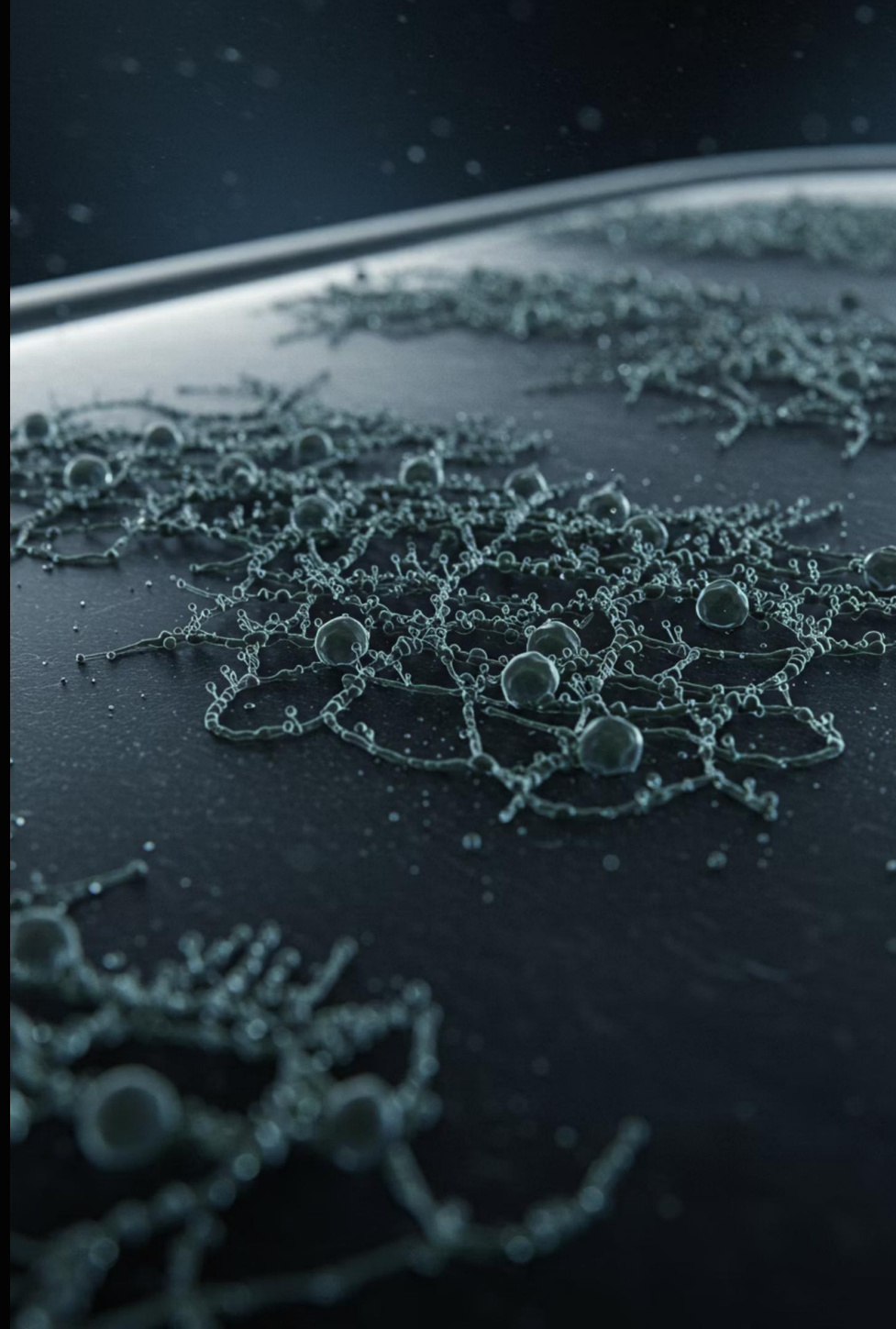
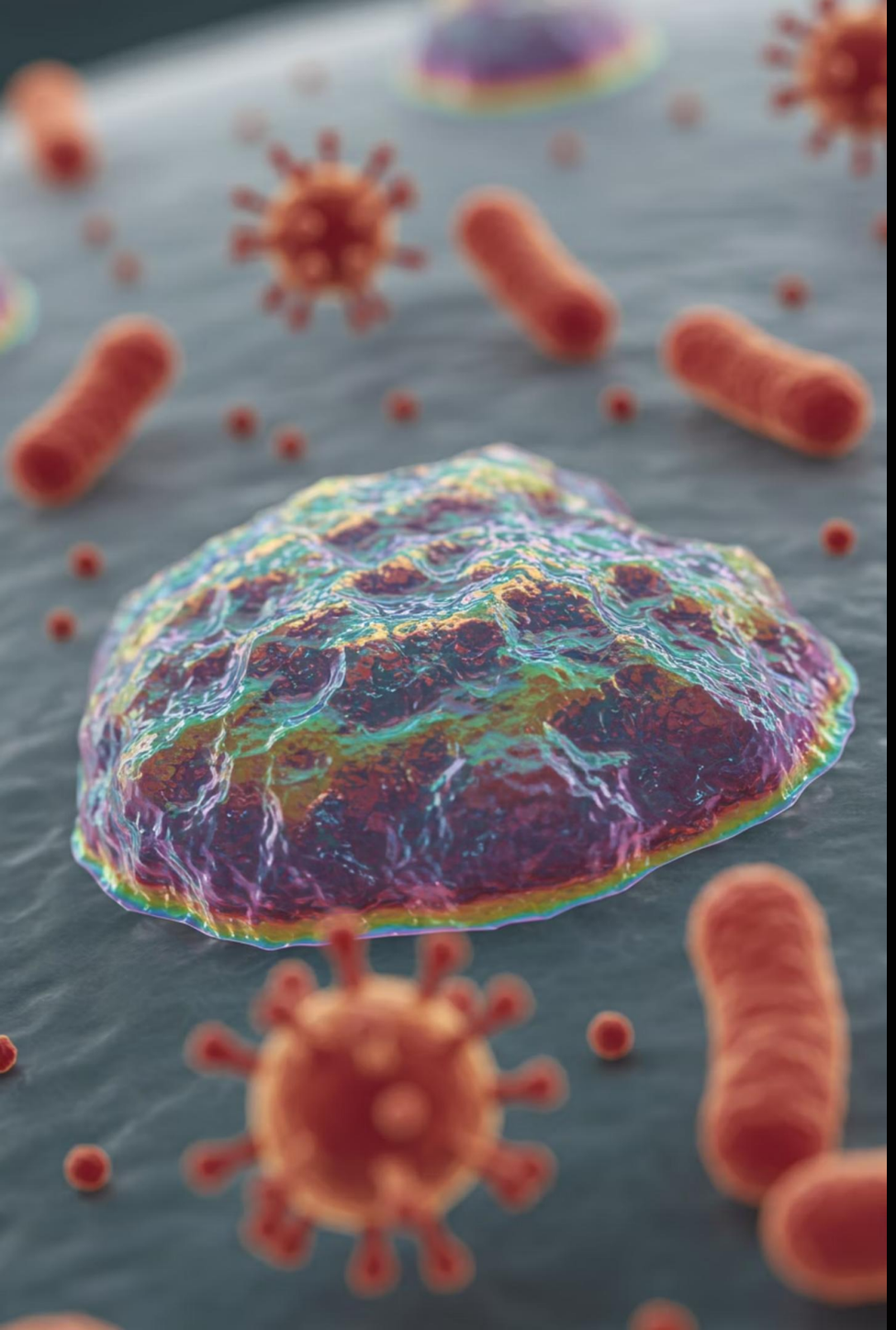
# VitaCoat 3D Antimicrobial Surface Coating

