IEC | IECEE CB SCHEME

Ref. Certif. No.

JPJQA-8058

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

SYSTEME CEI D'ACCEPTATION MUTUELLE DE CERTIFICATS D'ESSAIS DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC

CB TEST CERTIFICATE
CERTIFICAT D'ESSAI OC

Product *Produit*	Air purifier
Name and address of the applicant *Nom et adresse du demandeur*	Sharp Corporation 3-1-72, KitaKamei-cho, Yao-city, Osaka 581-8585, Japan
Name and address of the manufacturer *Nom et adresse du fabricant*	Same as above.
Name and address of the factory *Nom et adresse de l'usine*	Shanghai Sharp Electronics Co., Ltd. 1111 Jinhai Road, Jinqiao Export Processing Zone, Pudong New Area, 201206 Shanghai, P. R. China
Ratings and principal characteristics *Valeurs nominales et caractéristiques principales*	AC 220-240 V, 60/50 Hz, 49 W, Class II
Trademark (if any) *Marque de fabrique (si elle existe)*	SHARP
Model / Type Ref. *Réf. De type*	FU-Y30E-*, FU-Y30EU-*, FU-Y30J-* The above models are identical, except for Model name and plug. FU-Y30# - * Suffix letter (#) shows the destination country. E : Asia, EU : Europe, J : Australia Suffix letter (*) shows the color. W : White
Additional information (if necessary) *Informations complémentaires (si nécessaire)*	
A sample of the product was tested and found to be in conformity with *Un échantillon de ce produit a été essayé et a été considéré conforme à la*	PUBLICATION / EDITION IEC 60335-1 / 4 th edition with Amend. No. 1 and 2 IEC 60335-2-65 / 2 nd edition
As shown in the Test Report Ref. No. which forms part of this Certificate *Comme indiqué dans le Rapport d'essais numéro de référence qui constitue partie de ce Certificat*	KL65090110

This CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

JQA JAPAN QUALITY ASSURANCE ORGANIZATION
21-25, Kinuta 1-chome, Setagaya-ku, Tokyo 157-8573 Japan

Date: 2009-07-24

Signature: H. Inoue

(H. Inoue)

Issued 2003-05

IEC / EN 60335-2-65			
Clause	Requirement – Test	Result – Remark	Verdict
	subjected to glow-wire test of IEC 60695-2-11		Pass
	Test not carried out on material having a glow-wire ignition temperature according to IEC 60695-2-13 as specified		Pass
	Glow-wire test of IEC 60695-2-11, the temperature being:		Pass
	-750°C, for connections carrying a current exceeding 0,2A during normal operation		Pass
	-650°C, for other connections		Pass
	Parts that during the test produce a flame persisting longer than 2 s, tested as specified		Pass
	If a flame persists longer than 2 s during the test, parts above the connection, as specified, subjected to the needle-flame test of annex E, unless		Pass
	the material is classified as V-0 or V-1 according to IEC 60695-11-10		Pass
30.2.4	Base material of printed circuit boards subjected to needle-flame test of annex E	P.W.B	Pass
	Test not applicable to conditions as specified		Pass
31	**RESISTANCE TO RUSTING**		**Pass**
	Relevant ferrous parts adequately protected against rusting		Pass
32	**RADIATION, TOXICITY AND SIMILAR HAZARDS**		**Pass**
	Appliances shall not emit harmful radiation or present a toxic or similar hazard due to their operation in normal use. (IEC60335-1 A2: 2006)		Pass
	Compliance is checked by the limits or tests specified in Part 2. However, if no limits or tests are specified in Part 2, then the appliance is deemed to comply with the requirement without testing. (IEC60335-1 A2: 2006)		Pass.
	The ozone concentration produced by ionization is not excessive and shall not exceed 5 x 10/-6 (IEC 60335-2-65)	Less than 0,05 ppm	Pass
A	**ANNEX A (INFORMATIVE) ROUTINE TESTS**		**N/A**
	Description of routine tests to be carried out by the manufacturer		N/A

UKcert
Certification & Inspection

Certificate of Compliance

CE

We hereby declare that the technical file of product complied with the requirement of directives 2014/35/EU Low Voltage Directive & 2006/42/EC Machinery Directive

Certificate No.: CE-3215

Name : **SHARP BUISNESS SYSTEMS INDIA PVT. LTD.**

Address : **Sharp Business Systems (India) Private Limited, 214-221ansal Tower, 38 Nehru Place, New Delhi - 110019, Delhi, India**

Product : **Sharp Air Purifier FU-A80E-W**

The Certification body has performed an audit of the above product quality system covering the design, manufacture and final inspection of the certified product. The quality system has been assessed, approved and is subject to continuous surveillance according to Directive 2006/95/EC Low Voltage Directive & 2006/42/EC Machinery Directive

This certificate is issued under the following conditions:

1. It applies only to the quality system maintained in the manufacture of above referenced models and it does not substitute the design or type examination procedures, if requested.
2. The certificate remains valid until the manufacturing conditions or the quality systems are changed.
3. The certificate validity is conditioned by positive results or surveillance audits.

The CE mark as shown above can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of conformity and compliance with all relevant EC Directives. The statement is based on a single evaluation of one sample of above mentioned product. It does not imply an assessment of the whole production.

Validity of this certificate can be verified at www.ukcertifications.co.uk/verify

Date of initial registration	09th May 2015
Date of this certificate	09th May 2015
Certificate expiry	08th May 2016
Recertification due (subject to the company maintaining its system to the required standard)	08th May 2018

Authorised Signatory

UK Certification & Inspection Ltd

This certificate is the property of UK Certification & Inspection Limited and shall be returned immediately on request.
5 Jupiter House, Calleva Park, Aldermaston, Reading Berkshire RG7 8NN, UK
Website:- www.ukcertifications.co.uk

28 Research Institutes That Provided Data for Sharp's Academic Marketing

Target	Testing and Verification Organization	Country
Viruses	Kitasato Research Center of Environmental Sciences	Japan
	Seoul National University	Korea
	Shanghai Municipal Center for Disease Control and Prevention	China
	Kitasato Institute Medical Center Hospital	Japan
	Retroscreen Virology, Ltd.	UK
	Shokukanken Inc.	Japan
	University of Indonesia	Indonesia
	Hanoi College of Technology, Vietnam National University	Vietnam
	Institut Pasteur, Ho Chi Minh City	Vietnam
Allergens	Graduate School of Advanced Sciences of Matter, Hiroshima University	Japan
	Department of Biochemistry and Molecular Pathology, Graduate School of Medicine, Osaka City University	Japan
Fungi	Ishikawa Health Service Association	Japan
	University of Lübeck	Germany
	Professor Gerhard Artmann, Aachen University of Applied Sciences	Germany
	Japan Food Research Laboratories	Japan
	Shokukanken Inc.	Japan
	Shanghai Municipal Center for Disease Control and Prevention	China
Bacteria	Ishikawa Health Service Association	Japan
	Shanghai Municipal Center for Disease Control and Prevention	China
	Kitasato Research Center of Environmental Sciences	Japan
	Kitasato Institute Medical Center Hospital	Japan
	Dr. Melvin W. First, Professor Emeritus, Harvard School of Public Health	US
	Animal Clinical Research Foundation	Japan
	University of Lübeck	Germany
	Professor Gerhard Artmann, Aachen University of Applied Sciences	Germany
	Japan Food Research Laboratories	Japan
	Shokukanken Inc.	Japan
	Chest Disease Institute	Thailand
Odors, pet smells	Boken Quality Evaluation Institute	Japan
Skin beautifying effects	School of Bioscience and Biotechnology, Tokyo University of Technology	Japan
Hair beautifying effects	Saticine Medical Co., Ltd.	Japan
	C.T.C Japan Ltd.	Japan
Efficacy proven in clinical trials	Graduate School of Medicine, University of Tokyo / Public Health Research Foundation	Japan
	Faculty of Science and Engineering, Chuo University / Clinical Research Support Center, University Hospital, University of Tokyo	Japan
	Animal Clinical Research Foundation	Japan
	Japan Soiken Inc.	Japan
	School of Bioscience and Biotechnology, Tokyo University of Technology	Japan
	National Trust Co., Ltd. / HARG Treatment Center	Japan
	National Center of Tuberculosis and Lung Diseases	Georgia
Working mechanism of inhibitory effects on viruses, fungi, and bacteria	Professor Gerhard Artmann, Aachen University of Applied Sciences	Germany
Working mechanism of inhibitory effects on allergens	Graduate School of Advanced Sciences of Matter, Hiroshima University	Japan
Working mechanism of skin moisturizing (water molecule coating) effect	Research Institute of Electrical Communication, Tohoku University	Japan

Efficacy of Plasmacluster Ions in Inhibiting Activity of Various Pathogens Confirmed Through Collaborative Research

Target Substance	Species	Testing & Verification Organization	Date of Announcement
Bacteria	*Serratia* bacteria	Harvard School of Public Health (Dr. Melvin W. First, Professor Emeritus), United States	March 2007
	Coliform bacteria (*E. coli*)	Ishikawa Health Service Association, Japan	September 2000
	E. coli, *Staphylococcus* (*aureus*), Candida	Shanghai Municipal Center for Disease Control and Prevention, China	October 2001
	Bacillus subtilis	Kitasato Research Center of Environmental Sciences, Japan	September 2002
		CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences), Germany	November 2004
	MRSA (methicillin-resistant *Staphylococcus aureus*)	Kitasato Research Center of Environmental Sciences, Japan	September 2002
		Kitasato Institute Medical Center Hospital, Japan	February 2004
	Pseudomonas, Enterococcus, Staphylococcus	University of Lübeck, Germany	February 2002
	Enterococcus, Staphylococcus, Sarcina, Micrococcus	CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences), Germany	November 2004
Allergens	Mite allergens, pollen	Graduate School of Advanced Sciences of Matter, Hiroshima University, Japan	September 2003
	Mite allergens	Osaka City University Medical School's Department of Biochemistry & Molecular Pathology	July 2009
Fungi	Cladosporium	Ishikawa Health Service Association, Japan	September 2000
		University of Lübeck, Germany (growth-suppressing effect)	February 2002
		CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences), Germany	November 2004
	Penicillium, Aspergillus	University of Lübeck, Germany (growth-suppressing effect)	February 2002
	Aspergillus, Penicillium (two species), Stachybotrys, Alternaria, Mucorales	CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences), Germany	November 2004

Viruses	H1N1 human influenza virus	Kitasato Research Center of Environmental Sciences, Japan	September 2002
		Seoul University, Korea	September 2003
		Shanghai Municipal Center for Disease Control and Prevention, China	December 2003
		Kitasato Institute Medical Center Hospital, Japan	February 2004
	H5N1 avian influenza virus	Retroscreen Virology, Ltd., London, UK	May 2005 August 2008
	SARS virus	Retroscreen Virology, Ltd., London, UK	October 2005
	Coxsackie virus	Kitasato Research Center of Environmental Sciences, Japan	September 2002
	Polio virus	Kitasato Research Center of Environmental Sciences, Japan	September 2002
	Corona virus	Kitasato Institute Medical Center Hospital, Japan	July 2004
	New-type H1N1 influenza virus	Retroscreen Virology, Ltd., London, UK	November 2009

Note: Efficacy in inhibiting activity of the airborne target substances noted above was verified by exposing the substances to an ion concentration of at least 3,000 ions/cm^3.

September 18, 2014

In an investigator initiated[*1] clinical trial, Plasmacluster Ion technology[*2] reduced airway inflammation in pediatric patients with mild[*3] to moderate[*4] atopic asthma

In investigator initiated clinical research[*5] commissioned by Sharp, results were obtained in exploratory analysis[*6] indicating that Plasmacluster Ion technology reduced the level of airway inflammation in pediatric patients with mild to moderate atopic asthma (FeNO[*7] value less than 90).

Sharp commissioned The University of Tokyo Hospital, Clinical Research Support Center, to conduct this research, and provided special Plasmacluster Ion generators for use in the clinical study. Mr. Yasuo Ohashi, Emeritus Professor of The University of Tokyo, and also a Professor on the Faculty of Science and Engineering at Chuo University, assumed responsibility for data analysis and design of the clinical research. In addition, Mr. Toshio Katsunuma, Associate Professor, Department of Pediatrics, The Jikei University Daisan Hospital, served as coordinator of trial sites and was in charge of recruiting subjects as well as testing and measurement.

This clinical study targeted 130 pediatric patients with mild to moderate atopic asthma, In this clinical research study, special Plasmacluster Ion generators producing an ion concentration of 100,000 ions/cm^3 were set up in the home in two rooms where the subjects spent long periods of time selected from among the bedroom, living room, and children's room (nursery). Observations were made for eight weeks before and eight weeks after activation of the Plasmacluster Ion generators using the individual randomized crossover double-blind comparison protocol[*8].

This clinical study found that the level of airway inflammation in children with atopic asthma was reduced, and that Plasmacluster Ion technology[*2] will contribute to human health in an actual living environment.

Dust mite allergens are one of the major antigens causing asthma. Thus far, Sharp has proven that Plasmacluster Ions have an inhibitory effect against airborne dust mite allergens[*9], which are in dust mite fecal pellets and body fragments, and also went on to elucidate the mechanism underlying the inhibition of these allergens[*10].

In the future, Sharp will push ahead with further development of Plasmacluster Ion technology[*2] and continue to prove its efficacy with the aim of creating a healthy environment.

It should also be noted that the details of this clinical study are scheduled to be presented by the research group (Professors Yasuo Ohashi and Toshio Katsunuma) at the 51st Annual Meeting of the Japanese Society of Pediatric Allergy and Clinical Immunology to be held beginning November 8, 2014.

Comments by Mr. Yasuo Ohashi, Emeritus Professor of The University of Tokyo, and Professor, Faculty of Science and Engineering, Chuo University

This double-blind randomized clinical study of a home appliance technology for pediatric asthma patients is unique, and I can say that there is a strong trailblazing spirit in this current study. The findings indicate that there is a potential for Plasmacluster Ion technology to reduce the level of airway inflammation in pediatric patients with mild or moderate atopic asthma. This study will contribute to the development and deployment of the methodology, and I think it suggests that Plasmacluster Ion technology will make a difference in the world.

Comments of Mr. Toshio Katsunuma, Associate Professor, Department of Pediatrics, The Jikei University Daisan Hospital

Plasmacluster Ion technology is not a drug nor even medical equipment. This technology shows the potential to suppress respiratory tract inflammation in children with mild to moderate asthma and to improve their respiratory function, and I think this is highly significant with respect to undertaking long-term care of asthmatic children.
It is my hope that this data will bring good news to children with asthma and to their families.

*1 The University of Tokyo Hospital, Clinical Research Support Center was commissioned to conduct this research and provide research support.

*2 Plasmacluster is a registered trademark of Sharp Corporation.

*3 Mild asthma is defined as having coughing or wheezing symptoms more than once a month but not more than once a week. At times, it may be accompanied by difficulty in breathing. Duration is short, and interference in daily life is minimal (based on the Japanese Pediatric Guideline for the Treatment and. Management of Asthma 2012).

*4 Moderate asthma is defined as having coughing or wheezing symptoms at least once week, but not continuing on a daily basis. On occasion, it may manifest as a moderate to severe attack, and disrupts sleep and/or normal daily activities (based on the Pediatric Guideline for the Treatment and. Management of Asthma 2012).

*5 The University of Tokyo Hospital, Clinical Research Support Center, the organization contracted to conduct this research, is independent of Sharp Corporation and was commissioned to provide support in the form of planning of clinical research to implementation and reporting.

*6 Prior to the start of the study, it was determined that the analysis would cover all subjects. However, under this criteria, it was not possible to verify the effects of Plasmacluster Ion technology, most likely because subjects suffering from high levels of inflammation were included. By limiting the range of subjects, an improvement in respiratory function was found, for which expectations were initially low.

*7 Fractional exhaled nitric oxide, a measure of the concentration of NO in exhaled breath. An indicator of the level of airway inflammation.

*8 A protocol for clinical trials designed to objectively examine the efficacy of investigational new drugs.

*9 Announced on September 3, 2003.

*10 Announced on July 21, 2006.

Overview of Clinical Research

Participants

130 asthma patients between the ages of 6 and 15 years, with mild*3 or moderate*4 cases of atopy

Research design

Subjects were randomly split into two groups, and ion generators made specifically for clinical research were placed in their homes.
The individually randomized double-blind crossover comparison protocol*8 was used.

Period

August 9, 2013 to May 30, 2014

Assessment items

Change in FeNO value*7, change in asthma symptoms, change in respiratory function value, QOL (quality of life)*11

Ion density of ion generating device made specifically for clinical research

Maximum ion density of approximately 100,000 ions/cm^3

Test results

• For subjects who had an initial FeNO value*[7] of 90 or less, compared to the placebo device*[12], use of the ion generating device made specifically for clinical research resulted in a decrease (an improvement) in the FeNO value*[7], which is one of the indicators of inflammation.

• For subjects who had an initial FeNO value*[7] of 90 or less, compared to the placebo device*[12], use of the ion generating device made specifically for clinical research resulted in an increase (an improvement) in V_{25}*[13],which is one of the indicators showing constriction of peripheral airways of lungs.

• Compared to pre-test values, by the end of the test there was a decrease (an improvement) in the QOL score.

