

The study, published in the *American Journal of Infection Control*, examined the effects of a type of ultraviolet (UV) light technology called PurpleSun.

## UV light could reduce hospital-acquired infections



Written by [Monica Beyer](#) on February 3, 2019 — [Fact checked](#) by Gianna D'Emilio

A new study shows that ultraviolet disinfection technology eliminates up to 97.7 percent of pathogens in the operating room. Using this light wavelength might help defeat superbugs.



Could light help lower the risk of dangerous infections in hospitals?

This technology is designed for use in operating rooms, patient rooms, and other healthcare settings.

The study shows that the device can help reduce the risk of infections acquired in the hospital.

These infections cost billions of dollars, and some estimates state that they cause almost [100,000 deaths](#) each year in the United States.

In the current study, researchers used over 3,000 microbiological samples from 100 different surgical cases at three hospitals in the New York area.

Researchers then looked at how well the PurpleSun technology worked. They found that it eliminated most pathogens.

PurpleSun is unique, as it has foldable partitions, which means that it can surround equipment on all sides, and its light hits five surface points. It also uses high levels of UV intensity in 90-second intervals for optimum effect.

“[UV] light technology will not replace manual cleaning and disinfection with chemicals, but it has a place in healthcare settings,” says Donna Armellino, lead author of the study and vice president of infection prevention at Northwell Health. She explains:

“This technology can optimize environmental cleanliness, resulting in decreased pathogens that could potentially cause infection.”

– *Donna Armellino*

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## Healthcare-associated infections

The last thing anyone wants to experience is getting some sort of infection in a healthcare environment, such as an operating room or hospital, while they're already seeking medical care.

This type of infection, called a healthcare-associated infection (HAI), happens frequently. According to the Office of Disease Prevention and Health Promotion, around [1 in 25](#) inpatients has an infection that's directly related to hospital care.

Certain factors can raise someone's risk of developing an HAI; these include catheters, having surgery, getting a shot, and being in a healthcare setting that has not been properly disinfected.

Also, there is a risk of catching an infection from a healthcare worker who is sick. Overuse of [antibiotics](#) can play a part, as well.

**The U.S. Department of Health and Human Services estimate that over [1 million](#) HAIs develop within the country's health system every single year.**

HAIs can result in severe complications, and outcomes are often poor. These infections cost billions of dollars each year in healthcare spending and other costs, and HAIs remain a focus for people who work in public health.

## UV light in the healthcare setting

Using UV light for disinfection purposes is not a [novel](#) idea. In 1877, two Englishmen published a [paper](#) in the journal *Nature* describing how sunlight prohibited the growth of microorganisms.

Studies have looked at UV light in relation to cutting down on airborne pathogens, and work continues to see if this type of technology can be of further use, including the current study, which looks at UV light technology and its use in the operating room.

PurpleSun definitely has its advantages, as it eliminates human error and other common pitfalls of chemical disinfecting agents. It also affects multiple surfaces within seconds and has a configuration that allows it to reach all sides of a piece of equipment. As this study shows, it is very effective at eliminating pathogens.

**As Armellino says, while UV disinfection technology should not completely replace manual cleaning, it can be a great accompaniment to regular disinfection routines.**

Medical Innovation    Infectious Diseases / Bacteria / Viruses



FEEDBACK:  

## What to know about infections



Medically reviewed by [Cameron White, M.D., MPH](#) — Written by [Adam Felman](#) on March 30, 2020

[Types](#) | [Causes](#) | [Symptoms](#) | [Prevention](#)

An infection occurs when a microorganism enters a person's body and causes harm.

The microorganism uses that person's body to sustain itself, reproduce, and colonize. These infectious microscopic organisms are known as pathogens, and they can multiply quickly. Examples of pathogens include:

- bacteria
- viruses
- fungi

They can spread in several different ways, [including](#) through:

- skin contact
- the transfer of bodily fluids
- contact with feces
- ingesting contaminated food or water

- inhaling airborne particles or droplets
- touching an object that a person carrying the pathogen has also touched

In this article, we explain the different types of infections, how to reduce the risk of infection, and what symptoms they cause.

For more advice on COVID-19 prevention and treatment, visit our [coronavirus hub](#).

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## Types



The common cold is a type of viral infection.

How an infection spreads and its effects on the human body depend on the type of pathogen.

The immune system is an [effective barrier](#) against infectious agents. However, pathogens may sometimes overwhelm the immune system's ability to fight them off. At this stage, an infection becomes harmful.

