

Ideal for medical sites, nursing care facilities, public facilities, commercial facilities and restaurants

Antivirus Enzyme Sheet

A highly effective sheet that can sterilize collected viruses and bacteria

In addition to dust and dirt floating in the air, "Antivirus Enzyme Sheet" also collects microorganisms such as bacteria and mold. Since conventional filters cannot kill the collected microorganisms, there is a risk that bacteria and mold that have survived and proliferated inside the filter will be released outside the filter (secondary contamination). However, this enzyme sheet surely prevents secondary contamination and contributes to environmental improvement.

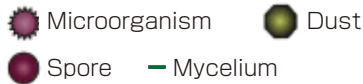
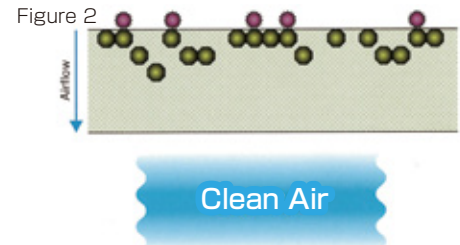
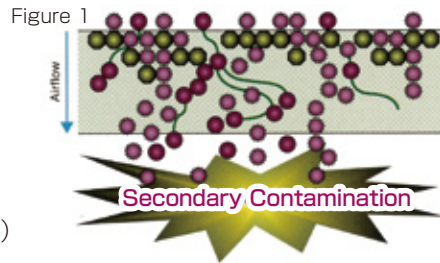


Figure 1. Conventional HEPA Filter Media

Figure 2. Enzyme HEPA Filter Media(sheet)

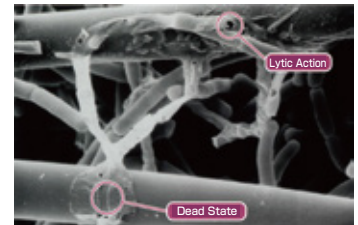


Bactericidal Performance of the Enzyme Sheet

Using our unique technology, natural lytic enzymes immobilized on sheet fibers break down the cell walls of microorganisms by hydrolysis.

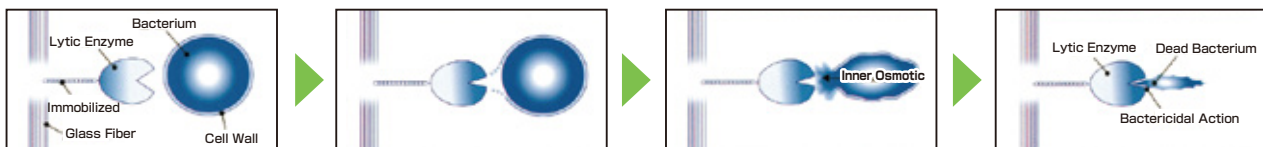
Eventually, the microorganisms rupture and die due to the osmotic pressure inside the cells. Due to this lytic action, the enzyme does not exfoliate and scatter from the sheet fiber.

In addition, because it uses a natural enzyme, it has excellent safety, and since the enzyme itself is not consumed in the lytic action, the bactericidal effect continues semi-permanently.



Sterilization Mechanism: Why can secondary contamination be prevented?

Microorganisms such as molds and bacteria continue to survive on the collected dust and nutrients contained in the dust, and eventually begin to grow. On the other hand, when microorganisms are collected on the enzyme sheet, the enzyme acts immediately and do not allow the survival and growth of microorganisms.



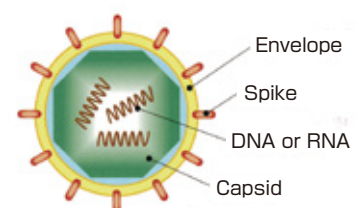
Excellent Durability * the following test items did not affect the bactericidal performance of the enzyme sheet.

