



Pathogen Match-up: Under the Microscope Learning Tool



Advancing Health in America

An Infection Prevention and Control Training Collaborative

Project Firstline is a CDC national training collaborative offering timely infection control training to frontline health care workers and the public health workforce in the fight against infectious disease threats. As a key partner in this initiative, the American Hospital Association (AHA) is pleased to help bring this critical training opportunity to the health care field and champion sound decision-making and positive behaviors in a time of crisis.

The Project Firstline program is a national training collaborative led by the Centers for Disease Control and Prevention (CDC) in partnership with the AHA and the Health Research & Educational Trust (HRET), an AHA 501(c)(3) nonprofit subsidiary.

Want to learn more about Project Firstline? Contact ProjectFirstline@aha.org.



AHA is proud to partner with Project Firstline, as supported through Cooperative Agreement CDC-RFA-OT18-1802. CDC is an agency within the Department of Health and Human Services (HHS). The contents of these materials do not necessarily represent the policies of CDC or HHS, and should not be considered an endorsement by the Federal Government.

www.cdc.gov/infectioncontrol/projectfirstline/index.html



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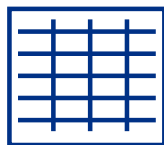
Pathogen Match-up: Under the Microscope Learning Tool

How to use:

The Pathogen Match-Up Tool is designed to inform frontline health care professionals about the six most common pathogens found in various health care settings. A pathogen is defined as any organism that can produce disease or simply a germ. This tool may be used as a team building tool for health care workers to use to enhance their knowledge of pathogens in the health care setting. To use this tool, begin by reviewing the pathogens reference table to learn more about the six pathogens. As a next step, test your knowledge! Use a pair of scissors to cut out the circular containers on pages 4- 6. Then place the cut-out of each pathogen container to the microscope board that describes it.

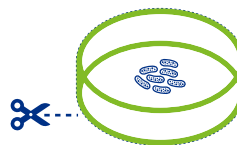
For example, you will match the cut-out container that contains the SARS-CoV-2 pathogen with the board that describes the SARS-CoV-2 pathogen. Once you have matched all the pathogen containers to a board, you can check your selections against the answer key at the bottom of this page to see if your matches are correct.

1



Review pathogen
reference

2



Cut out pathogen
container

3



Match the pathogen with
the correct characteristics

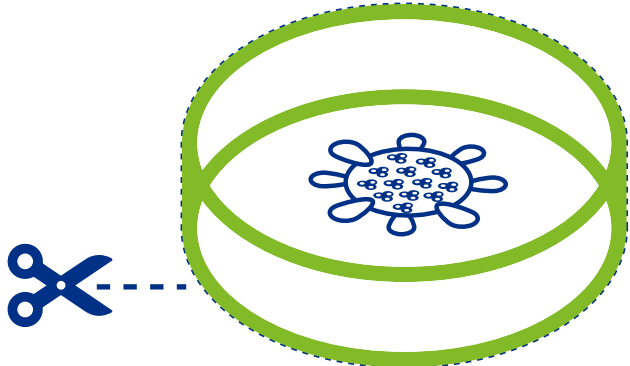
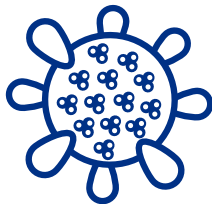
Answer Key:

Page 7 - SARS-CoV-2, Page 8 - *Clostridioides difficile* (C. diff), Page 9 - Carbapenem-resistant Enterobacterales (CRE),
Page 10 - *Acinetobacter* (A. baumannii), Page 11 - Methicillin-resistant *Staphylococcus aureus* (MRSA), Page 12 - Norovirus

