washer/extractor and using a 4-minute extraction step.
 - Wash garments with an appropriate detergent and use multiple rinse cycles but apply specialized cleaning at the maximum wash temperature up to 140°F.
 - Dry garments by air drying, using a drying cabinet, or applying machine drying on a “no heat” or “air-dry” option.

Refer to NFPA 1851, 2020 edition, for procedures and guidance on sanitizing and cleaning turnout gear. Also seek advice from the gear manufacturer or a Verified Independent Service Provider (ISP) on appropriate cleaning agents, sanitizers, or disinfectants, and processes.


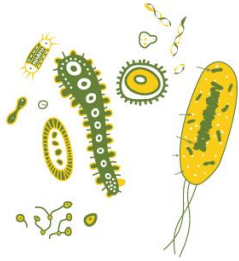
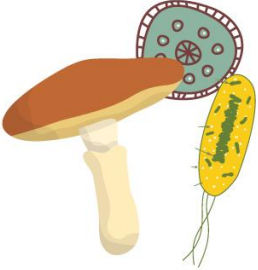
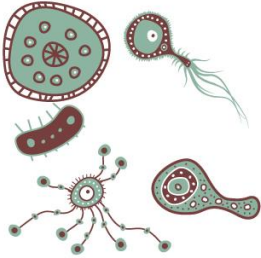
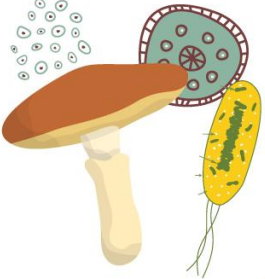


What About Field Disinfection?

- Preliminary exposure reduction is not intended for disinfection and sanitization of turnout clothing
 - Used to remove some surface contamination and soils; likely not to kill microbial contamination
 - Best practice to remove gear on scene, bag and isolate until sanitization and cleaning can occur
- Currently, there are no known effective methods for field disinfection of structural PPE to continue its use without taking the PPE out of service
 - There are some potential practices that are quickly being investigated, any approach to field disinfect gear must be exercised with the utmost caution for potentially compromising gear performance or creating health issues

Decontamination / Disinfection

What are the differences between these types of products?

CLEANER	SANITIZER	DISINFECTANT	VIRUCIDE	STERILANT
Aids in Soil Removal	Reduces the Number of Bacteria	Kills Fungi, Bacteria, and Viruses	Kills Viruses	Eliminates all Fungi, Bacteria, Viruses, and Spores
				
Simply aids in the removal of soil from a surface. Although cleaning does remove germs from a surface, it doesn't kill them.	Lowers the number of bacteria on surfaces to levels that are considered safe by public health orgs.	Kills infectious fungi, bacteria, and viruses but not bacterial spores on hard environmental surfaces.	Destroys or irreversibly inactivates viruses in the inanimate environment.	A sterilant is used to destroy or eliminate all forms of microbial life including fungi, viruses, and all forms of bacterial spores.

Any product that claims to kill bacteria, viruses, mold, or fungi must be registered with the EPA as a pesticide.



EPA Registered Disinfectants

<https://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1>

Pesticide Product and Label System

The Pesticide Product and Label System (PPLS) provides a collection of [pesticide product labels \(Adobe PDF format\)](#) that have been accepted by EPA under [Section 3 of the Federal Insecticide, Fungicide, and Rodenticide Act \(FIFRA\)](#). New labels were added to PPLS on February 21, 2020.

[\[+\] More](#)

EPA Registration, Distributor Product, or Special Local Need Number:

The EPA Registration Number (EPA Reg. No.) appears on all registered pesticides sold in the United States. It is usually found on the back panel of the label along with the detailed instructions for use. Enter the company number (the first set of digits before the dash) to see all products marketed by that company or the entire number (including the dash) to view the label for a particular product. To search by Special Local Need Number, please enter two-letter state abbreviations with or without 6 digit number (i.e. OH123456).

Product or Alternative Brand Name:

Enter the name of the product. As you type, options will be presented to you. Keep in mind that product names may vary, so if you don't find the product you are looking for, try the [EPA Registration Number Search above](#).

Company Name:

Enter the name of the company. Some companies may have several divisions that manufacture and market pesticides products. You can select among these divisions using the drop-down list or choose the root of the company name (e.g., "Bayer" or "3M") to see products associated with all of the divisions.

Other website searches possible on:

- Company name
- Chemical ingredients
- Chemical registry number



International Personnel Protection, Inc.™

EPA Labels



STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage and disposal.

PESTICIDE STORAGE: Store in a cool, dry, well-ventilated area at a temperature below 40°C/104°F. Avoid moisture getting into container.

PESTICIDE DISPOSAL: Pesticide may be acutely hazardous. Wastes resulting from the use of this product must be disposed of on-site, or at an approved waste disposal facility.

CONTAINER HANDLING: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available or puncture and dispose of in a sanitary landfill.

Manufactured for:
BruLin & Co., Inc.
Indianapolis, IN
46205
1.800.776.7149

Reorder Product No.
161021
3884/1115
EPA 8 APRIL 15



Effervescent Disinfectant Tablets
for Hospitals and Institutional Use

ACTIVE INGREDIENT:
Sodium dichloro-s-triazinetriene..... 48.21%
OTHER INGREDIENTS: 51.79%
TOTAL 100.00%

Refer to dilution chart for Available Chlorine concentrations.

KEEP OUT OF REACH OF CHILDREN DANGER

See side panels for Additional Precautionary Statements

First Aid: IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice. **IF SWALLOWED:** Call a poison control center, or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person. **IF INHALED:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice. **IF ON SKIN OR CLOTHING:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. **YOU MAY ALSO CONTACT 1-800-420-9236 FOR EMERGENCY MEDICAL TREATMENT INFORMATION.**

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER: Corrosive. Causes irreversible eye damage. Harmful if swallowed, inhaled, or absorbed through skin. Do not get in eyes, on skin, or clothing. Avoid breathing dust. Wear chemical-resistant gloves and safety glasses or face shield when making up solution. Wash thoroughly with soap and water after handling, and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.

PHYSICAL OR CHEMICAL HAZARDS: STRONG OXIDIZING AGENT: Use only clean dry utensils. Mix only into water. Contamination with moisture, dirt, organic matter or other chemicals or any other foreign matter may start a chemical reaction with generation of heat, liberation of hazardous gases and possible generation of fire and explosion. Avoid any contact with flaming or burning material such as a lighted cigarette. Do not use this product in any chlorinating device which has been used with any inorganic or unstabilized chlorinating compounds (e.g., calcium hypochlorite). Such use may cause fire or explosion.

