BIG POWER 03

The combination of ozone and UV-C for optimal bacterial treatment.

The BIG POWER 03 is now the benchmark for air sanitation and purification in your home. It also enables the massive destruction of all bacteria, viruses, mites present in your cushions, sheets, sofas, mattresses, etc.

How does BIG POWER 03 work? What are its filtration and germicidal capabilities?

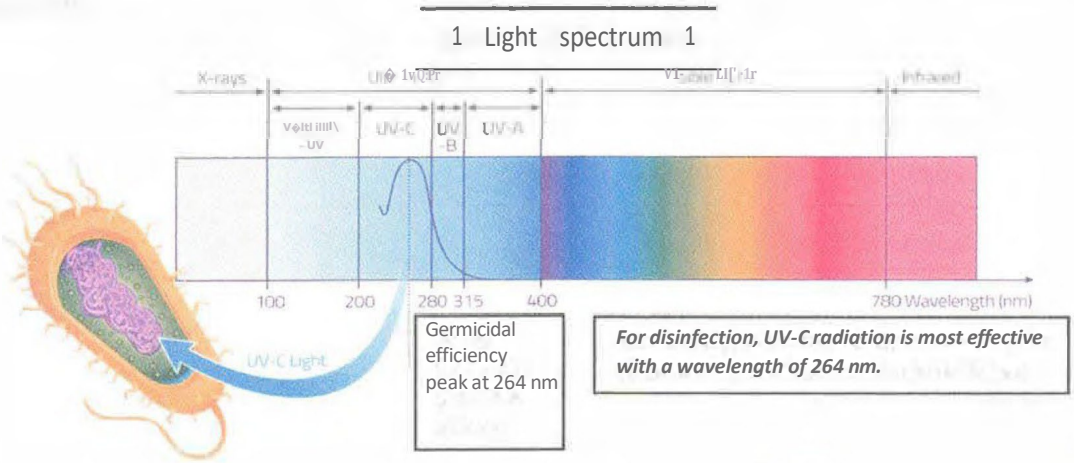
- **Effective filtration:**

Today, there are several solutions to obtain good quality filtered water. However, no device has a filtration system as effective as the one developed in the BIG POWER 03.

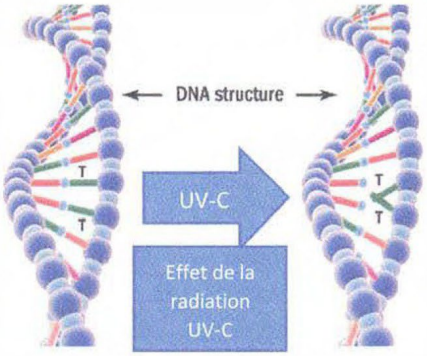
Patented by BIG POWER 03, the internal water filter is combined with a molecular separator. This system improves the filtration efficiency of this device. Through its superior water filter, BIG POWER 03 can also capture coal dust (which can pose certain risks, including chronic diseases if inhaled in excessive quantities) and thus avoid too much coal dust in the atmosphere.

- **Germicidal effect:**

The great quality of the BIG POWER 03 does not only lie in its exceptional filter. This device is equipped with a UV-C radiation system. The germicidal effect of UV-C radiation extends to bacteria (staphylococcus aureus), viruses, spores, molds, and mites. A wavelength of 264 nm is required.



Under the effect of radiation, the DNA of biological entities changes structure. This helps damage their reproductive system, preventing their growth and proliferation. UV-C rays have a strong germicidal effect and are most effective at a wavelength of 264 nm (nanometers).



According to the Planck-Einstein relation: $E = \frac{hc}{\lambda}$

E: energy in Joules (J)

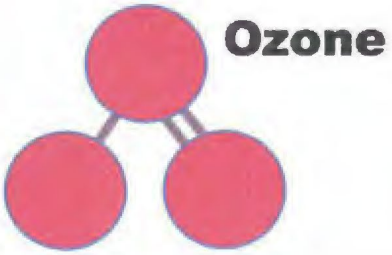
h: Planck constant {6,63.10-^{34} J.s) c: c: speed of light (3.10" m.s-^{1})

À: wavelength (here 264 nm)

The shorter the wavelength, the greater the energy. To modify the DNA structure by UV-C radiation, the necessary energy is E = 7.534x10^-19 J. Chemical bonds will be affected, and the molecular structure will be altered.

- **Destruction of microorganisms through ozone formation:**

In addition to UV-C rays, BIG POWER 03 can also produce ozone, a very powerful natural disinfectant with strong oxidizing power. Ozone penetrates inside bacterial cells and oxidizes all essential components (enzyme, proteins, DNA, RNA). When the cell membrane is damaged during this process, the cell is destroyed.



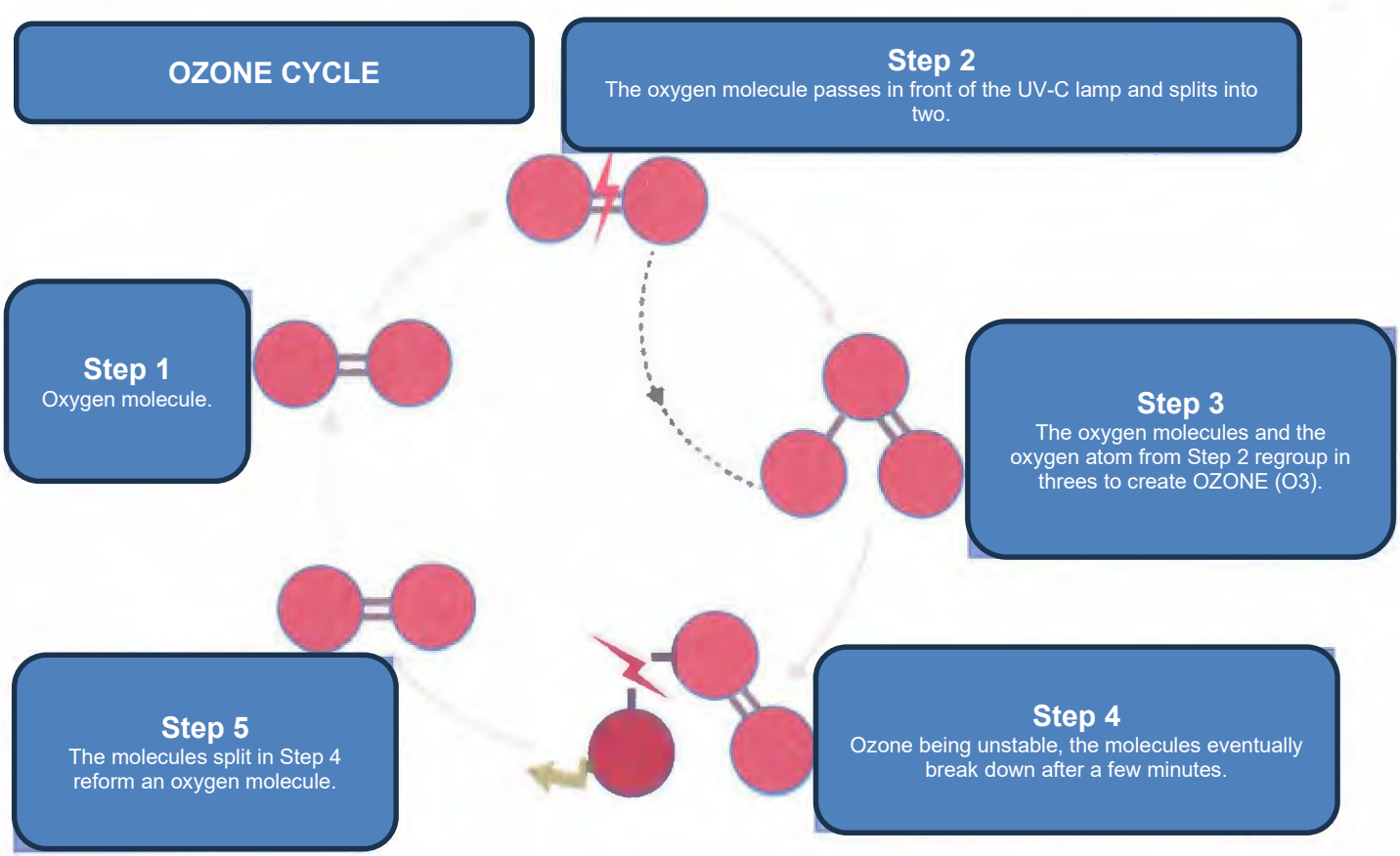
The strength of ozone increases when mixed with water.