*11 QOL: Like the name suggests, Quality of Life is an assessment of the quality of a person's day-to-day living conditions.

*12 Placebo device: A device that disperses air without Plasmacluster Ions.

*13 An indicator of the state of the airways (in particular the peripheral airways of lungs), one of the factors of respiratory functions.

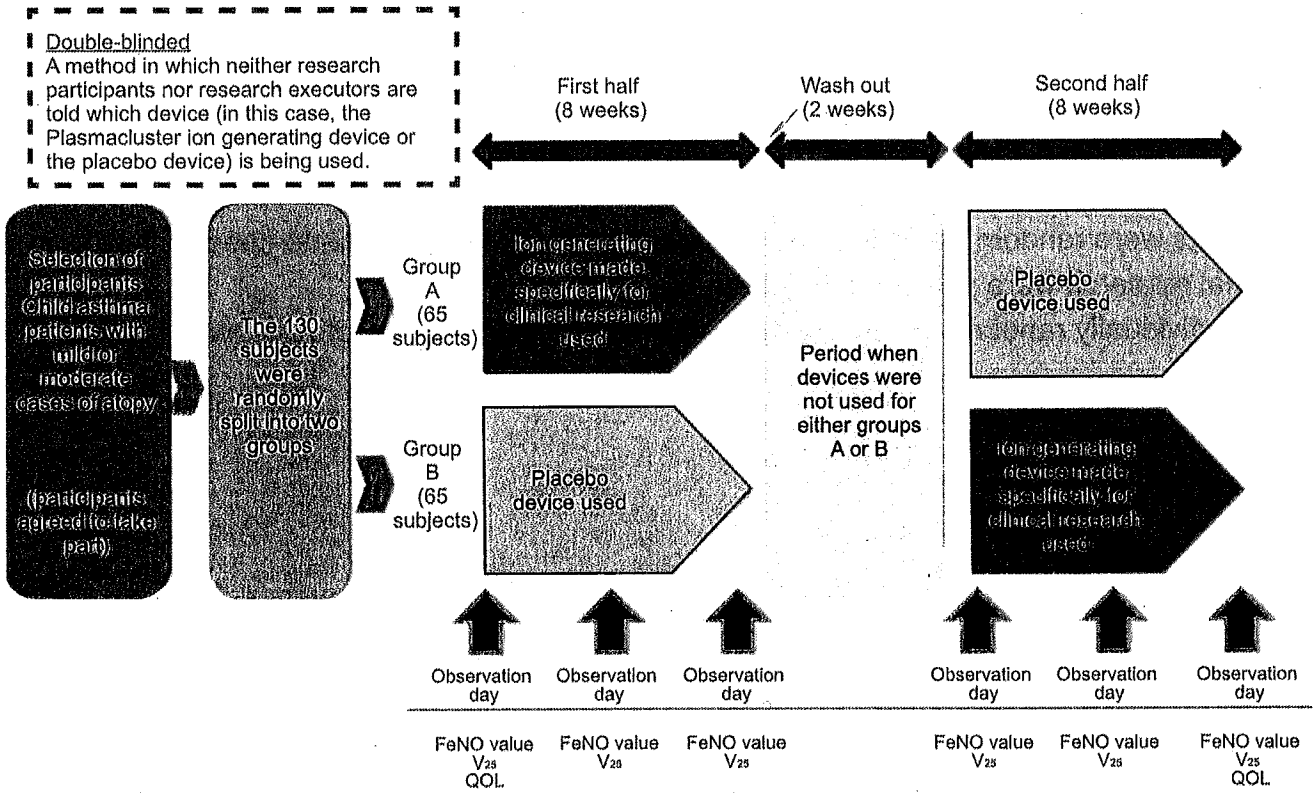


Diagram of research design

AllergyUK

SEAL OF APPROVAL CERTIFICATE

This is to certify that

Sharp Electronics UK Ltd

Has been awarded the British Allergy Foundation Seal of Approval for reduction in exposure to House Dust Mite and Pollen for their product

Plasmacluster Air Purifier

Model No's without Humidifying Function	Countries
KC930EK	UK
FUW53E, FUW43E, FUW28E, FUY30EU	EU & Russia
FPF30U, FPA80U, FPA60U, FPA40U, FPA40C, FPA28U, FPA28C, FPF60U, FPF50U	North America
FUA80SA, FUA80EA, FUY30EU, FUZ31E, FUY30SA	Middle East & Africa
FUW53J, FUW28J, FUA80J, FUY30J	Australia & New Zealand
FUZ35TA, FUY50K, FUA80E, FUA80A, FUA80TA, FUA80T, FUA80Y, FUW50A FUW40A, FUW25A, FUW53E, FUW53TA, FUW43E, FUW43TA, FUW43T, FUD40T FPD40T, FUD40A, FPD40A, FUD50A, FPD50TA, FPD50E, FPD50Y, FUD80T, FUD50T FUE30A, FPE50E, FPE50TA, FPE50Y, FU551KB, FU551KY, FU551KE, FU551KT, FPF30L FPF30E, FPF30TA, FPF30Y, FPF30SA, FPF30A, FPF40L, FPF40E, FPF40TA, FPF40Y, FPF40A FP-FM40L, FPFM40E, FPFM40B, FPFM40Y, FPGM30E, FPGM30L, FPGM30Y, FPGM30B FPG50L, FPG50E, FPG50TA, FPG50Y, FPGM50L, FPGM50E, FPGM50B, FPGM50Y DWE16FA, FPAG9, FU-GM50T, FU-G30T, FP-FM40A, FUY30E, FUY30A, FUY30K, FUY30TA FUY30T, FUY30EV, FUZ31E, FUZ31Y, FUZ31T, FUY28E, FUY28TA, FUY28Y, FUY28EP FUA28E, FUA28TA, FUA28Y, FUA28EV, FUD30T,	Asia
FUA420S, FUAW240SR, FUAW240SW, FUCD30, FUWD30, FUBD30, FUCD20, FUWD20 FUBD20, FUWE10, FUBE10, FUCE10, FUBE80, FXCF100, FXCF90, FUBF30, FUGFM50 DWCE15F, DWE10FT, FXCG908, FUBF30W1, FPBG500W, FUBG31, FUY180SW, FUGB10	China
FUA80, FUA51, FUB51, FU-D80, FU-D51, CV-DF100, FUE80, FUE51, CV-EF120, FUF51 FUGK50, FP140EX, FPFX2, FUG51, FUA30, FU30P1, FUB30, FU-D30, FUE30, FUF30 FUF28, FUG30	Japan

(Appropriate Room Sizes and the following wording must be Clearly Marked on External Packaging and Instruction Manual)

Signed: D Mcnus

Lindsey McManus, Deputy Chief Executive
Licence No: 323
Valid until: 8th August 2017

Allergy UK is the operational name of The British Allergy Foundation, a charitable company limited by guarantee and registered in England and Wales. Company No: 4509293. Charity No: 1094231. Registered in Scotland – Charity No: SC039257

Asthma Society of India
(Under KKV Trust)

To whomsoever it may concern

Asthma Society of India - Kisaan Kisani Vikas Trust a registered non-profit based charitable organization Registration No 621. Our Aim is to eradicate asthma disorders from general masses.

As a part of the continuous search to find medication and prevention for such disorders, we have observed that Sharp Plasmacluster Ion Air Purifiers, sold in India, are effective in removal of asthma and allergy triggers like House Dust Mites, Pollen, Influenza Virus, Pet hairs, foul odor.

Virendrakumar Jain
President

165, R.N.T. Marg, Indore -452001, India Phone : 0731-3069109, Fax : 0731-2515007
email : asthma@asthmasocietyofindia.org

Indoor Suspended Allergen Inactivation Technology Using Cluster Ions Generated by Discharge Plasma

Kazuo Nishikawa* Hideo Nojima*

Abstract

Mite allergen deactivation technology has been developed using cluster ions generatedby discharge plasma at atmospheric pressure. The effect of ions on airborne mite allergenshas been evaluated by ELISA and ELISA inhibition methods. The allergy reactivity of miteallergens has been reduced with exposure to ions generated by the present device, andit has been confirmed that these ions can deactivate airborne mite allergens. Furthermore,efficacy tests of these ions on airborne mite dust allergens floating indoors have beenperformed, and significant deactivation of these allergens due to the effect of ions hasbeen confirmed.

Preface

Mite allergies, hay fever, food allergies and atopic rashes receive widespread coverage in the media today.[1,2] The prevalence of these allergies is increasing every year in the developed world, and a survey by Japan's Ministry of Health, Labour and Welfare found that 1 in 3 Japanese have allergies. Caused by factors such as living environments, changing dietary habits and increasing stress, allergies are some of the diseases of civilization' that afflict the modern world.

Previous Sharp research work has shown that positively and negatively charged cluster ions generated by discharge plasma at atmospheric pressure can be used to inactivate suspended airborne bacteria, fungi, and viruses, and to remove toxic substances from tobacco smoke.[3,4,5]

The research described in this paper examined mite allergens (the major indoor allergens) and cluster ions generated by a discharge plasma created by ion generators at atmospheric pressure. We conducted tests to verify the effectiveness of these ions in inactivating these allergens, and found that the interaction of positive and negative cluster ions can significantly inactivate airborne mite allergens and inhibit their allergic reactivity. We also verified their effectiveness(of cluster ions in inactivating suspended mite dust in indoor environments. The effects we verified have been successfully applied to develop new-concept air purification technology. This paper reports on the effectiveness of positively and negatively charged cluster ions generated by ion generators in inactivating airborne mite allergens.

1. Experimental apparatus and methodology

1.1 Ion generators[4]

Figure 1 is a photo showing the type of ion generator used in the tests. Electrodes are formed

*A1241 Project Team member

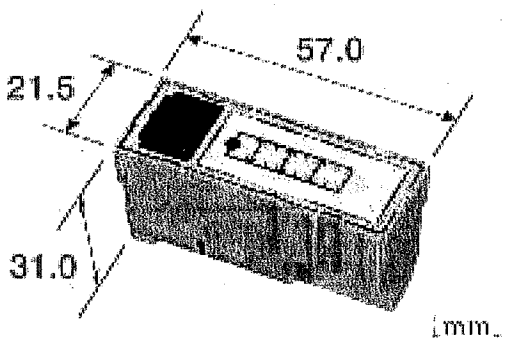


Fig. 1 Photograph of the ion generation device.

on the surface of a flat-plate dielectric, applying a high-voltage AC current to create a plasma discharge state on the surface. The discharge plasma ionizes and dissociates the molecules in the air to generate positively and negatively charged ions. For the tests described in this paper, the generated ions were diffused throughout the space by an air blower. The generated ion species were positively charged cluster ions of $H_3O^+(H_2O)_m$ (where m is an integer) and negatively charged cluster ions of $O_2^-(H_2O)_n$ (where n is an integer).

1.2 Specimen preparation method

We placed 1 g of adult European house mites (Dermatophagoides pteronyssinus; Der p) on 5 g of a food source (powdered Ebios beer yeast mixed in a 1:1 weight ratio with Lab. Animal Diet MF' used for mice, rats and hamsters), and allowed them to propagate for 2 months in an environment of 25°C and 75% RH. We then heated the specimen in a microwave oven for 2 minutes at 500 W, allowed it to air-dry overnight, then finely pulverized it to a uniform consistency in a mortar to create mite dust. The crude mite antigen we used (Dfb) was refined from this mite dust.

1.3 Crude mite antigen inactivation test method

Figure 2 shows the test apparatus. We used an acrylic cylindrical container of 50 cm in height and 14 cm in diameter fitted with 4 ion generators inside it, and a top-mounted nebulizer for spraying allergens. During the experiment, we filled the apparatus with positive and negative ions in an average concentration of 100,000 ions/cm³, and sprayed a mist of crude mite antigen (with a protein concentration of 200 ng/ml) from the nebulizer (Omron model NE-C10) on top of the apparatus. After the crude antigen had been suspended in the ion space for about 90 seconds, we collected it with the collection container at the bottom of the apparatus.

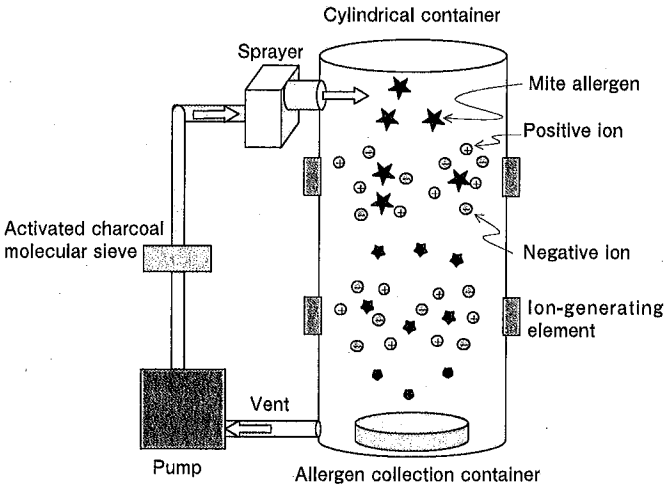


Fig. 2 A mite allergen atomization and collection system.

We then carried out an ELISA (enzyme-linked immunosorbent assay) to assess the change in the allergic reactivity of the collected crude mite antigen (Dfb) to anti-Der f 1 and anti-Der f 2 mouse antibodies (manufactured by Seikagaku Corporation), and to serum IgE antibodies from mite allergy sufferers. To quantitatively assess the allergic reactivity of crude mite antigens exposed to ions, we used the ELISA inhibition method to measure the allergen inactivation rate of the crude mite antigen.

1.4 Mite dust inactivation test method

Figure 3 shows the test apparatus. We installed ion generators and an air blower for ion agitation in a cubic acrylic chamber of 1 m³ in volume (1×1×1 m). We suspended 0.5 g of mite dust in the chamber, exposed it to ions for 15 minutes, then used a suction pump to evacuate the air from the chamber and pass it through a membrane filter to collect the mite dust. We extracted the proteins from the mite dust exposed to ions (the test group) and the mite dust not exposed to ions (the control group), and measured the protein quantity of each group by the Folin-Lowry method to quantitatively assess the difference between each group's allergic

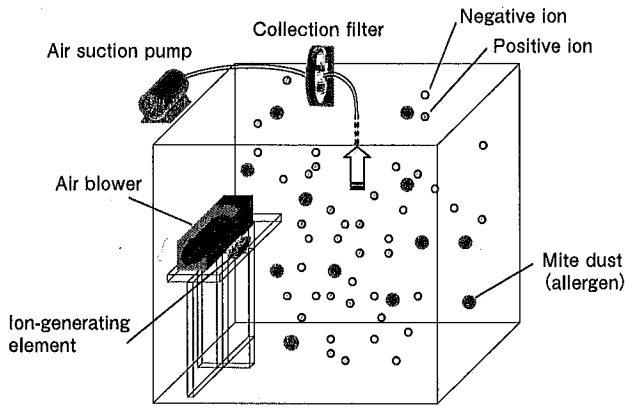


Fig. 3 Schematic diagram of the test apparatus.

reactivity to serum IgE antibodies from mite allergy sufferers. After making the protein concentrations of each group uniform, we used the ELISA inhibition method to measure the allergen inactivation rate of the mite dust of each group. We then allowed sensitized mouse mast cells to react with allergens extracted from the mite dust exposed to ions, and observed the mast cell response.

2. Experimental results and observations

2.1 Change in allergic reactivity of Der f 1 and Der f 2 (major component antigens of the crude mite antigen)

We carried out an ELISA to assess the change that ion exposure created in the allergic reactivity of Der f 1 and Der f 2 (the major component antigens of the crude mite antigen) to their monoclonal antibodies. Figure 4 shows the results. We exposed the crude mite antigen to an average ion concentration of 100,000 ions/cm^3 for 90 seconds.

We measured the allergic reactivity of the crude mite antigen to the anti-Der f 1 and anti-Der f 2 monoclonal antibodies when the crude mite antigen was exposed to ions (test group) and not exposed (control group). We carried out the test 3 times and used significance testing to obtain a 95% confidence interval by statistical analysis. Our results verify that the allergic reactivity of both Der f 1 and Der f 2 (the major component antigens of the crude mite antigen) to their monoclonal antibodies was significantly reduced by ion exposure.

2.2 Change in crude mite antigen allergic reactivity

We carried out an ELISA to assess the allergic reactivity of the crude mite antigen to serum IgE antibodies from mite allergy sufferers, when the crude mite antigen was exposed to ions (test group) and not exposed (control group). Figure 5 shows the results. We tested the significance of the

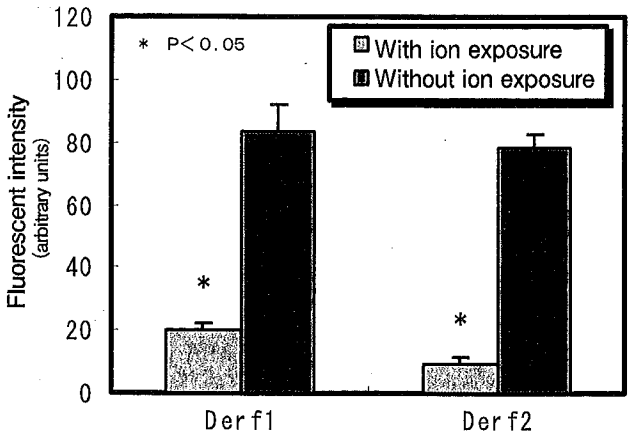


Fig. 4 Allergy reaction of principal mite allergens Der f 1, Der f 2 with exposure to ions.