NET CONTENTS:

256 TABLETS
(13.1g per tablet)

NET WT 7.39 LBS. (3.35 kg)

EPA Reg. No. 71847-6-106
EPA Est. No. 71847-IRL-001



BruTab 6S is effective against the following micro-organisms on pre-cleaned, hard, non-porous, inanimate surfaces: *Salmonella enterica*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Staphylococcus epidermidis*, *Escherichia coli O157:H7*, *Staphylococcus aureus* - MRSA & GRSA, *Poliovirus type 1*, *Herpes simplex virus type 1*, *Hepatitis A virus*, *Hepatitis B virus*, *Human Immunodeficiency Virus Type 1* (associated with AIDS) or (AIDS Virus), *Influenza virus H1N1*, respiratory syncytial virus, *Canine Parvovirus*, *Newcastle Disease Virus*, *Pseudorabies*, *Canine Distemper Virus*, *Feline Calicivirus*, *Norovirus*, *Enterococcus faecalis* Vancomycin Resistant, *Trichophyton mentagrophytes*, and *Clostridium difficile*.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read the entire label and use strictly in accordance with precautionary statements and directions.

BruTab 6S is a Hospital Use Disinfectant. General Healthcare disinfectant (479ppm available chlorine disinfectant solution) is effective against standard gram positive and gram negative bacteria (*Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella enterica*) and Cold and flu viruses (respiratory syncytial virus, influenza H1N1).

Notice to User: This product is not to be used as a terminal sterilant/high level disinfectant on any surface or instrument that (1) is introduced directly into the human body, either into or in contact with the blood stream or normally sterile areas of the body, or (2) contacts intact mucous membranes but which does not ordinarily penetrate the blood barrier or otherwise enter normally sterile areas of the body. This product may be used to pre-clean or decontaminate critical or semi-critical medical devices prior to sterilization or high level disinfection.

GENERAL DISINFECTION: BruTab 6S is a general disinfectant at 479ppm available chlorine disinfectant solution effective against *Staphylococcus aureus*, *Salmonella enterica*, *Pseudomonas aeruginosa* and cold and flu (respiratory syncytial virus, influenza H1N1). Prepare a 479ppm solution (refer to Dilution Chart). Apply to pre-cleaned surface with mop, cloth, sponge, brush, wipe, foaming equipment, or coarse trigger sprayer. Allow surface to remain wet for 10 minutes. Allow to air dry. Prepare a fresh solution weekly when using closed containers (spray bottles). Prepare a fresh solution daily when using open containers (buckets) or if solution becomes diluted. All treated equipment that will contact food, feed, or drinking water must be rinsed with potable water before reuse.

DISINFECTION/VIRUCIDAL DIRECTIONS: Prepare a 958ppm solution; refer to dilution chart. Apply use solution to pre-cleaned, hard, non-porous, inanimate surfaces with brush, spray device, sponge, cloth, or mop to wet all surfaces thoroughly. Allow to remain wet for 10 minutes, then remove product by wiping with brush, sponge, or cloth. For sprayer applications use a coarse spray device. Spray 6-8 inches from surface, and rub with brush, sponge, wipe or cloth. Do not breathe spray mist. Before using this product, food products and packaging materials must be removed from the room or carefully protected. Prepare a fresh solution weekly when using closed containers (spray bottles). Prepare a fresh solution daily when using open containers (buckets) or if solution becomes diluted. All treated equipment that will contact food, feed, or drinking water must be rinsed with potable water before reuse.

Kills HIV-1, Hepatitis A, and Hepatitis B viruses on PRE-CLEANED ENVIRONMENTAL SURFACES/OBJECTS PREVIOUSLY SOILED WITH BLOOD/BODY FLUIDS in health care settings or other settings in which there is an expected likelihood of soiling of inanimate surfaces/objects with blood or body fluids, and in which the surfaces/objects likely to be soiled with blood or body fluids can be associated with the potential for transmission of human immunodeficiency virus Type 1 (HIV-1) (associated with AIDS), Hepatitis A virus, and Hepatitis B virus.

SPECIAL INSTRUCTIONS FOR CLEANING AND DECONTAMINATION AGAINST HIV-1 OF SURFACES/OBJECTS SOILED WITH BLOOD/BODY FLUIDS: PERSONAL PROTECTION: Specific barrier protection items to be used when handling items soiled with blood or body fluids are disposable latex gloves, gowns, masks, and eye coverings. CLEANING PROCEDURE: Blood and other body fluids must be thoroughly cleaned from surfaces and objects before application of BruTab 6S. This cleaning process may be accomplished with any cleaning solution including BruTab 6S. DISPOSAL OF INFECTIOUS MATERIALS: Blood and other body fluids should be autoclaved and disposed of according to federal, state and local regulations for infectious waste disposal. CONTACT TIME: Leave surfaces wet for 10 minutes.

DISINFECTION FOR SURFACES CONTAMINATED WITH CLOSTRIDIUM DIFFICILE IN 4 MINUTES
Special Label Instructions for Cleaning Prior to Disinfection against Clostridium difficile spores: Personal Protection: Wear appropriate barrier protection such as gloves, gowns, masks or eye covering. Cleaning Procedure: Fecal matter/waste must be thoroughly cleaned from surfaces/objects before disinfection by application with a clean cloth, mop, and/or sponge saturated with the sporicidal product. Cleaning is to include vigorous wiping and/or scrubbing, until all visible soil is removed. Special attention is needed for high-touch surfaces. Surfaces in patient rooms are to be cleaned in an appropriate manner, such as from right to left or left to right, on horizontal surfaces, and top to bottom, on vertical surfaces, to minimize spreading of the spores. Restrooms are to be cleaned last. Do not reuse soiled cloths.

Infectious Materials Disposal: Materials used in the cleaning process that may contain feces/wastes are to be disposed of immediately in accordance with local regulations for infectious materials disposal.

Prepare a 4311ppm solution; (refer to Dilution Chart). Apply to pre-cleaned surface with mop, cloth, sponge, brush, wipe, foaming equipment, or coarse trigger sprayer. Allow surface to remain wet for 4 minutes. Allow to air dry. Prepare a fresh solution weekly when using closed containers (spray bottles). Prepare a fresh solution daily when using open containers (buckets) or if solution becomes diluted.

All treated equipment that will contact food, feed, or drinking water must be rinsed with potable water before reuse.

See package insert for additional directions for use.

DILUTION CHART			
Tablet Size	13.1g		
Solution ppm (mg/L) Available Chlorine	Tablets	Gallons of Water	
100	1	10	
479	1	2	
958	1	1	
1988	2	1	
4311	5	1	



BruTab 6S is designed to provide effective cleaning, and disinfection in areas where it is of prime importance in controlling the hazard of cross contamination on treated pre-cleaned, hard, non-porous, inanimate surfaces.

