Panasonic
ideas for life

News Release
パナソニック電工株式会社
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May 12, 2009

Positive effects of charged water particles “nanoe®” (*1) on viruses, bacteria, and agricultural chemicals have been verified.

Panasonic Electric Works Co., Ltd. verified that nano-size charged water particles that were generated by applying a high voltage to water had positive effects of suppressing viruses and bacteria and reducing the amount of agricultural chemicals.

Nano-size charged water particle generation technologies were developed by Panasonic Electric Works Co., Ltd. in collaboration with Hiroshima Graduate School of Engineering (Higashihiroshima City, Hiroshima Prefecture) in 2003. In 2005, maintenance-free charged water particle generation technologies were developed, by which water in the atmosphere was condensed by Peltier elements.

■ Verification method

Viruses, bacteria, and agricultural chemicals that were exposed to charged water particles and those that were not exposed were compared.

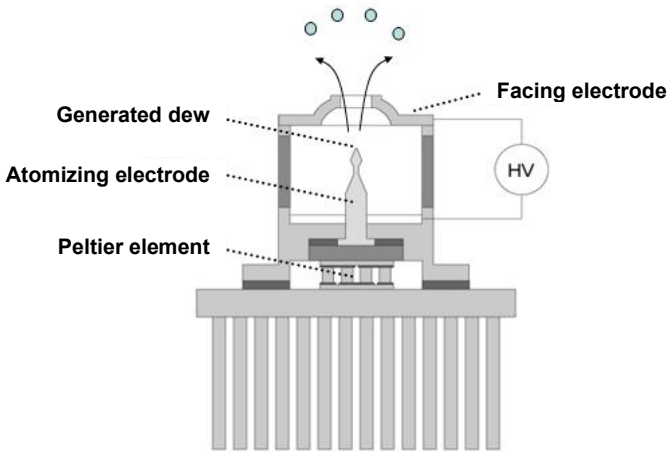
■ Results of verification

(1) 99.9% of bird flu viruses (H5N1 subtype) were suppressed within four hours.
99.9% of bird flu viruses (H9N2 subtype) were suppressed within four hours.
(2) 98.2% of canine distemper viruses were suppressed within four hours.
(3) 99.99% of enterohemorrhagic Escherichia coli (O157: H7) were suppressed within one hour.
99.99% of methicillin-resistant staphylococcus aureus (MRSA) were suppressed within one hour.
(4) Methamidophos (agricultural chemical) was reduced by 92.3% within four hours.
Dichlorvos (agricultural chemical) was reduced by 77.1% within four hours.

■ Principle of generating charged water particles

Atomizing electrode is cooled by Peltier elements to condense water particles in the atmosphere to generate water. A high voltage is applied across the atomized electrode and the facing electrode to generate charged water particles of 5 to 20 nanometers (nm).

Charged water particles



***1 We call the charged water particles "nanoe."**

ホームページ http:// panasonic-denko.co.jp/

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■ **Verification data (1)**

[Description of the test]

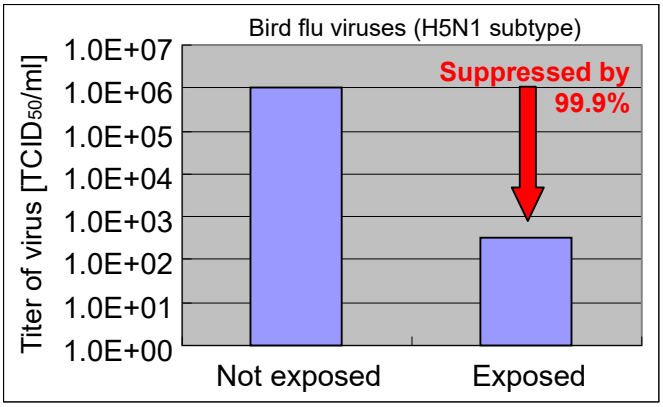
Bird flu viruses (H5N1 and H9N2 subtypes) were exposed to charged water particles to verify their virus suppression effects.