A revolutionary long-lasting antimicrobial coating that provides continuous protection for up to six months. VitaCoat combines natural citrus bioflavonoids with advanced silica technology to create an invisible barrier that kills pathogens on contact.





# Executive Overview

## What is VitaCoat?

VitaCoat is an innovative 3D microbiota barrier coating designed for long-lasting antimicrobial protection on hard surfaces.

This hybrid sol-gel formulation combines natural citrus bioflavonoids (Citrox) embedded in a silica-based matrix, forming a thin, invisible film that kills microbes on contact and prevents their adhesion.

## Key Innovation

Unlike temporary disinfectants that evaporate, VitaCoat creates a semi-permanent nanocoating that bonds to surfaces and remains active for months.

A single application provides proven protection for up to six months under normal use conditions.

# Performance Highlights

## Broad-Spectrum Efficacy

Demonstrated antiviral, antibacterial, and antifungal activity against a wide range of pathogens. Achieves >4–5 $\log_{10}$ reductions (99.99%–99.999% kill) in standard lab tests.

## Long-Term Durability

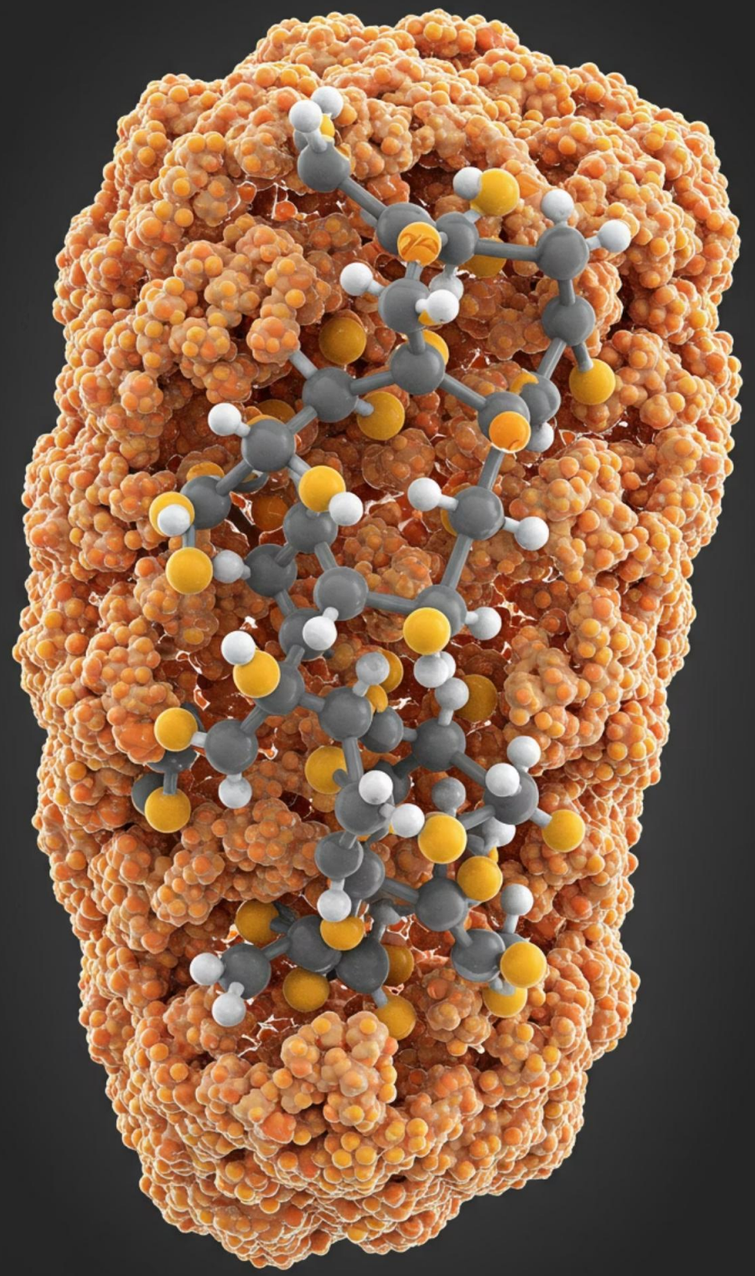
Engineered for wear resistance. Independent testing confirmed the hydrophobic barrier remains intact after 5,000 friction cycles—equivalent to approximately 6 months of frequent touching.