BruTab 6S is for use in:

- Hospitals, nursing homes, medical and dental offices and clinics, operating rooms, isolation wards, and medical research facilities.
- Day care centers and nurseries.
- Veterinary clinics, animal life science laboratories, kennels, breeding and grooming establishments, pet animal quarters, zoos, pet shops, and other animal care facilities.
- Pharmaceutical and medical device manufacturing facilities.

BruTab 6S is a disinfectant that disinfects pre-cleaned, hard, non-porous, inanimate surfaces. This cleaning process may be accomplished with any cleaner solution including BruTab 6S.

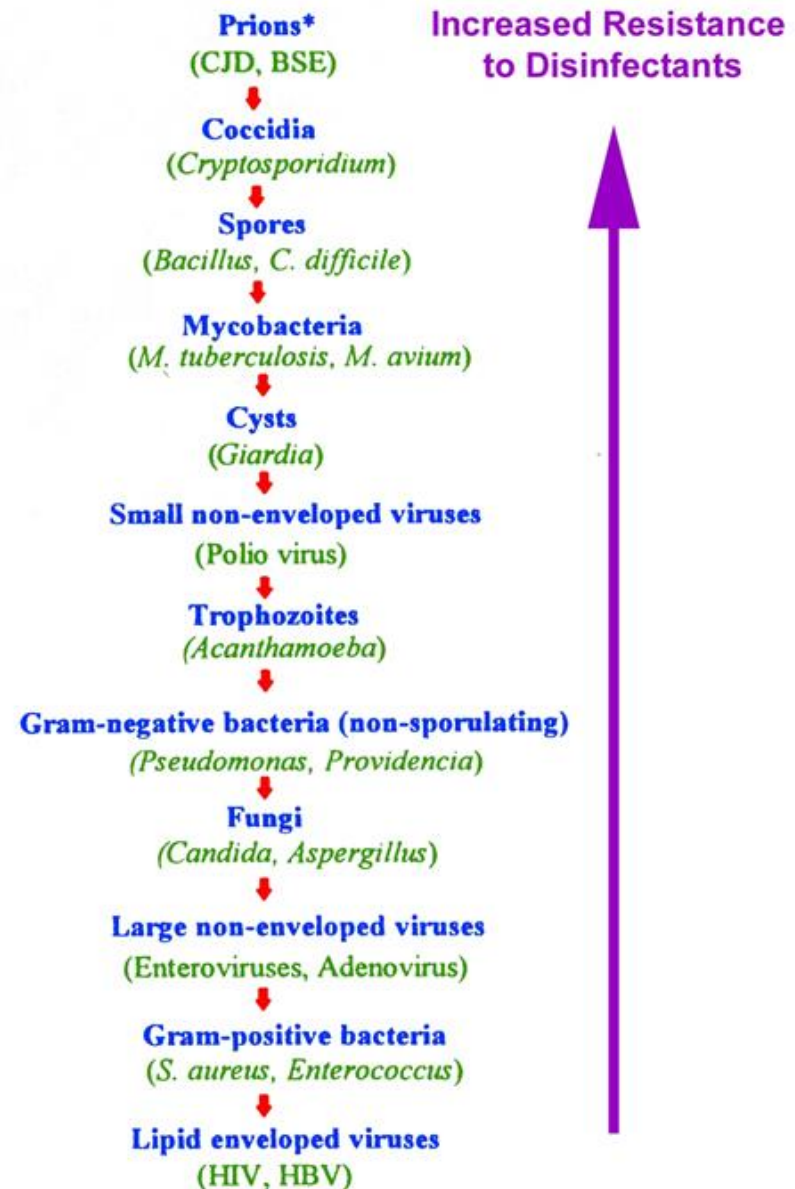
BruTab 6S provides effective cleaning strength that will not dull high gloss floor finishes with repeated use.

2-48-028E



Selecting a Chemical Disinfectant

- Rapid action, even at low concentrations
- Solubility and stability
- Broad-spectrum activity without toxicity
- Penetration of inanimate surfaces to sustain persistent action
- Resistance to inactivation by organic matter
- Affordability and readily available



Selecting a Chemical Disinfectant – Operational Considerations

- Kill claim for *Clostridium difficile* (*C. diff.*)
 - *Hard to destroy*
- pH neutral
 - Can be used on turnout gear, work uniforms, and sensitive equipment
- Low odor
- Multi-year shelf-life
 - Dry materials have longer shelf-lives, but require water to be added
- Easy to mix or use

Selecting a Chemical Disinfectant

3.3g Tablets



BruTab 6S® is a US EPA registered broad spectrum disinfectant, virucide and sanitizer as has been demonstrated by its performance in tests that are prescribed and regulated by the federal government under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Human Microorganisms for Disinfection, Germicidal, Virucidal, and Fungicidal Claims		ATCC and/or Strain Number	Disease/Effect	1 minute contact time with organic soil load # tablets (ppm Solution)	4 minute contact time with organic soil load # tablets (ppm Solution)	10 minute contact time # tablets (ppm Solution)
<i>Mycobacterium bovis</i> (TB)	Bacteria	ATCC 35743	Tuberculosis (TB)		5 per quart (5382 ppm)	
<i>Clostridium difficile</i> spores	Spores	ATCC 43598	Colitis		4 per quart (4306 ppm)	2 per quart (2153 ppm)
<i>Acinetobacter baumannii</i>	Bacteria	ATCC BAA-1709	Wound infections etc.		4 per quart (4306 ppm)	
Carbapenem resistant <i>Klebsiella pneumoniae</i>	Bacteria	ATCC BAA-1705	Pneumonia		4 per quart (4306 ppm)	
<i>Pseudomonas aeruginosa</i>	Bacteria	ATCC 15442	Septicemia		4 per quart (4306 ppm)	1 per 2 quarts (538 ppm)
<i>Salmonella enterica</i>	Bacteria	ATCC 10708	Food poisoning		4 per quart (4306 ppm)	1 per 2 quarts (538 ppm)
<i>Staphylococcus aureus</i>	Bacteria	ATCC 6538	Wound infections etc.		4 per quart (4306 ppm)	1 per 2 quarts (538 ppm)
Norovirus	Virus (Non-Enveloped)	ATCC VR-782, Strain F-9	Gastroenteritis	4 per quart (4306 ppm)		1 per quart (1076 ppm)

Selecting a Chemical Disinfectant

STABILITY DATA

A stability study was conducted and found that solutions made up of strengths from 100 - 5382 ppm active chlorine, retained the required chlorine activity after storage for 7 days in a closed container at room temperature out of direct sunlight.

Based on this, BruTab 6S solutions can be used for up to 7 days if stored in a closed container such as a spray bottle or buddy jug at room temperature out of direct sunlight. The solution should be replaced each week with freshly made solution.

PHYSICAL & CHEMICAL SPECIFICATIONS

Active Ingredient: Sodium dichloro-s-triazinetrione	48.21%
Working pH	6.5 +/- 0.5
Color	Clear
Odor	Slight Chlorine
OSHA GHS Rating In-Use	Non-Hazardous

MATERIAL SUBSTRATE COMPATIBILITY

Sodium dichloro-s-triazinetrione tablets dissolved in water produce a solution of hypochlorous acid.