- **Test laboratory:** Obihiro University of Agriculture and Veterinary Medicine
  Research Center for Animal Hygiene and Veterinary Medicine
- **Test period:** December 2008 to February 2009
- **Test subject:** Highly pathogenic bird flu viruses, H5N1 subtype
  Weakly pathogenic bird flu viruses, H9N2 subtype
- **Test method:**
  - Exposed to charged water particles for four hours/Not exposed
  - Test box volume: 350 x 350 x 400 mm
  - Method of making virus fluid
    Viruses were proliferated in an embryonated egg's allantoic cavity. The allantoic fluid (concentrate virus solution) was diluted to 10 times with ultrapure water and used as an experimental virus fluid.
  - Method of exposure to nanoe:
    A charged water particle generator was installed on the ceiling of the box. The experimental virus fluid was exposed to charged water particles for four hours.
  - Measurement of the titer of the virus:
    Each virus fluid was collected after it had been exposed to charged water particles for four hours, gradually diluted to 10 times, and inoculated into culture cells. The titer of the virus (50% tissue culture infectious dose: TCID 50/ml) was calculated based on the cytopathogenic effects observed four days later.

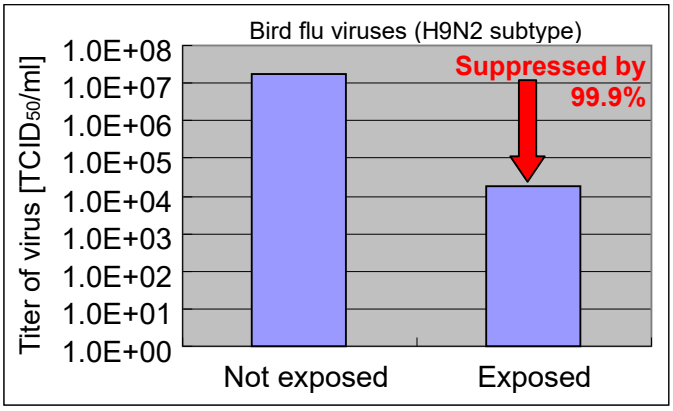
[Results]

- **99.9% of bird flu viruses (H5N1 subtype) were suppressed within four hours.**
- **99.9% of bird flu viruses (H9N2 subtype) were suppressed within four hours.**

[Our drawing]



[Our drawing]



■ **Verification data (2)**

[Description of the test]

Canine distemper viruses were exposed to charged water particles to verify their virus suppression effects.

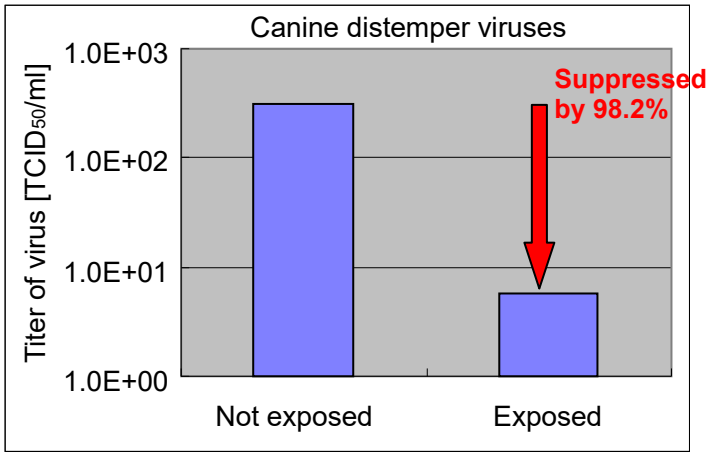
- **Test laboratory:** Rakuno Gakuen University
- **Test period:** December 2008 to March 2009
- **Test subject:** Canine distemper viruses
- **Test method:**
  - Exposed to charged water particles for four hours/Not exposed
  - Test box volume: 350 x 350 x 400 mm

- Method of creating virus fluid
  The viruses were inoculated into culture cells, which were cultivated in a cell maintenance medium for three days. After cultivating, the culture cells were centrifuged. Its clear supernatant liquid was diluted to by a phosphate buffer solution twice and was used as an experimental virus fluid.
- Method of exposure to nanoe:
  A charged water particle generator was installed on the ceiling of the box. The experimental virus fluid was exposed to charged water particles for four hours.
- Measurement of the titer of virus:
  Each virus fluid was collected after it had been exposed to charged water particles for four hours, gradually diluted to 10 times, and inoculated into culture cells.
  The titer of virus (50% tissue culture infectious dose: $TCID_{50}$/50µl) was calculated based on the cytopathogenic effects observed five days later.

