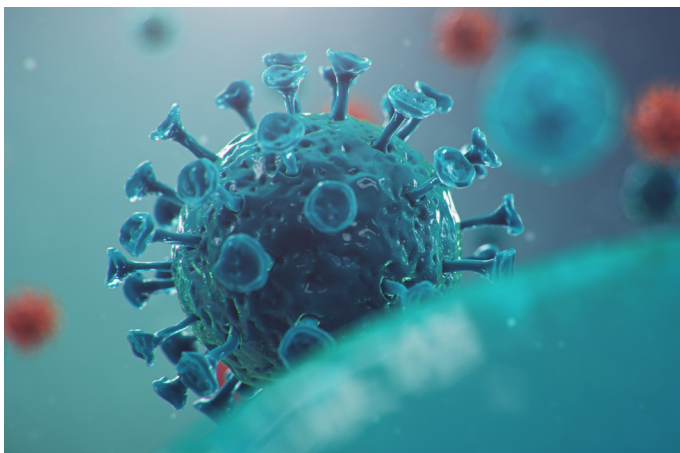


# PUREDRI AND PURESHERE: NEUTRALIZING HARMFUL BACTERIA AND VIRUSES

More Powerful Than Filters and Purifiers.

A heightened level of washroom and workspace sanitization is taking place across the country as a result of coronavirus (common cold and COVID-19). Throughout the COVID-19 pandemic and during cold and flu season, articles have documented workplace safety and restroom concerns which are the result of general cleanliness, individuals congregating and the emission of restroom plumes. These concerns are not unwarranted; however, Bobrick's new BobrickPure Hygiene Solutions – PureDri and PureSphere – neutralize bacteria and viruses to provide safer, more hygienic spaces.

Studies have long shown that viruses and bacteria live on surfaces and in the air. As a global pandemic, the COVID-19 virus and its variants are of paramount concern for most individuals. The following three sections will address three areas of transmission concern for COVID-19 and other viruses.



## General Cleanliness

According to a January 29, 2021, article published in Nature written by Dyani Lewis, entitled “[COVID-19 rarely spreads through surfaces. So why are we still deep cleaning?](#)” there has been debate about whether or not COVID-19 can be spread through high-touch surfaces such as counters, doorknobs and elevator buttons. According to the article, “The World Health Organization (WHO) updated its guidance on 20 October, saying that the virus can spread “after infected people sneeze, cough on, or touch surfaces, or objects, such as tables, doorknobs and handrails”. A WHO spokesperson told Nature that “there is limited evidence of transmission through fomites.” (Fomites are defined as objects or materials which are likely to carry infection, such as doorknobs, utensils and furniture.) “Nonetheless, fomite transmission is considered a possible mode of transmission, given consistent finding of environmental contamination, with positive identification of SARS-CoV-2 RNA in the vicinity of people infected with SARS-CoV-2.”

## Congregating

Social relationships are a part of the human experience and are connected to stress management, mental health support and overall wellbeing in individuals of all ages. Social relationships in the workplace, classroom, boardroom and the majority of settings involve the congregating of two or more individuals meeting in close proximity for a limited or extended period of time.

According to the [Centers for Disease Control and Prevention \(CDC\)](#), COVID-19 is primarily transmitted from person-to-person through respiratory droplets. These droplets are released when someone with COVID-19 sneezes, coughs, or talks. Infectious droplets can land in the mouths or noses

of people who are nearby or possibly be inhaled into the lungs. In congregate settings, it's difficult to ascertain who has COVID-19 and who does not; just as it's difficult to determine who is vaccinated and who is not. For this reason, congregate settings are high-risk areas for COVID-19 transmission.

## Plumes

Since the COVID-19 pandemic, a wide variety of research has been conducted concerning plumes emitted from flushing toilets and the associated risk of the spread of virus aerosol particles.