The following chart shows the compatibility of a variety of materials with solutions up to 5,000 mg/L of available chlorine.

Metals	Compatibility
SS 304	A
SS 316	A
Aluminum	B
Brass	B
Bronze	B
Carbon Steel	C
Cast iron	C
Hasteloy C®	A
Titanium	A

The following chart shows the compatibility of a variety of materials with solutions up to 2,000 mg/L of available chlorine.

Plastics	Compatibility	Elastomers	Compatibility
ABS	A	Nitrile (Buna N)	A
CPVC	A	EPDM	A
Hytrel®	A	Hypalon®	A
HDPE	A	Kel-F®	A
LDPE	A	Santoprene®	A
Noryl®	A	Silicone	B
Polycarbonate	A	Tygon®	A
Polypropylene	A	Viton®	A
PPS	A	Nonmetals	Compatibility
PTFE	A	Carbon graphite	A
PVC	A	Ceramic A1203	A
PVDF	A	Ceramic magnet	A

Explanation of Ratings — Chemical Effect

A = Excellent.

B = Good – Minor Effect, slight corrosion or discoloration.

C = Fair – Moderate Effect, OK for short term use. Not recommended for continuous use. Some pitting may occur.

D = Severe Effect, not recommended for any use.

Factors Affecting the Efficacy of Disinfection and Sterilization

- Number and location of microorganisms
- Innate resistance of microorganisms
- Concentration and potency of disinfectants
- Physical and chemical factors
 - Presence of organic matter
- Duration of exposure
- Biofilms
 - Microorganisms may be protected from disinfection by production of thick masses of cells and extracellular materials which are tightly attached to surfaces and not easily removed
 - Some detergents can degrade biofilms or reduce number of viable bacteria within a biofilm, but no products are EPA-registered or FDA-cleared for this purpose

Applying Disinfectants

Benefits of Electrostatic Sprayers for Decon

- **Significantly Less Decon Solution Needed**

- 1000ml (1/4 gallon) of Solution can decon 4 Personnel
- Less water needs to be brought to the fight
- Little to No Wastewater to Manage

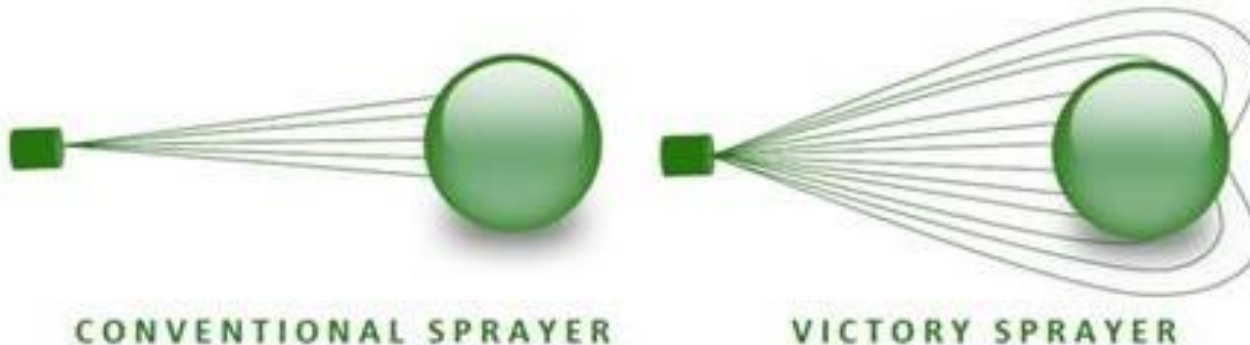
- **Electrostatic Wrapping**

- Spray envelops the target
- Coats all surfaces including shadowed and underneath
- Reduces operator error (ie, missed a spot)

- **Liquid Adhesion**

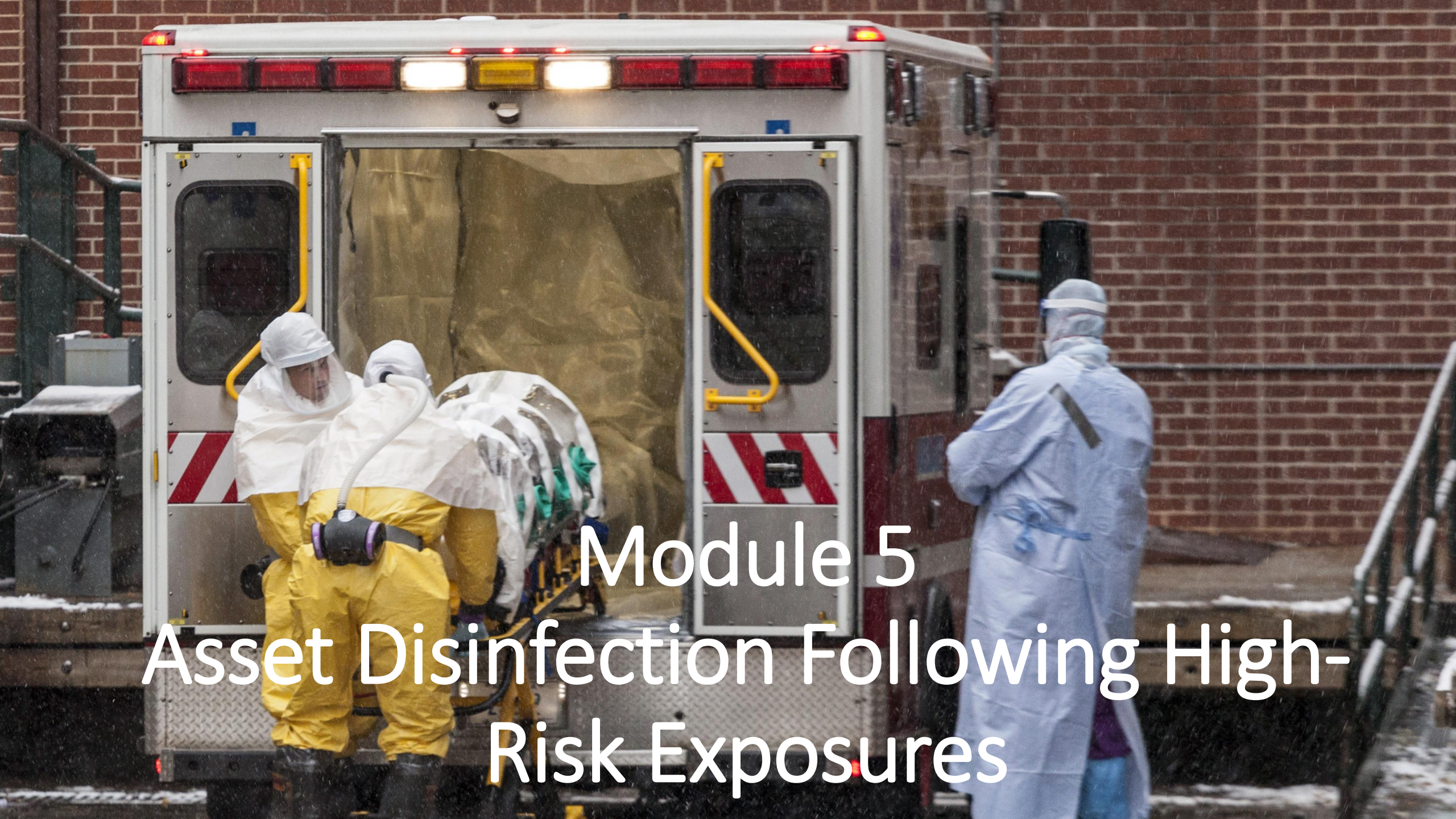
- Charged droplets stick to the target
- Ensures solution dwell time is met instead of running off