[Results]

- 98.2% of canine distemper viruses were suppressed within four hours.

[Our drawing]



■ **Verification data (3)**

[Description of the test]

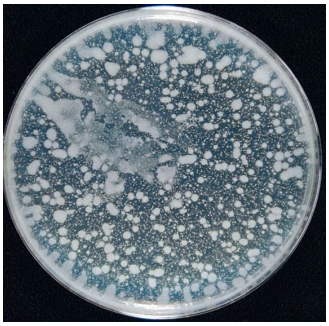
Enterohemorrhagic Escherichia coli (O157: H7) and methicillin-resistant staphylococcus aureus (MRSA) were exposed to charged water particles to verify their bacteria suppression effects.

- **Test laboratory:** Japan Food Research Laboratories
- **Date of issue of test report:** January 13, 2009 and February 10, 2009
- **Test report issue number**
  Enterohemorrhagic Escherichia coli: No. 208120880-001 and No. 209010584-001
  Methicillin-resistant staphylococcus aureus: No. 208120880-002 and No. 209010584-002
- **Test subject:**
  - Enterohemorrhagic Escherichia coli (serotype O157: H7, verotoxin type I and II producers)
  - Methicillin-resistant Staphylococcus aureus (MRSA)
- **Test method:**
  - Exposed to charged water particles for one hour/Not exposed
  - Test box volume: 350 x 350 x 400 mm
  - Method of making bacterium fluid
    The tester strain was cultured in an agar-containing medium at 35°C±1°C for 18 to 24 hours. Fungal bodies were floated in purified water and adjusted so that the number of bacteria became 10^5/ml. A gauze was impregnated with this water and used as a sample.

- Method of exposure to nanoe:
  A charged water particle generator was installed on the ceiling of the box. The experimental bacteria fluid was exposed to charged water particles for one hour.
- Measurement of the number of bacteria
  Bacteria in the sample that were exposed to charged water particles were extracted from an SCDLP culture of 10 ml.
  The number of live bacteria extracted was measured in a culture for measuring the quantity of bacteria.

[Results]

- 99.99% of enterohemorrhagic Escherichia coli (O157: H7) were suppressed within one hour.



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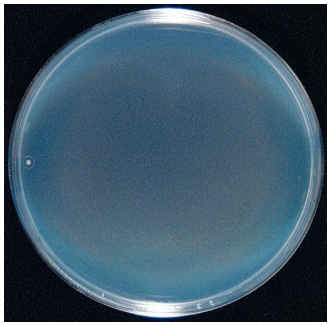
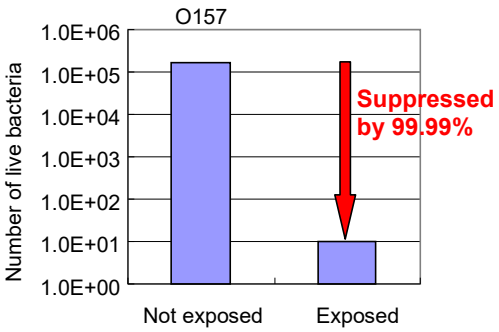
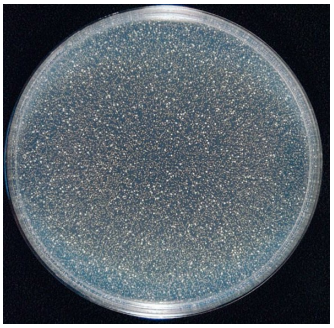


<Exposed>

[Our drawing]



- 99.99% of methicillin-resistant staphylococcus aureus (MRSA) were suppressed within one hour.



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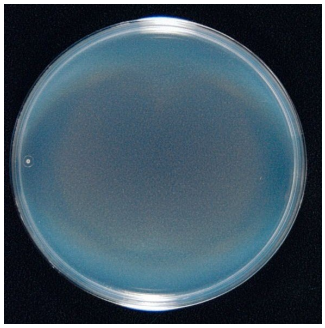
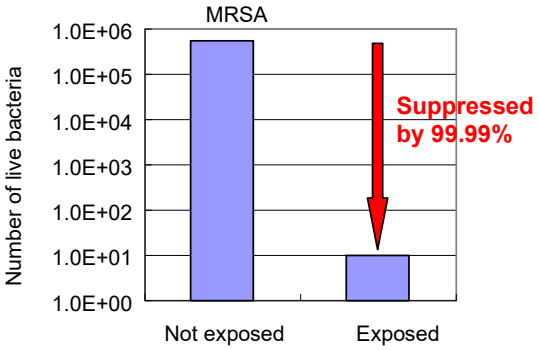


<Exposed>

[Our drawing]



■ **Verification data (4)**

[Description of the test]

Methamidophos and dichlorvos, agricultural chemicals, were exposed to charged water particles to verify their agricultural chemical suppression effects.