Some pathogens have little effect at all. Others produce toxins or inflammatory substances that trigger negative responses from the body. This variation means that some infections are mild and barely noticeable, while others can be severe and life threatening. Some pathogens are resistant to treatment.

Infection can spread in a variety of ways.

Bacteria, viruses, fungi, and parasites are different types of pathogens. They vary in several ways, including:

- size
- shape
- function
- genetic content
- how they act on the body

For example, viruses are smaller than bacteria. They enter a host and take over cells, whereas bacteria can survive without a host.

Treatment will depend on the cause of the infection. This article will focus on the most common and deadly types of infection: bacterial, viral, fungal, and prion.

## **Viral infections**

Viral infections occur due to infection with a virus. Millions of different viruses may exist, but researchers have only identified about [5,000 types](#) to date. Viruses contain a small piece of genetic code, and a coat of protein and lipid (fat) molecules protects them.

Viruses invade a host and attach themselves to a cell. As they enter the cell, they release their genetic material. This material forces the cell to

replicate the virus, and the virus multiplies. When the cell dies, it releases new viruses, which infect new cells.

Not all viruses destroy their host cell, however. Some of them [change the function](#) of the cell. Some viruses, such as [human papillomavirus \(HPV\)](#) and Epstein-Barr virus (EBV), can lead to [cancer](#) by forcing cells to replicate in an uncontrolled way.

A virus can also target certain age groups, such as infants or young children.

Viruses may remain dormant for a period before multiplying again. The person with the virus can appear to have fully recovered, but they may get sick again when the virus reactivates.

Viral infections include:

- the common cold, which mainly occurs due to rhinovirus, [coronavirus](#), and adenovirus
- [encephalitis](#) and [meningitis](#), resulting from enteroviruses and the [herpes simplex virus \(HSV\)](#), as well as West Nile Virus
- [warts](#) and skin infections, for which HPV and HSV are responsible
- [gastroenteritis](#), which norovirus causes
- [COVID-19](#), a respiratory disease that develops after a novel coronavirus infection that is currently causing a global pandemic

Other viral conditions include:

- [Zika virus](#)
- [HIV](#)
- [hepatitis C](#)
- [polio](#)
- [influenza \(flu\)](#), including H1N1 swine flu
- [Dengue fever](#)
- [Ebola](#)
- [Middle East respiratory syndrome \(MERS-CoV\)](#)

Antiviral medications can help relieve the symptoms of some viruses while the disease passes. They can either prevent the virus from reproducing or boost the host's immune system to counter the effects of the virus.

Antibiotics are not effective against viruses. These drugs will not stop the virus, and their use increases the risk of antibiotic resistance.

Most treatment aims to relieve symptoms while the immune system combats the virus without assistance from medication.

## Bacterial infections

Bacteria are single-celled microorganisms, also known as prokaryotes.

Experts estimate that there are at least [1 nonillion](#) bacteria on Earth. A nonillion is a 1 followed by 30 zeros. Much of the Earth's biomass comprises bacteria.

Bacteria take three main shapes:

- **Spherical:** These are known as cocci.
- **Rod-shaped:** These have the name bacilli.
- **Spiral:** Coiled bacteria are known as spirilla. If the coil of a spirillum is particularly tight, scientists call it a spirochete.

Bacteria can live in almost any type of environment, from extreme heat to intense cold, and some can even survive in radioactive waste.

There are trillions of strains of bacteria, and few cause diseases in humans. Some of them live inside the human body, such as in the gut or airways, without causing harm.

Some “good” bacteria attack “bad” bacteria and prevent them from causing sickness. However, some bacterial diseases can be deadly.

These include:

- [cholera](#)
- [diphtheria](#)
- [dysentery](#)



- bubonic plague
- tuberculosis
- typhoid
- typhus

Some examples of bacterial infections are:

- bacterial meningitis
- otitis media
- pneumonia
- tuberculosis
- upper respiratory tract infection (although this is usually viral)
- gastritis
- food poisoning
- eye infections
- sinusitis (again, more often viral)
- urinary tract infections (UTIs)
- skin infections
- sexually transmitted infections (STIs)

A doctor can treat bacterial infections with [antibiotics](#). However, some strains become resistant and can survive the treatment.

## Fungal infections

A fungus is often a [multicellular parasite](#) that can decompose and absorb organic matter using an enzyme. However, some types, such as yeasts, are single celled.

Fungi almost always reproduce by spreading single celled spores. The structure of a fungus is usually long and cylindrical, with small filaments branching from the main body.

There are approximately [5.1 million](#) <sup>✓</sup> species of fungus.