THE ELECTROSTATIC DIFFERENCE



Electrostatic Decontamination





Module 5

Asset Disinfection Following High-Risk Exposures



Cleaning & Disinfecting Stations

- Standard sanitation steps apply, including:
- Hand washing BEFORE entering the living quarters
 - Do not share towels; consider using paper towels during pandemic
- Add hand sanitizers or skin barrier product dispensers at all entry points between the apparatus bays and the living quarters
- Minimize bringing civilians into living quarters
- Clean and disinfect targets surfaces (high touch)
- Clean dirt and debris off work boots and disinfect walking surfaces. Leave boots outside the living quarters.
- Launder work clothes at the fire station OR have it dry cleaned. It should not be worn to and from home and the station.
- For future fire station planning, avoid the use of carpets and furniture with cloth coverings.
- High Touch Surfaces
 - Kitchen tables, counters, and appliances
 - Bathroom counters, sink handles/knobs, and toilet/urinal handles
 - Door handles/knobs
 - Light switches
 - Fitness equipment
 - TV remotes
 - Armchair rests
 - Desks
 - Computer keyboards
 - Beds and carpeting
 - Soap dispensers
 - Elevator control buttons
 - Physical fitness equipment



Disinfecting Apparatus

- In addition to disinfecting apparatus as needed post incident, consider establishing a procedure to ensure apparatus are disinfected daily as part of apparatus checks/inspections.
- Using an EPA-registered disinfectant, apply to all surfaces in the apparatus with special attention focused on high-touch areas.
 - Seat belts and buckles
 - Door handles and grab rails
 - Compartment handles and latches, especially compartments that house EMS equipment
 - Steering wheel
 - Switches, including parking brake and light/siren controls
 - Mobile data terminals
 - Arm rests
 - Floors
 - Medical bags
 - Pump handles/levers, including routinely used levers like recirculate valves
 - Vehicle keys for light duty vehicles
 - Accountability tags and boards



Ambulance Prep for High-Risk Transports

Manual Taping



Planned Transfers

Isolation PODs



Ambulance Disinfection for High-Risk Pathogens

- Study to demonstrate the spread of microbes during EMS activities
- Method
 - Bacteriophage FX174 was used to trace contaminate emergency response vehicles (on 2 surfaces)
 - Current disinfection practices and hydrogen peroxide wipes used for intervention
 - Upon call completion, EMS vehicle and equipment surfaces were sampled before decontamination, after decontamination, and after hydrogen peroxide wipes
- Results
 - **Firefighters hands were main vehicles for microbial transfer**
 - Current decontamination practices did not significantly reduce viral load
 - Practices were not consistently applied or standardized
 - Hydrogen peroxide wipes did significantly reduce viral load
 - Training and promotion of surface disinfection should be provided

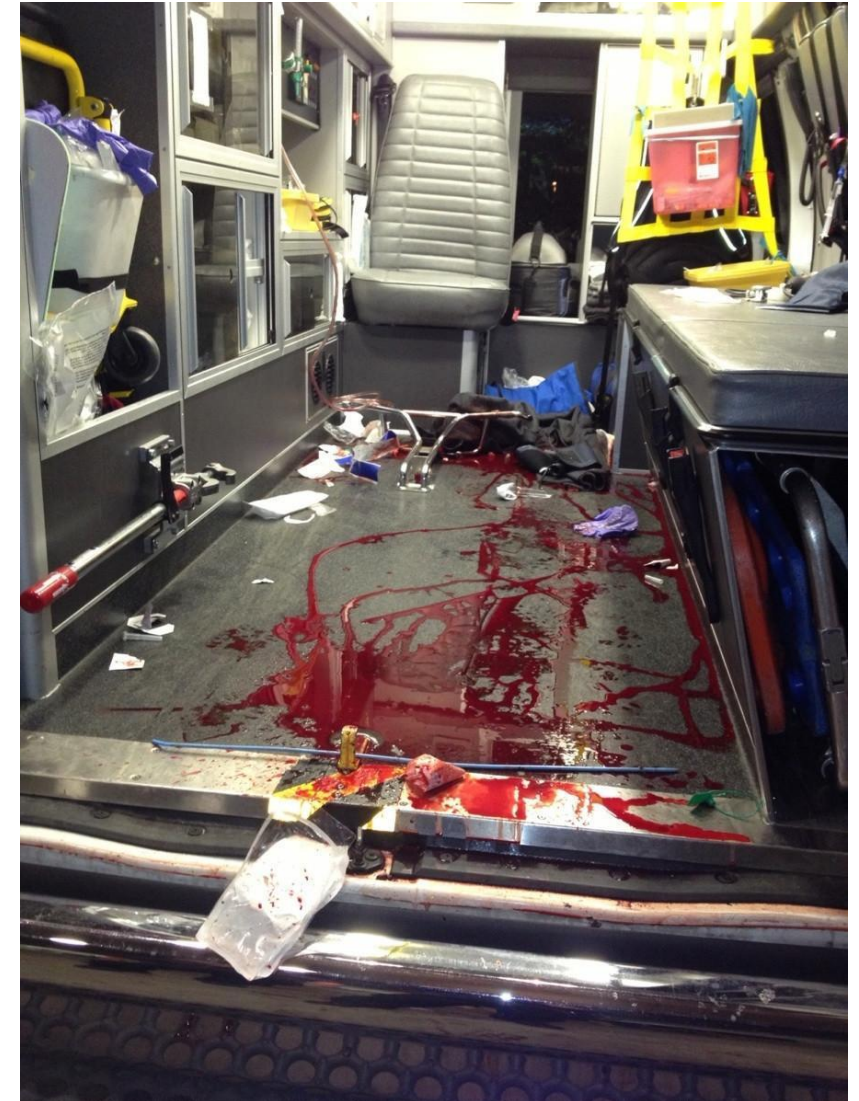
Ambulance Disinfection for High-Risk Pathogens