Pathogen	Mode of Transmission	Characteristics	Survival Rate in Various Healthcare Settings	References
<div>SARS-CoV-2</div> <div></div>	<p>This pathogen is spread through respiratory droplets carrying infectious virus. Transmission can occur three ways: (1) by breathing in respiratory droplets, (2) by having droplets land on mucous membranes in the mouth, nose and eye, and (3) by touching mucous membranes with hands that have virus on them.</p>	<ul style="list-style-type: none">> Spread mainly from person to person through respiratory droplets breathed in near an infected person.> Cleaning hands and masking are effective ways to prevent spread from infected persons.	<p>Survival rates depend on the type of surface but can range from hours to days. Under typical indoor conditions, most virus (up to 99%) is inactivated after 3 days.</p>	<div>1</div> <div>2</div>
<div>Clostridioides difficile (C. diff)</div> <div></div>	<p>This pathogen is shed in stool. Any surface, device, or material that becomes contaminated with stool may serve as a reservoir, or the place in which the pathogen spores live and grow. The spores, which are single cells that can grow into new organisms, can be transferred to patients through the hands of health care personnel after they've touched a contaminated surface or item.</p>	<ul style="list-style-type: none">> Many routine disinfectants are ineffective against this pathogen spores.> This pathogen's spores can only be killed by EPA-registered sporicidals.	<p>Spores have been shown in some experiments to survive as long as five months on certain hospital surfaces.</p>	<div>3</div> <div>4</div> <div>5</div>
<div>Carbapenem-resistant Enterobacterales (CRE)</div> <div></div>	<p>In health care settings, the pathogens are transmitted from person to person, often via the hands of healthcare personnel or through contaminated medical equipment.</p>	<ul style="list-style-type: none">> These pathogens are resistant to many antibiotics and can cause serious infections that are difficult to treat. It is important to prevent their spread in health care settings, where they are more common than in the community.	<p>These pathogens can survive on dry surfaces for weeks to months.</p>	<div>6</div> <div>7</div>
<div>Acinetobacter (A. baumannii)</div> <div></div>	<p>This pathogen can spread from one person to another through contact with contaminated surfaces or equipment or through person-to-person spread.</p>	<ul style="list-style-type: none">> This pathogen rarely causes infections outside of the healthcare setting. However, people who have weakened immune systems, chronic lung disease, or diabetes may be more susceptible.	<p>This pathogen can live for long periods of time on environmental surfaces and shared equipment if they are not properly disinfected.</p> <p>This pathogen can live on the skin and can survive for days to months.</p>	<div>8</div>
<div>Methicillin-resistant Staphylococcus aureus (MRSA)</div> <div></div>	<p>This pathogen is usually spread by direct contact with colonized or infected patients or contaminated surfaces. This is a bacteria that causes many illnesses, including boils, pneumonia, and other infections commonly referred to as "staph infections".</p>	<ul style="list-style-type: none">> This pathogen is resistant to many antibiotics.> 2 of every 10 individuals are carriers of this pathogen. A carrier is a person who is not infected but has the pathogen growing on their body and can spread it to others.	<p>This pathogen can survive on surfaces anywhere from 7 to 12 months.</p>	<div>9</div> <div>10</div> <div>11</div>
<div>Norovirus</div> <div></div>	<p>This pathogen is spread through direct contact with an infected person, by ingesting food or drink that are contaminated, or through contact with contaminated surfaces.</p>	<ul style="list-style-type: none">> This pathogen does not have a vaccine to prevent or a drug to treat.> This pathogen is very contagious.> This pathogen spreads rapidly.> Hand washing with soap and water is an effective way to prevent transmission.	<p>This pathogen can survive on objects or surfaces for days or weeks.</p>	<div>12</div> <div>13</div>

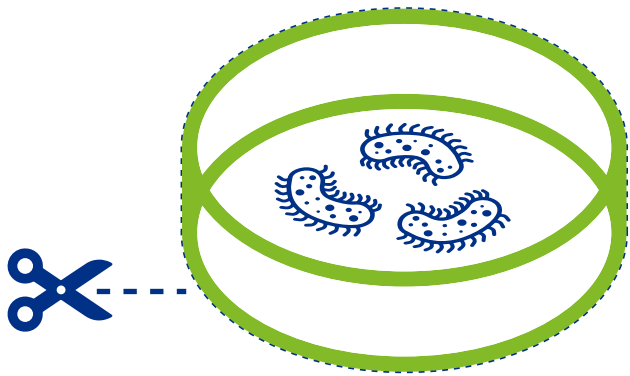
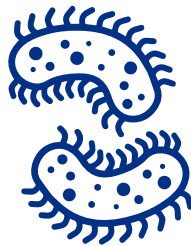
Pathogen