## Safety & Environment

Composed of eco-friendly, non-toxic ingredients. Naturally derived from citrus fruits with no harsh chemicals, nanoparticles, or heavy metals. Passes dermatological tests and EU compliance.

## Regulatory Compliance

Backed by accredited laboratory tests following EN standards. Antiviral performance qualifies under EN 14476 for use as a surface disinfectant in healthcare settings.



# The Science Behind VitaCoat

## Two-Component Innovation

VitaCoat consists of two key components working in synergy: **Citrox bioflavonoids** provide the biocidal activity, while **silicon dioxide ($SiO_2$)** cures into a transparent film that affixes the actives onto surfaces and adds durability.

The coating is microscopically thin and invisible, operating at the nanoscale level without containing free nanoparticles. The silica forms a continuous network that encapsulates the active ingredients, providing stability and controlled slow release over months.

# Active Ingredients
# Citrox Bioflavonoids


## Nature’s Defense Compounds

Citrox is a natural extract derived from citrus fruits containing a blend of bioflavonoids and organic acids. These compounds are known for broad antimicrobial, antiviral, and antioxidant properties.

The extracted flavonoids are combined with fruit-derived organic acids to create a Bioflavonoid Complex (BCL) concentrate. This achieves high antimicrobial potency without synthetic disinfectants or heavy metals.

By using nature's own defense compounds, VitaCoat delivers powerful protection with minimal environmental impact.

# The Silica Matrix Durability & Protection

## Protective Barrier

Silicon dioxide is an inert, glass-like compound that is GRAS (Generally Recognized as Safe). It cures into a crosslinked network that encapsulates Citrox actives and physically modifies the surface.

## Hydrophobic Surface

The cured coating is water-repellent (contact angle >65°) and oil-resistant. This creates an inhospitable environment for microbes while protecting underlying materials from moisture and wear.

## Anti-Adhesion Effect

By filling microscopic pores and creating a smooth finish, the coating prevents microbes from embedding in surface crevices. Virus-laden droplets bead up and slide off rather than persisting.

# Triple-Action Mechanism

## Chemical Kill on Contact

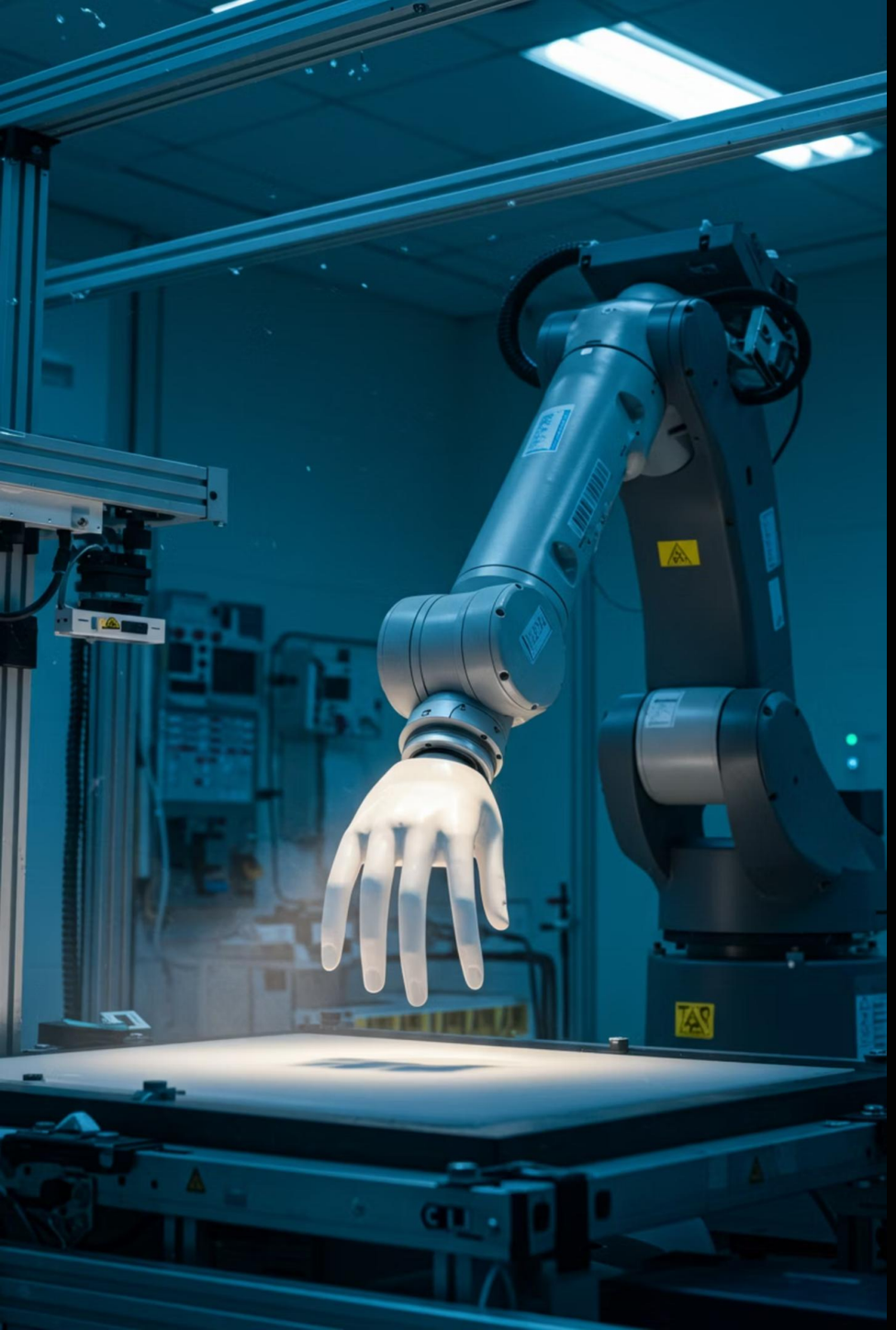
Citrox bioflavonoids disrupt microbial cell walls and viral envelopes. When microbes contact the surface, embedded molecules exert rapid virucidal/bactericidal effects—often within minutes or seconds for enveloped viruses.