According to an American Institute of Physics (AIP) article published in *Physics of Fluids* in May 2020, entitled "[Can a toilet promote virus transmission? From a fluid dynamics perspective](#)," written by Yun-yun Li, Ji-Xiang Wang and Xi Chen, strong turbulence is generated from toilet flushing. The article says that an upward velocity of as much as 5 m/s (meters per second) is produced, which is capable of expelling aerosol particles out of the toilet bowl. Approximately 40%-60% of particles can rise above the toilet seat and spread into a larger area. The height of these particles can reach 106.5 cm (>41 inches) from the ground, as shown in Fig. 1. According to the article, the data analysis indicates that given the same amount of water and the same gravitational potential energy, annular flushing causes more virus spread.

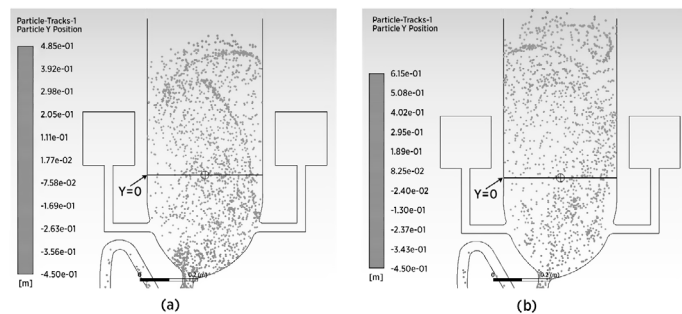


Fig. 1 — Fluid Dynamics



There is good news. Independent studies show that Bobrick's PureDri and PureSphere neutralize 98.11% of airborne and 99.6% of surface micro-organisms.

## The PureDri + PureSphere Technology — How it Works

The PureDri and PureSphere technology work by destroying existing pathogens in the air and on surfaces. Through PureDri, which is an enhanced restroom hand-drying process, continuous sanitization takes place in a closed space of up to 215 square feet.

PureSphere, on the other hand, is an air sanitizer that mounts to a wall and neutralizes viruses and bacteria <0.03 microns in an area up to 323 square feet like restaurants, classrooms, offices, boardrooms and breakrooms. In addition, the unit works to remove odors; thus, eliminating the need for masking agents.


### Both Units Work Through a Four-part Process:

1. A combination of photocatalytic oxidation, germicidal irradiation and dual waveband UV produce a continuous flow of sanitizing plasma.
2. UV-based photocatalytic oxidation and titanium dioxide combine to create hydroxyl radicals. The hydroxyl radicals neutralize bacteria, mold and fungi, viruses, dust mites, allergens and harmful volatile organic compounds (VOCs).
3. When the UV light reacts with the titanium dioxide catalysts, it causes a release of electrons that bond with oxygen to produce superoxide ions. Superoxide ions charge very small particles (0.01 microns) resulting in their forming clusters that remove viruses and bacteria from the air – for example, COVID-19 is 0.06 microns.
4. Finally, ozone is produced when the 185nm UV light reacts with oxygen to form monatomic oxygen which then bonds with oxygen to form ozone. Ozone is a powerful oxidizing agent and highly effective in neutralizing molds, bacteria, fungi and viruses as well as removing odors associated with them. See Fig. 2 on the following page.

**1. GERMICIDAL UV**

As air flows through the plasma chamber and over the UV lamp all micro-organisms in the air are killed/inactivated


The plasma chamber is comprised of dual waveband UV lamps at 254nm and 185nm surrounded by nano coated catalytic plates.



**2. HYDROXYL RADICALS**

As air flows through the chamber the UV light reacts with the titanium dioxide catalysts causing water vapor to be converted to highly reactive hydroxyl radicals (OH).


$H_2O \rightarrow OH$



**3. SUPEROXIDE IONS**

As air flows through the chamber the UV light reacts with the titanium dioxide catalysts causing a release of free electrons, they bond with oxygen to form. Superoxide ions.

$O_2 \rightarrow O_2^- (-)$



**4. OZONE**

As air flows through the chamber the 185nm UV light reacts with the oxygen and forms monatomic oxygen, this then bonds with oxygen to form ozone.