- **Test laboratory:** Takara Bio Inc.
- **Test period:** January to March 2009
- **Test subject:** - Methamidophos
  - Dichlorvos

- **Test method:**
  - Exposed to charged water particles for four hours/Not exposed
  - Test box volume: 350 x 350 x 400 mm
  - Test method for methamidophos:
    A 0.5 ml standard methanol solution containing 1 ppm methamidophos was poured into a Petri dish. After the methanol evaporated, the sample was exposed to charged water particles for four hours. 0.5 ml ethanol was poured into a Petri dish. The ethanol solution was collected. The sample was analyzed by the LC/MS//MS method.

- Test method for dichlorvos:
  A 0.3 ml standard solution containing 0.1 ppm dichlorvos was poured into a Petri dish and weighed. It was exposed to charged water particles for four hours. Water was added to adjust the weight to its initial value.
  The added water was collected. The sample was analyzed by the LC/MS//MS method.

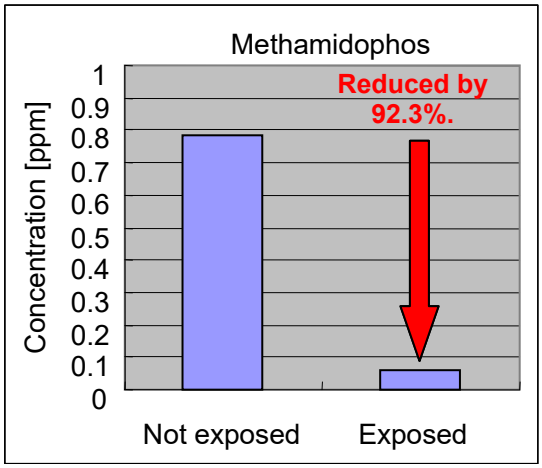
● **Test report issue number:** No. 080920 and No. 080912 for methamidophos
No. 080925 and No. 080926 for dichlorvos

[Results]

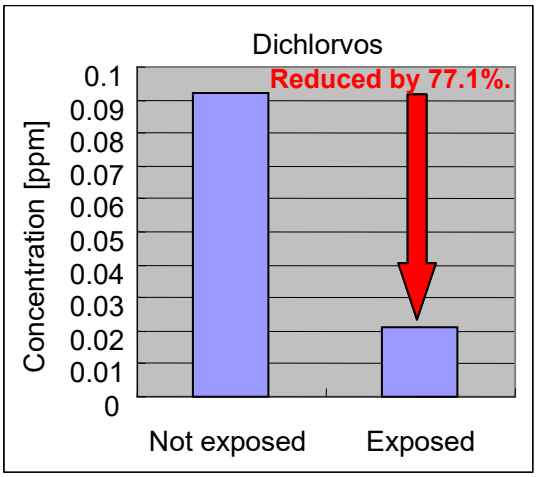
- Methamidophos was reduced by 92.3% within four hours.

- Dichlorvos was reduced by 77.1% within four hours.

[Our drawing]



[Our drawing]



■ **Future development**

The Panasonic Electric Works Co., Ltd. has been developing nano-size charged water particle generation technologies which requires no water replenishments, so we will integrate the technologies into various appliances.
We will promote the development of these technologies for personal, business, public, and moving environments to make your personal and business environments more comfortable.

[For reference]

(1) Obihiro University of Agriculture and Veterinary Medicine
Research Center for Animal Hygiene and Veterinary Medicine
Kunitoshi Imai, Professor and Haruko Ogawa, Associate Professor

(2) Department of Veterinary Medicine, Rakuno Gakuen University
Rikio Aizawa, Professor

(3) Japan Food Research Laboratories
Established: In 1957
Outline of business operations: Based on the basic philosophy “The Food Research Laboratories support people's health and safety and contribute to the progress and development of our society”, the Food Research Laboratories carry out analyses in various fields such as nutrition, health, pharmaceutical affairs, environment, home appliances, biological safety, etc.