This allows ozone to kill bacteria even faster. Moreover, the use of ozone as a sterilizer does not create secondary pollution.

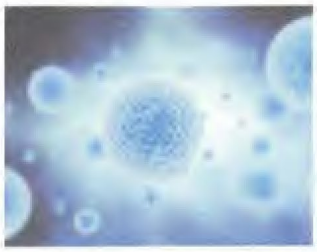
How is ozone generated in BIG POWER 03?

Ozone is a molecule with the formula O3, generated from O2 molecules. Ozone can be produced by two processes: either through an electric arc or UV-C radiation.

It is preferable to create ozone with UV-C. Indeed, using an electric arc has a drawback: the oxidation of the metallic elements that create the electric arc due to the presence of water vapor in the atmosphere. A UV-C radiation lamp does not require dry air and does not oxidize. Ozone is created when O2 molecules are split by UV radiation. The two oxygen atoms in the O2 molecule split and then reform into O3 (ozone).

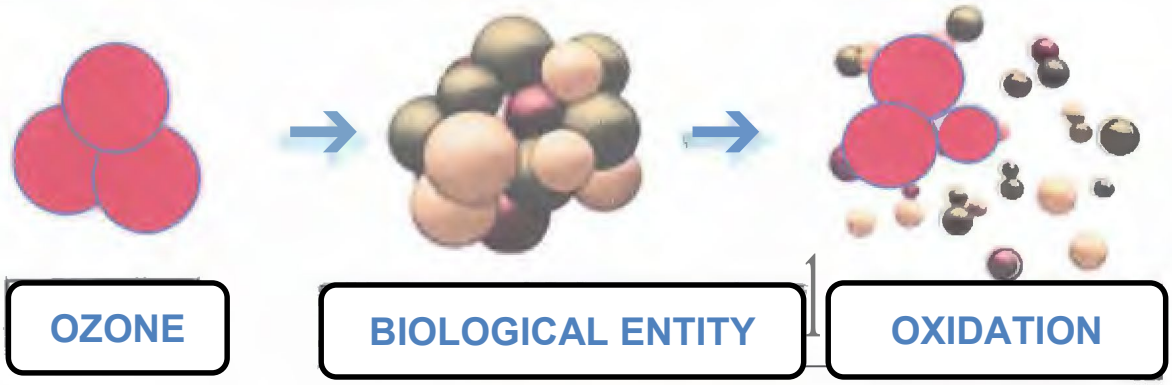


Ozone is unstable, and within about ten minutes, one of the three oxygen atoms is always ejected from the group to reform O2. Therefore, there is no risk of ozone overdose.



Ozone interferes with the metabolism of bacterial cells, probably by inhibiting and blocking the functioning of the enzymatic control system. A sufficient amount of ozone penetrates the cell membrane, leading to the destruction of the bacterium. At higher concentrations, ozone destroys the capsid or outer protein shell by oxidation, so the DNA (deoxyribonucleic acid) or RNA (ribonucleic acid) structures of the microorganism are affected.

OXIDATION SCHEME OF OZONE ON A BIOLOGIC ENTITY



- **Finally, what is the BIG POWER 03?**

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Product Service

CERTIFICATE

No. 21 15 12 33965 036

Certification Mark:

Production monitored
Safely tested

Product: **Electric vacuum cleaners (vacuum c.leaner with water filter)**

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any **way.** In addition the certification holder must not transfer the certificale to third parties. See also notes overleaf.

Test report no.: SIC15145.01

Valid until: 2020-11-30

Date, 2015-12-03

TÜV SÜD Product Service GmbH . Zertifizierstelle • RidlerstraBe 65 • 80339 München • Germany

ITN®

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Product Service

CERTIFICATE
No. 21 15 12 33965 036

Model(s): BP SIL, BP SIL UVC

Brand Name: BIG POWER

Parameters:

Rated Voltage:	220-240 VAC
Rated Frequency:	50/60 Hz
Rated Power:	1200W
Protection Glass:	I
Degree of protection against liquids:	IPX0

Tested according to:

EN 60335-1 :2012/A11 :2014
EN 60335-2-2:2010/A1 :2013
EN 62233:2008

Production Facility(ies): 33965

PrcuJc Service

TÜV SÜO Product Service GmbH • Zertifizierstelle • RidlerstraBe 65 • 80339 München • Germany

TEST REPORT

N° 14AM17936

Identlflc11tlon numbor:	14AM17936
&ample description:	Vacuum Cleaner Big Power
Sampledby:	Customer (§)
Ar,lval date:	15/06/2016
Teat atart	01/07/2015
Test end	09/07/2015

(§)Laboratory ls not re11ponalb!e ror sempllrig mods:lt!es.

Test Method and testing condition:

The Instrument was tested eccordlng to IEC 60335-2-109:2012- item 32 radiation, toxiclly and simllar hazards.

TEST RESULTS

Test Item	Result	Unlts	Acceptablllty llmlt
Total UV-Cirradlance	<0.003	W/m^2	<0.003
Total effective UV lrradlance	<l	mW/m^2	<1
Ozone	< **5**)(10^{6}	%v/v	< 5)(10^{-6}

Ozone test was carried out for 24 hours ln a windowless room slzed 3.5 m x 3_0 m x 2.6 m wlth walls covered with polyethylene foll.

Commente:

Tho tested instrument complies with Technlcal Standard IEC 60335-2-109:2012 Item 32.101 end 32.102

Sambuca Val di Pesa, July 14 2015

ORDINE DEI CHIMICI 1614 TOSCANA

the Laboratory Manager
Dott.ssa Maria Filomena Vitulli

The results In this re11ort app/ies on/y to the sample(s) speclficolly listed obove.
This report sholf not be reproduced except In full, wlthout the written approval of the taboratory.

ANNEXE AUX **RAPPORTS** DE TESTS **N• 104589** / 104591

But du test : tester l'acttvité bactéricide de disposlttf UV (BIG POWER 03}

Pour réaliser le TEST mentionné ci-dessus, avec la coopération du client, nous avons procédé de la façon suivante :

1. Production et récolte de micro-organismes connus :

Staphylococcus aureus ATCC 6538

2. inoculation de la culture bactérienne à 5 L d'eau prévue pour traitement
3. Analyse de la situation microbiologlque de l'échantillon avant traltement « BIGPOWER 03 »(rapport de test 104589}
4. Traitement de l'eau contaminée avec la machine Identifiée« BIGPOWER 03 •
S. Analyse de l'échantillon d'eau après traitement avec la machine pour déterminer le nombre de micro-organismes survivants (rapport de test 104591)

	RAPPORT DE TEST **N•t04589**	**RAPPORT DE** TEST **N.104591**
Compte de colonie à 3r c	5440	1

CONaUSION

Nous notons, dans l'échantillon testé, une haute réduction des micro-organismes

Director of the laboratory and Technical Responsible of chemical tests
Dr Rosario Pecoraro
N.182

ANNEX TO TEST REPORTS NR.104589-104590-104591

Aim of the test: test the bactericidaJ ctivity of UV devices (MIDIVAP UVe B'IG POWER UV)

ln order to achieve the aforementioned alm, with the cooperation of the customer, we proceeded to:

1. Produce crops of kno _n microorg nism of the following:

Staphylococcus aureus ATCC 6538

2. Inoculate the bacterial culture in 5 Lof water to be treated

3. Analyze the microbiological situabon of the sample goinginto the machine to be tested ***(MIDIVAP** UVe BIG **POWER** UV)*

4. Tr,eat the contaminaved water with the machine identified as Minivap

5. Analyze the sample of water in output from the machine to determine the number of survived microorganisms (Test report Nr.104590-104591)

	TEST REPORTS *Nr. 104589*	***TEST REPORTS*** *Nr. 104590*	*TEST* ***REPORTS*** *Nr. 104591*
Colony count at 37 ° C (ufclmL)	**5440**	1	1

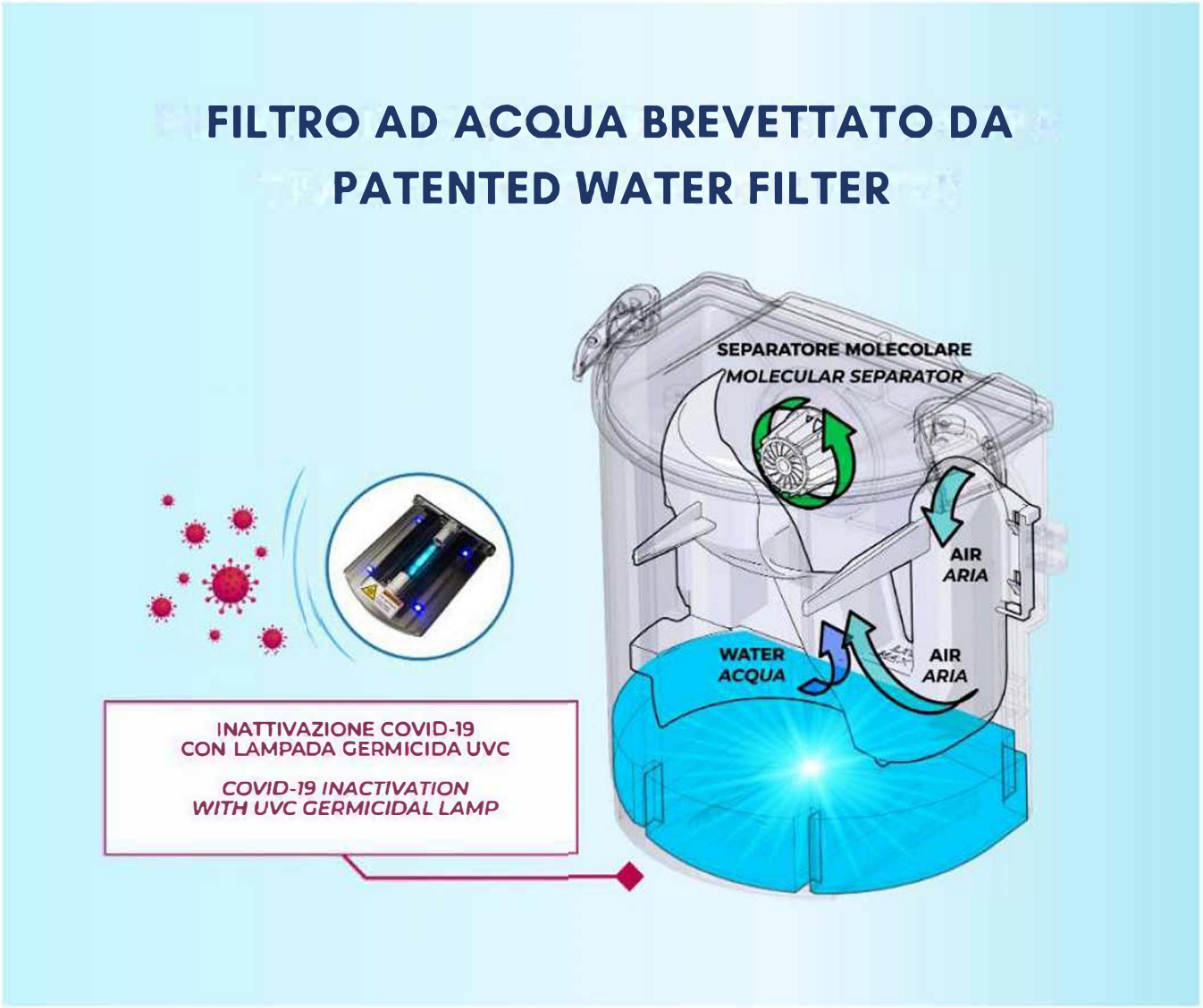
CONCLUSIONS -

We note, in the sample under test, a high reduction of bacteria .

Dlrec , TachnJcal

Dr. R

Everything you need to know about our water filter with UVC germicidal lamp



There are many types of filtration systems on the market: a classic example is the filter bag or cartridge. This system is not really efficient because it will gradually plug as the bag is filled with dust, causing overheating and inefficiency of the vacuum cleaner, not to mention the need to find out the suitable replacement bag for your particular vacuum cleaner.

However, some latest systems use water to filter dirt and debris.

In this article you'll find out everything you need to know about water filtration systems along with the advantages and features of the water filter.

Why not create a product with a universal filter that may be found everywhere?

The evolution of filtration systems has led to use water as a filtering element.

The strong point of the water filtering system is basically that of avoiding any contact with dust for the user.

For example, when the water recovery tank is emptied, in water filter systems the collected dust is no longer volatile, unlike what is offered by vacuum bags and / or cyclone systems.

The dust contained in the water, in fact, is to be considered "trapped" inside the recovery tank together with other heavier particles that deposit on the bottom.

Therefore, this system is able to purify the air in closed environments (indoor pollution) at 99.9%, preventing all disorders caused by polluting factors in the air such as pollen, dust mites or pet hair.

When you empty the water recovery tank, you also permanently get rid of the dirt sucked in without breathing it again together along with dust, germs, bacteria, hair, pet hair, etc. that are trapped inside.

But are water filters all the same?

You can find many types of household devices that use this water system but not all of them have the same filtering efficiency. For example, the most common (and economical) type is the one that uses a tube immersed in water. The operation is quite simple, it is like blowing into a straw immersed in water to make bubbles.

If we look deeper, we will discover that the bubbles are actually containers of dust and dirt. Once they reach the surface they burst, releasing the vacuumed dirt into the air.

The result? Poor filtration quality.

How can we trap dust with a better filtration system?

Over the years, technological innovation has significantly improved and this has made it possible to create filters that use water, but in a state of nebulization in which water is fractionated into tiny droplets of a few microns in size.

The main element of this new concept is a special turbine, called molecular separator, which, rotating at several thousand revolutions per minute, is able to nebulize the water.

Moreover, it goes without saying that this nebulization, being very fine, manages to break down and weigh down even the finest dust that will fall into the appropriate recovery tank.

The appliances using this system release fresh air free of dust particles and impurities into the environment.

What others don't say: filtration isn't constant for every application.

As mentioned above, there are several water filters with molecular separator. Although many products use this innovative technology, most are unable to guarantee consistent filtration quality for every application because they do not have an effective nebulization control.

In fact, sometimes a temporary absence of nebulization can occur (for example, in the cleaning of upholstery or in the cleaning of grouts, floors, hoods, etc.).

This means that the dust removed in depth from the upholstery is not adequately blocked by this system at the moment of greatest demand.