## Physical Anti-Adhesion

The $SiO_2$ layer makes surfaces hydrophobic and ultra-smooth. By sealing microscopic cracks, it removes niches where bacteria could attach and form biofilms, creating a "non-stick" coating that repels contamination.

## Controlled Release

Actives are gradually released from the silica matrix over time through slow diffusion. This ensures biocidal agents remain at the surface for months, with the coating retaining efficacy even after 6 months of wear.



# Durability Testing Built to Last

## Accelerated Wear Simulation

An independent study by Professor Jeremy J. Ramsden (University of Buckingham, 2020) subjected VitaCoat to rigorous mechanical testing. A robotic apparatus simulated human finger touches with a soft leather pad pressing at 3 N force.

The test involved **5,000 touches** on coated glass slides—equivalent to approximately 6 months of frequent use on high-touch surfaces. Water contact angle measurements after every 500 touches confirmed the hydrophobic barrier remained intact with no significant loss of water-repellency.

# Durability Results

## Exceptional Wear Resistance

After 5,000 simulated touches, the water contact angle remained virtually unchanged (within ±3° of initial value). The coating stayed intact and water-repellent throughout the test's equivalent of 6 months use.

Surface energy analysis found no significant increase that would indicate loss of hydrophobicity. In fact, slight improvements in hydrophobicity were observed at intermediate cycles, possibly due to "post-polymerization polishing" by repeated touching.

**Conclusion:** VitaCoat's functional coating survives prolonged mechanical wear and continues to provide hydrophobic and antimicrobial properties for at least the claimed 6-month period.

**5,000**

Touch Cycles

Simulated touches survived

**6**

Months

Equivalent protection duration

**>65°**

Contact Angle

Maintained hydrophobicity

# Antiviral Efficacy EN 14476 Standard

## European Standard for Virucidal Activity

VitaCoat was tested according to EN 14476:2013+A2:2019, the European standard for virucidal activity in medical area disinfectants. Testing was performed by an accredited lab (Abbot Analytical, UK) using Modified Vaccinia Virus Ankara (MVA) as the test virus—the prescribed surrogate for enveloped viruses including coronaviruses.