- After transporting the patient, leave the rear doors of the ambulance open to allow for air movement to reduce and remove potentially infectious particles.
 - The time required for one complete air exchange in a standard size ambulance using passive ventilation (low wind conditions) is approximately 10 minutes or 6 air changes per hour (ACH). This correlates to 90% efficiency in 23 minutes, 99% efficiency in 46 minutes, and 99.9% efficiency in 69 minutes



Ambulance Disinfection for High-Risk Pathogens

- Remove organic materials
- With manual cleaning, the two essential components are friction and fluidics
 - Friction involves the rubbing/scrubbing of the soiled area with a brush
 - Fluidics involves the use of fluids under pressure and is used to remove debris from internal channels after brushing and when the design does not allow for passage of the brush
- Neutral or near-neutral pH detergent solutions provide the best material compatibility profile



Ambulance Disinfection for High-Risk Pathogens

- Spray disinfectant
 - Pay special attention to high touch points
 - Consider using an electrostatic sprayer to obtain complete coverage



Ambulance Disinfection for High-Risk Pathogens

- Utilize UV-C Light
 - Complements liquid disinfection but should NOT be used alone
 - UV-C Benefits
 - Effective on flat surfaces at 90 angles (walls, floors, ceilings, etc.)
 - Not subjectively applies like wipes and some sprays
 - Does not require personnel to enter contamination zone
 - UV-C Limitations
 - Diminishing power over increasing distance
 - Angle of exposed surfaces
 - Surface shadowing





Remember...

- COVID-19 exposure is via Inhalation and Contact of droplets, aerosols, and fomites
 - It is not a skin hazard
- Protection Priorities (Minimize Dose)
 - Airway
 - Mucous Membranes
 - Hands
 - Body
- COVID-19 survives on some surfaces for up to 17 days
 - But, it's easy to destroy!
- Incubation period for infected people can be up to 12.5 days
 - Guidance is 14 days
- US now leads in total number of confirmed cases

This is a manageable situation – Follow a Risk-Based Response



For More Information

- www.emergencyresponsetips.com/papers
 - Firefighter Protective Ensemble Use Against SARS-CoV-2
 - Risk Management Strategies for Respiratory Protection
 - Detailed Guide
 - Quick Reaction Guide
 - Minimum PPE and Decon Recommendations for Emergency Response to COVID-19
 - Detailed Guide
 - Quick Reaction Guide
 - Gear Types for EMA Collection from Industry

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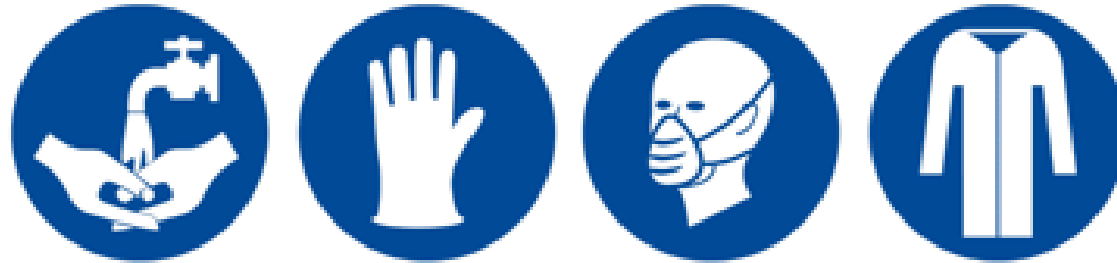


Back-Up Slides

Infectious Disease Risk-Based Response

Standard Precautions (S)

Apply PPE as needed to prevent exposure to bodily fluids and PPE is based on how the disease is transmitted.



FOLLOW STANDARD PRECAUTIONS

- **WASH HANDS**
- **WEAR GLOVES**
- **WEAR MASK**
- **WEAR GOWN**

Reorder: NHE-18542 www.ComplianceSigns.com



Standard Precautions (or are they?)

- Method
 - Observational study of the use of standard precautions by EMS providers arriving at a large urban emergency department
 - Research assistants observed EMS crews throughout their arrival and delivery of patients and recorded data related to the use of gloves, hand hygiene, and equipment disinfection
 - N=423 EMS deliveries, including 899 EMS providers
- Results
 - 57% of EMS providers arrived wearing gloves
 - Hand washing was observed in 28% of providers
 - Reusable equipment disinfection was noted in 32%
 - The most commonly disinfected item was the stretcher (55%)
- Conclusions
 - EMS provider compliance with standard precautions and equipment disinfection recommendations is suboptimal.



Standard Precautions (S)

- EMS Operations
 - Assess patient upon arrival from a distance of 6 feet, if possible
 - Adjust level of precautions as needed
 - Wash hands before and after patient care
 - Provide patient with medical mask if they are exhibiting respiratory symptoms
- EMS Transport
 - Standard transportation to hospital
 - Utilize exhaust fan in ambulance, if available

According to the CDC, the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infectious status of the patient, in any setting where healthcare is delivered include:

1. Hand hygiene;
2. Use of PPE (gloves, gowns, masks, etc.) depending upon the anticipated exposure;
3. Respiratory hygiene and cough etiquette;
4. Safe injection practices; and,
5. Safe handling of potentially contaminated equipment or surfaces in the patient environment.

Don't forget OSHA 1910.130, Bloodborne Pathogens.

Standard Precautions (S)

	Task	Gloves	Protective eyewear	Mask	Gown
a.	Airway management/intubation/suction	Yes	Yes	Yes	No
b.	Starting IVs/IOs	Yes	No	No	No
c.	Trauma, dressing wounds	Yes	Yes	Yes	Yes
d.	Obtaining blood samples	Yes	No	No	No
e.	Public assist calls	Yes	No	No	No
f.	Moving, evaluating, or treating patients	Yes	No	No	No
g.	Administering medications	No	No	No	No
h.	Performing CPR/mouth-to-mouth resuscitation (if off-duty and no barrier device was available)	Yes	No	No	No
i.	Handling, cleaning, and disposing of contaminated equipment or materials	Yes	Yes	No	*Varies
j.	Extrication/trauma	Yes	Yes	Yes	*Varies
<p>* Depending on volume of bodily fluids present</p> <p>Source: CDC. 2007 guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Available at: http://www.cdc.gov/hicpac/2007IP/2007ip_table4.html. Accessed January 24, 2013.</p>					

Standard Precautions (S)

RESPONSE GUIDE # IDR-03 Infectious Disease Risk-Based Response



STANDARD PRECAUTIONS (S)