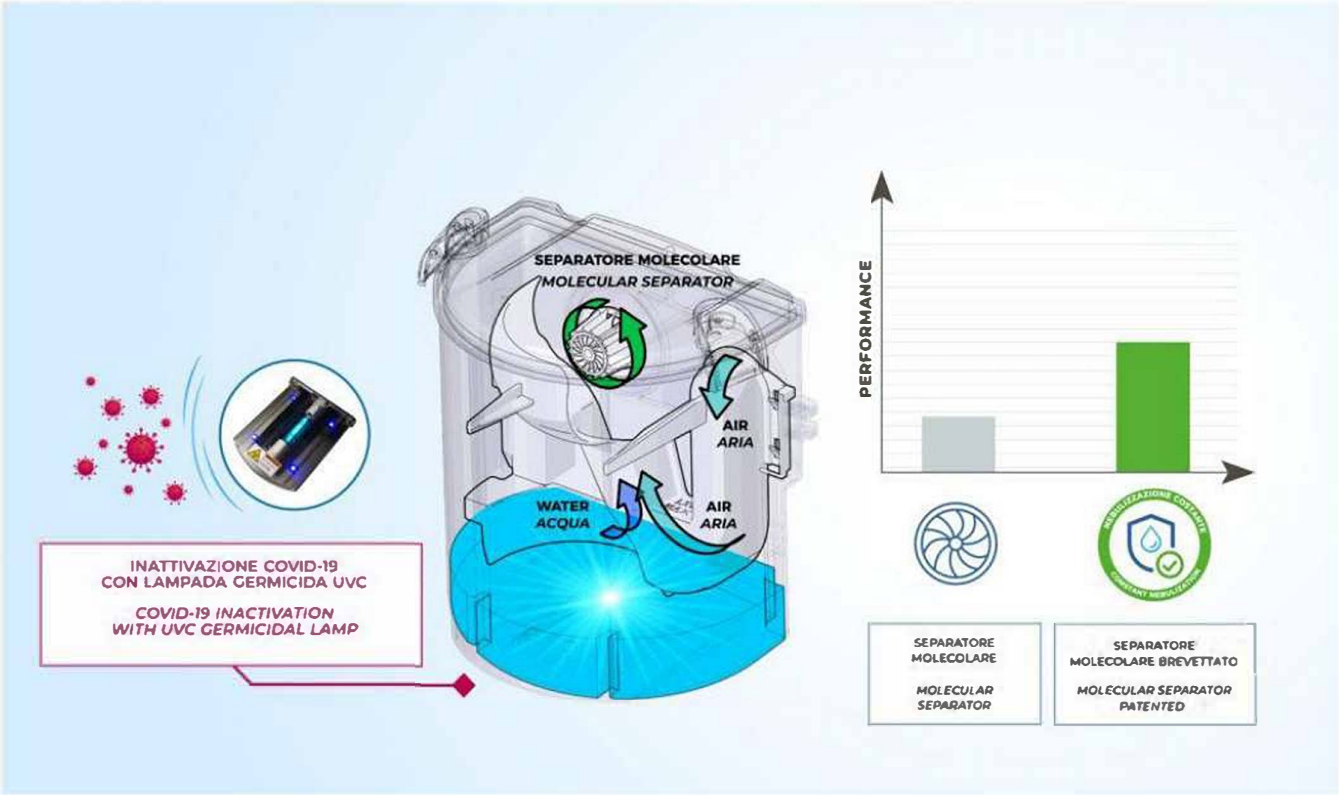
This problem is fully solved in the patented filtration system equipped with UVC germicidal lamp, a helpful tool to inactivate viruses like Covid-19.

An optimal result is guaranteed in all conditions of use by constantly monitoring the nebulization.

In the following graph you can see a comparison of the filtration quality between the patented system and the other conventional filters currently on the market.

The green bar indicates the filtration performance which in the case of the water filter is at the highest levels.

The advantages of our patented water filter with germicidal UVC lamp



It's obvious t that the use of water as a filtering element is extremely effective in blocking dust and microbes in the water.

A water filter can be combined with the sanitizing effect of a steam generator, a combined system that you can find in our products and can guarantee a higher lever of sanitization.

The advantages are several and do not stop only at an optimal cleaning and sanitizing result.

The water filter is the best ally of the environment. You will be able to carry out a healthy, hygienic and impeccable cleaning thanks to the sanitizing power of steam without using harmful chemicals and detergents.

To sum up, the advantages of our water filter are the following:

- Air sanitization
- Constant filtration power
- Convenience of not replacing bags and filters that cause bad smells and extra costs
- No direct contact with dust
- Better indoor air quality, essential for the health and wellbeing of people
- Removes 99.9% of germs and bacteria
- Covid-19 virus inactivation

UV-C irradiation is highly effective in inactivating and inhibiting SARS-CoV-2 replication

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[7] *Don C. Gnocchi Foundation, IRCCS Foundation, Milano, Italy.*

The potential virucidal effects of UV-C irradiation on SARS-CoV-2 were experimentally evaluated for different illumination doses and virus concentrations (1000, 5, 0.05 MOI). Both virus inactivation and replication inhibition were investigated as a function of these parameters. At a virus density comparable to that observed in SARS-CoV-2 infection, an UV-C dose of just 3.7 mJ/cm² was sufficient to achieve a 3-log inactivation, and complete inhibition of all viral concentrations was observed with 16.9 mJ/cm². These results could explain the epidemiological trends of COVID-19 and are important for the development of novel sterilizing methods to contain SARS-CoV-2 infection.

The COVID-19 pandemic caused by SARS-CoV-2 virus[1] has had an enormous, as yet barely understood, impact on health and economic outlook at the global level[2]. The identification of effective microbicide approaches is of paramount importance in order to limit further viral spread, as the virus can be transmitted via aerosol[3] and can survive for hours outside the body[4]. In this context, non-contact disinfection technologies are highly desirable, and UV radiation, in particular UV-C (200 – 280 nm), is one of the most reliable and widely accepted approach[5–8]. The interaction of UV-C radiations with viruses has been extensively studied[9], and the most common mechanism consists in direct absorption of the UV-C photon by the nucleic acid basis and/or capsid proteins leading to the generation of photoproducts that inactivate the virus[10,11]. Some models have been proposed to correlate the nucleic acid structure with the required dose to inactivate the virus, but we are far from a reliable model[12]. This is also due to the fact that UV-C measurements were conducted using different viruses and diverse experimental conditions[13–16]. This led to an extremely wide range of values for the same virus and, e.g. in the case of SARS-COV-1 values reported in the literature range from a few mJ/cm² to hundreds mJ/cm²[13,16,17]. It is therefore crucial to have direct

evidences of UV-C disinfection mechanism on SARS-CoV-2 with the corresponding doses, knowing that the UV light from sunlight seems to be efficient in inactivating the virus[18].

Herein, we report the effect of monochromatic UV-C (254 nm) on SARS-CoV-2, showing that both virus inactivation and inhibition can be easily achieved. Experiments were conducted using a custom-designed low-pressure mercury lamp system, which has been spectral-calibrated providing an average intensity of 1.082 mW/cm^2 over the illumination area (see the supplementary information for the details). Three different illumination exposure times, corresponding to 3.7, 16.9 and 84.4 mJ/cm^2, were administered to SARS-CoV-2 either at a multiplicity of infection (MOI) of 0.05, 5, 1000. The first concentration is equivalent to the low-level contamination observed in closed environments (e.g. hospital rooms), the second one corresponds to the average concentration found in the sputum of COVID-19 infected patients, and the third one is a very large concentration, corresponding to that observed in terminally diseased COVID-19 patients[19] . After exposure to UV-C, viral replication was assessed by Real Time Polymerase Chain Reaction (PCR) targeting two regions (N1 and N2) of the SARS-CoV-2 nucleocapsid gene, as well as by analyzing SARS-CoV-2-induced cytopathic effect. Analyses were performed in the culture supernatant of infected cells at three different time points (24, 48 and 72 hours for SARS-CoV-2 at MOI 1000 and 5; 24, 48 hours and 6 days for SARS-CoV-2 at MOI 0.05) as well as on cell lysates at the end of cellular culture (72 hours: MOI 1000 and 5; 6 days: MOI 0.05).