(4) Takara Bio Inc.
Established: In 2002
Outline of business operations: Takara Bio Inc. manufactures and sells reagents and physics and chemistry machinery and tools for research and carries out research on a commission basis and inspections of agricultural chemical residue in food.

[Verified test items]

Test item		Results	Technology released this time	Test conditions		Test laboratory	Report No.
				Capacity volume (L)	Time (Hr)		
Deodorization	Tobacco smell	Deodorized within 30 minutes.		250	0.5	Panasonic Electric Works Analysis Center Co., Ltd.	E02-090313 MH-01
	Methylmercaptan (garbage odor)	Deodorized within 15 minutes.		250	0.25	Panasonic Electric Works Analysis Center Co., Ltd.	E02-080219 MH-01
Bacterial suppression	Enterohemorrhagic Escherichia coli (O157)	Suppressed by 99.99%. (*1)	●	45	1	Japan Food Research Laboratories	208120880-001, 209010584-001
	Methicillin-resistant Staphylococcus aureus (MRSA)	Suppressed by 99.99%. (*1)	●	45	1	Japan Food Research Laboratories	208120880-002, 209010584-002
	Escherichia coli	Suppressed by 99.9%.		45	1	Panasonic Electric Works Analysis Center Co., Ltd.	E02-080303 IN-01
	Staphylococcus aureus bacteria	Suppressed by 99.9%.		45	1	Panasonic Electric Works Analysis Center Co., Ltd.	E02-090105 IN-02
Mold suppression	Trichophyton	Suppressed by 99.9%.		40	24	Panasonic Electric Works Analysis Center Co., Ltd.	E02-061002 IN-01
	Cladosporium	Suppressed by 98.2%.		45	8	Panasonic Electric Works Analysis Center Co., Ltd.	E02-080303 IN-02
Allergen suppression	Pollen	Suppressed by 97.4%.		45	1	Panasonic Electric Works Analysis Center Co., Ltd.	E02-080303 IN-03
	Tick	Suppressed by 97.7%.		45	1	Panasonic Electric Works Analysis Center Co., Ltd.	E02-080204 IN-02
Virus suppression	Bird flu viruses (H5N1 and H9N2 subtypes)	Suppressed by 99.9%. (*1)	●	45	4	Test laboratory: Obihiro University of Agriculture and Veterinary Medicine Research Center for Animal Hygiene and Veterinary Medicine	
	Canine distemper viruses	Suppressed by 98.2%. (*1)	●	45	4	Test laboratory: Rakuno Gakuen University	
	Influenza viruses (H1N1 type)	Suppressed by 99.9%. (*1)		45	4	Japan Food Research Laboratories	208030610-001
	Feline calicivirus (related form of norovirus)	Suppressed by 99.9%. (*1)		25	2	Japan Food Research Laboratories	207031493-001
Agricultural chemical reduction	Methamidophos	Reduced by 92.3% (*1)	●	45	4	Takara Bio Inc.	080920 080921
	Dichlorvos	Reduced by 77.1% (*1)	●	45	4	Takara Bio Inc.	080925 080926
	Chlorpyrifos	Reduced by 98.0% (*1)		45	4	Panasonic Electric Works Analysis Center Co., Ltd.	08BY397
	Diazinon	Reduced by 89.1% (*1)		45	4	Panasonic Electric Works Analysis Center Co., Ltd.	08BY397

[Method of evaluation] *1 Value converted by us

- Deodorization test: Sensory inspection based on the six-level odor intensity indication method (tobacco: -1.0 with a panel of 12 test subjects and methylmercaptan: -1.2 with a panel of eight test subjects)
- Bacterium, mold, and allergen suppression test: Gauzes impregnated with target substances were exposed to charged water particles for a specified period of time and evaluated.
- Virus (feline calicivirus) suppression test: Clothes impregnated with viruses were exposed to charged water particles for a specified period of time and evaluated.
- Virus (bird flu, canine distemper, or influenza virus) suppression test: Charged water particles were directly applied for evaluation.