### Test Virus

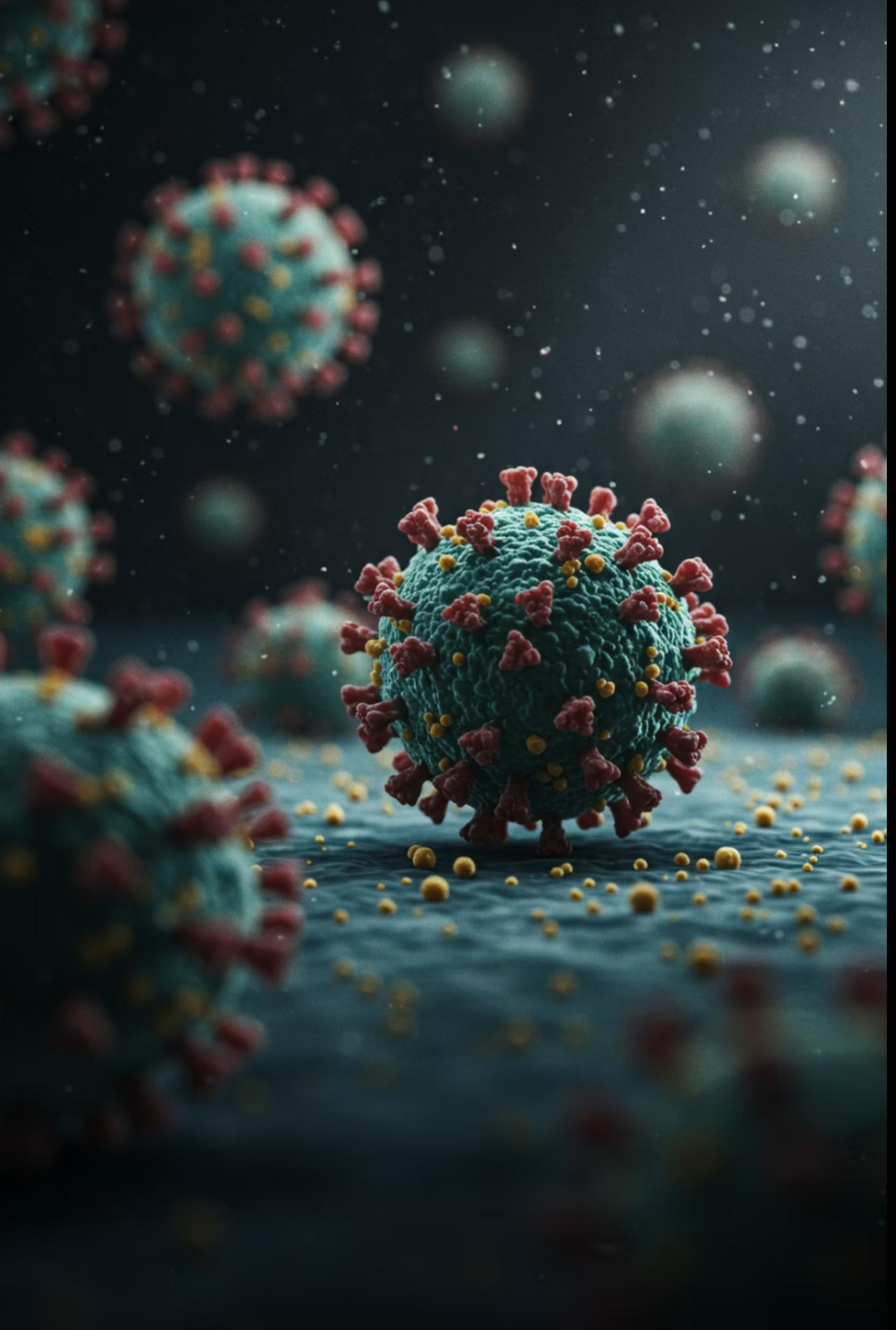
Vaccinia MVA (ATCC VR-1508), a robust enveloped virus model representing coronaviruses and other enveloped pathogens.

### Test Conditions

VitaCoat tested neat (undiluted) at 100% concentration with 5-minute contact time at 20°C under clean conditions.

### Results

**>4.0 $\log_{10}$ reduction (>99.99% kill)** achieved, meeting EN 14476 criteria for virucidal claim against enveloped viruses.



# SARS-CoV-2 Efficacy Rapid Action

## Direct Testing Against COVID-19

Utah State University Institute for Antiviral Research conducted a virucidal assay with live SARS-CoV-2 virus (USA-WA1/2020 strain) in mid-2020. The protocol used a short contact time to simulate realistic touch contamination.