Test Item	Contents of the Test
Chlorine gas	10ppm, processed at room temperature for 5 days
Acetic acid gas	500ppm, processed at 30°C for 5 days
Hydrogen peroxide gas	500ppm, processed at room temperature for 5 days
Ethylene oxide gas	20% ethylene oxide gas, processed at room temperature for 4 hours in 6 times
Formaldehyde gas	500-3,500ppm, processed at room temperature for 15 hours in 24 times
Heat (temperature)	10 years at room temperature, 4 years at 70°C, 24 hours at 100°C, 1 hour at 120°C
Gamma ray irradiation	Dose on the upper side of filter paper:21.0kGy, Dose on the underside of filter paper:21.1kGy, Dose on the upper side of filter paper:41.5kGy, Dose on the underside of filter paper:41.6kGy, Dose on the upper side of filter paper:61.5kGy, Dose on the underside of filter paper:62.4kGy

Efficacy of the Enzyme Sheet in Viral Inactivation

A virus is a particulate matter consisting of either DNA or RNA nucleic acid, and a small number of protein molecules.

The virus does not grow by itself, but invades the host cell by spikes on the envelope and propagates. The enzyme sheet can theoretically inactivate a virus that has the envelope of the virus by its own technology.

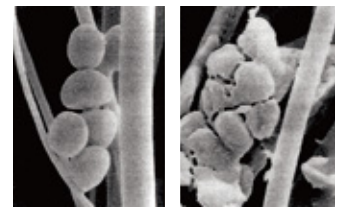


**The enzyme filter has been recognized for its bactericidal effect and patented in Japan and overseas.
Proof report on bactericidal power and prevention of secondary contamination**

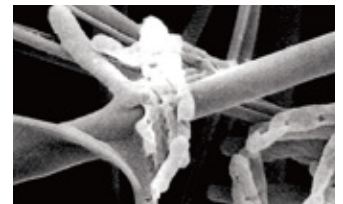
Source: the former Institute of Public Health, the present National Institute of Public Health

Bacteria (Gram-positive bacteria)

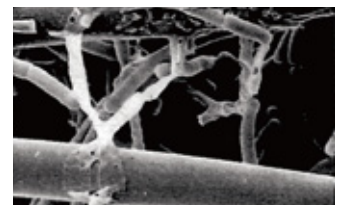
No	Group	Generic Name	Species	Sterilization rate(%)
1	Cocci	Staphylococcus	S.aureus	99.9% or more
2	"	"	S.epidermidis	99.9% or more
3	"	"	MRSA	99.9% or more
4	"	"	S.intermedius	99.9% or more
5	"	Micrococcus	M.luteus	99.9% or more
6	"	Streptococcus	S.pyogenes	99.9% or more
7	"	Lactococcus	L.lactis	99.9% or more
8	Bacillus	Bacillus	B.subtilis	99.9% or more
9	"	"	B.natto	99.9% or more
10	"	"	B.anthraxis	99.9% or more
11	"	"	B.cereus	99.9% or more
12	"	Clostridium	C.perfringens	99.9% or more
13	"	"	C.botulinum	99.9% or more
14	"	"	C.tetani	99.9% or more
15	"	Lactobacillus	L.burugaricus	99.9% or more
16	"	"	L.delbrueckii	99.9% or more
17	"	Corynebacterium	C.diphtheriae	99.9% or more
18	"	Mycobacterium	M.bovis	99.9% or more
19	"	"	M.tuberculosis	99.9% or more
20	"	Listeria	L.ivanovii	99.9% or more
21	"	Erysipelothrix	E.rhusiopathiae	99.9% or more
22	"	Actinomyces	A.pyogenes	99.9% or more
23	"	"	A.israelii	99.9% or more
24	"	Bifidobacterium	B.bifidum	99.9% or more



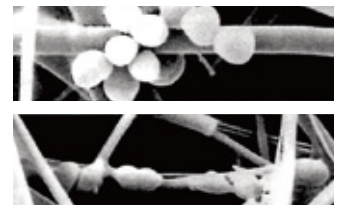
MRSA
(Left: Before dead, Right: After dead)



M.Bovis
(After dead)



B.subtilis
(After dead)



M.luteus
(Above: Before dead, Below: After dead)



S.epidermidis
(After dead)

Fungus (Mold, Yeast)