The effect of the UV-C exposure was extremely evident independently from the MOI employed; dose-response and a time-dependent curves were observed. Figure 1 reports the number of SARS-CoV-2 copies for the three concentrations as a function of the UV-C dose and time, quantified on a standard curve from a plasmid control (the corresponding normalised curves are reported in the Supplementary Information, figure S3).

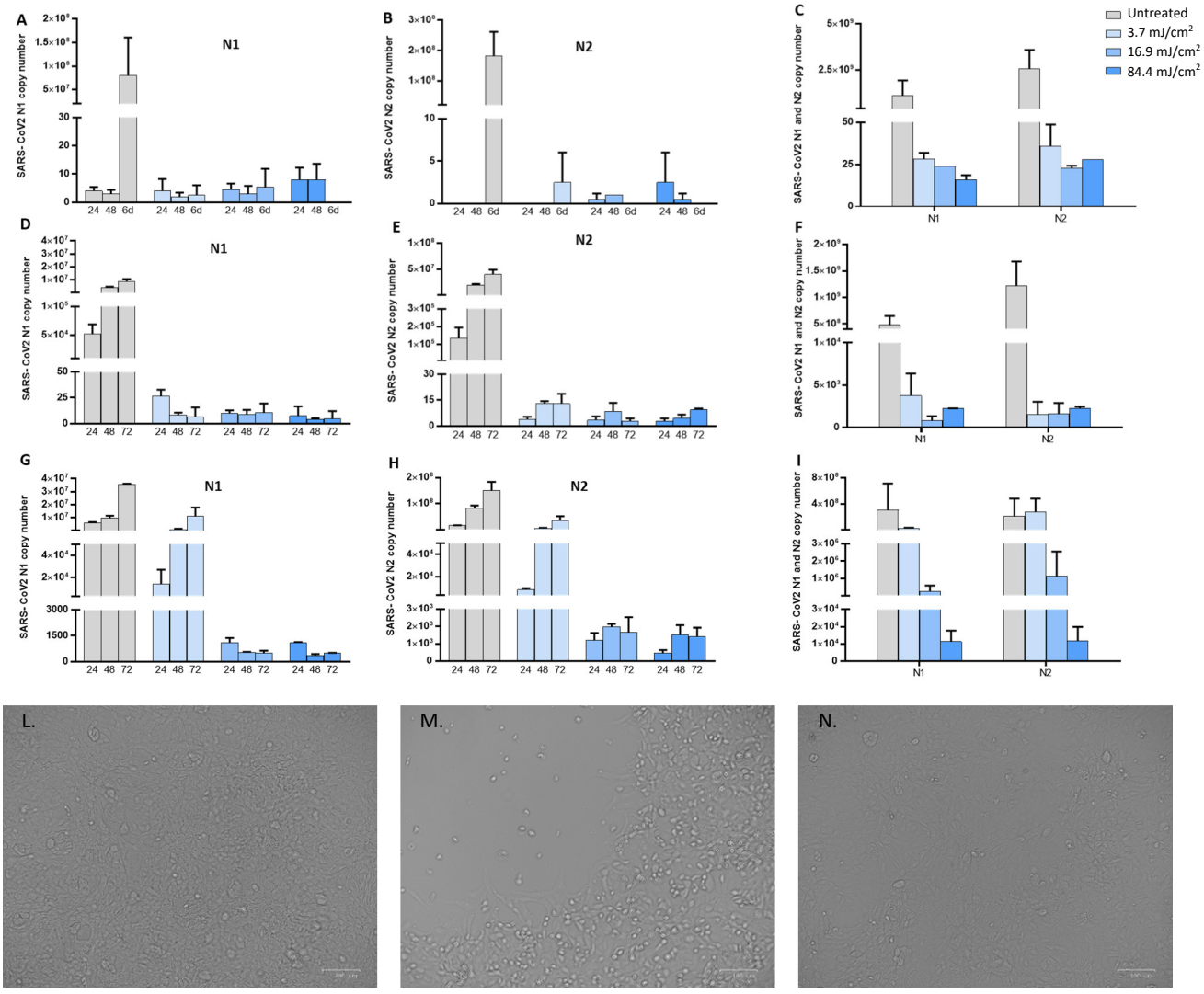

Figure 1. Viral replication of UV-irradiated SARS-CoV-2 virus in in vitro VeroE6 cells. Vero E6 cells were infected with UV-C irradiated SARS-CoV-2 virus at a MOI of 0.05 (A, B and C), 5 (D, E and F) or 1000 (G, H and I). Culture supernatants were harvested at the indicated times (24, 48 72 hours and 6 days) and virus titers were measured by absolute copy number quantification (Real-Time PCR) (A, B, D, E, G and F). Viral replication was assessed on cell lysate harvested at the end of cell cultures at 72 hours (5 and 1000 MOI) (panel F and I) and 6 days (0,05 MOI) (Panel C) post infection. All cell culture conditions were seeded in duplicate. (L) No cytopathic effect was observed in uninfected cultured VeroE6 monolayers maintained in 50mJ/cm² UV-treated complete medium for 72 hours. (M) In vitro infection of SARS-CoV-2 (5 MOI) UV-C untreated VeroE6 cells resulted in an evident cytopathic effect. (N) SARS-CoV-2 irradiation with 3.7 mJ/cm² UV-C rescued the cytopathic effect induced by UV-C untreated virus.

Viral replication could not be observed for the first 48 hours at the lowest concentration (0.05 MOI) in either untreated or UV-C-irradiated samples. However, 6 days after infection viral replication was distinctly evident in the UV-C unexposed condition, but was completely inhibited following UV-C irradiation even at

3.7 mJ/cm^2 in both cell culture supernatants (Figure1, panel A and B, figure S3) and cell lysate (Figure 1, panel C).

At the intermediate viral concentration (5 MOI), an effective reduction of copy number starting from the 3.7 mJ/cm^2 dose with a decrease of a factor of 2000 (> 3-log decrease) after 24 hours (Figure 1, panel D and Figure S3) was observed. Even more important, the copy number value did not increase over time, suggesting an effective inactivation of the virus, further confirmed by cytopathic effect assessment (Figure1, panel L, M and N). The highest UV-C doses followed the same trend (Figure 1, panel D and E). Evaluation of viral replication at intracellular level further corroborated the antiviral UV-C effect (Figure 1, panel F). Therefore, at this viral input exposure to a minimal dose of 3.7 mJ/cm^2 results in viral depletion. The outcome was different with the highest viral input (1000 MOI). Indeed, viral replication significantly decreased in a UV-C dose-dependent manner as early as 24 hours with a factor of 10^3 at 3.7 mJ/cm^2 and 10^4 at 16.9 mJ/cm^2 (as reported in figure S3). After 48 hours, viral concentration increased in cultures exposed to the lowest UV-C dose, whereas it remained stable for the 16.9 and 84.4 mJ/cm^2 doses, consistent with the results at 72 hours (Figure 1, panel G and H). Results were confirmed by assessment of viral replication at intracellular level (Figure 1, panel I). This clearly indicates that the residual viral input left by the 3.7 mJ/cm^2 was able to replicate and enough to generate an effective infection. Therefore, the partial inactivation of the viral input led to an inhibition of infection. This is not the case in cultures exposed to higher UV-C doses, as no replication could be detected in these conditions.

In conclusion, UV-C radiation inhibit SARS-CoV-2 and the response depends on both the UV-C dose and the virus concentration. Indeed, for virus concentrations typical of low-level contaminated closed environment and sputum of COVID-19 infected patients, a very small dose of less than 4 mJ/cm^2 was enough to achieve full inactivation of the virus. Even at the highest viral input concentration (1000 MOI), viral replication was totally inactivated at a dose $\geq$16.9 mJ/cm$^{2.}$ These results are extremely important since they allow for a proper design and development of efficient UV based disinfection methods to contain SARS-CoV-2 infection.