- Acquired Immune Deficiency Syndrome (AIDS)
- Anthrax (cutaneous or pulmonary)
- Aspergillosis
- Avian influenza
- Botulism
- Cellulitis
- Dengue
- Hepatitis B
- Hepatitis C
- Human Immunodeficiency Virus (HIV)
- Upper respiratory infection, non-specific
- Wound infection including abscess

PPE Considerations

- Minimum of gloves, *additional PPE as needed*
- Eye protection
- Mask (ASTM F2100 Level 2 or 3 Medical Mask)
- Impermeable gown for any splash situations

Response Considerations

- Standard response resources
- Assess potentially infectious persons from a distance of 6 feet

Decon Considerations

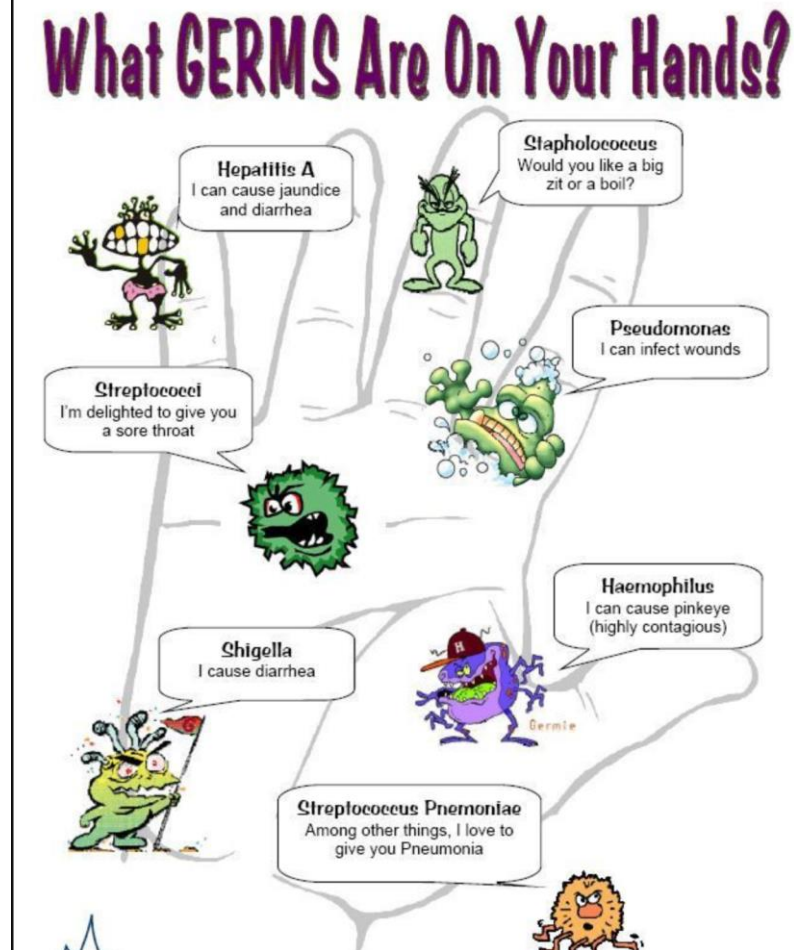
- Wash hands with soap and water for 20 seconds after encounter with potentially infectious persons
- Doff PPE and place in labeled leak-proof container
- Clean and disinfect surface contamination
- Disinfect all potentially contaminated/high touch surfaces with an EPA-registered disinfectant

EMS Considerations

- Provide patient with a medical mask if they are exhibiting respiratory symptoms and consider PPE upgrade
- Utilize exhaust fan in EMS transport unit, if available
- Adjust level of precautions as needed

Contact Hazards (C)

Provide impermeable barriers to infectious agents that are either highly pathogenic, drug resistant, contagious, or persistent that can easily be contracted or spread to other environments via contact with objects and surfaces.





Contact Hazards (C)

RESPONSE GUIDE # IDR-04 Infectious Disease Risk-Based Response



CONTACT PRECAUTIONS (C)

- Adenovirus
- C. difficile
- Diarrhea, suspected infectious
- E. coli
- Enterovirus
- Hepatitis A
- Herpes Zoster (shingles, localized)
- Herpes Simplex
- Lice/Scabies
- MRSA
- Norovirus
- Parainfluenza
- Respiratory syncytial virus (RSV)
- Rotavirus
- Salmonella
- Shigella
- Vancomycin-resistant enterococci (VRE)
- Wound, excessive drainage

PPE Considerations

- Gloves (long enough to interface with gown/coveralls)
- Eye protection
- Mask (ASTM F2100 Level 2 or 3 Medical Mask)
- Fluid-resistant gown or coveralls

Decon Considerations

- Follow all Standard Precaution Decon Considerations and:**
- Inspect PPE for visible contamination
 - Decon as needed prior to doffing to minimize cross contamination
 - Soiled surfaces must be cleaned prior to disinfection
 - Disinfect all impacted areas with EPA registered disinfectant
 - For C. Diff, and spore forming pathogens, verify EPA kill claim and dwell time of disinfectant

Response Considerations

- Standard response resources
- Assess potentially infectious persons from a distance of 6 feet

EMS Considerations

- Inquire about history of C. difficile and MRSA
- Look for evidence of open wounds
- Not all GI illness require contact precautions; however, they should be maintained until C. diff., norovirus, and others are ruled out
- Consider placing plastic sheeting between patient and stretcher to minimize contamination



Droplet Hazards (D)

Provide additional respiratory protection against inhalation of larger infectious droplets during direct patient care activities.





Droplet Hazards (D)

RESPONSE GUIDE # IDR-05 Infectious Disease Risk-Based Response



DROPLET PRECAUTIONS (D)

- Bacterial Meningitis
- Coxsackie
- Influenza, seasonal
- Mumps
- Mycoplasma
- *Neisseria meningitidis*
- Parvovirus
- Pertussis
- Pneumonic Plague
- Rhinovirus
- Rubella
- Streptococcal pharyngitis
- Streptococcal pneumonia
- Other forms of pneumonia

PPE Considerations

- Gloves (long enough to interface with gown/coveralls)
- Eye protection (goggles or face shield)
- Mask (ASTM F2100 Level 2 or 3 Medical Mask)
- Fluid-resistant coveralls or gown

Decon Considerations

Follow all Contact Precaution Decon Considerations and:

- Inspect PPE for visible contamination
- Decon as needed prior to doffing to minimize cross contamination
- Soiled surfaces must be clean prior to disinfection
- Disinfect all impacted areas with EPA registered disinfectant
- For *C. Diff* and spore forming pathogen, verify EPA kill claim and dwell time of disinfectant

Response Considerations

Follow all Contact Precautions Response Considerations and:

- Provide potentially infectious persons with a medical mask if they are exhibiting respiratory symptoms