25	Mold	Aspergillus	A.fumigatus	Very Effective (Bacteriostatic)
26	"	"	A.niger	Very Effective (Bacteriostatic)
27	"	Penicillium	P.notatum	Very Effective (Bacteriostatic)
28	"	"	P.roqueforti	Very Effective (Bacteriostatic)
29	"	Aureobasidium	A.pullulans	Very Effective (Bacteriostatic)
30	"	Cladosporium	C.cladosporioides	Very Effective (Bacteriostatic)
31	"	Mucor	M.hlemalis	Very Effective (Bacteriostatic)
32	Yeast	Candida	C.albicans	Very Effective (Bacteriostatic)

■ Reference to Enzyme Filter Application

•Hospital

The University of Tokyo, The Institute of Medical Science, University of Tsukuba Hospital, Keio University Hospital, Hokkaido University Hospital, Tohoku University Hospital, Jichi Medical University Saitama Medical Center, Nagoya City University Hospital, Hyogo University Hospital, Showa University Hospital, National Hospital Organization Tokyo National Hospital, Okinawa Nanbu Medical Center, Bureau of Social Welfare and Public Health Tokyo Metropolitan Government, Iwate Prefectural Central Hospital, Ogaki Municipal Hospital, Yamato Municipal Hospital, Japanese Red Cross Kyoto Daiichi Hospital

•Pharmaceutical company

Ono Pharmaceutical Co., Ltd., Taisho Pharmaceutical Holdings, Banyu Pharmaceutical Co., Ltd., Sumitomo Dainippon Pharma, Torii Pharmaceutical Co., Ltd., Otsuka Pharmaceutical Co., Ltd., Yuki Gosei Kogyo Co., Ltd., Shiseido Japan Co., Ltd., Solvay Seiyaku K. K., Denka Company Limited., Nikken Chemical Laboratory Co., Ltd., Asahi Kasei Corporation, Terumo Corporation

•Beverage maker

Fuji Coca-Cola Bottlers Japan Inc., Tokyo Coca-Cola Bottling Co., Ltd., Mikuni Coca-Cola Bottling Co., Ltd., Kinki Coca-Cola Bottling Co., Ltd., Hokkaido Coca-Cola Bottling Co., Ltd., Hokuriku Coca-Cola Bottling Co., Ltd., Coca-Cola West Company Ltd., Meiji Co., Ltd., Morinaga Milk Industry Co., Ltd., Megmilk Snow Brand Co., Ltd., Yotsuba Milk Products Co., Ltd., Asahi Breweries, Ltd., Sapporo Breweries, Ltd., Asahi Soft Drinks Co., Ltd., Kirin Holdings Company, Limited., Japan Sangaria Beverage Co., Ltd.

•Food manufacturing company

Riken Vitamin Co., Ltd., Ajinomoto Co., Inc., Sato Foods Industries Co., Ltd., Echigo Seika, Cot., Ltd., Miyoshi Oil & Fat Co., Ltd., Oji Cornstarch Co., Ltd.,

•Container Manufacture company

Jujo Central Co., Ltd., Hokuetsu Package Co., Ltd., Toyokagaku Co., Ltd.,

•Laboratory

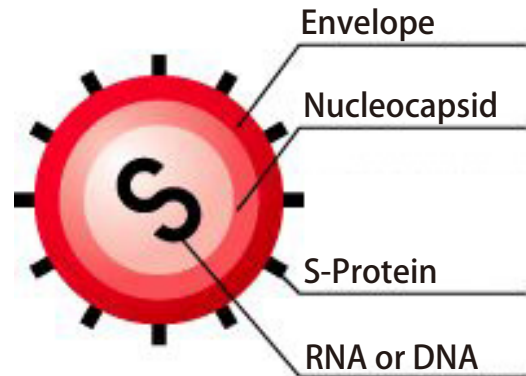
Riken Japan., Central Research Institute of Electric Power Industry, Tokyo University of Agriculture and Technology, Institute of Development, Aging and Cancer Tohoku University

•Application for counter-bioterrorism

Facilities of Government of Japan, TV stations and other facilities of foreign government

Efficacy of Enzyme Filters in Viral Inactivation

80% of known viruses have envelope shells. If the viral envelope is broken down, the virus becomes unable to invade the host cell, but rather gets absorbed by it, essentially losing its functionality. This is known as viral inactivation.