$O_2 \rightarrow O_3$






Fig.   Four-part Sanitization Process

In addition to PureDri in restrooms, PureSphere is suitable for many other environments in a commercial space such as meeting rooms, break rooms, classrooms, restaurants, offices and installation in households can also prove beneficial.

### Plasma Neutralizes Odors

Plasma is the 4th state of matter along with solid, liquid and gas. While plasma may be similar to a gas, it behaves like a liquid and flows through the air. Plasma carries electrical currents and generates magnetic fields similar to lightning in the atmosphere to create positive and negative ions, which [neutralizes odors](#) to generate a clean smell similar to the air after a thunderstorm.

Airborne particles are charged by the ions. This causes the particles to cluster. As they divide to reproduce, bacteria and virus cells bond with oxygen ions and are destroyed. A ripple effect continues as odorous gasses and aerosols oxidize on

contact with oxygen ions and are neutralized. Oxygen ions cause a chemical reaction with VOCs breaking down their molecular structure.

### Results of Independent Studies

The efficacy of both PureDri and PureSphere was determined by three independent research organizations in the United Kingdom that include the following British authorities – the Health Protection Agency, SGS and University of Leeds. The findings showed the neutralization of a variety of bacteria and viruses. The efficacy is as follows:

- 100% air disinfection and elimination of E. coli, staphylococcus aureus and aspergillus fumigatus after 1 hour
- Surface disinfection and bacteria elimination achieved high results after 8, 24 and 48 hours

### Air and Surface Testing Against Listed Pathogens

#### Air Disinfection Efficiency

Pathogen	1 hour
E.Coli	100%
S.aureus	100%
A.fumigatus	100%

#### Surface Disinfection Evaluation Efficiency

Pathogen	8 hours	24 hours	48 hours
E.Coli	79.6%	97.7%	99.9%
S.aureus	87.4%	91.1%	99.5%
C.difficile	91.4%	98.1%	99.6%

### PureDri and PureSphere: More Than Simple Filtration; A Higher Level of Sanitization

Until now, HEPA's ability to purify air has served as the standard of filtration. The UV power of PureDri and PureSphere provide sanitization powerful enough to neutralize bacteria and viruses and provide an extra layer

of safety and cleanliness. Both products are more effective than HEPA filtration by destroying particles that are <0.3 microns such as dust, bacteria, mold spores, tobacco smoke, odors, infectious particles and allergens.

In addition, HEPA filters lose their effectiveness when they become clogged with debris, and only those labeled as washable or permanent can be cleaned. While research shows they can be effective in capturing a variety of viruses and bacteria in healthcare settings, they can only capture up to 0.03 microns. PureDri and PureSphere go a step further to neutralize up to 0.1 microns. In addition, appropriate sourcing and installation of HEPA filtration to achieve negative pressure isolation during virus outbreaks can be tedious and time-consuming. Care must be taken during cleaning to avoid damaging the filter or breaking or stretching out the fibers, which happens all too easily. [Airborne Infectious Disease Management: Methods for Temporary Negative Pressure Isolation, Minnesota Department of Health, Office of Emergency Preparedness, Healthcare Systems Preparedness Program, [https://dehs.umn.edu/sites/dehs.umn.edu/files/airborneweb2\\_07linked.pdf](https://dehs.umn.edu/sites/dehs.umn.edu/files/airborneweb2_07linked.pdf).

***PureDri and PureSphere are not encumbered by these issues.***

### **Harnessing Ozone Safely**

Ozone (O<sub>3</sub>) is a molecule consisting of three atoms of oxygen. It is found both in the Earth's upper atmosphere and at ground level. It is widely known that at unsafe levels, ozone emissions can be harmful; however, ozone emitted through PureDri and PureSphere is between 0.02 and 0.03 parts per million which is well beneath regulatory requirements by the UL, California Air Resources Board (CARB) and FDA, each of which specify 0.05 parts per million to be safe.

In the abstract for a 2011 article published in the Journal of Natural Science, Biology and Medicine, titled "Ozone therapy: A clinical review," <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3312702/> the authors A. M. Elvis and J.S. Ekta supported use of O<sub>3</sub> for disinfection and treatment of disease.