Acknowledgements

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Supplementary information

UV-C irradiation is highly effective in inactivating and inhibiting SARS-CoV-2 replication

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In vitro SARS-CoV-2 infection assay

3 x 10^5 VeroE6 cells were cultured in DMEM (Euroclone, Milan, Italy) with 2 % FBS medium, with 100 U/ml penicillin and 100 μg/ml streptomycin, in a 24-well plate one day before viral infection assay. SARS-CoV-2 (Virus Human 2019-nCoV strain 2019- nCoV/Italy-INMI1, Rome, Italy) at a multiplicity of infection (MOI) of 1000, 5 and 0.05 were treated with different doses of UV-C radiation (see the dedicated section) before inoculum into VeroE6 cells. UV-C-untreated virus served as positive controls. Cell cultures were incubated with the virus inoculum in duplicate for three hours at 37°C and 5% CO_2. Then, cells were rinsed three times with warm PBS, replenished with the appropriate growth medium and observed daily for cytopathic effect. Viral replication in culture supernatants was assessed at 24, 48, and 72 hours post-infection (hpi) while infected cells were harvested for RNA collection at 72 hpi. Cell cultures from SARS-CoV-2 at 0.05 MOI were harvested 6 days post infection. RNA was extracted from VeroE6 cell culture supernatant and cell lysate by the Maxwell® RSC Instrument with Maxwell® RSC Viral Total Nucleic Acid Purification Kit (Promega, Fitchburg, WI, USA) and retrotranscribed in cDNA as previously described (Promega, Fitchburg, WI, USA). Real-time PCR was performed on a CFX96 (Bio-Rad, CA, USA) using the 2019-nCoV CDC qPCR Probe Assay emergency kit (IDT, Iowa, USA), which targets two regions (N1 and N2) of the nucleocapsid gene of SARS-CoV-2. Viral copy quantification was assessed by creating a standard curve from the quantified 2019-nCoV_N positive Plasmid Control (IDT, Iowa, USA).

UV illumination test

The illumination of the virus solution was conducted using a low-pressure mercury lamp mounted in a custom designed holder, which consist in a box with a circular aperture 50 mm in diameter placed at approximately 220 mm from the source. The aperture works as a spatial filter to make the illumination of the area behind more uniform. A mechanical shutter is also present to start the illumination process. The plate is placed 30 mm below the circular aperture and a single dwell (34.7 mm in diameter), centered in respect to the 50 mm aperture, has been irradiated from the top. The dwell was filled with 0.976 ml of the virus suspended in Dulbecco's Modified Eagle's Medium (DMEM) in order to have a 1 mm thick liquid layer. After the irradiation, the sample was treated as described in the previous section.

The intensity of the lamp and its spectral properties have been measured using an Ocean Optics HR2000+ spectrometer (Ocean Optics Inc., Dunedin, USA). The HR2000+ spectrometer was calibrated against a reference deuterium–halogen source (Ocean Optics Inc. Winter Park, Winter Park, Florida) and in compliance

with National Institute of Standards and Technology (NIST) practices recommended in NIST Handbook 150-2E, Technical guide for Optical Radiation Measurements. The last calibration was performed in March 2019. The detector of our spectrometer is a high-sensitivity 2048-element Charge-Coupled Device (CCD) array from Sony. The spectral range is 200–1100 nm with a 25 µm wide entrance slit and an optical resolution of 1.4 nm (FWHM). The cosine-corrected irradiance probe, model CC-3-UV-T, is attached to the tip of a 1 m long optical fibre and couples to the spectrometer. The intensity of the lamp has been measured by positioning the spectrometer in five positions: in the center and at the ends of a 20 mm cross arm after a warming up time of 30 s. The spectra in the five positions are reported in figure S1 together with a scheme of the dwell and illuminated area.

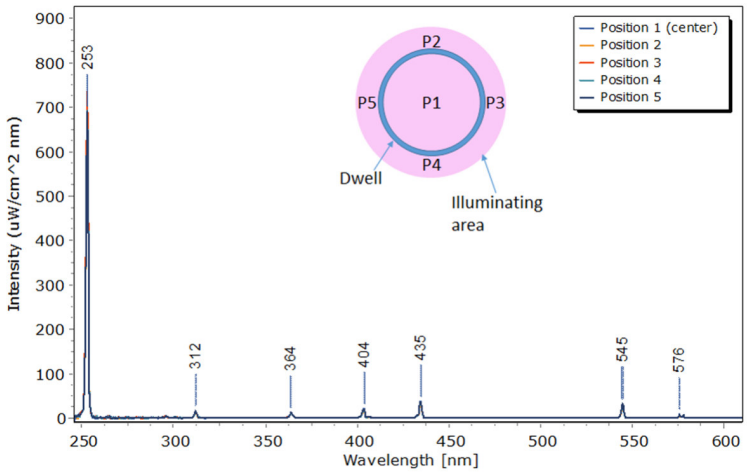

Figure S1. Mercury lamp spectrum measured in the five positions. Inset: scheme of the illuminated dwell and the measuring position.

As expected, the emission is dominated by the UV-C line and its intensity was uniform in the area with an average value of 1082 uW/cm^2. The stability of the lamp was evaluated in +/- 11 uW/cm^2 during a 130 s measurement. According to this value, three exposure times were set: 5, 23 and 114 s (with an accuracy of 0.2s), which correspond to following doses: 5.5, 25.0, 124.4 mJ/cm^2. This is the nominal UV doses provided to the dwell, but we were interested in the effective doses reaching the virus. Therefore, we measured the UV-vis absorption spectrum of the Dulbecco's Modified Eagle's Medium (DMEM) in a quartz cuvette (1 mm thick) by means of a Jasco V770 spectrophotometer (Figure S2). This thickness is the same of the solution in the dwell during the UV irradiation step.

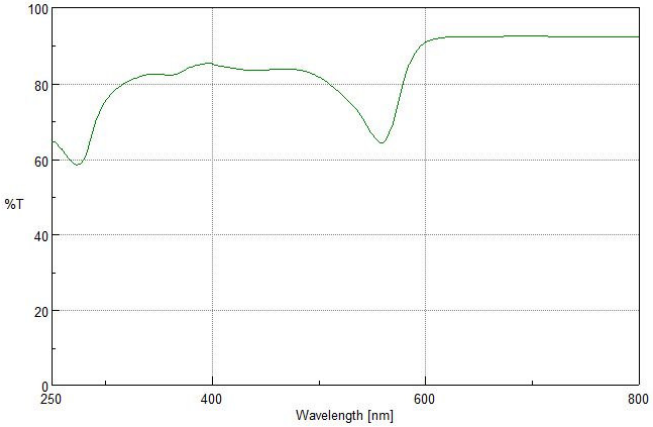

Figure S2. UV-vis transmission spectrum of the Dulbecco's Modified Eagle's Medium (DMEM) in a 1 mm quartz cuvette.

The transmittance at 254 nm has been firstly corrected by the reflection losses of the quartz cuvette; then, the reflection loss due to the air-water interface has been taken into account and a final transmittance of

0.68 at 254 nm was calculated. According to this value, the effective doses provided to the viruses were: 3.7±0.15, 16.9±0.2 and 84.4±0.9 mJ/cm^2.

Plots of the virus fraction as function of the UV dose and time.