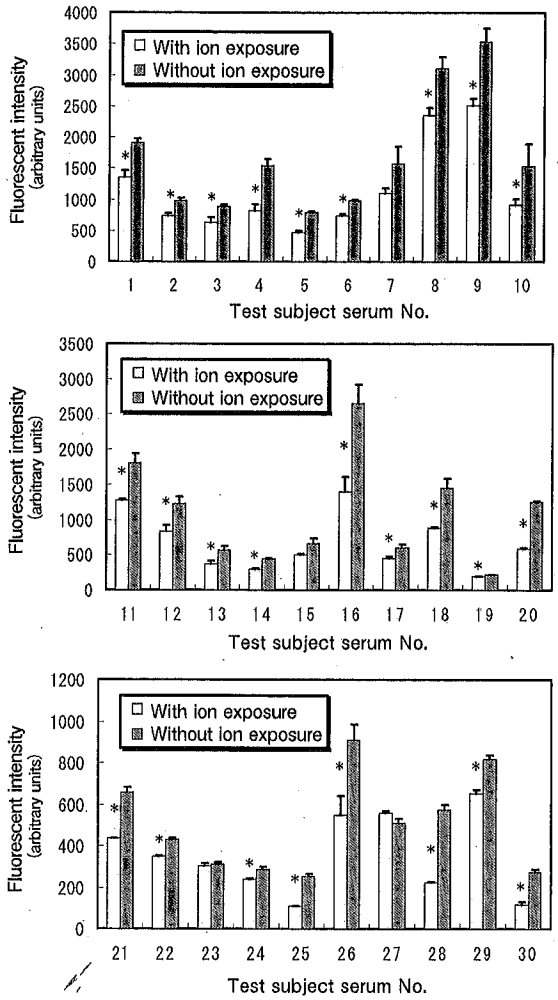


Fig. 5 Allergy reaction of refined mite allergens with exposure to ions.

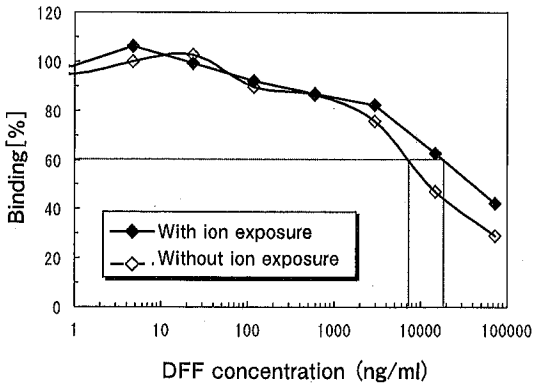


Fig. 6 Deactivation effect of refined mite allergens with exposure to 100,000 counts/cm^3 ions for 90sec.

change 3 times and used significance testing to obtain a 95% confidence interval by statistical analysis.

We measured allergic reactivity to the serum IgE antibodies of 30 mite allergy sufferers, and verified that ion exposure significantly reduced the allergic reactivity of 26 of the 30 sufferers. This finding indicates that allergic reactions were significantly

reduced for 87% of mite allergy sufferers. Reactivity to IgE antibodies fell by 80% or more for 4 test subjects, by 70 to 80% for 2 subjects, by 60 to 70% for 5 subjects, by 50 to 60% for 6 subjects, by 40 to 50% for 3 subjects, and by 30 to 40% for 4 subjects.

We used the ELISA inhibition method to measure the allergen inactivation rate by quantitative measurement of the reactivity of crude mite antigen to serum IgE antibodies from mite allergy sufferers, when the crude mite antigen was exposed to ions (test group) and not exposed (control group). The allergen inactivation rate of the crude mite antigen was 68% when exposed to

2.3 Change in mite dust allergic reactivity

We used the ELISA inhibition method to assess allergen inactivation rates by quantitative measurement of the reactivity of mite dust to serum IgE antibodies from mite allergy sufferers, when the mite dust was exposed to ions (test group) and not exposed (control group). In the test group, mite dust exposed to ions inhibited mite dust not exposed to ions from bonding with serum IgE antibodies from mite allergy sufferers. In the control group, suspended mite dust not exposed to ions inhibited bonding.

In the test group, we suspended mite dust for 15

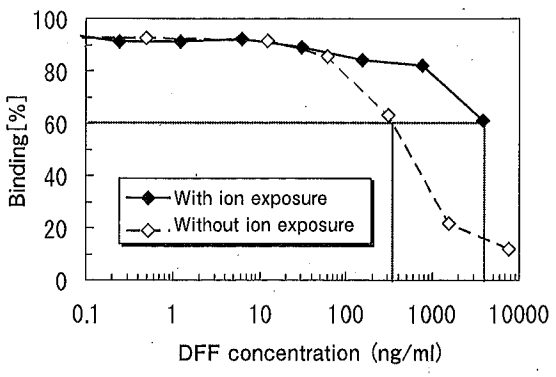


Fig. 7 Deactivation effect of the mite dust allergens with exposure to 10,000 counts/cm³ ions for 15 min.

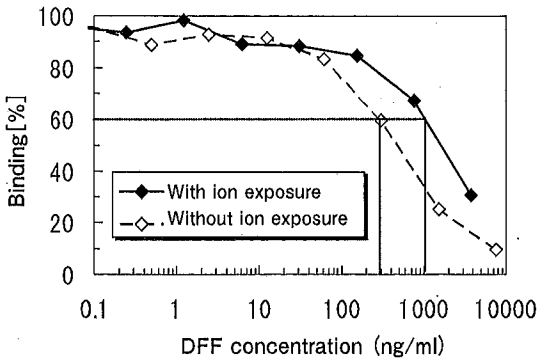


Fig. 8 Deactivation effect of the mite dust allergens with exposure to 3,000 counts/cm³ ions for 15 min.

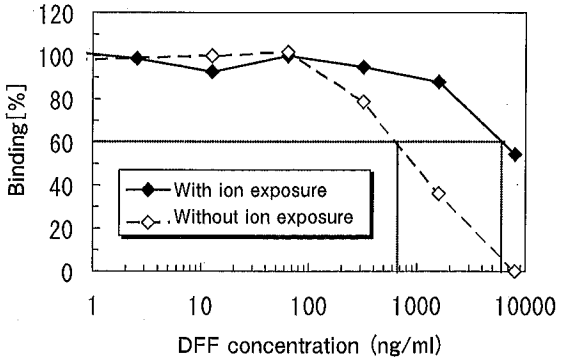


Fig. 9 Deactivation effect of the mite dust allergens with exposure to 2,000 counts/cm³ ions for 60 min.

minutes in a space with an average ion concentration of 10,000 ions/cm³, then collected it. In the control group, we suspended mite dust in a space not exposed to ions for 15 minutes, then collected it. We compared the antigenic properties of the two groups of mite dust at an inhibition rate of 60%. While 4,000 ng of the mite dust exposed to ions (test group) was required for a 60% inhibition rate, only 360 ng of mite dust not exposed (control group) was required for this rate. In other words, the test group mite dust exhibited the same inhibition rate at about 11.1 times the quantity of the control group, so the allergen inactivation rate of test group mite dust was 91% (Figure 7).

Using the same methodology, we tested the mite allergen inactivation effectiveness when mite dust was suspended for 15 minutes in spaces with average ion concentrations of 3,000 ions/cm³ and 2,000 ions/cm³. The allergen inactivation rates in these cases were 74% (Figure 8) and 23% respectively. When mite dust was suspended in a space with an average ion concentration of 2,000 ions/cm³ for 60 minutes, the mite allergen inactivation rate was 89% (Figure 9). These findings indicate that the allergen inactivation rate increases in proportion to ion concentration and length of ion exposure time.

Figure 10 illustrates the mechanism by which allergens cause allergic reactions. The human body contains cells of 10 to 30 μm in diameter called mast cells, located on the epithelium of mucus membranes and in tissues. Mast cells control the body's immune functions, and produce irritants such as histamines that cause allergies. In allergy sufferers, IgE antibodies stick to the surface of mast cells, causing a discharge of histamines and other irritants from them when allergens bond with the IgE antibodies. These irritants irritate the mucous membranes in the throat and nose causing allergic reactions such as coughing, sneezing and postnasal drip.

Figure 11 shows photos of mast cells in which IgE antibody bonding had previously occurred. Photo

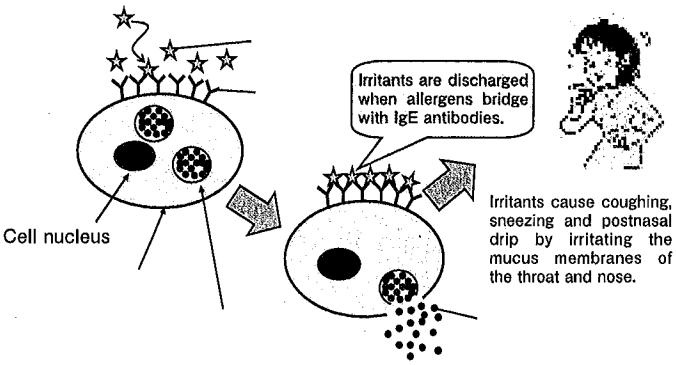
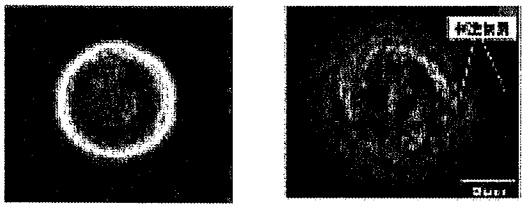


Fig. 10 Mechanism of allergy disease attack by allergens.



(a) (b)

Fig. 11 Photograph of the mast cell reacted with mite allergens (a) with ions, (b) without ions.

(a) shows the mast cell reaction to mite allergens exposed to Plasmacluster Ions. Photo (b) shows the reaction to mite allergens not exposed to Plasmacluster Ions.

Since the mite allergens exposed to Plasmacluster Ions became inactivated, they were unable to bond with the IgE antibodies on mast cell surfaces, and no irritant discharge was observed. In contrast, mite allergens not exposed to Plasmacluster Ions bonded with the IgE antibodies on mast cell surfaces, and irritant discharge from mast cells was observed. These observations of actual cells provided further verification of the effectiveness of Plasmacluster Ions in allergen inactivation.

2.4 Model for allergen inactivation by cluster ions

As described, we verified the effectiveness of positively and negatively charged cluster ions generated by ion generators, in inactivating mite allergens. Figure 12 illustrates the model by which positive and negative cluster ions inactivate suspended allergens. Cluster ions collide with, and surround airborne allergens. Positively charged $H_3O^+(H_2O)_m$ cluster ions (where m is an integer) and negatively charged $O_2^-(H_2O)_n$ cluster ions (where n is an integer) react on the surface of the allergen to generate highly reactive species of active radicals. These active radicals may react with the allergen's proteins, causing them to degenerate. In mite allergens, cluster ions may cause degeneration of

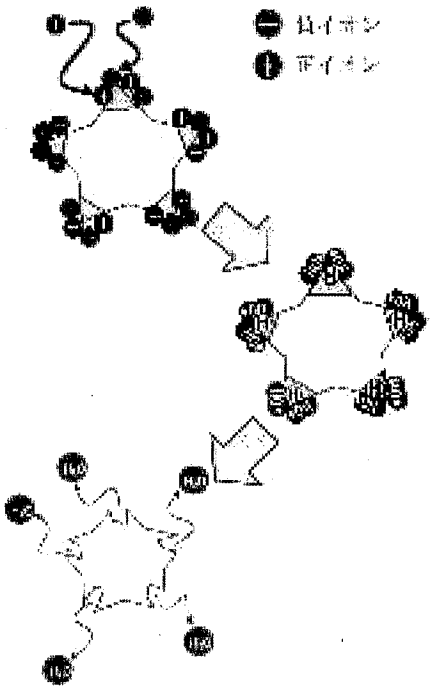


Fig. 12 Model for deactivation of allergens.

sites for bonding with IgE antibodies, eliminating the allergen's ability to bond with the antibodies. IgE antibody bonding is therefore disabled, inactivating the allergens.

Conclusion

We examined the mite allergen inactivation properties of positive and negative ions generated by ion generators, and found the following results:

(1) We verified that cluster ions significantly reduce the reactivity of both Der f 1 and Der f 2 (major component antigens of the crude mite antigen) to antibodies.

(2) We verified that cluster ions significantly reduce the allergic reactivity of crude mite antigen to serum IgE antibodies from mite allergy sufferers. We verified that ion exposure significantly reduced the allergic reactivity to serum IgE antibodies of 26 out of 30 sufferers, with a 95% confidence interval.

(3) We verified that cluster ions can inactivate the allergens of mite dust suspended in an indoor environment, and actually observed allergic inhibition in mast cells

This research verified the effectiveness of positive and negative cluster ions in inactivating mite allergens (the main cause of indoor allergies), and the allergens in mite dust suspended in indoor environments. These results indicate that Plasmacluster Ions may be highly effective in inhibiting and reducing mite

allergies. This technology has been successfully applied to products such as air conditioners and air purifiers, and can be expected in a wider range of applications in future..

Acknowledgements

For their help with our analysis and assessments of the allergic reactivity of allergens, we would like to thank Professor Kazuhisa Ono, Assistant Professor Seiko Shigeta, and Norihiko Fukuoka, of the Department of Molecular Biotechnology of Hiroshima University's Graduate School of Advanced Sciences of Matter.

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The International Journal of Tuberculosis and Lung Disease

The Official Journal of the International Union Against Tuberculosis and Lung Disease

ABSTRACT BOOK

41st World Conference on Lung Health of the International Union Against Tuberculosis and Lung Disease (The Union)

BERLIN · GERMANY
11–15 NOVEMBER 2010

PS-101205-13 Monitoring anti-tuberculosis drug induced chemical changes in *M. tuberculosis* by SERS

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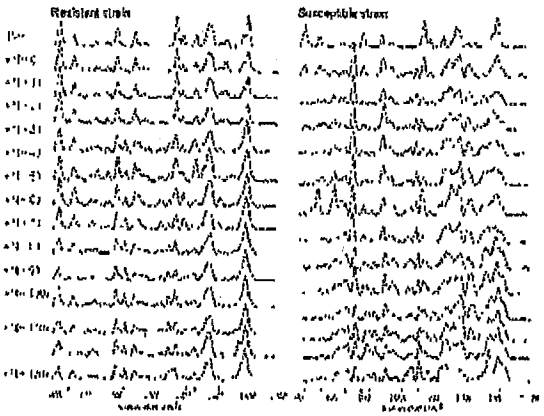
Aim: To monitor antibiotic-induced chemical changes of *Mycobacterium tuberculosis* by surface-enhanced Raman spectroscopy (SERS) and to demonstrate the feasibility of using such a high-speed nondestructive optical technique for detecting the differences between drug-susceptible and drug-resistant strains.
Methods: Substrates with extremely large and uniform enhancing power are exploited for measuring the vibrational spectra of molecules on the cell-wall of *M. tuberculosis* by SERS. Thanks to the sensitivity of the method, the spectrum of single or few bacteria can be recorded in a few seconds, allowing real time monitoring of chemical changes on bacteria after being exposed to antibiotics. Based on the characteristic differences in the changes, drug susceptibility of *M. tuberculosis* can be identified. Pan-susceptible and monodrug (isoniazid, rifampicin, ethambutol, or pyrazinamide) resistant *M. tuberculosis* were analyzed.
Results: The SERS spectra of a pan-susceptible *M. tuberculosis* strain exhibits dramatic changes in a few tens of minute after treating with isoniazid (INH), as shown in the following example (Figure). In contrast, the SERS spectra of an INH-resistant strain show relatively minor and stable changes. Two robust peaks (400 cm-1 and 525 cm-1) for INH resistant, while one (725 cm-1) for INH susceptible *M. tuberculosis* were identified.



Conclusion: The SERS-based detection platform with single bacterium sensitivity opens unprecedented opportunities for drug susceptibility testing of *M. tuberculosis* and assessing the efficacy of new drugs for tuberculosis.

PS-101291-13 SELDI-TOF-MS for detecting serum protein biomarkers of smoking in North Chinese Han males

D Xiao, S I Chu, C Wang. Beijing Institute of Respiratory Medicine, WHO Collaborating Center for Tobacco or Health, Beijing, China. e-mail: xiaodan7299@hotmail.com

Objectives: To discover the potential biomarkers and establish a diagnostic pattern for smoking by using proteomic technology.
Methods: Serum proteomic spectra were generated by surface-enhanced laser desorption ionization time of flight mass spectrometry (SELDI-TOF-MS). A set of spectra, derived from analyzing serum from 40 smokers and 40 age- and sex-matched healthy non-smokers, was used to develop a decision tree model with a machine learning algorithm called decision boosting. A blinded testing set, including 10 smokers and 10 healthy non-smokers, was used to determine the accuracy of the model.
Results: The diagnostic pattern with a panel of three potential protein biomarkers of mass-to-charge (m/z) 3159.13, 7561.03, 9407.32 could accurately recognize 38 of 40 smokers and 39 of 40 non-smokers. Validation on the blinded testing set indicated that the decision tree could differentiate 8 of 10 smokers and 10 of 10 non-smokers.
Conclusions: The preliminary data suggested a potential application of SELDI-TOF-MS as an effective technology to profile serum proteome of smoking, and with pattern analysis, a diagnostic model comprising three potential biomarkers was indicated to differentiate smokers and non-smokers rapidly and precisely.