SARS-CoV-2



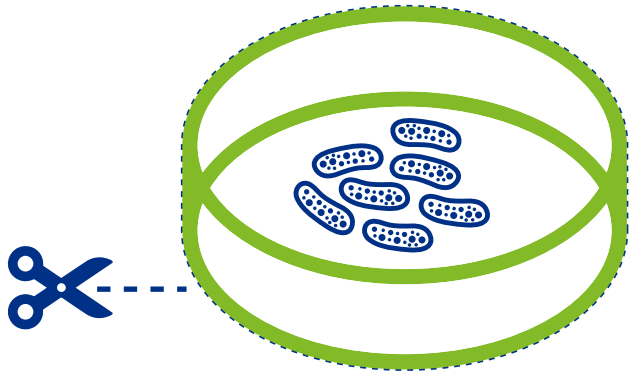
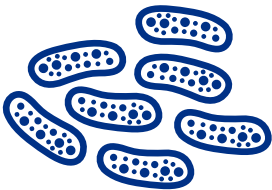
Pathogen

Clostridioides difficile (C. diff)



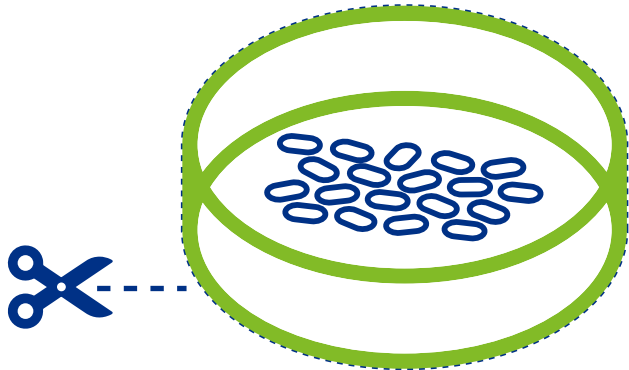
Pathogen

Carbapenem-resistant
Enterobacterales (CRE)



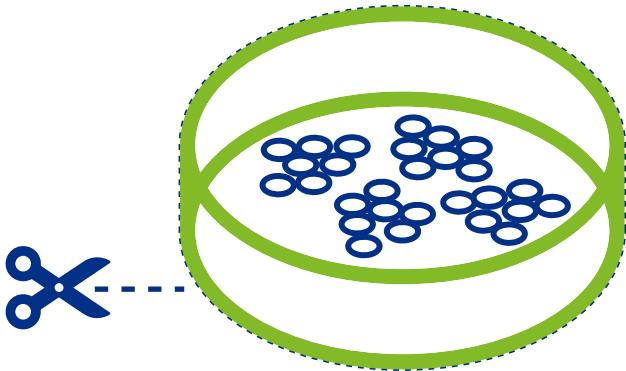
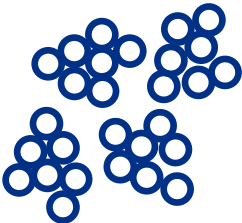
Pathogen

Acinetobacter (A. baumannii)



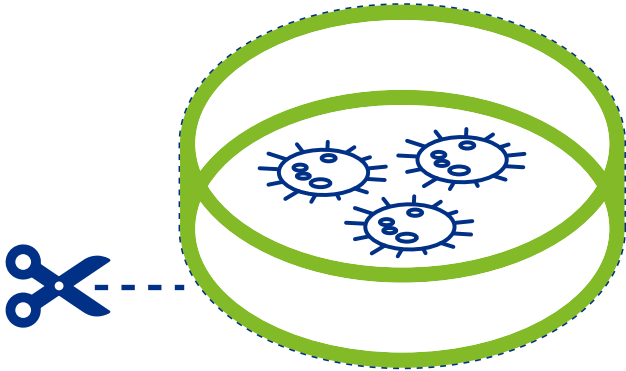
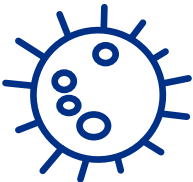
Pathogen

Methicillin-resistant
Staphylococcus aureus
(MRSA)



Pathogen

Norovirus



Mode of Transmission

This pathogen is spread through respiratory droplets carrying infectious virus. Transmission can occur three ways:

(1) by breathing in respiratory droplets, **(2)** by having droplets land on mucous membranes in the mouth, nose and eye, and **(3)** by touching mucous membranes with hands that have virus on them.