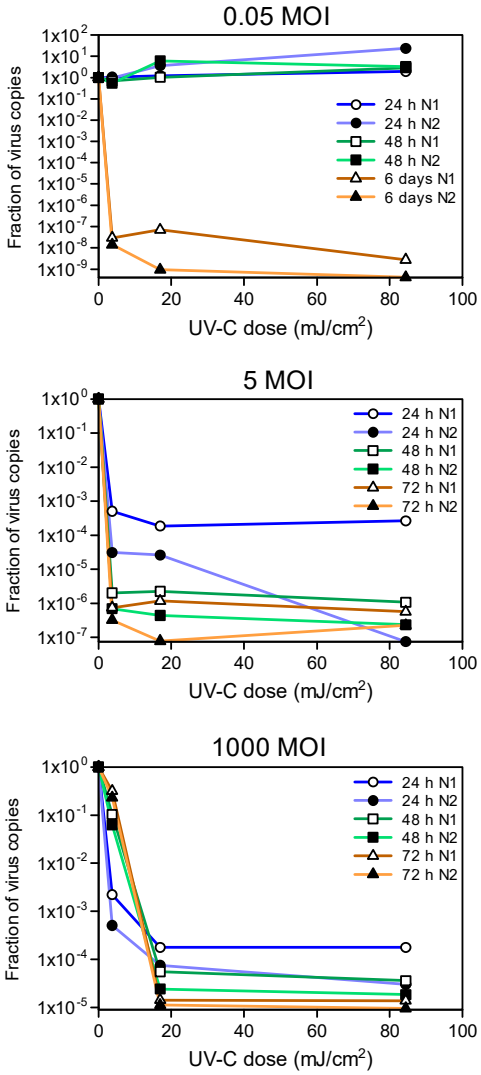

Figure S3. Plots of the measured virus copies normalized at the untreated sample in the different conditions.

BIG•POWER®

THE POWER OF WATER,
THE PURITY OF AIR

BIG POWER UVC®

The power of water, the strength of active oxygen.

Big Power O_3 is a unique decontamination system combining water, ozone, and UVC rays.
It neutralizes 99.99% of germs, viruses, mold, allergens, and unpleasant odors in enclosed spaces.
It sterilizes the air and surfaces, fights humidity, purifies fabrics, and eliminates invisible spores.
Its patented intermolecular separator enhances deep antibacterial action.
Ideal for homes, clinics, and workplaces, it restores a healthy environment and prevents respiratory issues.

Big Power O_3: the alliance of science and health, serving your space.

BIG POWER UVC TECHNICAL DATA	
POWER SUPPLY	230 V
FILTRATION SYSTEM	WATER MOLECULAR SEPARATION
MAXIMUM DEPRESSION	1700 mm H_2O
AIR FLOW	100 m^3/h
SUCTION POWER ADJUSTMENT	Yes, with 4 levels
DIMENSIONS L x W x H	420 x 370 x 400 mm
RANGE OF ACTION	9 mt
MAXIMUM POWER ABSORBED	1200 W
SANITIZATION WITH UVC RAYS	yes

Made in Italy

QUALITÀ CERTIFICATA

MADE IN ITALY

BIG POWER has been certified by external control bodies to be a safe and high-quality product, 100% Made In Italy.

INTERNATIONAL CERTIFICATIONS

BIG POWER is subject to strict inspections by renowned, independent, international certification bodies, which guarantee and certify that the product fully complies with the production standards and regulations.

US CERTIFICATION

The United States Patent and Trademark Office (USPTO) is the administrative body responsible for issuing patents and trademarks registered in the United States of America. It is considered the most important body in the field of patents, in particular, because of the economic size of the US market.

In carrying out its duties, the USPTO fulfils the mandate of Article I, Section 8, Clause 8, of the US Constitution which is to "promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries".

The USPTO registers trademarks on the basis of the trade clause of the Constitution (Article I, Section 8, Clause 3).

CERTIFIED
QUALITY

BIG·POWER

O_3

Oggetto: Certificazione

L'azienda FRAEM srl Gruppo TPA Impex spa dichiara che quest' ambiente viene sanificato giornalmente con sistema BIG POWER®

L'ambiente viene sottoposto ad un processo di igienizzazione e sanificazione dell'aria in grado di eliminare il 99,9% dell'inquinamento indoor. Sono debellati acari, spore, muffe e batteri da contagio, odori persistenti causati da materiale chimico e/o organico.

Protocollo di ricerca ed indagine: Università di Pisa - DIPARTIMENTO DI PATOLOGIA SPERIMENTALE, BIOTECNOLOGIE MEDICHE, INFETTIVOLOGIA ED EPIDEMIOLOGIA 17_07_09

CERTIFICAZIONE UNIVERSITÀ DI PISA

The Department of Experimental Pathology, Medical Biotechnology, Epidemiology and Infectious Diseases of the University of Pisa conducted an experimental test to evaluate the effectiveness of BIG POWER.

IN SUPREMÆ DIGNITATIS
1343

UNIVERSITÀ DI PISA

CERTIFIED QUALITY

CERTIFICATO

L'Organismo di Certificazione TÜV Rheinland Italia S.r.l.
certifica, in accordo alle procedure TÜV Rheinland Group, che l'azienda

Mediante un audit, rapporto N° 1311202, è stata conseguita dimostrazione che il sistema di gestione per la qualità è conforme alla Norma

UNI EN ISO 9001:2008

Milano, li 22/06/2012. Prima Certificazione: 24/06/2003

ACCREDIA

TÜVRheinland®

TÜV CERTIFICATION

The TÜV SÜD certification mark is recognized worldwide and is only awarded upon completion of a careful verification and inspection program.

TÜV SÜD carries out regular inspections to ensure that products promptly comply with the new standards.

The achievement of this certification demonstrates commitment to offer a range of products that is increasingly reliable, efficient and long-last-ing.

TEST REPORT N° 14AM17936

Identification number: 14AM17936
Sample description:
Sampled by:
Customer:

Arrival date: 15/06/2015
Test start: 01/07/2015
Test end: 09/07/2015

Test Method and testing conditions:
The instrument was tested according to IEC 60335-2-109:2012 - item 32 radiation, toxicity and similar hazards

TEST RESULTS

Test item	Result	Units	Acceptability limit
Total UV-C irradiance	< 0.003	W/m²	< 0.003
Total effective UV irradiance	< 1	mW/m²	< 1
Ozone	$< 5 \times 10^{-4}$	% v/v	$< 5 \times 10^{-4}$

Ozone test was carried out for 2d hours in a windowless room sized 3.6 m x 3.0 m x 2.6 m with walls covered with polyethylene foil

Comments:
The tested instrument complies with Technical Standard IEC 60335-2-109:2012 item 32.101 and 32.102

Sambuca Val di Pesa, July 14 2015

the Laboratory Manager
Dott.ssa Maria Filomena Vitulli

The results in this report applies only to the sample(s) specifically listed above
This report shall not be reproduced except in full, without the written approval of the laboratory.

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OZONE TEST

All our tests and test reports are checked and verified by a team of professionals who guarantee the high-quality standards and the very high reliability of the results. pH Srl carries out testing activities for the food/food contact sector as well as for the environmental sector. Since January 2013 it has been part of the international network of laboratories operating for the TÜV SÜD Group.

The ozone test carried out by pH Srl determines the concentration of ozone for devices related to the treatment of water with ultraviolet radiation. The ozone values found in the test room, under specific conditions, are lower than the maximum value provided by the IEC EN 60335-2-109 standard. This standard regulates the safety of electrical appliances for domestic and similar use, as well as water treatment appliances with UV radiation.

CERTIFIED QUALITY

EMC TEST

TEST REPORT
RAPPORTO DI PROVA

EMC tests on
BIG POWER
Test di compatibilità elettromagnetica
BIG POWER

Test Request Form no.: *Modulo Richiesta Prova n.:*	Test Report sent to: *Rapporto inviato a:*
EMC15/137	Cristiano Tosin
Name and Signature of the test engineer: *Nome e Firma esecutore prova:*	Name and Signature of the Technical reviewer: *Nome e Firma del Revisore tecnico:*
Luciano Sillla	Giuseppe Mecchia
Date of test samples receipt: *Data ricevimento campioni:*	Date of test execution: *Data esecuzione prove:*
24/06/2015	From 24/06/2015 to 25/06/2015
Site of test execution (if different from the address in the footer): *Località esecuzione prove (se diversa dal piè pagina):*	Witness to the test: *Presenti alle prove:*
	none

The test results contained in this Test report relate to the tested samples only.
I risultati del presente rapporto di prova si riferiscono esclusivamente al campione sottoposto a prova.
The integral reproduction of the present Test report is allowed; the partial reproduction must be authorized in writing by the Lab.
E' ammessa la riproduzione integrale del presente Rapporto di prova da parte del Richiedente; la riproduzione parziale dev'essere autorizzata per iscritto dal Laboratorio.