PS-101364-13 Efficiency of Plasmacluster ion in killing of *Mycobacterium tuberculosis* on culture media ***

C Chuchottaworn,[1] J Boonyasopun.[2] [1]Department of Respiratory Medicine, and [2]Department of Pathology, Chest Disease Institute, Nonthaburi, Thailand. Fax: (+66) 25919252. e-mail: charojnj@hotmail.com

Setting: Prevention of tuberculosis transmission in environment is control ventilation, ultraviolet germicidal irradiation and filtration air with high efficiency particulate air filter. New innovation of Plasmacluster ion generation for air cleaning has been proved to be effective in killing pathogenic viruses, clinically important bacteria and fungus. There was no any study done for *Mycobacterium tuberculosis*.
Objective: To study the efficiency and exposure time of Plasmacluster ions in killing standard strain of

M. tuberculosis (H37Rv) and 50 isolated *M. tuberculosis* strains from tuberculosis patients on culture media in laboratory.
Method: Prepare suspension of bacteria with McFarland No.1 and diluted to 1:10000. Inoculate 0.1 ml. suspension on Middlebook 7H10 media for 5 media. Incubate media in incubator at 37°C for 48 hours to check contamination. Expose 4 media at a distance of 1 foot from Plasmaclustrer Ions Generator in a closed chamber. After 15, 30, 45 and 60 minutes brought out one media each time. The unexposed media was used as a control. Incubate all media in incubator and read result after 3 weeks. Standard strain was repeated test for 3 times.
Result: For standard strains of *M. tuberculosis* there was no growth after exposure time of 30 minutes. For clinical isolate strains, there was no growth after exposure time of 15, 30, 45 and 60 minutes in 4 (8%), 4 (8%), 9 (18%) and 19 (38%) strains respectively. In 14 (28%) strains which has growth on media after 60 minutes of exposure, the number of colony on media was declined according to the longer exposure time.
Conclusion: Plasmacluster ions can kill *M. tuberculosis.*

PS-101427-13 Financing of TB in a low-income country: the case of DRC

F Kalunga,[1] S Kavuke,[1] G Kabuya,[1] M Kaswa,[1] G Bakaswa,[2] S Bisuta,[1] J P Okiata.[1] [1]National Program Tuberculosis, Kinshasa, [2]Damian Action, Kinshasa, Democratic Republic of the Congo. e-mail: kmutala@yahoo.fr

Introduction: The TB Program has a Development Plan 2006-2015, which cost $545 861 560. Since 1996, the NTP applies the DOTS. The detection rate remains low (61%), but the success rate in treatment of new cases TPM + is 85% in 2005. The NTP is supported by the Government, the Global Fund (in Rounds 2, 5 and 6), Action Damien TLMI, USAID, The Union, WHO, ALM, UBS, CE detection rate is increasing with increased funding.
Objective: To show how PNTLT DRC could achieve efficient outcomes (indicators WHO) with a diversity of donors and the mode of financing.
Methodology: Full analysis of how and financing strategies of the Strategic Plan NTP DRC from 2006 to 2009.
Results: Four years after the implementation of its Strategic Plan, the NTP has mobilized $79 079 743 (14.49%). The Gap cover is $466 781 820 (85.51%) until 2015.
Conclusion: End 2009, the Strategic Plan has been funded at 14.49% and the number of diagnosed patients has increased from 98 139 to 111 851 for the same period.

PS-101444-13 Recruiting adolescents for an epidemiology study in Uganda in preparation for TB vaccine trials

J Waako,[1] A Wajja,[2] P Nabongo,[1] H Mayanja-Kizza.[2,3] [1]TB Study, Iganga/Mayuge Demographic Surveillance Site, Iganga, [2]Infectious Diseases Institute, Makerere College of Health Sciences, Kampala, [3]Department of Medicine, Makerere College of Health Sciences, Kampala, Uganda. e-mail: awajja@idi.co.ug

Background: A number of novel TB vaccines currently in early phases of development will need to be tested in large phase III trials in developing countries. Adolescents, a potential target population are not a usual target for vaccines and require both proxy consent and assent to participate. As a prerequisite, it is important to determine the incidence of TB and feasibility of forming, tracking and retaining a cohort in this population. As part of site preparation, we are conducting an epidemiological study to estimate the incidence and prevalence of Tuberculosis disease among adolescents in the Iganga/Mayuge Demographic Surveillance Site in Uganda.
Methods: A cohort of 7000 adolescents aged 12–18 years is being recruited and followed for two years. Adolescents identified from the DSS database are visited at home to obtain parental consent while assent is obtained at school. At enrolment, key demographic parameters, vital signs and relevant medical history are collected. All participants have TST administered to determine annual risk of TB infection. Participants identified as TB suspects as defined by the protocol undergo TB diagnostic work up which includes sputum coaching and collection of 2 sputum samples.
Results: Difficulty in obtaining parental consent and adjusting to the school calendar and schedule are the main challenges in recruitment. Out of 1269 participants enrolled, 1179 (93%) are school going. A total 499 met the criteria for TB diagnostic work up; 224 were TST positive (≥10 mm), 69 had cough of ≥14 days and 106 had positive household contacts. So far, there are 6 smear positive participants of whom 4 are culture confirmed *M. tuberculosis* but none have HIV.
Conclusion: Early results indicate there is TB in this population and recruitment is feasible however sites need to devise ways of addressing the challenges.

PS-100778-13 The nutritional status IFN-γ response of household and non-household tuberculosis contacts

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Background: Malnutrition has long been associated with the development of tuberculosis and may be re-

CELL & TISSUE TECHNOLOGY

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-Report-

Specific protein and DNA damages in bacterial cells exposed to Plasma-Generated Cluster Ions (Task 3)

October 1, 2003 - September 30, 2004

Aachen, October 2004

Prof. Dr. habil. G.M. Artmann
(Cell and Tissue Technology)

FINAL REPORT:

VERIFICATION OF EFFICACY SHARP PLASMACLUSTER IONS TECHNOLOGY AGAINST AIRBORNE *Serratia marcescens* USING AIR PURIFIER MODEL: FU-S51CX (without active carbon filter and HEPA filter)

(Study No. MF01-2007)

March 9, 2007

Melvin W. First

Professor of Environmental Health Engineering, Emeritus

Harvard School of Public Health

Melvin W. First

Japan
Food
Research
Laboratories

Test Report
試験報告書

No. 20807071(-001
第 208070714-001 号
2008年(平成20年)07月23日
23th, July, 2008.

Client ; SHARP Corporation
依頼者 シャープ株式会社

Specimena Sample ; written in this report.
検体 本報告書中

Title ; Observation of mold growth
表題 かび発育の観察

2008年(平成20年)07月09日当センターに提出された
上記検体について試験した結果は次のとおりです。

The results are shown as follows ;

of test regarding specimena sample above provided to us on 9th, July, 2008

(Incorporated foundation)
Japan Food Research Laboratories

財団法人
日本食品分析センター

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Chitose-Research Centre

Saito-Research Centre

Address

November 13, 2009

Sharp's Plasmacluster[*1] Technology Proven Effective in Inhibiting the Activity of Adherent and Airborne Methicillin-Resistant Staphylococcus Aureus[*3] (MRSA), a Typical Bacterial Cause of Hospital-Acquired Infections[*2]

Sharp Corporation, working together with the Kitasato Institute Medical Center Hospital at the Kitasato Institute of Kitasato University, has proven that High-Density Plasmacluster ions inhibit the activity of Methicillin-resistant Staphylococcus aureus (MRSA[*3]), a typical bacterial cause of hospital-acquired infections, both when airborne and when adhering to surfaces.

These experiments proved that high-density Plasmacluster ions (at an ion density of approximately 25,000 ions/cm^3) inhibit the activity of adherent MRSA (as plane state on a petri dish) by approximately 99.9% in eight hours, and the activity of airborne MRSA (as a suspension in a box having a volume of one cubic meter) by approximately 99.9% in 20 minutes.

Additional experiments verified the effectiveness of Plasmacluster ions in inhibiting the activity of airborne multidrug-resistant Pseudomonas aeruginosa[*4] (MDRP) by approximately 99.9%, and the viral infectivity of airborne Coxsackie virus[*5], by approximately 99.9% (see table below for more details on verified efficacy). Both of these microorganisms are similarly the source of hospital-acquired infections.

These experimental proofs demonstrated that high-density Plasmacluster ions have an inhibitory effect on the activity of adherent MRSA, as well as confirmed that the higher the ion density, the greater the inhibitory effect on the activity of airborne MRSA and MDRP and on the infectivity of airborne Coxsackie virus.

Sharp's collaborative research with academic and research organizations[*6] around the world began in 2000 and has since proven that Plasmacluster ions are effective in inhibiting the activity of 28 kinds of harmful substances, including the new-type H1N1 influenza virus[*7]. In 2002, research also confirmed the safety of high-density Plasmacluster ions with respect to human health[*8], and in 2004, joint research with an academic research institution[*9] elucidated the mechanism by which Plasmacluster ions destroy the proteins on the surface of microorganisms.

In the future, Sharp intends to further its efforts for improving the effectiveness of Plasmacluster technology to create a healthy environment.

Verified Effectiveness of Plasmacluster Ions

Target Substance	Ion Density (ions/cm^3)	Verified Effectiveness
Adherent MRSA	25,000	Reduced by approx. 99.9% in 8 hours
Airborne MRSA	25,000	Reduced by approx. 99.9% in 20 minutes
	7,000	Reduced by approx. 99.9% in 30 minutes
Airborne MDRP	25,000	Reduced by approx. 99.9% in 30 minutes
	7,000	Reduced by approx. 99.9% in 40 minutes
Airborne Coxsackie virus	25,000	Reduced by approx. 99.9% in 20 minutes
	7,000	Reduced by approx. 99.9% in 30 minutes

*1 Plasmacluster and Plasmacluster ions are trademarks of Sharp Corporation.

*2 Microorganisms that cause hospital-acquired infections (known as nosocomial infections) include bacteria, viruses and other pathogens that are the source of infections occurring in patients in the clinical setting (hospitals, healthcare facilities, etc.).

*3 MRSA is an acronym for methicillin-resistant Staphylococcus aureus, a bacterium responsible for difficult-to-treat infections in humans. MRSA typically infects humans with weakened immune systems, for example, patients in hospitals, and its resistance to a large group of antibiotics is a serious problem.

*4 MDRP is an acronym for multidrug-resistant Pseudomonas aeruginosa. MDRP infections in critically ill patients have become a serious clinical problem in hospitals and other health care settings because of the limited number of antibiotics that are effective against this bacteria.

*5 Coxsackie virus is a group of human pathogens that can cause nonspecific febrile illnesses (called "summer colds" in Japan), upper respiratory tract disease and meningitis.

*6 Sharp has adopted a collaborative research approach to product marketing in which the effectiveness of a technology is verified based on scientific data developed in collaboration with leading-edge academic research institutions. New products are then brought to market based on the results.

*7 A new-type H1N1 influenza virus first confirmed in Mexico and the US in 2009, which is now causing a global pandemic.

*8 Testing conducted by Mitsubishi Chemical Medience Corporation. (inhalation toxicity, as well as eye and skin irritation/corrosion tests).

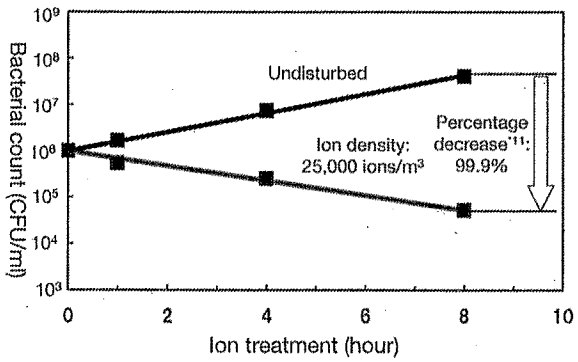
*9 Joint research conducted with Professor Gerhard Artmann, of Aachen University of Applied Sciences.

Method for Proving Effectiveness Against Adherent Methicillin-resistant Staphylococcus aureus (MRSA)

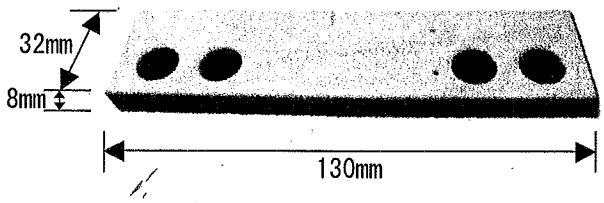
Adherent MRSA bacteria (in the form of an emulsion dripped onto a plastic petri dish) was exposed for a prescribed length of time to Plasmacluster ions generated by a high-density Plasmacluster ion generator at a density of approximately 25,000 ions/cm^3.

After eight hours of exposure, the adherent MRSA bacteria was collected and a study done to count the number of microorganisms using a culture technique[*10] commonly employed in the field of microbiology research. The results confirmed that the number of bacteria decreased by approximately 99.9% compared to the natural state not exposed to Plasmacluster ions.

Change over time in numbers of adherent MRSA



High-Density Plasmacluster Ion Generator



*10 A method of inoculating a medium with bacteria and then studying the number of bacterial colonies that form (bacterial count).

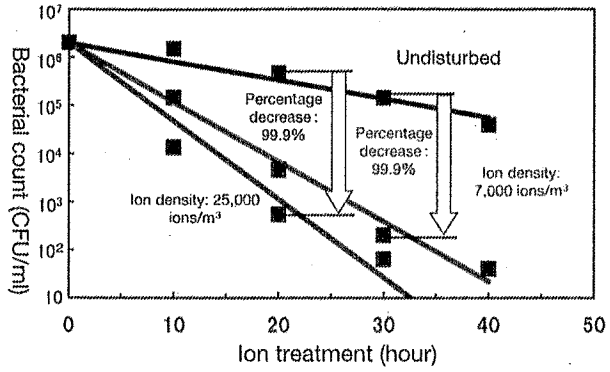
*11 Stated as the percentage of decrease in the bacteria count resulting from exposure to Plasmacluster ions compared to the count of bacteria left undisturbed in their natural state.

Method for Proving Effectiveness Against Airborne Methicillin-resistant Staphylococcus aureus (MRSA), Multidrug-resistant Pseudomonas aeruginosa (MDRP), and Coxsackie Virus

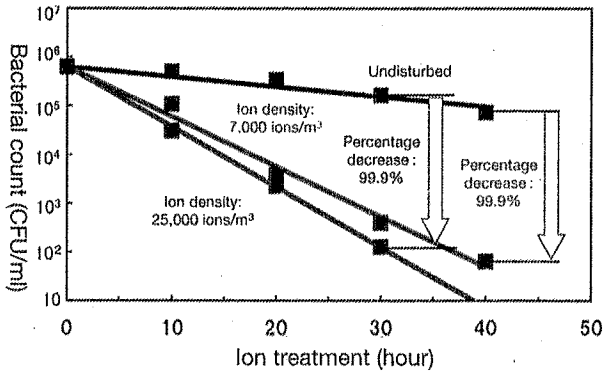
A high-density Plasmacluster ion generator was placed in a box having a volume of 1 m^3. Plasmacluster ions were generated (at densities of 25,000 ions/cm^3 and 7,000 ions/cm^3) and MRSA, MDRP and the Coxsackie virus were separately sprayed in mist form into the box. After a prescribed time, samples of the airborne microorganisms inside the box were collected, and studies were done, in the case of the bacterial substances, using the culture method to obtain a bacterial count, and in the case of the virus, using the $TCID_{50}$ method[*12] commonly used in the virology research field to obtain a measure of infectivity (viral

infectivity titer). The results confirmed that the higher the ion density, the greater the inhibitory effect on the activity of airborne MRSA and MDRP, and on the viral infectivity of airborne Coxsackie virus.

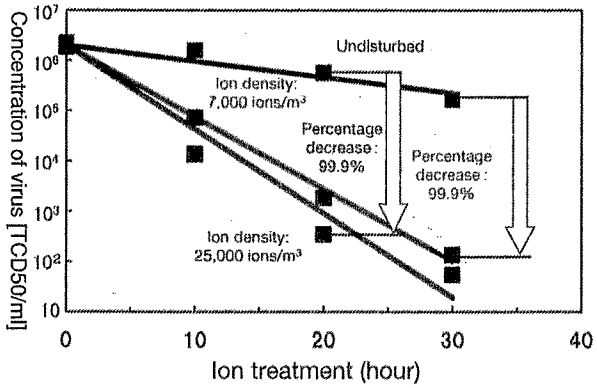
Change over time in bacterial count of airborne MRSA



Change over time in bacterial count of airborne MDRP



Change over time in viral titer of airborne Coxsackie virus



About the Kitasato Institute Medical Center Hospital, Research Division

The Kitasato Institute was founded in 1914 by Dr. Shibasaburo Kitasato to contribute to the improvement of the health of the nation by researching the causes of diseases and approaches to preventative treatments, and by operating medical treatment facilities. The Research Division of the Kitasato Institute Medical Center Hospital is involved in numerous clinical investigations as well as basic research. As part of these programs, a Medical Environmental Science Center was established within the Institute along with construction of hospital rooms specially designed to prevent the spread of infection. The Research Division is engaged in R&D with the goal of improving and enhancing the healthcare environment from a comprehensive perspective.