Examples of viruses that have envelopes

Virus	Notes
SARS-CoV (Severe Acute Respiratory Syndrome Coronavirus)	The virus has caused new type of pneumonia spread mainly in Asia.
Human Coronavirus (HCoV)	Common cold virus
Influenza Virus	Influenza Virus A and B
Human Immunodeficiency Virus (HIV)	
Variola Virus	

- ◆ Enzyme Filters have been tested and shown to be effective in inactivating the following viruses:

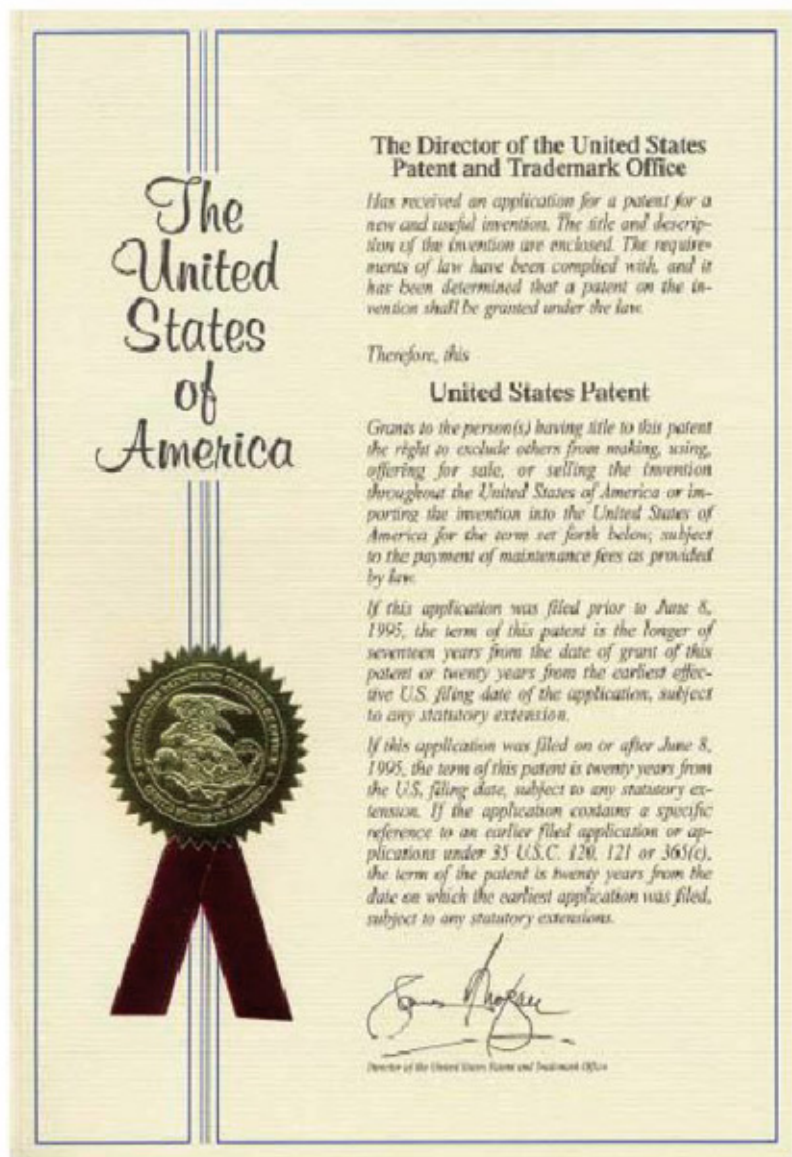
Genus	Name
Orthomyxovirus	Influenza Virus A
Orthomyxovirus	Influenza Virus B
Paramyxovirus	Parainfluenza Virus
Herpes	Herpes Simplex Virus (HSV)

The enzyme filter is not effective to inactivate non-envelope viruses. However, due to the antibacterial function, no host microorganisms can survive on the filtration media surfaces, and viruses are unable to proliferate (effective inactivation).

Reference to product reliability of the enzyme filter, recognized by Japan and other countries.