Electromagnetic interference, produced by equipment and systems, can pose a danger to human health and to the environment; for this reason, many countries have made electromagnetic compatibility (EMC) testing mandatory, so that electrical and electronic products can be marketed safely.

Thanks to a team of technical experts in EMC, TÜV SÜD Group carries out electromagnetic compatibility tests.

is committed to meeting the electro-

magnetic requirements and achieving the safety standards required by law.

OPTIONAL ACCESSORIES

In addition to the standard accessories, it is possible to enrich BIG POWER with a special series of optional accessories that will transform BIG POWER into a real multifunctional system.

MINI BAT LED

Carpet cleaner with LED lights, ideal for sanitizing mattresses and upholstered furniture.

BIG BAT LED

Carpet cleaner with LED lights and adjustable height.

MORE HYGIENE
LESS BACTERIA

BIG POWER is one of the most practical, hygienic and affordable choices in the medium to long term. This system is designed for continuous use and is a safe and easy-to-use product that cleans up both solids and liquids simultaneously.

Having a filter that is always clean ensures excellent suction, but it also guarantees that the air returned to your home has been adequately filtered, providing you with a healthy and allergy-proof environment. With a dirty filter, bad smells pass through it and dirty air comes out of the cleaner!

Cleaning the filter is therefore crucial in conventional vacuum cleaners. But how should the filter be cleaned?

Usually you have to open the vacuum cleaner and come into contact with colonies of germs and bacteria, which is both uncomfortable and unpleasant.

With BIG POWER you do not have to do this. Thanks to a patented water filtration system, the annoying operation of cleaning the filter is avoided.

PATENTED
WATER FILTER

WATER FILTER WITH MOLECULAR SEPARATOR

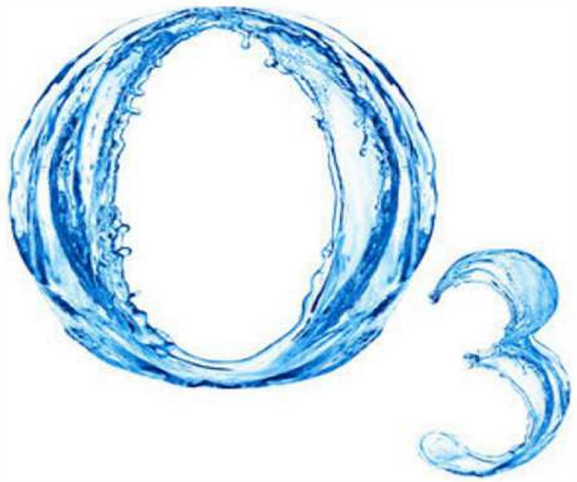
Many types of water filters are available on the market, but they do not provide constant filtration for all the allowed types of use (floors, upholstered furniture, etc.).

Our special water filter combined with an internal molecular separator, ensure that our products filter in a constant and efficient manner, in every situation.

This innovative system enhances filtration right when maximum effectiveness is required, surpassing the competitors' products which are not able to perform at the same level.

The water filtration system retains dust, hair and small particles that are then simply removed by emptying the water from the tank.

THE BENEFITS OF OZONE



OZONE: HELP FROM NATURE

L'ozono è una molecola dalle straordinarie proprietà Ozone is a molecule with extraordinary properties, as it is a powerful natural disinfectant.

Integrated into many applications, it is a valuable tool to effectively combat mold, mites, spores and bacteria present in the water we drink and in the air we breathe.

Unfortunately, since it is not a molecule that lasts over time, it is necessary to generate it at the right time and in the right quantity.

TPA has managed to seize this opportunity by creating products that generate this type of molecule.

OZONE AND ITS PROPERTIES

The possibility of exploiting ozone for cleaning and sanitizing both objects and environments derives from its high oxidizing and disinfecting power, which allows it to be widely used to disinfect water and air.

Ozone can degrade and eliminate any polluting or harmful elements such as viruses, mites, insects, spores, mold, harmful chemicals, and even smoke and odors, all in an environmentally friendly way.

In closed environments, ozone performs an effective antifungal and bactericidal disinfection, bringing great benefits in many fields of application.

THE ADVANTAGES OF OZONE

√ No more chemical products are needed: ozone totally eliminates the use of additives.

√ Eco-friendly: it leaves no residues, odors, toxins, but returns to oxygen after a few minutes.

√ Deep sanitization: it reaches all points, even the most difficult ones to sanitize.

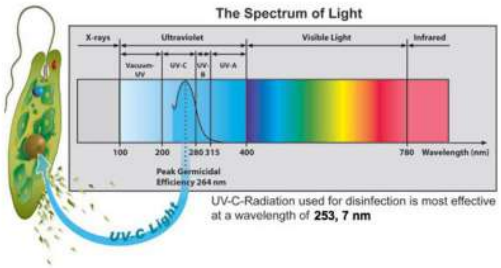
To validate the absolute compatibility of ozone, in the right quantities, the FDA (Food and Drug Administration), the US government body responsible for the regulation of food and pharmaceutical products, has also admitted the use of ozone in the production processes of the food industry, since June 26, 2001.

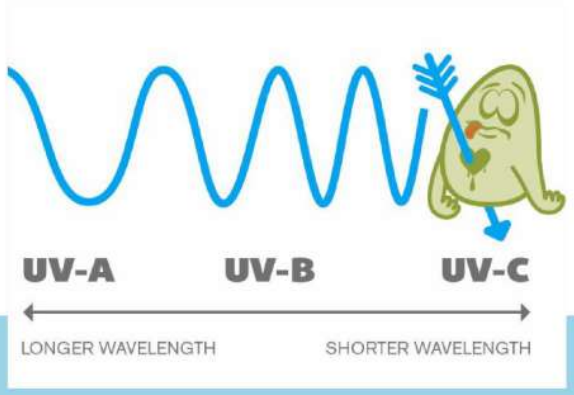
In addition, ozone has been used for the disinfection of bottled water since 1982.

Since 1984, all the swimming pools for the Olympic Games have to be purified with ozone.

In July 1996, with Protocol No. 24482, the Italian Ministry of Health recognized ozone as a "NATURAL ELEMENT FOR THE STERILIZATION OF ENVIRONMENTS".

SANITIZING
WITH UVC RAYS





The germicidal effect of UVC radiation has the highest efficacy at a wavelength of 253, 7 nm (nanometers). This particular characteristic is mainly due to the destructive effect of UVC radiation on the DNA of germs. In particular, their reproductive system is damaged, preventing their growth and multiplication.

Sanitizing with UVC rays: an ecological and functional process

This type of sanitizing procedure has a great advantage: bacteria, viruses, spores, fungi, molds, and mites are in fact very sensitive to UVC radiation. Microbes cannot become resistant to UVC radiation, which is what happens, on the other hand, with chemical disinfectants. UVC radiation is ecological, unlike traditional cleaning systems that pollute and damage the environment. Our UVC radiation system avoids the danger of serious health risks that can occur with the use of traditional disinfectants (their vapors can be inhaled directly during use or they can contaminate food products which are subsequently ingested).

New air for your environment

√ Less sick leave: there is a sharp increase in school and preschool absences caused by epidemics and viral infections due to poor room ventilation.

√ The value of well-being: BIG POWER allows a perfect sanitization of the environment and of the air itself, thereby, becoming a valid help for people who are weak due to illness or surgery.

√ A valuable service: BIG POWER guarantees a precious service to subjects suffering from respiratory diseases (asthma, rhinitis, allergies), thanks to its innovative system.