*12 TCID50 (50% Tissue Culture Infective Dose) method is a test protocol that examines the amount of a virus that will produce pathological change in 50% of cell cultures inoculated with a virus suspension diluted in stepwise increments.

Contract Research Report.

受託研究成果報告書

Title: Effects of deactivation for mite allergen with plasma Claster Ion (P.C.I.)

研究課題名: プラズマクラスターイオンによるダニアレルゲン失活効果

－アレルゲンとPCIの濃度依存性の検証－

— Verification of concentration dependence between Allergen and P.C.I.

Period:

実施期間: 1st, Feb, 2009 30th, Apr. 2009.

平成21年2月1日 ～ 平成21年4月30日

Osaka City Univ. Medical Department, Biochemistry Course.

大阪市立大学医学部生化学講座・

大学院医学研究科生化学分子病態学講座

教授 井上正康

Prof. Dr. Inoue Masayasu.

RETROSCREEN VIROLOGY

Final Report

CONFIDENTIAL

Evaluation of the SHARP Plasmacluster Ions Air Purification Technology Product against the Avian Influenza virus H5N1 and Urbani SARS virus

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OX4 4GB

Study No: PNT-PCS-003
Date Issued: 21 OCT 2005

Total number of pages: 48

November 2, 2009

For First Time Ever*[1], Plasmacluster*[2] Ions Shown to Inhibit Infectivity of New-Type H1N1 Influenza Virus in Both Stationary and Airborne Form

Verified in Collaboration with Retroscreen Virology Ltd.*[3] of the UK

Sharp Corporation, working in collaboration with Retroscreen Virology Ltd. founded by Professor John S. Oxford of the University of London, UK, has demonstrated for the first time in the world that high-density Plasmacluster ions can inhibit the infectivity of the new-type H1N1 influenza virus, whether it is airborne or stationary.

In the latest experiment, it was shown that Plasmacluster ions inhibit 99.9% of the new-type H1N1 influenza virus in stationary form (drops of the virus placed in a petri dish; concentration of 300,000 ions/cm^3) in 2 hours and 95% of the virus in airborne form (inside a box with a volume of 1 m^3; concentration of 25,000 ions/cm^3) in 40 minutes.

The airborne virus is in either droplet infection form or aerial infection form (droplet infection is when the airborne particles have a diameter of between 5 μm and 10 μm and are infectious; aerial infection is when the airborne particles have a diameter of between 1 μm and 5 μm and are infectious).

Since the year 2000, Sharp has used a "collaborative research approach to product marketing*[4]"— based on working with academic research organizations around the world—to demonstrate that Plasmacluster technology can remove 28 types of harmful microbes, including MRSA*[5]. The efficacy of Plasmacluster ions for inhibiting the infectivity of airborne viruses has been proven against the seasonal H1N1 human influenza virus, the H5N1 avian influenza virus, as well as Corona, SARS, Polio, and Coxsackie viruses.

In 2002, the safety of high-density Plasmacluster ions was also confirmed*6. In addition, in 2005, Sharp, working together with a number of academic institutions*7, elucidated the mechanism behind the ability of Plasmacluster ions to destroy the spike-like proteins on the virus surface, which are the triggers for infections.

Sharp will continue to strive to create healthy environments by further advancing Plasmacluster technology and demonstrating its effectiveness.

Comments by Professor John S. Oxford

The new-type H1N1 influenza virus appeared almost out of nowhere and in just three months spread around the world, threatening us all. We can become infected with the virus by breathing it in or by coming into contact with it in a stationary form. Our experiment showed that Plasmacluster ions are effective against both routes of infection. The biggest advantage of this technology is that it can be applied for use against a wide range of viruses; as our experiment showed, it is effective against not just the H5N1 avian influenza virus but against the new-type H1N1 influenza virus as well. I believe that this technology is one of the measures we can take to protect ourselves from the threat of viruses, in addition to wearing facemasks and washing hands.

*1 As of November 2, 2009; according to Sharp.

*2 Plasmacluster and Plasmacluster ions are trademarks of Sharp Corporation.

*3 The OECD (Organisation for Economic Co-operation and Development) Principles of GLP (Good Laboratory Practice) is a set of standards intended to ensure the generation of high-quality and reliable test data through periodic reviews of operational organization and management, test apparatus and materials, study designs, internal audit controls, quality assurance systems, test data, etc., at all test facilities. Re-certification is required every three years.

*4 The "collaborative research approach to product marketing" verifies the effectiveness of a technology based on scientific data developed in collaboration with leading-edge academic research institutions. New products are then brought to market based on the results.

*5 MRSA is an acronym for methicillin-resistant Staphylococcus aureus, a bacterium responsible for difficult-to-treat infections in humans. MRSA typically infects humans with weakened immune systems, for example, patients in hospitals, and its resistance to a large group of antibiotics is a serious problem.

*6 Testing conducted by Mitsubishi Chemical Safety Institute Ltd. (inhalation toxicity, as well as eye and skin irritation/corrosion tests).

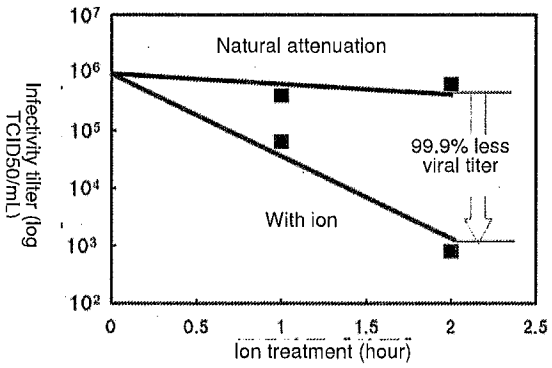
*7 Joint research conducted with Professor Gerhard Artmann, of Aachen University of Applied Sciences (2005).

Method of Testing Efficacy Against Stationary New-Type H1N1 Influenza Virus

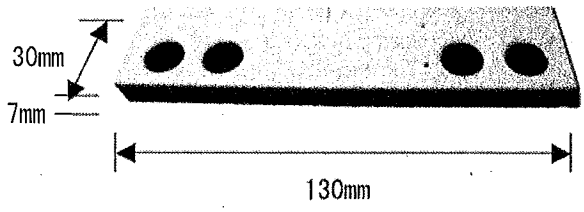
Using a high-density Plasmacluster ion generator, an ion concentration of approximately 300,000 ions/cm^3 was sprayed on the new-type H1N1 influenza virus in stationary form (drops of the virus placed in a plastic petri dish) for a set period of time.

The virus was collected after being sprayed for 2 hours, and the infectivity (viral infectivity titer*8) was studied using the TCID50 method*9 commonly used in the virology research field. As a result, the infectivity of the virus was 99.9% less than that of virus not treated with Plasmacluster ions and left to natural attenuation.

Change in infectivity titer of stationary new-type H1N1 influenza virus



High-density Plasmacluster ion generator



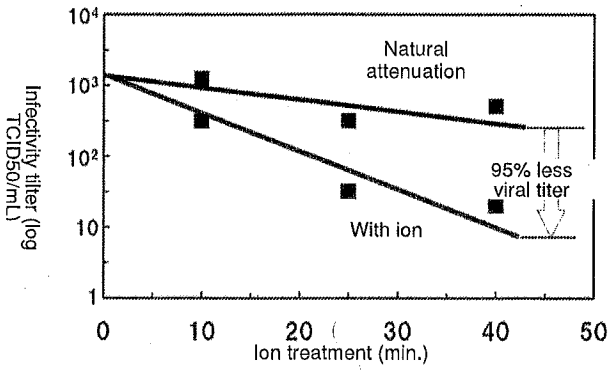
*8 A value indicating the capacity of a virus to infect cells.

*9 50% Tissue Culture Infective Dose method; a test protocol that examines the amount of a virus that will produce pathological change in 50% of cell cultures inoculated with a virus suspension diluted in stepwise increments.

Method of Testing Efficacy Against Airborne New-Type H1N1 Influenza Virus

A Plasmacluster ion generator was placed in a box having a volume of 1m^3. Plasmacluster ions were generated at a concentration of approximately 25,000 ions/cm^3 and the new-type H1N1 influenza virus was sprayed into the box (particle diameter: between 1 μm and 10 μm). After spraying for 40 minutes, the airborne virus in the box was collected and its infectivity was studied using the TCID50 method. As a result, the infectivity of the virus was 95% less than that of virus left to natural attenuation.

Change in infectivity titer of airborne new-type H1N1 influenza virus



Profile of Professor John S. Oxford

- Professor of Virology in the Institute of Cell and Molecular Science at St. Bartholomew's and the Royal London Hospital, Queen Mary's School of Medicine and Dentistry, University of London, UK
- Founder and Scientific Director of Retroscreen Virology Ltd.
- Has chaired numerous international academic conferences and meetings

Retroscreen Virology Ltd.

Retroscreen Virology Ltd. was founded by Professor John Oxford in 1989 to conduct R&D and verification testing related to viruses, drugs, and vaccines, and is well known as one of the leaders of its field. It is certified under GLP (Good Laboratory Practices), an international set of standards for maintaining high levels of reliability and safety in trials involving chemical substances. It is also ISO 9001-certified.

Test Report

試験報告書

—インフルエンザウィルスを指標とした空気清浄機装置における
ウィルス除去効果評価試験—

— Evaluation Test regarding Virus Removal Effects with Air Purifiering Equipment to Influenza Virus —

(Corporate juridical Personan incorporated bodya coporation) Kitazato Research Centre

社団法人　北里研究所
北里研究所メディカルセンター病院
医療環境科学センター

6/6/2005

Plasmacluster Ions®*1 Proven Effective Against Airborne Highly Pathogenic H5N1 Avian Influenza

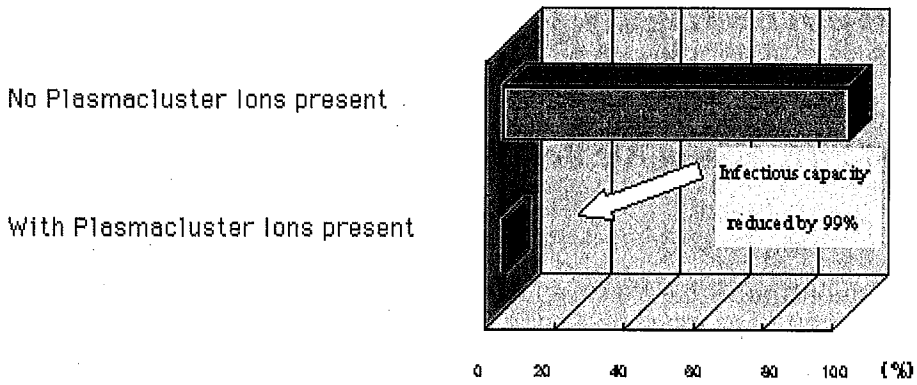
A World First Among Air Purification Technologies*2

Sharp Corporation has demonstrated that Plasmacluster Ions reduce activity of the highly fatal and highly pathogenic airborne H5N1 avian influenza ("bird flu") virus by 99%. This research was conducted in collaboration with Retroscreen Virology, Ltd., an organization which was established by one of the world's leading authorities on virology, Professor John S. Oxford of the University of London School of Medicine & Dentistry, and which works in compliance with Good Laboratory Practice*3 (GLP). Among the diverse range of air purification technologies available, Plasmacluster Ions are the first in the world to have been proven effective against this virus.

Plasmacluster Ion technology was developed in 2000 and is an air purification technology that disables airborne microorganisms by releasing positive and negative ions into the air. In the five years since its development, Sharp has been working together with academic research organizations around the world based on a "collaborative research approach to product marketing*4" and has demonstrated that Plasmacluster Ions are effective against a total of 26 kinds of harmful airborne substances, including bacteria, mold fungi, viruses and allergens. In addition, in November 2004, the mechanism by which Plasmacluster Ions cause cell death was explained: they damage the proteins on the cell membrane surface of bacteria. It has now been proven scientifically that they have the potential to be effective against a broad array of harmful airborne substances that have proteins on their cell surfaces.

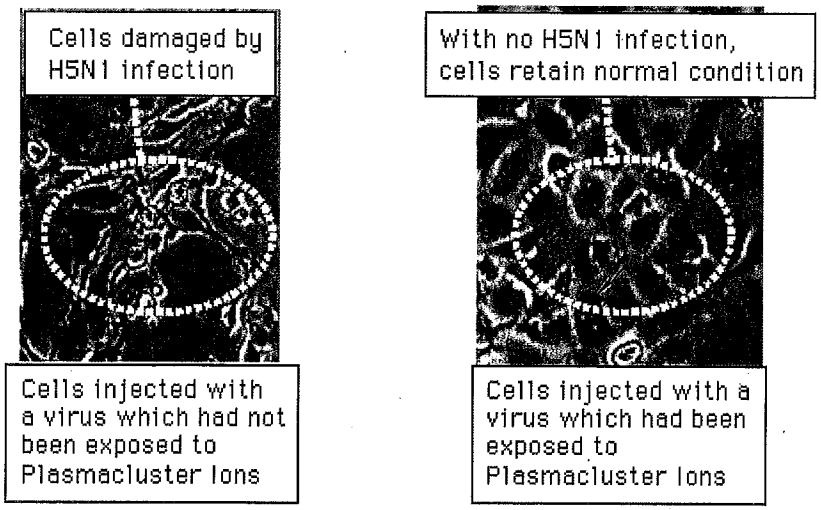
The type of avian influenza virus for which effectiveness has most recently been confirmed is the highly pathogenic H5N1 avian influenza virus, which has in fact taken a toll on human life. This research finding confirms that Plasmacluster Ions are effective against newly emerging viruses and has further expanded the fields in which Plasmacluster Ions demonstrate efficacy.

Efficacy Against H5N1 Avian Influenza Virus



Suppressive Effect on Viral Infection Using Cultured Cells (MDCK cells*5)

(Magnification: 40 times)



*1 *Plasmacluster and Plasmacluster Ions are trademarks of Sharp Corporation.*

*2 *As of June 6, 2005*

*3 *In the OECD (Organization for Economic Co-operation and Development), Good Laboratory Practice is a set of standards intended to ensure the reliability of test results by reviewing operation management, test equipment, test design, internal audit controls, quality assurance systems, test results, etc., at all test facilities. Re-certification is required every three years.*

*4 *The "collaborative research approach to product marketing" verifies the effectiveness of a technology based on scientific data developed in collaboration with leading-edge academic research institutions. New products are then brought to market based on the results.*

*5 *Canine kidney cells*

Virus infection test using cultured cells
A Plasmacluster Ion Generator was placed in a box with a volume of one (1) m^3, and Plasmacluster Ions were generated (concentration: 7000 ions/cm^3). Then, aerosolized highly pathogenic avian influenza virus was sprayed into the box. Five minutes after the spraying was complete, the air in the box containing the airborne virus was sampled at 10-minute intervals. The virus was then extracted and injected into cell cultures. Changes in the cells were then observed over a four-day period.

Four days after injection, the cells injected with the virus that had not been exposed to Plasmacluster Ions were deformed and damaged. In contrast, cells injected with the virus that had been exposed to Plasmacluster Ions retained their normal condition with almost no change in evidence.

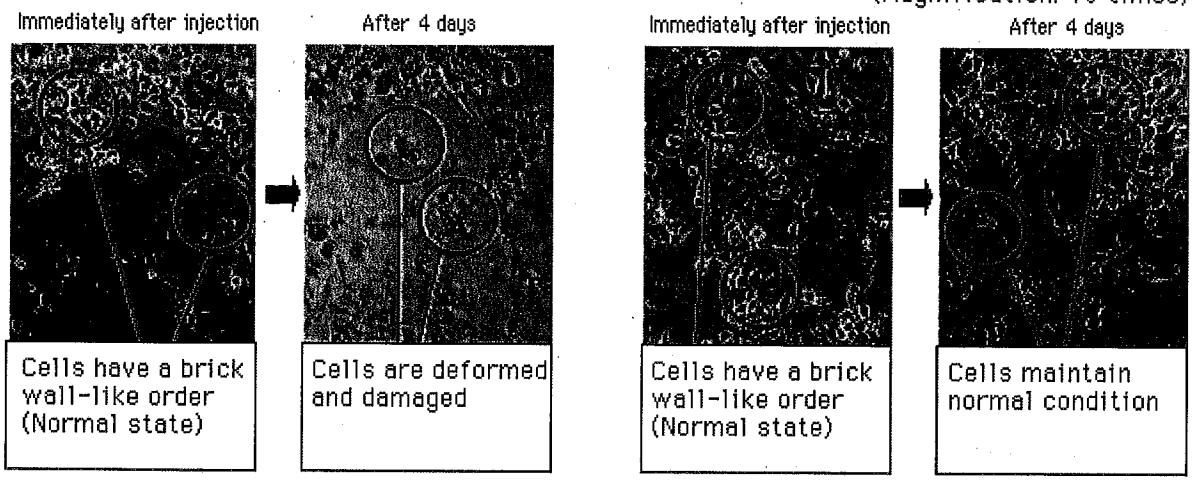
From this, it was confirmed that Plasmacluster Ions can reduce the activity of the virus by 99%. (The $TCID_{50}$ [Tissue Culture Infectious Dose 50%] assay, which is widely used in the field of virology, was used to evaluate the test results.)