**>99%**

**Virus Kill Rate**

In just 60 seconds

**>2.3**

**Log Reduction**

Below detection limit

**1**

**Minute**

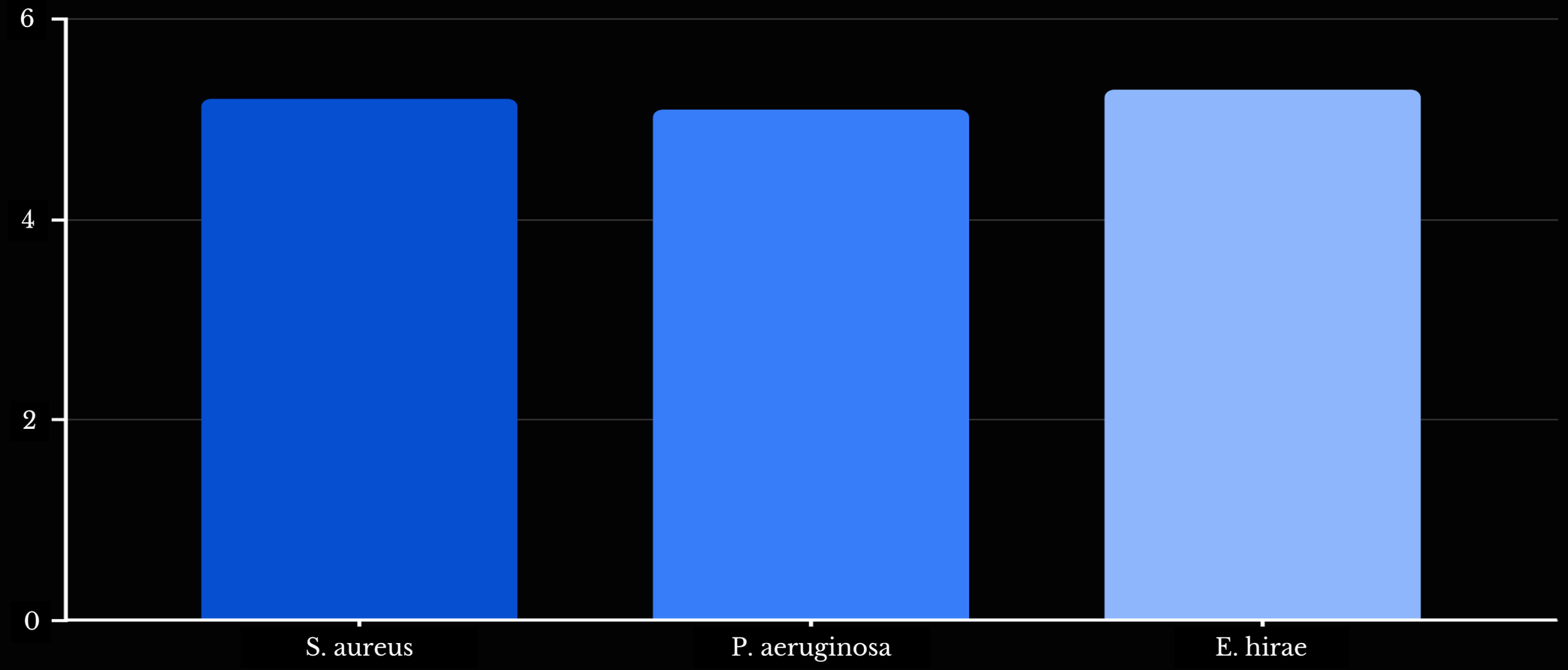
Contact time required

Within 1 minute contact, infectious SARS-CoV-2 titers dropped from $10^4$ to undetectable levels. This remarkable speed means coronavirus-laden droplets landing on VitaCoat-treated surfaces are neutralized almost immediately, drastically reducing fomite transmission risk.

# Antibacterial Performance

## EN 13727 - Bactericidal Efficacy in Medical Areas

VitaCoat was tested according to EN 13727:2012+A2:2015, the hospital-grade disinfectant standard. Testing at 100% concentration with 5-minute contact time at 20°C demonstrated complete bacterial elimination.




VitaCoat achieved **>5.0 $\log_{10}$ reduction (≥99.999% kill)** for all test bacteria, exceeding the ≥5.0 $\log_{10}$ requirement. The official lab report concluded VitaCoat "possesses bactericidal activity" under test conditions, certifying its use in medical environments.

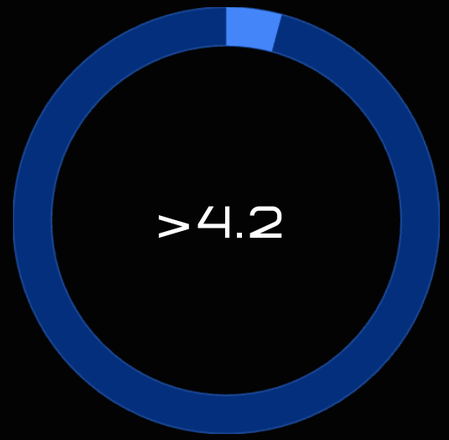
# Antifungal Activity

# EN 13624 Yeasticidal Efficacy

Testing against *Candida albicans* (strain DSM 1386) according to EN 13624:2013 demonstrated strong antifungal performance.


Yeast Kill Rate

In 5 minutes

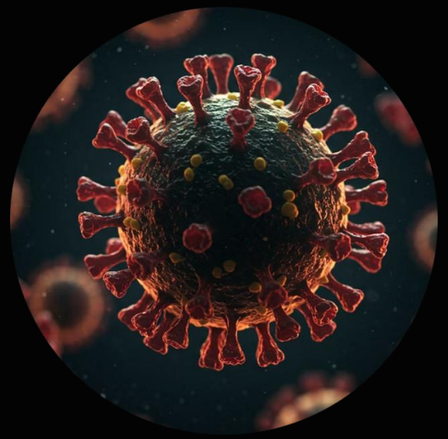



$Log_{10}$ Reduction

Exceeds standard

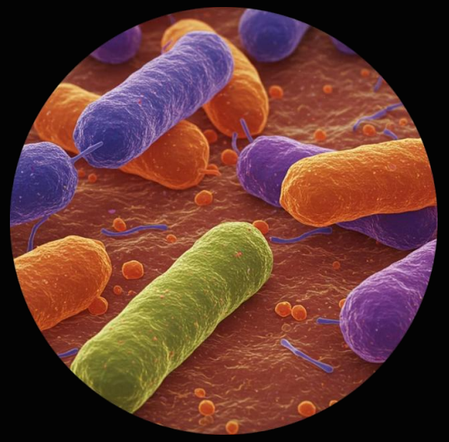
VitaCoat achieved >4.2 $log_{10}$ reduction in 5 minutes, exceeding the ≥4.0 $log_{10}$ requirement for yeasticidal activity. This demonstrates effectiveness against fungal pathogens on surfaces, important for preventing fungal infections in hospitals.

# Comprehensive Pathogen Spectrum



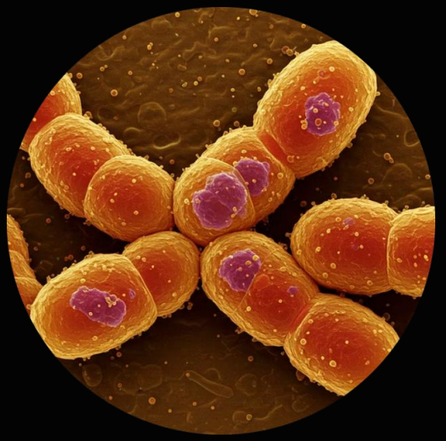
## Viruses

Coronaviruses (SARS-CoV-2, SARS-CoV-1, HCoV-229E, -OC43), influenza A (H1N1, H3N2, H5N1), paramyxoviruses, HIV, herpes simplex



## Bacteria

*Staphylococcus* (including MRSA), *E. coli*, *Salmonella*, *Listeria*, *Pseudomonas*, *Legionella*, *Streptococcus*, *Enterococcus*, *Klebsiella*



## Fungi & Yeasts

*Candida albicans*, *Aspergillus niger*, *Chaetomium globosum*, and other common fungal pathogens

This extensive spectrum is backed by internal tests and literature on the Citrox BCL ingredient, demonstrating efficacy across the most clinically relevant pathogens.