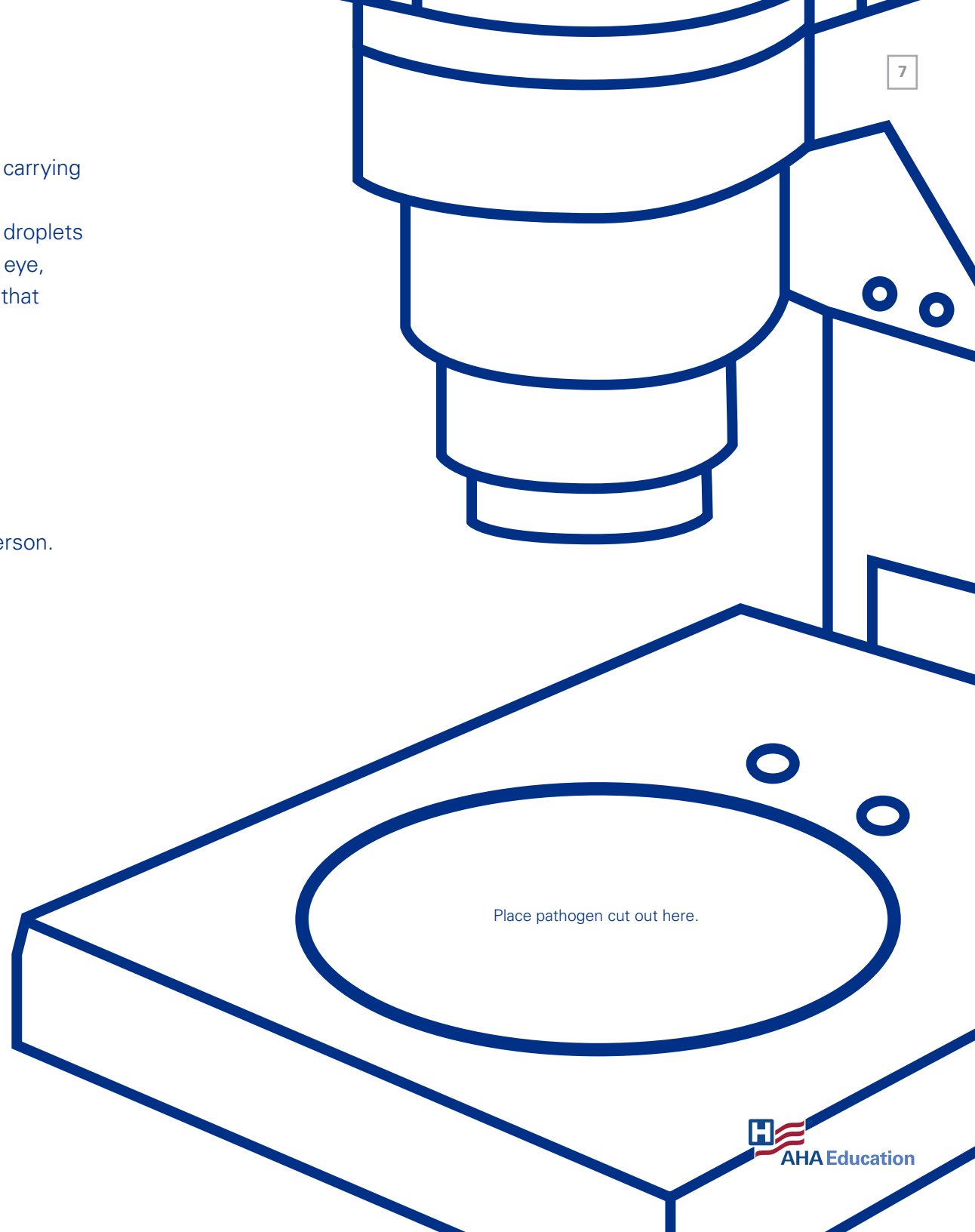
Characteristics

- > Spread mainly from person to person through respiratory droplets breathed in near an infected person.
- > Cleaning hands and masking are effective ways to prevent spread from infected persons.

Survival Rate in Various Healthcare Settings

Survival rates depend on the type of surface but can range from hours to days.

Under typical indoor conditions, most virus (up to 99%) is inactivated after 3 days.



Mode of Transmission

This pathogen is shed in stool. Any surface, device, or material that becomes contaminated with stool may serve as a reservoir, or the place in which the pathogen spores live and grow. The spores, which are single cells that can grow into new organisms, can be transferred to patients through the hands of health care personnel after they've touched a contaminated surface or item.