Observation photographs of cells (MDCK cells) injected with virus samples

Cells injected with virus sample not exposed to Plasmacluster Ions

Cells injected with virus sample exposed to Plasmacluster Ions

(Magnification: 10 times)



Analysis of cell antibodies with the Fluorescent Antibody Technique
Both the virus samples, those exposed to Plasmacluster Ions and those not, were injected into cells and the cell reaction to the viral infection was evaluated. This examination was conducted using the Fluorescent Antibody Technique, a standard method in the field of virus research. The technique involves dyeing cells with fluorescence to identify whether or not the cell is infected; if the cell has been infected by the virus, it will radiate.

In cells injected with the virus "not exposed" to Plasmacluster Ions, fluorescent coloring indicative of a viral infection was present. And, in contrast, the coloring was not present in cells injected with the virus "exposed" to Plasmacluster Ions. From this analysis, the virus sampled in the presence of Plasmacluster Ions was verified to have lost its capacity for infection.

Fluorescent coloring photograph of cells (MDCK cells) injected with virus samples

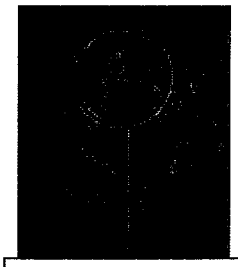
Injected with a virus sample not exposed to Plasmacluster Ions

Injected with a virus sample exposed to Plasmacluster Ions

(Magnification: 7 times)

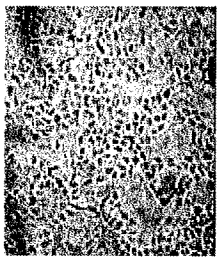
Microscope photograph

Fluorescent coloring

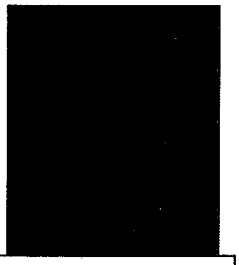


Infected cells are dyed green

Microscope photograph



Fluorescent coloring



No visible dyed parts indicating no infection

About Highly Pathogenic Avian Influenza ("Bird Flu")

Various types of influenza virus are classified according to two types of "spikes" on the virus surface (H: hemagglutinin and N: neuraminidase), and among these, viruses that infect poultry and cause illness and death are well known, such as H5N1, H7N7, H9N2, etc.

In contrast to mildly pathogenic influenza viruses which infect and proliferate only in the respiratory organs and intestinal tract and whose symptoms remain relatively minor, highly pathogenic influenza viruses infect and multiply throughout the entire body. In poultry, the mortality rate approaches 100%.

Since 1997, avian influenza has taken a tremendous toll on poultry in Hong Kong, the Netherlands, Vietnam, Cambodia, Thailand, Korea and Japan. Furthermore, in Vietnam, Cambodia and Thailand, its transmission to humans, who were previously not considered susceptible, has been confirmed with the occurrence of 97 patient cases and 53 deaths[*6]. This current research proves the efficacy of Plasmacluster Ions on the highly pathogenic H5N1 avian influenza virus, which has in fact taken a toll on human life.

**6 As of May 19, 2005; according to a news release from the World Health Organization (WHO).*

Overview of Plasmacluster Ion Technology

A plasma discharge generates positive ions (H^+) and negative ions (O_2^-) from water vapor in the air. These ions have the property of clustering around microparticles, and thus, they surround harmful substances such as airborne mold, viruses and allergens. At that point, a chemical reaction occurs on the cell membrane surface, and they are transformed into OH radicals, a powerfully active but unstable material, which robs the harmful substance of a hydrogen atom (H). As a result, they are inactivated by severing the protein on the cell membrane, opening holes. The OH radicals instantly bond with the removed hydrogen (H),

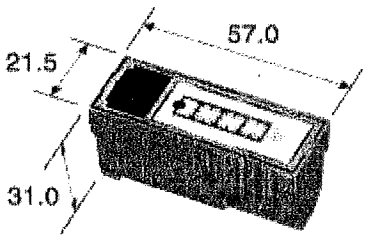
forming water vapor (H_2O), and return to the air.

1) The Plasmacluster Ions are the same positive and negative ions found in abundance in nature, for example, in woods and forests. They turn into OH radicals only on the surface of harmful substances to inactivate them, so they are completely harmless to the human body. The amount of ozone generated is less than 0.01 ppm, significantly below the 0.05-ppm value set as the standard for industry and for electrical equipment.

2) Compared to passive air cleaning systems that trap airborne contaminants by using a fan to draw air through a filter, air purification systems based on Plasmacluster Ions effectively eliminate bacteria by working directly on the air contained in the entire room.

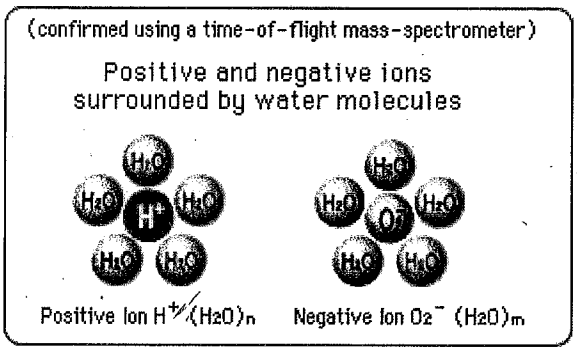
3) The Plasmacluster Ion Generator never loses its effectiveness by becoming dirty and never needs replacing like filters. It consumes a miniscule amount of electricity (0.5 W). Annual electricity costs for continuous use are around ¥100.

Plasmacluster Ion Generator



Units: mm

Chemical Composition and Structure of Plasmacluster Ions



Efficacy of Plasmacluster Ions on Various Pathogens Confirmed Through Collaborative Research

Target Substance	Species	Testing & Verification Organization	Date of Announcement
Fungi	Cladosporium (black mold, mildew)	Ishikawa Health Service Association	September 2000
		Universitäklinikums Lübeck University Clinic (Germany) (proliferation control effect)	February 2002
		CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences)	November 2004
	Penicillium, Aspergillus	Universitäklinikums Lübeck University Clinic (Germany) (proliferation control effect)	February 2002
	Aspergillus, Penicillium (two species), Stachybotrys,	CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences)	November 2004

	Alternaria, Mucorales		
Bacteria	Coliform bacteria (E. coli)	Ishikawa Health Service Association	September 2000
	E. coli, Staphylococcus (aureus), Candida	Shanghai Municipal Center for Disease Control and Prevention, China	October 2001
	Bacillus subtilis	Kitasato Research Center of Environmental Sciences	September 2002
		CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences)	November 2004
	MRSA (methicillin-resistant Staphylococcus aureus)	Kitasato Research Center of Environmental Sciences	September 2002
		Kitasato Institute Medical Center Hospital	February 2004
	Pseudomonas, Enterococcus, Staphylococcus	Universitäklinikums Lübeck University Clinic (Germany)	February 2002
	Enterococcus, Staphylococcus, Sarcina, Micrococcus	CT&T (Professor Gerhard Artmann, Aachen University of Applied Sciences)	November 2004
Allergens	Mite allergen (dust from dead mite bodies and feces), pollen	Graduate School of Advanced Sciences of Matter, Hiroshima University	September 2003
	Airborne allergens	Asthma Society of Canada	April 2004
Viruses	H1N1 influenza virus	Kitasato Research Center of Environmental Sciences	September 2002
		Seoul University, Korea	September 2003
		Shanghai Municipal Center for Disease Control and Prevention, China	December 2003
		Kitasato Institute Medical Center Hospital	February 2004
	H5N1 avian influenza virus	Retroscreen Virology, Ltd, London, U.K.	May 2005
	Coxsackie virus (summer colds)	Kitasato Research Center of Environmental Sciences	September 2002
	Polio virus	Kitasato Research Center of Environmental Sciences	September 2002
	Corona virus	Kitasato Institute Medical Center Hospital	July 2004

Profile of Professor John S. Oxford

- World authority on virology

- Professor, Institute of Cell and Molecular Science at St. Bartholomew's and The Royal London Hospital, Queen Mary's School of Medicine and Dentistry, London, U.K.
- Founder and Scientific Director, Retroscreen Virology Ltd.,

Expertise
Virology

Publications
- Published over 250 scientific papers
- Co-authored three standard texts:
  1) Influenza, the Viruses and the Disease
  2) Human Virology, a Text for Students of Medicine, Dentistry and Microbiology
  3) Conquest of Viral Diseases

Other Professional Activities
- Appeared on numerous radio and TV programs (BBC, National Geographic, etc.)
- Served as chairman of numerous international scientific and academic conferences

Conferences where Prof. Oxford will serve as Chairman in the near future:
1) Second European Conference on Influenza, September 2005, Malta
2) Optimizing Antiviral Drug Therapy Symposium, October 2005, Berlin
3) The Central Role of Antivirals for the First Pandemic of the 21st Century, January 2006, London

About the University of London
Established in 1836 as England's national university, the University of London consists of 19 colleges with a total of 115,000 students, one of the largest student bodies in the world.

Queen Mary is one of the largest multi-faculty colleges of the University of London. Queen Mary merged with two distinguished medical colleges, St Bartholomew's Hospital Medical College, established in 1843, and the London Hospital Medical College, England's oldest medical school, founded in 1785, to form the School of Medicine & Dentistry. With nearly 8,800 students, the School provides education in a wide range of fields in addition to medicine and dentistry, including biology, chemistry, physics, electrical engineering, computer science, law, literature, and political science.

Dinstinguished Graduates
Alexander Graham Bell, Hirofumi Ito (first prime minister of Japan), John F. Kennedy, Mahatma Gandhi, H.G. Wells, Arthur C. Clarke; seven Nobel Prize winners.

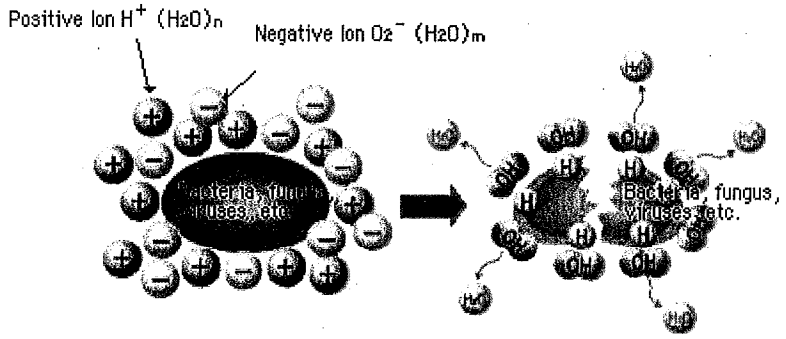
About Retroscreen Virology, Ltd.
Founded in 1989 by Professor John Oxford, Retroscreen Virology Ltd. is a recognized leader in the research and testing of antiviral compounds and vaccines. In carrying out safety tests

of chemical substances, the company works to extremely high standards in compliance with the principles of Good Laboratory Practice (GLP), an international management standard for maintaining high reliability, and has obtained accreditation under the quality control management standard ISO 9001.

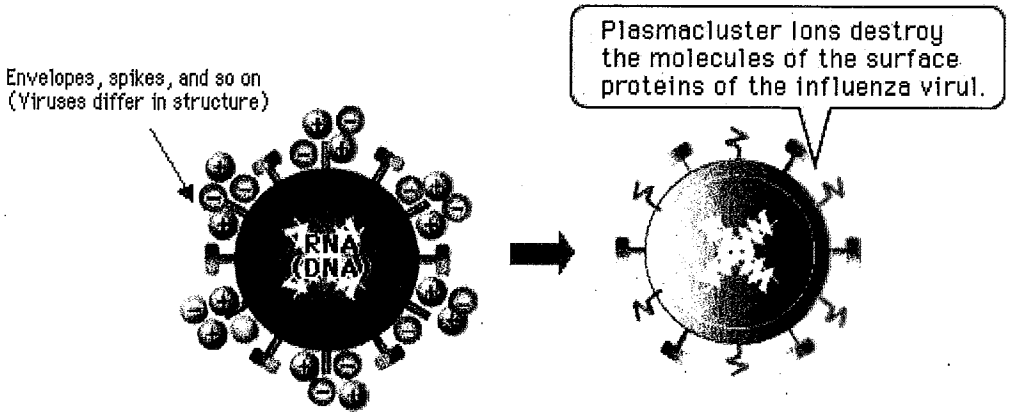
Reference

Mechanism of Plasmacluster Ion for Inactivating Harmful Substances

Mechanism for Inactivating Airborne Fungi
The positive (H^+) and negative (O_2^-) ions cluster together on the surface of airborne fungi, causing a chemical reaction that results in the creation of highly reactive OH groups called hydroxyl radicals (•OH). The hydroxyl radical will take a hydrogen molecule from the cell wall of an airborne fungi particle. Inhibits mold infestation as well as controls musty and household odors (caused in large part by mold fungi) as they occur.

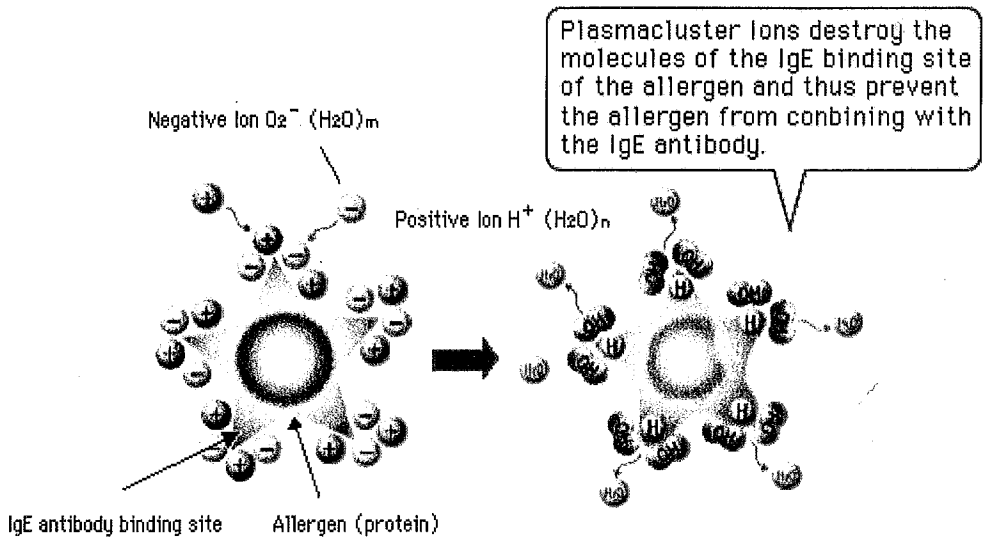


Mechanism for Inactivating Airborne Virus
The positive (H^+) and negative (O_2^-) ions surround the hemagglutinin (surface proteins that form on organisms and trigger infections) and change into highly reactive OH groups called hydroxyl radicals (•OH). These take a hydrogen molecule from the hemagglutinin and change into water (H_2O). The ions destroy the virus surface structure, for example its envelopes and spikes, on a molecular level. As a result, the virus cannot infect even if it enters the body.



Mechanism for Deactivating Airborne Allergens
The positive (H^+) and negative (O_2^-) ions surround the airborne allergen and change into highly reactive hydroxyl radicals (•OH). The hydroxyls then deactivate the molecules of the

IgE antibody binding site of the allergen. No allergic symptoms occur even if allergens enter the body.



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filename gutachten/sharp1

22 April 2002

Expert Report

Testing of the fungistatic and bacteriostatic/bactericidal action of plasma cluster ions, generated by the plasma cluster generator 1 (from Sharp), in a test chamber under static test conditions

T №0 04268

June 4, 2010

Sharp Confirms Three Skin Beautifying Effects from Water Molecule Coating— Preserves Skin Moisture as Well as Improves Skin Elasticity and Texture

Mechanism Behind Skin Moisture Preservation by High-Density Plasmacluster Ions*1 (25,000 Ions/cm^3)*2 Explained

Sharp Corporation, in collaboration with Professor Michio Niwano of the Research Institute of Electrical Communication at Tohoku University, has proven that the skin moisture preservation effect of high-density Plasmacluster Ions (density of 25,000 ions/cm^3) announced in February of this year*3 is based on a mechanism in which the water molecules of the ions form a "water molecule coating" on the surface of the skin.

Further, through testing commissioned to Soiken Inc.*4, it was proven in actual living spaces (floor area of approximately 9.8 m^2 to 13.2 m^2) that three skin beautifying effects*5 can be obtained based on the water molecule coating function. The three effects are retaining skin moisture*3 (previously announced), improving skin elasticity, and improving skin texture.

Plasmacluster is Sharp's proprietary air purification technology based on positive and negative ions generated by applying a plasma discharge to the moisture and oxygen in the air. Working with academic research organizations around the world, Sharp has thus far proven that Plasmacluster technology is effective against 28 kinds of harmful substances. Research has also confirmed its safety*6.