Many fungal infections develop in the upper layers of the skin, and some progress to the deeper layers. Inhaled yeast or mold spores can

sometimes lead to fungal infections, such as pneumonia, or infections throughout the body. These are also known as systemic infections.

The body usually has a population of good bacteria that help maintain the balance of microorganisms. These line the intestines, mouth, vagina, and other parts of the body.

Those with a higher risk of developing a fungal infection include people who:

- use antibiotics for a long time
- have a weakened immune system, due, for example, to living with HIV or [diabetes](#) or receiving [chemotherapy](#) treatment
- have undergone a transplant, as they take medications to prevent their body from rejecting the new organ

[Examples of fungal infections](#) <sup>✓</sup> are:

- valley fever, or coccidioidomycosis
- histoplasmosis
- candidiasis
- athlete's foot
- [ringworm](#)
- some eye infections

A rash may indicate a fungal infection of the skin.

## **Prion disease**

A prion is a protein that contains no genetic material and is usually harmless. Scientists do not class prions as living microorganisms. However, if a prion folds into an abnormal shape, it can become a rogue agent and cause infection.

Prions can affect the structure of the brain or other parts of the nervous system. They do not replicate or feed on the host. Instead, they trigger abnormal behavior in the body's cells and proteins.

Prions cause degenerative brain diseases, all of which are rare but progress rapidly and are currently fatal. They include bovine spongiform

encephalopathy (BSE), which people typically refer to as mad cow disease, and [Creutzfeldt-Jakob disease \(CJD\)](#).

Researchers [have also linked](#) some cases of [Alzheimer's disease](#) to prion infection.

## Other infections

While the forms of infection that we have listed above are the main types, there are [others](#) that can have an effect on the body.

A single celled organism with a nucleus can cause a protozoan infection. Protozoa commonly show features similar to those of animals, such as mobility, and they can survive outside the human body.

They most commonly transfer to other humans through feces. Amebic dysentery is an example of a protozoan infection.

Helminths are larger, multicellular organisms that tend to be visible to the naked eye when fully grown. This type of parasite includes flatworms and roundworms. These can also cause infection.

Finally, ectoparasites — including mites, ticks, lice, and fleas — can cause infection by attaching or burrowing into the skin. Ectoparasites can also include blood-sucking arthropods, such as mosquitoes, which transmit infection by consuming human blood.

## Causes

The cause of an infection is whichever type of organism has entered the body. A specific virus, for example, will be the cause of a viral infection.

The effects of an infection, such as swelling or a runny nose, occur due to the immune system's attempt to get rid of the invading organism.

A wound fills with [pus](#), for example, when white blood cells rush to the site of an injury to combat foreign bacteria.

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## Symptoms

The symptoms of an infection depend on the organism responsible, as well as the site of the infection.

Viruses target specific cells, such as those in the genitals or upper respiratory tract. The [rabies](#) virus, for example, targets the nervous system. Some viruses target skin cells, causing warts.

Others target a wider range of cells, leading to several symptoms. A flu virus can cause a runny nose, muscle aches, and an [upset stomach](#).

A person with a bacterial infection will often experience redness, heat, swelling, fever, and pain at the site of infection, as well as swollen lymph glands.

A rash can indicate a fungal infection of the skin. However, viruses and bacteria may also cause skin conditions and rashes.

Common symptoms of prion diseases include rapid onset of brain damage, memory loss, and cognitive difficulties. They can also trigger the buildup of plaque in the brain, causing this organ to waste away.

## Prevention

There is no single method for preventing all infectious diseases. However, people should take the following steps to [reduce the risk](#) of transmission:

- Wash the hands often, especially before and after preparing food and after using the bathroom.
- Clean surface areas and avoid keeping perishable food at room temperature for too long while preparing a meal.
- Receive any recommended vaccinations and keep them up to date.

- Only take antibiotics with a prescription and be sure to complete the recommended course, even if symptoms improve at an earlier stage.
- Disinfect rooms that may have high concentrations of bacteria, such as the kitchen and bathroom.
- Reduce the risk of sexually transmitted infections (STIs) by receiving regular STI checks, using condoms, or abstaining altogether.
- Avoid sharing personal items, such as toothbrushes, combs, razor blades, drinking glasses, and kitchen utensils.
- Follow a doctor's advice about traveling or working while living with an infectious disease, as doing so could pass the infection to others.

Following an active lifestyle and eating a nutritionally balanced diet can help keep the immune system strong and prime the body's defenses against different types of infection.

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