# Safety Profile Human Health

## Non-Toxic Ingredients

Active constituents are citrus bioflavonoids and organic acids—substances commonly found in foods and used as dietary supplements. Non-toxic to humans at coating levels.

## Dermatologically Tested

Human Repeat Insult Patch Test with 50 volunteers confirmed no skin irritation or sensitization. Classified as "non-irritant" and "hypo-allergenic."

## Odorless & VOC-Free

No added fragrances or volatile organic solvents. Application and cured film are essentially odorless with no off-gassing, beneficial for indoor air quality.

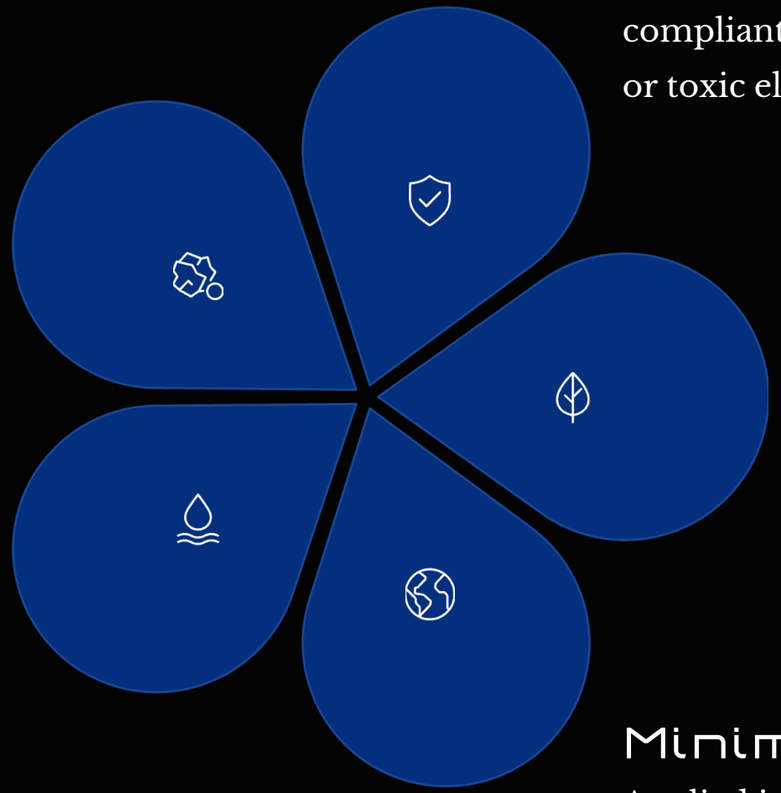
# Environmental Safety

## Biodegradable

Citrox bioflavonoids are organic compounds that readily break down into carbon dioxide and water by natural microbial action.

## Safe Disposal

Components can be flushed with water. Citrus extracts and silica are safe for sewage systems at amounts used.



## No Heavy Metals

Contains no regulated heavy metals (RoHS compliant). Free from mercury, lead, arsenic, or toxic elements that could leach.

## Renewable Resources

Citrox derived from citrus peels, aligning with green chemistry and sustainability principles.

## Minimal Waste

Applied in situ with almost no waste generated. Empty containers can be recycled normally—not classified as hazardous waste.

# Regulatory Compliance & Standards

1

## EN 14476:2013+A2:2019

**PASSED.** Virucidal efficacy in medical area. >4 $\log_{10}$ reduction against Vaccinia virus, qualifying for enveloped viruses including SARS-CoV-2.

2

## EN 13727:2012+A2:2015

**PASSED.** Bactericidal efficacy in medical area. ≥5 $\log_{10}$ kill of test bacteria in 5 min, certifying use in medical environments.

3

## EN 13624:2013

**PASSED.** Fungicidal/yeasticidal efficacy. >4 $\log_{10}$ reduction against *Candida albicans* in 5 min.

4

## EN 13697:2015

**PASSED.** Surface disinfectant test. ≥3 $\log_{10}$ reduction for bacteria and fungi on surface carriers.

5

## EN 1276 & EN 1650

**PASSED.** Bactericidal and yeasticidal in food/industrial areas, qualifying for food industry settings.

6

## RoHS & REACH

**COMPLIANT.** No hazardous substances. All ingredients registered/approved for use under EU regulations.

# Application Use Cases

## Healthcare Facilities

High-touch surfaces in hospitals—bed rails, over-bed tables, door handles, waiting room chairs, touch screens, medical carts. Provides extra defense against hospital-acquired infections including MRSA, *E. coli*, and *Candida*.

## Public Facilities & Transport

Schools, offices, airports, airplanes, elevators—anywhere large numbers of people contact surfaces. Long-lasting nature means coating works 24/7 even with once-daily cleaning.

## Food Industry

Food-safe profile and efficacy against foodborne bacteria (*Salmonella*, *Listeria*) make it attractive for food processing or restaurant settings. Can coat preparation tables and refrigerator handles.

## Electronics & Equipment

Non-corrosive and non-conductive, suitable for device touchscreens, ATM keypads, kiosks, and keyboards. Offers gentle alternative to harsh disinfectants that can damage equipment.