Sharp currently has 11 of its own Plasmacluster-application products, and 24 companies in other business fields have also adopted Plasmacluster technology for use in products*7 as diverse as railway coaches and car air conditioners. In addition, the use of in-vehicle and professional-use Plasmacluster products is expanding to a wide variety of spaces including hotels, daycare facilities, and taxi interiors.

Sharp will use this new proven efficacy of Plasmacluster Ions to work toward even more widespread use of products incorporating Plasmacluster technology in the home, as well as in the office and in vehicles.

*1 Plasmacluster Ion and Plasmacluster are trademarks of Sharp Corporation.
*2 A measure of the number of ions/cm^3 emitted into the air measured at a point near the center of a room (at a height of about 1.2 m from the floor) having an appropriate floor surface area, during operation at the "high" airstream setting, when the high-density Plasmacluster Ion generator is placed near a wall.
*3 Announced on February 17, 2010.
*4 Soiken Inc. conducts clinical trials on a contract basis for the development of pharmaceuticals and foods.
*5 Effect will vary depending on the individual.
*6 Testing conducted by Mitsubishi Chemical Medience Corporation, including tests for inhalation toxicity and for skin and eye irritancy and corrosivity.
*7 Ion density differs with each product.

1. Mechanism for preserving skin moisture by high-density Plasmacluster Ions (25,000 ions/cm^3) explained

The positive and negative ions generated by the plasma discharge are surrounded by water molecules, and remain suspended in the air (Figure 1). Working in collaboration with Professor Michio Niwano of the Research Institute of Electrical Communication at Tohoku University, it was confirmed that the water molecules surrounding the ions adhered to the surface of a substance simulating human skin, forming a "water molecule coating." As a result, the mechanism by which the evaporation of water molecules from the skin is inhibited, thereby making it possible to obtain a moisturizing effect, was revealed. (Figure 2)

In testing, a Plasmacluster Ion generator was placed in a spectroscopic instrument to analyze the molecules of water. Infrared absorption spectroscopy (IRAS) with multiple internal reflection (MIR) geometry*8 was used to confirm the presence of a water molecular layer (water molecule coating)*9 on the surface of a plate designed to simulate human skin*10 when ions were being generated and when they were not being generated. It was confirmed that, when no ions were generated, there was no adhesion of water molecules. In contrast, when ions were being generated, the adhesion of water molecules was confirmed after approximately ten minutes*9 of ion generation, and it was shown that, after the generation of ions was stopped at approximately 80 minutes, the water molecule coating function persisted for several dozen minutes. (Figure 3)

*8 A method to detect chemical substances adhering to solid surfaces with high sensitivity.
*9 A plate made of a silicone is used.
*10 The water molecule layer is several nanometers (nm) thick; 1 nm = 1 millionth of a mm.

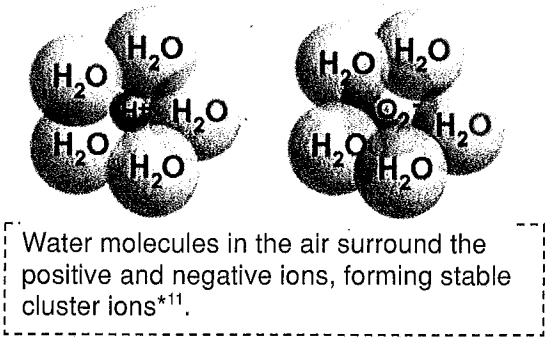


Figure 1: Schematic drawing of Plasmacluster Ions (conceptual rendering)

*11 These ions are shaped like clusters of grapes.

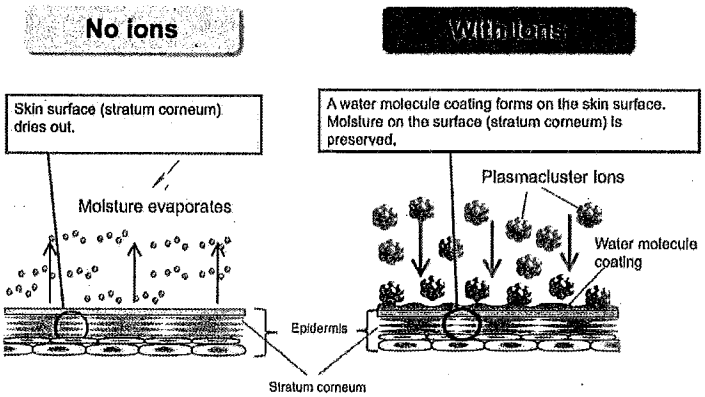


Figure 2: Skin moisture preservation mechanism (conceptual rendering)
Water molecule coating function

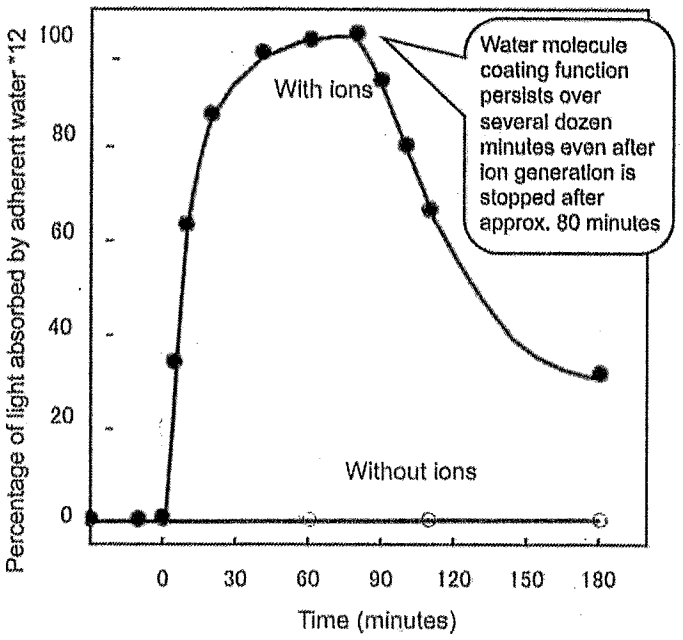


Figure 3: Change over time in percentage of light absorbed as a result of adherent water

*12 The higher the percentage of light absorbed by adherent water, the more water molecules attached to the skin.

Comments by Professor Michio Niwano of the Research Institute of Electrical Communication at Tohoku University

It was quite surprising that Plasmacluster Ions surrounded by water molecules adhered to the surface so readily. We also confirmed that Plasmacluster Ions readily adhere to surfaces where proteins have adsorbed, so the moisturizing effect of Plasmacluster Ions on the skin can be fully accepted. I hold out great expectations that this Plasmacluster technology will be able to find even wider application in the health-related field.

About the Research Institute of Electrical Communication at Tohoku University

The Research Institute of Electrical Communication (RIEC) was established in 1935 as a research institute affiliated with Tohoku Imperial University to study the theory of higher-order information and communication technologies and their practical application. The Institute takes the view that everything from the basic science of materials and information, to devices, circuitry, architectures, and software to generate, identify, transmit, store, process, and control information forms an integrated system. Based on organized collaboration with researchers inside and outside the Institute, it strives to extend its research findings to other areas and integrate its activities with groups working in other fields.

2. Proof of three skin beautifying effects based on the water molecule coating function of high-density Plasmacluster Ions (25,000 ions/cm^3)

1) Preserves skin moisture*13

The graph at the right shows the moisture preservation effect announced on February 17, 2010.

The fact that it is based on this water molecule coating function has now been explained.

*13 Test conditions for confirming the skin moisture preservation effect: a Plasmacluster Ion generator was set up in a testing room having a floor area of approximately 9.8 m^2 with the temperature adjusted to 28°C and humidity around 40% relative humidity (RH). Tests were conducted on 13 healthy female subjects ranging from 20 to 65 years of age. Announced on February 17, 2010.

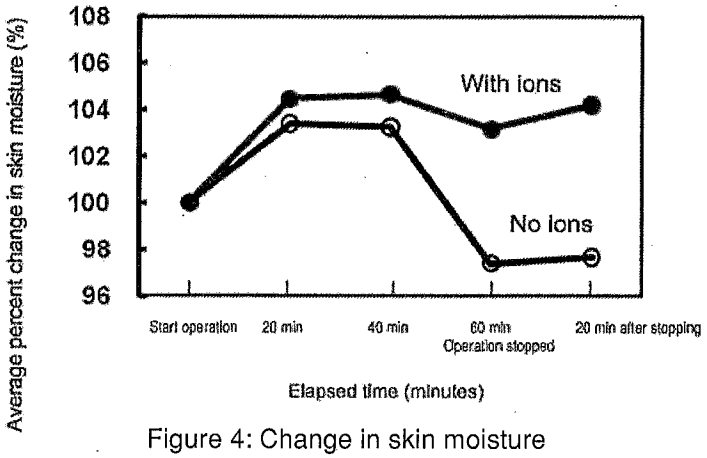


Figure 4: Change in skin moisture

2) Improves skin elasticity*14

A Plasmacluster Ion generator was used daily upon retiring at night. The elasticity of the skin was measured using a Cutometer® MPA580*15, an instrument commonly employed in medical research, at 14 days and 28 days after the start of use. The results confirmed that the elasticity of the skin in the cheek area of the face, which is regarded as an indicator of skin age*16, improved when the Plasmacluster Ion generator was used. (Figure 5)

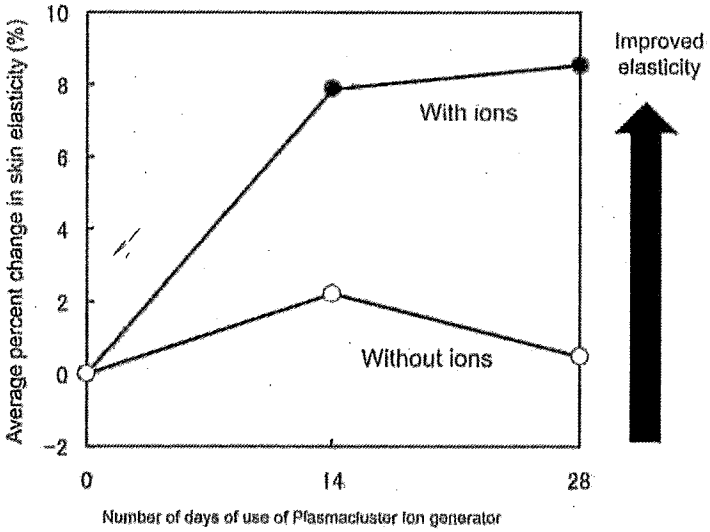


Figure 5: Change in skin elasticity

*14 A Plasmacluster Ion generator was set up in actual living spaces having floor areas of approximately 9.8 m^2 to 13.2 m^2. Tests were conducted on 24 healthy female subjects ranging from 30 to 65 years of age. The Plasmacluster Ion generator was used at bedtime every day for a period of 28 days, the time required for the skin to renew itself through natural cellular metabolism.

*15 Manufactured by Courage + Khazaka Electronic Gmbh.

*16 "Skin age" is an indication of the level of skin aging, for example, the degree to which the skin is firm and healthy looking, etc., expressed in number of years, and is used as guideline for skin care.

3) Improves skin texture*[14]

Test subjects used a Plasmacluster Ion generator on a daily basis only upon retiring at night. After 28 days of use (the time required for the skin to renew itself through natural cellular metabolism), the condition of the skin underneath the outer corner of the eye was examined by microscope. As a result, it was confirmed that skin texture improved after use of the Plasmacluster Ion generator. (Figure 6)

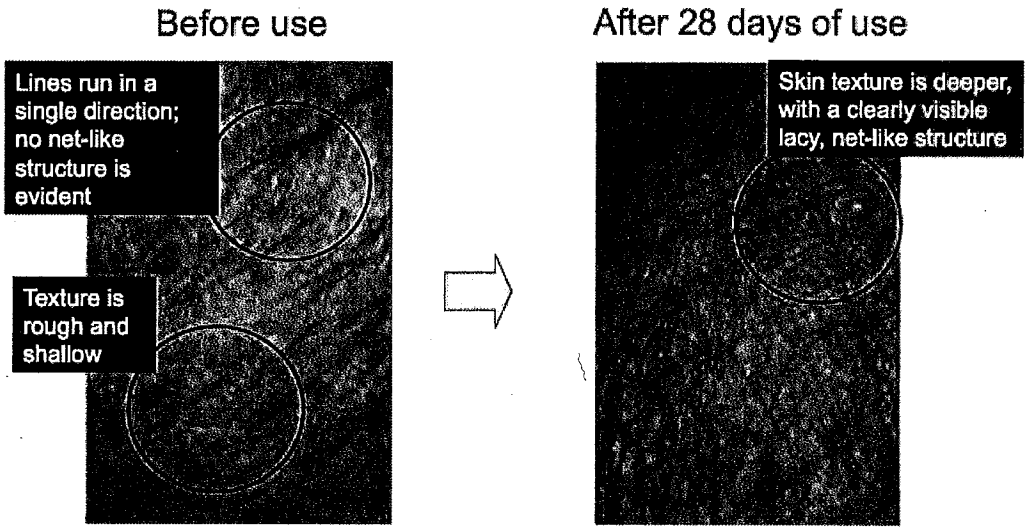


Figure 6: Example of change in skin condition (30X photomicrograph)

In addition, an opinion questionnaire using a Visual Analogue Scale (VAS) survey instrument*[17] was administered to the 24 test subjects to elicit their subjective responses to the test.
As a result, statistically significant responses were obtained for items such as "The skin is moister," "Make-up goes on more smoothly and evenly," and "The skin feels soft" after the Plasmacluster Ion generator had been used, when compared to not having used the Plasmacluster Ion generator.

*17 A method employed in the medical field that uses numerical values to objectively evaluate subjective perceptions, such as the severity of pain.

Comment by Mr. Tomohiro Sugino, Representative Director of Soiken Inc.
Following on the skin moisturizing effect announced in February of this year, these current tests prove the effectiveness of Plasmacluster Ions in improving skin elasticity and skin texture. It is believed that these effects are the result of the skin being coated with water from Plasmacluster Ions. Based on this proof, Plasmacluster technology can be expected to be one measure for skin care.

About Soiken Inc.
Soiken was founded as Soiken Limited in 1994 and underwent reorganization to become Soiken Inc. in 2001. The company has since been developing businesses related to medical marketing support and providing specific health care advice related to lifestyle diseases, as well as conducting clinical trials of foods and devices, making use of its independently developed technologies for biomarkers and assay systems.

October 13, 2016

Plasmacluster Ion Technology*[1] Shown to Promote Hair Growth by Improving Barrier Function of Scalp*[2] (Improving Scalp Environment)

Sharp Corporation has shown that Plasmacluster ion technology is effective in improving the barrier function of scalp and promoting hair growth in tests conducted on patients undergoing mesotherapy*[3] for hair growth. Tests were commissioned to National Trust Co., Ltd. (head office: Minato-ku, Tokyo; president: Hideki Setoyama), and conducted at the Shinjuku Ouka Clinic of the HARG Treatment Center (location: Shinjuku-ku, Tokyo; chief physician: Hirotaro Fukuoka) using an ion-generating device for clinical testing (ion concentration of approx. 1.5 million ions/cm^3).

In addition, in tests commissioned to Soiken Inc. (head office: Toyonaka City, Osaka Prefecture; CEO: Tomohiro Sugino), a hair and beauty care testing device for clinical testing (ion concentration of approx. 3.3 million ions/cm^3) was used on healthy women. Results showed an improvement in the barrier function of the scalp, a decrease of scalp oil, and a decrease in the microorganism (malassezia fungi) causing dandruff and itching. Many of the test subjects surveyed after the tests said that they no longer had problems with itchy scalp and that it felt like their hair had more volume.

There has been a focus in recent years on preventing baldness and caring for the scalp in response to people's hair concerns as they get older. Against this background, Sharp looked at the water molecule clusters that make up the company's Plasmacluster ions. In 2010, in joint tests conducted with Professor Michio Niwano of the Research Institute of Electrical Communication, Tohoku University, it was shown*[4] that the water molecules of Plasmacluster ions form a water molecule coat on the skin. Joint tests with Soiken showed*[5] that the water coating function of the water molecules has beautifying effects (moisture retention*[6], resilience improvement*[7], smoothness and radiance improvement*[7], and oil reducing effect*[7]), and the effect of reducing bacteria that cause rough skin.

Since 2000, Sharp has been conducting academic marketing*[8] showing the effects of Plasmacluster ions in collaboration with world-class third-party test institutes. So far, Sharp and numerous third-party test institutes*[9] have shown beautifying effects, such as beautification of skin and hair, and have confirmed the safety*[10] of Plasmacluster ions. As Plasmacluster ion technology advances, Sharp will continue to prove its effects in order to contribute to the field of beauty and hair care.

For more information please contact (press only please)
Osaka: +81-6-6796-1462 Tokyo: +81-3-5446-8205

Comment from Hideki Setoyama, President, National Trust Co., Ltd.

The tests confirmed that patients undergoing mesotherapy for hair growth exposed to Plasmacluster ions showed a trend of reduced transpiration of moisture from the scalp, as well as a significant increase in the number of hairs that grew. It is thus very probable that Plasmacluster ion technology can help improve the scalp environment.

Comment from Tomohiro Sugino, CEO, Soiken Inc.