Characteristics

- > Many routine disinfectants are ineffective against this pathogen's spores.
- > This pathogen's spores can only be killed by EPA-registered sporicidal.

Survival Rate in Various Healthcare Settings

Spores have been shown in some experiments to survive as long as five months on certain hospital surfaces.

Place pathogen cut out here.

Mode of Transmission

In health care settings, the pathogens are transmitted from person to person, often via the hands of healthcare personnel or through contaminated medical equipment.

Characteristics

- > These pathogens are resistant to many antibiotics and can cause serious infections that are difficult to treat. It is important to prevent their spread in health care settings, where they are more common than in the community.

Survival Rate in Various Healthcare Settings

These pathogens can survive on dry surfaces for weeks to months.

Place pathogen cut out here.

Mode of Transmission

This pathogen can spread from one person to another through contact with contaminated surfaces or equipment or through person-to-person spread.

Characteristics

- > This pathogen rarely causes infections outside of the healthcare setting. However, people who have weakened immune systems, chronic lung disease, or diabetes may be more susceptible.

Survival Rate in Various Healthcare Settings

This pathogen can live for long periods of time on environmental surfaces and shared equipment if they are not properly disinfected.

This pathogen can live on the skin and can survive for days to months.

Place pathogen cut out here.

Mode of Transmission

This pathogen is usually spread by direct contact with colonized or infected patients or contaminated surfaces. This is a bacteria that causes many illnesses, including boils, pneumonia, and other infections commonly referred to as "staph infections".

Characteristics

- > This pathogen is resistant to many antibiotics.
- > 2 of every 10 individuals are carriers of this pathogen.
A carrier is a person who is not infected but has the pathogen growing on their body and can spread it to others.

Survival Rate in Various Healthcare Settings

This pathogen can survive on surfaces anywhere from 7 to 12 months.

Place pathogen cut out here.

Mode of Transmission

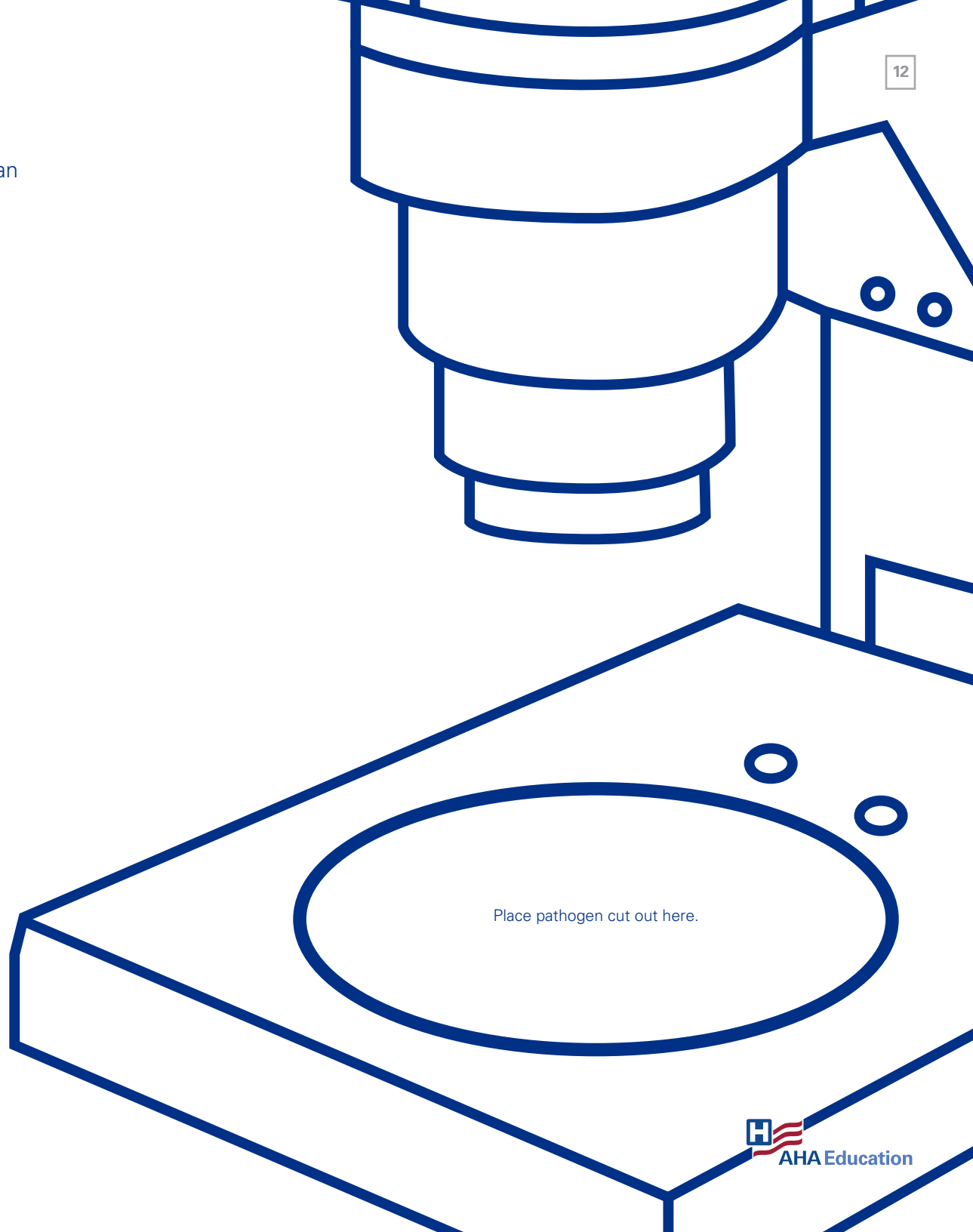
This pathogen is spread through direct contact with an infected person, by ingesting food or drink that are contaminated, or through contact with contaminated surfaces.