EMS Considerations

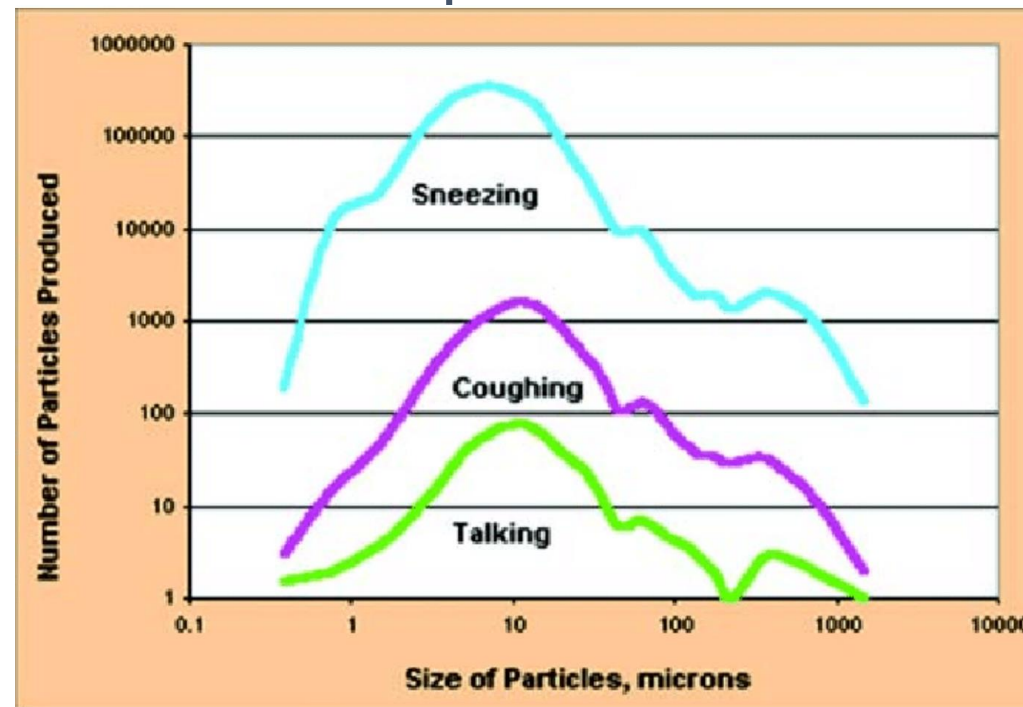
- Minimize use of nebulizers to decrease droplet generation; instead, use metered inhalers
- Consider having the patient compartment exhaust vent on high and isolating the driver compartment *if* performing aerosol producing procedures (airway suctioning, intubation, aerosolized medication administration). Increase ventilation by having air or heat on non-recirculating cycle and/or opening windows



Airborne Hazards (A)

A: Provide respiratory protection against inhalation of infectious aerosols (agents that remain infectious over long distances when suspended in the air).

- Airborne transmission refers to situations where droplet nuclei (residue from evaporated droplets) or dust particles contain microorganisms can remain suspended in air for long periods of time.



Airborne Hazards + (A+)

Provide respiratory protection against inhalation of infectious aerosols (infectious agents that remain infectious over long distances when suspended in the air) as well as impermeable barriers to reduce spread of highly pathogenic viruses on objects and surfaces during direct patient care activities.



Airborne Hazards (A/A+)

RESPONSE GUIDE # IDR-06 Infectious Disease Risk-Based Response



AIRBORNE PRECAUTIONS (A/A+)

- Chicken Pox
- Herpes Zoster (shingles, disseminated)
- Measles
- Monkeypox
- Tuberculosis
- Diphtheria
- Meningococcal disease
- Middle East Respiratory Syndrome (MERS)
- Novel Coronavirus
- Novel influenza strains (e.g. H7N9)
- Severe Acute Respiratory Syndrome (SARS)
- Smallpox

PPE Considerations

- Gloves (long enough to interface with gown/coveralls)
- Eye protection
- Fit-tested respirator- N95, APR, or PAPR
- Fluid-resistant coveralls or gown

For A+, consider NFPA 1999 garment or add double gloves and footwear covers to standard A precautions

Decon Considerations

Follow Droplet Precautions Decon Considerations and:

- Decon prior to doffing to minimize cross contamination
- Soiled surfaces must be cleaned prior to disinfection
- Disinfect all impacted areas with EPA registered disinfectant
- Consider disinfection of adjacent areas as needed based on air flow

Response Considerations

Follow Droplet Precautions Response Considerations and:

- Isolate the immediate area
- Inquire specifically about travel and relevant exposures
- Deploy personnel with infectious disease training and PPE
- Minimize personnel exposed to potentially infectious persons. Unprotected personnel should consider withdrawing if possible.

EMS Considerations

Follow Droplet Precautions EMS Considerations and:

- Isolate the driver compartment from the patient compartment. If driver/pilot compartment is not isolated from the patient compartment, vehicle operator to wear NIOSH-approved, fit-tested respirator
- Patients who are intubated should be ventilated with a bag-valve device or ventilator equipped with a HEPA filter on exhalation port
- For A+, consider a portable isolation unit



Viral Pathogens (V)

Provide maximal impermeable barrier and respiratory protection against highly pathogenic hemorrhagic fever viruses.

- Higher levels of PPE cause increased heat stress as well as increased motor limitations that may lead to injury. These factors should be considered when determining the duties and duration of work while wearing the PPE ensemble.



Viral Pathogens (V)

RESPONSE GUIDE # IDR-07 Infectious Disease Risk-Based Response



PATHOGENIC VIRUS PRECAUTIONS (V)

- Ebola Virus Disease (EVD) – Dry or wet patient
- Viral Hemorrhagic fever (VHF) – Dry or wet patient
- Lassa Fever
- Marburg Virus

PPE Considerations

- NFPA 1999 Multi-Use Ensemble
- NFPA 1994 Class 4 Ensemble
- Assign designated dress out area
- Use a checklist for donning and doffing

Decon Considerations

Follow Airborne Precautions Decon Considerations and:

- Designate decon area
- Assign decon personnel
- Have absorbent materials available to manage increased amount of bodily fluids
- Upgrade decon solution to peracetic acid-based solution. Standard EPA disinfectants may have limited effect on pathogens in dry organic material
- Determine if waste material must be managed as DOT Category A Infectious Material

Response Considerations

Follow Airborne Precautions Response Considerations and:

- When possible, ensure encounters with potentially infectious persons are pre-planned and include a safety brief
- Assign trained support personnel to oversee PPE donning/doffing and to conduct decon

EMS Considerations

- Utilize a patient isolation unit or line ambulance with 6 mil plastic with one-inch overlaps
- Seal any compartment between driver and passenger compartments
- Exercise caution when performing aerosol-producing procedures
- Note that cardiac arrest early in the illness may be due to electrolyte imbalance and may be survivable
- Consider giving oral or nasal medicine to reduce nausea and/or pain per service protocols rather than injectable.