In double-blind tests, Plasmacluster ion technology was found to improve scalp functions, and test subjects surveyed after the tests said that they no longer had problems with itchy scalp and that it felt like their hair had more volume. This shows that Plasmacluster ion technology constitutes effective treatment in the field of hair and beauty care. Plasmacluster ion technology thus holds promise for improving the scalp environment and helping provide customers with healthy, sanitary hair and beauty care.

*1 Plasmacluster is a registered trademark of Sharp Corporation.
*2 The function of retaining moisture in the scalp.
*3 A type of hair loss treatment.
*4 Announced on June 4, 2010.
*5 Announced on August 5, 2010.
*6 Announced on February 17, 2010.
*7 Announced on June 4, 2010.
*8 A marketing method in which a company collaborates with a leading research institute to gather and verify data on the effects of a certain technology, and then uses this data as the basis for commercialization of the technology.
*9 Current as of October 13, 2016.
*10 According to tests conducted by LSI Medience Corporation (inhalation toxicity test, eye and skin irritation/corrosion tests, teratogenicity test, and two-generation reproduction toxicity test).

■ Hair Growth Promotion Verification Test

● Clinical testing institutes
National Trust Co., Ltd.
Shinjuku Ouka Clinic, HARG Treatment Center

● Test conditions

• Test subjects:	Patients undergoing mesotherapy for hair growth (115 men and women in their 20s to 70s)
• Assessment criteria:	Number of hairs, amount of transpiration of moisture from the scalp
• Test period:	Approx. 3 months
• Test method:	To assess the number of hairs that grow in the same spot, a 2-centimeter round spot was shaved on the right and left sides of the subjects' heads, and a tattoo was painted in the center of each shaved spot. Using an ion-generating device for clinical testing, the shaved spot on the right side was exposed to ions (ion concentration of approx. 1.5 million ions/cm^3) for approximately 20 minutes each day. Once a month, mesotherapy was performed on the shaved spots on the right and left sides. Each month, the number of hairs that grew in both the shaved spots (surface area of 160 mm^2) was counted.

● Test results

After three months, the number of hairs that grew on the shaved spots on the right side of the head, which were exposed to Plasmacluster ions, was found to be 2.5 times that of the shaved spots on the left side, showing a statistically significant increase*[11].

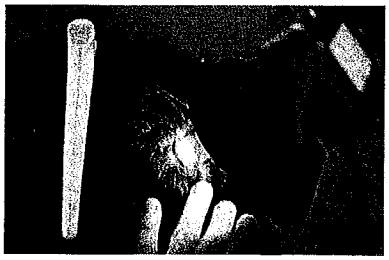
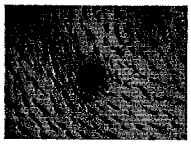


Photo 1: Clinical testing

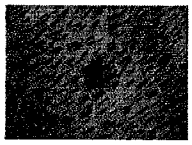
Average number of hairs (Hair/160 mm^2)

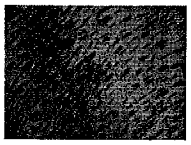
	Initially	After 1 month	After 2 months	After 3 months	Increase in number of hairs after 3 months
Right side (exposed to ions)	224.0	233.3	232.1	244.9	20.9
Left side (not exposed to ions)	219.0	226.9	224.7	227.2	8.2
Right-left difference	5.0	6.4	7.4	17.7	–

Test result 1—Subject: Female aged 50–59



Test result 2—Subject: Male aged 30–39





Left photos: Before start of test; right photos: after 3 months of exposure to ions

■ Scalp Environment Improvement Verification Test

● Clinical testing institute
Soiken Inc.

● Test conditions

- Test subjects: 59 healthy people (women aged 40 to 63)
- Assessment criteria: Amount of transpiration of moisture from scalp, amount of scalp oil, amount of malassezia fungi on the scalp, visual analogue scale (VAS)*[12]
- Test period: Approx. 3 months
- Test method: In a randomized, double-blind, parallel group, comparative study*[13], two groups were exposed to airflow from a hair and beauty care testing device for clinical testing for 5 minutes a day for 12 continuous weeks. The test group of 29 people was exposed to airflow containing ions (concentration of 3.3 million ions/cm^3) and the control group of 30 people was exposed to airflow containing no ions. The two groups were compared on the assessment criteria.

Photo 2: Using a hair and beauty care testing device for clinical testing

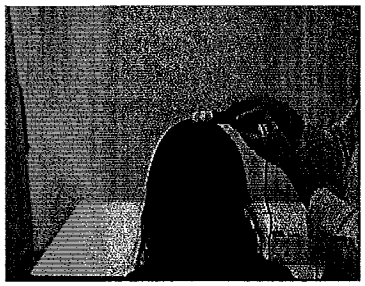


Photo 3: Measuring the scalp environment

Test results

Compared to the test subjects exposed only to airflow containing no ions, the test subjects exposed to airflow containing ions showed lower levels of transpiration of moisture from the scalp, scalp oil, and the microorganism (malassezia fungi) that causes dandruff and itching.

In response to a VAS questionnaire administered before and after the test, compared to the test subjects exposed only to airflow containing no ions, the test subjects exposed to airflow containing ions showed a positive trend in the difference in value*[14] on questionnaire items for "increased hair volume," "dandruff concerns," "scalp itchiness concerns," "gray hair concerns," "scalp odor concerns," "and hair part concerns." Likewise, on the questionnaire item "hair-loss concerns," test subjects exposed to ions showed a positive trend in the difference in responses before and after the test*[14].

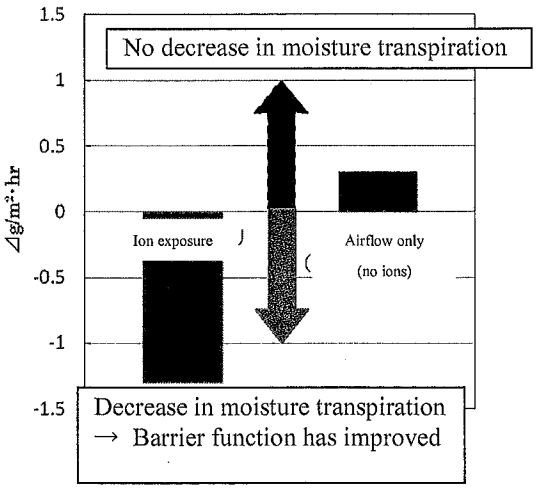


Chart 1: Comparison of transpiration of moisture from scalp (scalp barrier function)

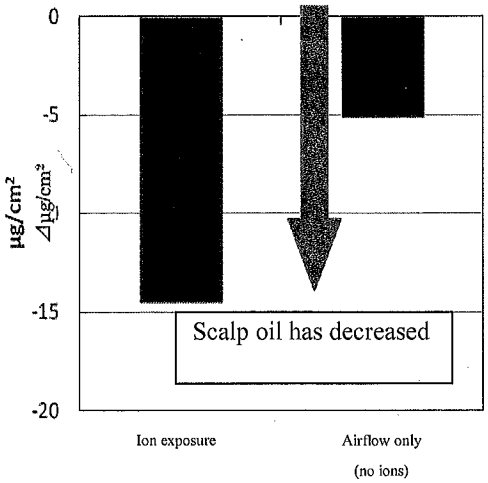


Chart 2: Comparison of amount of scalp oil

*11 Test results confirmed a statistically significant p-value of 0.05 or less.
*12 Visual analogue scale (VAS): A measurement of how the test subjects feel about the test (subjective measurement).
*13 Randomized, double-blind, parallel group, comparative study: Test subjects and evaluators take the test without being told whether the airflow contains ions. This clinical testing method eliminates bias between test subjects and evaluators and allows for the objective discovery of the effect of the intervention.
*14 Although the test results did not reach the statistically significant p-value of 0.05 or less, they reached a p-value of less than 0.20 or less, enough to confirm a positive trend for these questionnaire items.

■ National Trust Co., Ltd.

Established in 1998. Started Japan's first financial scheme for the liquidation of compensation and receivables in the medical care field. Its main areas of business are management support for healthcare organizations, management turnaround of facilities, new business startup, and business succession.

■ Shinjuku Ouka Clinic, HARG Treatment Center

Opened in 2012 as the Ouka Clinic, Oukaikai Medical Corporation. Specializes in HARG*[15] (hair regenerative therapy) treatment, while instructing clinics around Japan in HARG treatment.

*15 HARG: A regenerative method in which AAPE (Advanced Adipose-Derived Stem Cell Protein Extract), which includes more than 150 types of growth factors and extracted from stem cells (the starting point of all cells in the human body) is injected directly into the scalp to restore hair growth functions.

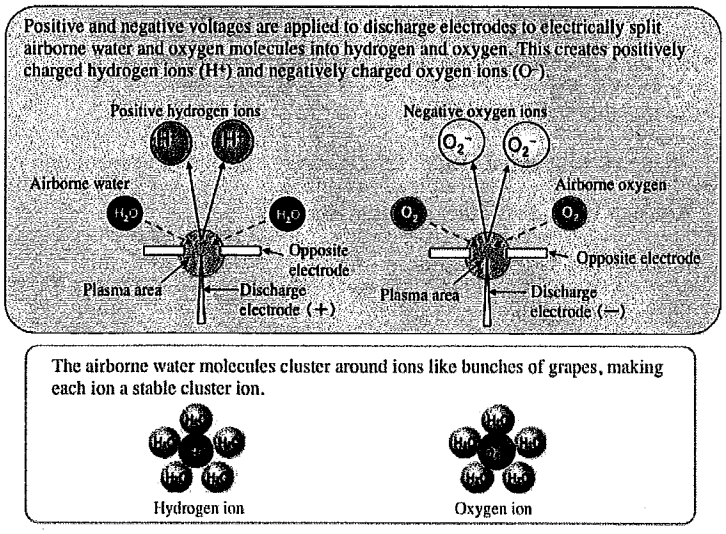
■ Soiken Inc.

Established in 2007. Conducts clinical evaluation tests for foods and equipment using in-house-developed biomarkers and evaluation systems, provides pharmaceutical marketing support, and carries out specific health guidance.

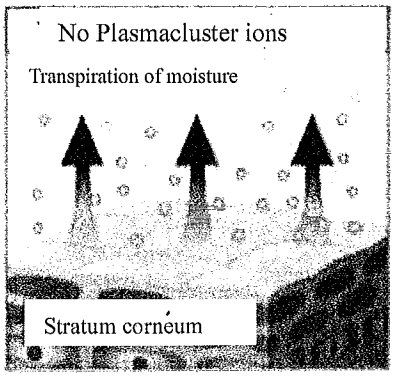
■ About Plasmacluster Technology

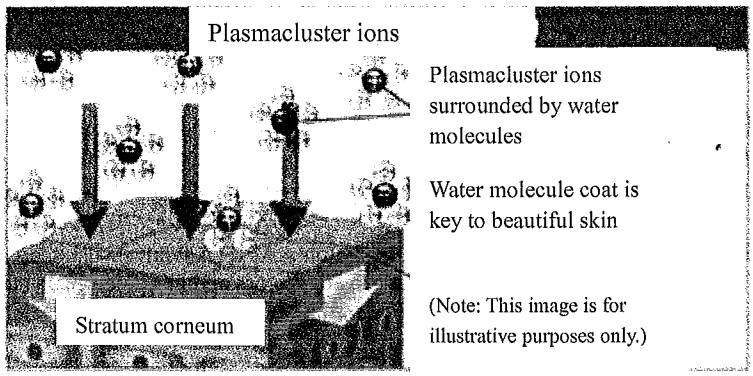
In Sharp's proprietary air purification technology, positively charged hydrogen ions ($H^+ (H_2O)_n$) and negatively charged oxygen ions ($O_2^- (H_2O)_m$) are discharged simultaneously. These positive and negative ions instantaneously bond on the surface of airborne substances such as bacteria, fungi, viruses, and allergens, becoming highly reactive OH radicals (hydroxyl radicals) that break down the proteins on the surface of these bacteria and other substances. By chemical reaction, the OH radicals work to suppress the activity of those substances.

How Plasmacluster Ions Are Generated



How a water molecule coat is formed with Plasmacluster ions





Skin surface (stratum corneum) dries out

Skin surface (stratum corneum) retains its moisture

• Test institute: Research Institute of Electrical Communication, Tohoku University

28 Research Institutes That Provided Data for Sharp's Academic Marketing

Target	Testing and Verification Organization	Country
Efficacy proven in clinical trials	Graduate School of Medicine, University of Tokyo / Public Health Research Foundation	Japan
	Faculty of Science and Engineering, Chuo University / Clinical Research Support Center, University Hospital, University of Tokyo	Japan
	Animal Clinical Research Foundation	Japan
	Soiken Inc.	Japan
	School of Bioscience and Biotechnology, Tokyo University of Technology	Japan
	National Trust Co., Ltd. / HARG Treatment Center	Japan
	National Center of Tuberculosis and Lung Diseases	Georgia
Viruses	Kitasato Research Center of Environmental Sciences	Japan
	Seoul National University	Korea
	Shanghai Municipal Center for Disease Control and Prevention	China
	Kitasato Institute Medical Center Hospital	Japan
	Retroscreen Virology, Ltd.	UK
	Shokukanken Inc.	Japan
	University of Indonesia	Indonesia
	Hanoi College of Technology, Vietnam National University	Vietnam
	Institut Pasteur, Ho Chi Minh City	Vietnam
Allergens	Graduate School of Advanced Sciences of Matter, Hiroshima University	Japan
	Department of Biochemistry and Molecular Pathology, Graduate School of Medicine, Osaka City University	Japan
Fungi	Ishikawa Health Service Association	Japan
	University of Lübeck	Germany

	Professor Gerhard Artmann, Aachen University of Applied Sciences	Germany
	Japan Food Research Laboratories	Japan
	Shokukanken Inc.	Japan
	Shanghai Municipal Center for Disease Control and Prevention	China
Bacteria	Ishikawa Health Service Association	Japan
	Shanghai Municipal Center for Disease Control and Prevention	China
	Kitasato Research Center of Environmental Sciences	Japan
	Kitasato Institute Medical Center Hospital	Japan
	Dr. Melvin W. First, Professor Emeritus, Harvard School of Public Health	US
	Animal Clinical Research Foundation	Japan
	University of Lübeck	Germany
	Professor Gerhard Artmann, Aachen University of Applied Sciences	Germany
	Japan Food Research Laboratories	Japan
	Shokukanken Inc.	Japan
	Chest Disease Institute	Thailand
Odors, pet smells	Boken Quality Evaluation Institute	Japan
Skin beautifying effects	School of Bioscience and Biotechnology, Tokyo University of Technology	Japan
Hair beautifying effects	Saticine Medical Co., Ltd.	Japan
	C.T.C Japan Ltd.	Japan
Working mechanism of inhibitory effects on viruses, fungi, and bacteria	Professor Gerhard Artmann, Aachen University of Applied Sciences	Germany
Working mechanism of inhibitory effects on allergens	Graduate School of Advanced Sciences of Matter, Hiroshima University	Japan
Working mechanism of skin moisturizing (water molecule coating) effect	Research Institute of Electrical Communication, Tohoku University	Japan

ISO 9001
Appendix

Certificate Number : JQA-QM4441

Organization :

SHARP APPLIANCES (THAILAND) LTD.

Scope of Registration:

- THE DESIGN / DEVELOPMENT, MANUFACTURE AND SUPPORT FOR SERVICING (SUPPLY OF SPARE PARTS) OF MICROWAVE OVENS, REFRIGERATORS AND AIR CONDITIONERS.
- THE DESIGN VERIFICATION, DESIGN VALIDATION, DESIGN CHANGE, MANUFACTURE AND SUPPORT FOR SERVICING (SUPPLY OF SPARE PARTS) OF HUMIDIFIERS, WATER OVEN, ION GENERATOR, AIR PURIFIER, WASHING MACHINE AND RICE COOKER.

Registration Date : March 3, 2000
Last Renewal Date : March 26, 2013

Expiry Date : March 25, 2016

O. Morimoto

OSAMU MORIMOTO
PRESIDENT

Feel free to contact JQA for the validity of this certificate.

JAPAN QUALITY ASSURANCE ORGANIZATION

This Appendix is an integral part of the Certificate and should only be used in conjunction with the Certificate.

JQA

ISO 9001
Management System Certificate

CERTIFIED JQA MANAGEMENT SYSTEM
QUALITY SYSTEM

Certificate Number : JQA-QM4441

Organization :

SHARP APPLIANCES (THAILAND) LTD.

64 MOO 5, BANGNA-TRAD KM. 37, TAMBOL BANGSAMUK, AMPHUR BANGPAKONG, CHACHOENGSAO, PROVINCE 24180 THAILAND

MS
JAB
CM009

UKAS MANAGEMENT SYSTEMS
091

IQNet

JQA certifies that the above organization operates the Quality Management System, within the scope of the Appendix attached, which has been assessed and found to comply with the requirements of;

ISO 9001 :2008 / JIS Q 9001 :2008

Registration Date : March 3, 2000
Last Renewal Date : March 26, 2013

Expiry Date : March 25, 2016

Feel free to contact JQA for the validity of this certificate.

O. Morimoto

OSAMU MORIMOTO
PRESIDENT

JAPAN QUALITY ASSURANCE ORGANIZATION

To be used in conjunction with attached Appendix.

TOKYO, JAPAN

JQA

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