Characteristics

- > This pathogen does not have a vaccine to prevent or a drug to treat.
- > This pathogen is very contagious.
- > This pathogen spreads rapidly.
- > Hand washing with soap and water is an effective way to prevent transmission.

Survival Rate in Various Healthcare Settings

This pathogen can survive on objects or surfaces for days or weeks.



- 1 "Risk for Fomite-Mediated Transmission of SARS-CoV-2 in Child Daycares, Schools, Nursing Homes, and Offices - Volume 27, Number 4-April 2021 - Emerging Infectious Diseases Journal - CDC." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, https://wwwnc.cdc.gov/eid/article/27/4/20-3631_article
- 2 "Scientific Brief: SARS-CoV-2 Transmission." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, <https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/sars-cov-2-transmission.html>
- 3 "FAQs for Clinicians about *C. diff*." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 20 July 2021, <https://www.cdc.gov/cdiff/clinicians/faq.html#:~:text=diff%20is%20shed%20in%20feces,diff%20spores>
- 4 EPA, Environmental Protection Agency, <https://www.epa.gov/pesticide-registration/list-k-epas-registered-antimicrobial-products-effective-against-clostridium>
- 5 "Epidemiology of antibiotic-associated colitis" American Journal of Medicine. [https://www.amjmed.com/article/0002-9343\(81\)90553-2/pdf](https://www.amjmed.com/article/0002-9343(81)90553-2/pdf)
- 6 "CRE." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 5 Nov. 2019, <https://www.cdc.gov/hai/organisms/cre/index.html>
- 7 "Scientific Review." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 22 July 2019, <https://www.cdc.gov/infectioncontrol/guidelines/isolation/scientific-review.html>
- 8 "*Acinetobacter* in Healthcare Settings." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 13 Nov. 2019, <https://www.cdc.gov/hai/organisms/acinetobacter.html>
- 9 "MRSA and the Workplace." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 17 Aug. 2015, <https://www.cdc.gov/niosh/topics/mrsa/default.html>
- 10 "Methicillin-resistant *Staphylococcus aureus* (MRSA)." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 26 June 2019, <https://www.cdc.gov/mrsa/community/index.html>
- 11 "Antibiotic Resistance Threats In The United States." Centers for Disease Control and Prevention. <https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf>
- 12 "Common Settings of Norovirus Outbreaks." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 5 Mar. 2021, <https://www.cdc.gov/norovirus/trends-outbreaks/outbreaks.html>
- 13 Norovirus Illness: Key Facts - Centers for Disease Control. <https://www.cdc.gov/norovirus/downloads/keyfacts.pdf>



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CDC'S National Training Collaborative
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