The bactericidal enzyme filter has been patented in these countries:

Japan, USA, Canada, UK,
EU (Germany, France, Italy, Holland),
China, Hong Kong, Korea, Singapore



The awards given to enzyme filter in Japan:

The Chairperson Award from Japan Air Cleaning Association

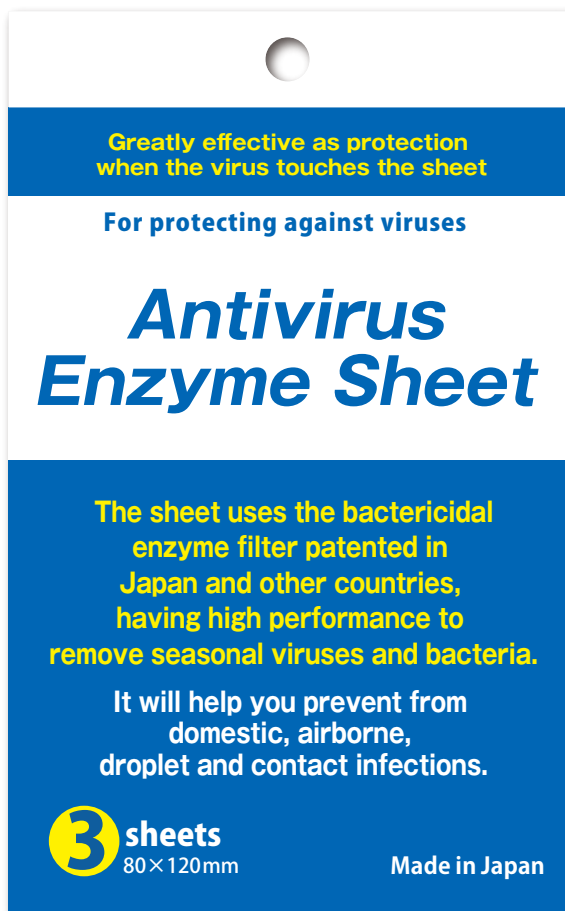
The Technology Award from Catalyst Manufacturers Association JAPAN

These patents and awards have been taken and received by Nikki-Universal Co., Ltd.

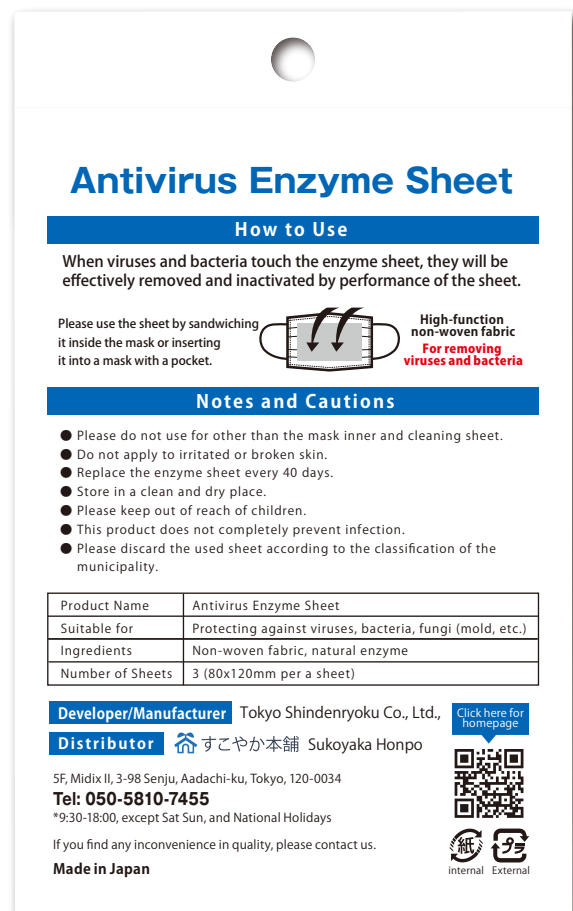
*The enzyme material of Nikki-Universal Co., Ltd. is used for "Antivirus Enzyme Sheet".

Antivirus Enzyme Sheet

For protecting against viruses



Front



Back

Not only can the sheet be used as a mask inner, but it also kills viruses by simply wiping daily necessities and household goods such as PCs, smartphones, leather products and furniture.



Keep clean just by simply wiping