Ozone therapy has been utilized and extensively studied for many decades altogether. Its effects are proven, consistent and with minimal side effects. Medical O<sub>3</sub>, used to disinfect

and treat disease, has been around for over 150 years. Used to treat infections, wounds and multiple diseases, O<sub>3</sub>'s effectiveness has been well-documented.

Inactivation of bacteria, viruses, fungi, yeast and protozoa: Ozone therapy disrupts the integrity of the bacterial cell envelope through oxidation of the phospholipids and lipoproteins. In fungi, O<sub>3</sub> inhibits cell growth at certain stages. With viruses, the O<sub>3</sub> damages the viral capsid and upsets the reproductive cycle by disrupting the virus-to-cell contact with peroxidation. The weak enzyme coatings on cells which make them vulnerable to invasion by viruses make them susceptible to oxidation and elimination from the body, which then replaces them with healthy cells.



*In addition to PureDri in restrooms, PureSphere is suitable for many other environments in a commercial space such as meeting rooms, break rooms, classrooms, restaurants, offices and installation in households can also prove beneficial.*

There is a generally accepted hierarchy of resistance to disinfection, (recognized by the Centers for Disease Control and Prevention as well as the Food and Drug Administration). This hierarchy is based on the structural taxonomy (grouping) of microbes. This ranking is shown below along with which type of microbes have been used to validate the technology in PureDri and PureSphere.

Structure	Typical organisms	Organisms used in third-party United Kingdom testing
With lipid envelope	Corona virus, Influenza, Measles, Mumps, HIV	Under test using human coronavirus surrogate 229E
Gram positive bacteria	MSRA, Streptococcus, staphylococcus	Staphylococcus epidermis, Methicillin resistant staphylococcus aureus
Gram negative bacteria	E Coli, Legionella Pseudomonas	E. Coli
Fungal spores	Candida, Aspergillus	Aspergillus Fumigatus
Virus without envelope	Norovirus Rhinovirus, Poliovirus	MS2 Coliphage
Mycobacteria	Tuberculosis	Not tested
Bacterial Spores	Tetanus, Anthracis, Bacterial endospores	Clostridium cifficile
Prions	CJD, Mad cow disease (BSE)	Not tested

### Ease of Use While Promoting Safety and Wellness

- **PureDri Sanitizing Hand Dryer**
  - Touch-free hand-drying function
  - 12-second pre-set dry time
  - Immediately following dry time, a focused plasma emits for 8 seconds
- **PureSphere Air Sanitizer**
  - Sanitizes up to 323 square feet
  - Provides odor control and purifies 24/7
  - No filters to change

### Technical Specifications

PureDri Technical Specifications	
Dimensions	10.5" wide x 32.25" High x 4" deep
Weight	20.3 pounds
Electrical Supply	110/240 volts 50/60 Hz
Current Consumption	17 Amps @ 115 volts
Normal Output	0.2 kW
Air Volume	1,200 cubic feet / hour
Air Velocity	164' / second @ 4"
Noise Level	85 dBA
Area Size	215 square feet

PureSphere Technical Specifications	
Dimensions	5.5" wide x 15.5" High x 4" deep
Weight	3 pounds
Electrical Supply	110/240 volts 11.5-13 watts
Construction	Polycarbonate
Area Size	Up to 323 square feet
Cover material	Polycarbonate
Cover color	Silver

## The Bobrick**Pure** Hygiene Solutions Value Proposition

The revolutionary UV+ technology of PureDri and PureSphere creates hygienic air and surfaces which promotes wellness and safety when installed in myriad areas such as washrooms, restaurants, workplaces and classrooms. The safety seal that is included with the installation of PureDri and PureSphere products shows patrons, parents and employees that they are surrounded by an environment safe from most bacteria and viruses.

## Hygiene & Wellness | Safety | Clean Environments

Bobrick**Pure** Hygiene Solutions are making the world a more hygienic place, one space at a time.

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Visit [Bobrick.com](https://www.bobrick.com) for additional resources