# Long-Lasting Protection vs. Routine Cleaning

## A Paradigm Shift in Surface Disinfection

VitaCoat represents a major shift from transient disinfection (liquid disinfectants that kill microbes only at application) to **persistent surface protection**. Coated surfaces essentially "self-disinfect" continuously for months between regular cleanings.

### Traditional Approach

- Frequent chemical spraying required
- Protection only at time of application
- Labor-intensive and costly
- Potential for missed areas
- Chemical exposure concerns

### VitaCoat Approach

- Single application lasts 6 months
- Continuous 24/7 protection
- Reduced labor and chemical use
- Consistent coverage
- Safe, eco-friendly ingredients

# Economic & Operational Benefits

| 6 | 50% | 24/7 | 99.99% |
| --- | --- | --- | --- |
| Months | Reduction | Active | Efficacy |
| Protection from single application | In cleaning frequency potential | Continuous antimicrobial action | Pathogen kill rate achieved |

By switching to VitaCoat, facilities achieve cost savings and efficiency gains. Reduced cleaning frequency and chemical use offset application costs over the coating's life. Intangible benefits like reduced sickness improve productivity and trust—crucial for businesses in a post-pandemic world.

VitaCoat essentially "outsources" continuous disinfection to the surface itself, freeing up staff time and ensuring consistent hygiene that human effort alone might fail to maintain.

# Application Process

01

## Surface Preparation

Clean and dry the surface thoroughly. Remove any existing dirt, grease, or contaminants to ensure optimal coating adhesion.

02

## Application

Apply VitaCoat using spray or wipe method. Polish the solution onto the surface with a soft cloth, ensuring even coverage across all areas.

03

## Curing Period

Allow 1-2 days (typically 72 hours) for the coating to cure undisturbed. During this time, the silica matrix bonds to the surface and encapsulates the active ingredients.

04

## Maintenance

Continue normal gentle cleaning with non-abrasive detergents. Avoid harsh scrubbing that could wear the coating faster. Reapply every 6 months for continued protection.

# Limitations & Considerations

## Non-Enveloped Viruses

While highly effective against enveloped viruses (coronaviruses, influenza), non-enveloped viruses (norovirus, adenovirus) are more resistant and may require longer contact times. Use in conjunction with other control measures for comprehensive coverage.

## High Abrasion Surfaces

Very high abrasion will diminish coating lifespan. Floors and surfaces subject to extreme wear may require more frequent reapplication. Manufacturer excludes floors from 6-month warranty due to heavy traffic.

## Application Quality

Effectiveness relies on proper application. Trained technicians should apply coating to ensure even coverage. Curing time must be respected for full performance.

## Not a Cleaning Replacement

VitaCoat supplements but does not replace routine cleaning. Dust and dirt can still accumulate and potentially shield microbes. Continue regular gentle cleaning for optimal results.

# Comparison to Alternatives

### VitaCoat

- **Duration:** 6 months continuous
- **Actives:** Natural bioflavonoids
- **Safety:** Non-toxic, eco-friendly
- **Efficacy:** 99.99%+ kill rate
- **Application:** Once per 6 months
- **Cost:** Low long-term

### Chemical Disinfectants

- **Duration:** Minutes only
- **Actives:** Bleach, alcohol, quats
- **Safety:** Toxic residues, fumes
- **Efficacy:** 99.9%+ at application
- **Application:** Multiple times daily
- **Cost:** High ongoing

### Metal Coatings

- **Duration:** Permanent but degrades
- **Actives:** Copper, silver ions
- **Safety:** Toxicity concerns
- **Efficacy:** Variable, moisture-dependent
- **Application:** Complex installation
- **Cost:** Very high initial

VitaCoat offers the optimal balance of efficacy, safety, durability, and cost-effectiveness compared to traditional alternatives.

# Scientific Validation Summary

## Comprehensive Testing Program

VitaCoat's performance is backed by extensive scientific validation from accredited laboratories and independent research institutions:

1 ### Durability Testing

University of Buckingham (Prof. J. Ramsden, 2020): 5,000-cycle accelerated wear test confirming 6-month protection equivalent.

2 ### Antiviral Efficacy

Abbot Analytical (UK): EN 14476 testing with Vaccinia virus. Utah State University: Direct SARS-CoV-2 testing with >99% kill in 60 seconds.

3 ### Antibacterial Testing

Microbiological Solutions Ltd: EN 13727 testing achieving >5 $\log_{10}$ reduction against hospital-grade bacteria.

4 ### Safety Assessment

Human Repeat Insult Patch Test (50 subjects, 6 weeks): No irritation or sensitization. RoHS and REACH compliance verified.

# The Future of Surface Protection

## A Revolutionary Solution

VitaCoat represents a **cutting-edge convergence of nanotechnology and green chemistry** that addresses the critical need for safer, continuously protected surfaces. It offers a scientifically proven solution to reduce pathogen transmission risk in public and private spaces alike.

### Proven Efficacy

99.99%+ kill rate against bacteria, viruses, and fungi. Meets or exceeds all major international standards for antimicrobial performance.

### Long-Lasting Protection

Single application provides up to 6 months of continuous antimicrobial action, dramatically reducing maintenance needs.

### Safe & Sustainable

Natural ingredients, non-toxic, eco-friendly. No harsh chemicals, heavy metals, or hazardous residues.

### Versatile Applications

Suitable for healthcare, public facilities, food industry, electronics, and any high-touch environment requiring continuous protection.

By implementing VitaCoat, organizations position themselves at the forefront of hygienic innovation—creating environments that stay clean and protected long after each application. In an era where hygiene is paramount, VitaCoat delivers **peace of mind through persistent protection**.