

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 the scalp and promoting hair growth in tests conducted on patients undergoing mesotherapy*³ for hair growth. National Trust Co., Ltd. (head office: Minato-ku, Tokyo; president: Hideki Setoyama) was commissioned to conduct clinical tests, which were carried out 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 (with an ion concentration of approx. 1.5 million ions/cm³).

In addition, Soiken Inc. (head office: Toyonaka City, Osaka Prefecture; CEO: Tomohiro Sugino) was commissioned to carry out clinical tests with healthy female subjects using a hair and beauty care testing device for clinical testing (with an ion concentration of approx. 3.3 million ions/cm³). Results showed an improvement in the barrier function of the scalp, a decrease of sebum, and a decrease in the microorganism (malassezia fungi) that causes dandruff and itching. Many of the test subjects surveyed after the tests said that it felt like their hair had more volume and that they no longer had problems with an itchy scalp.

Recent years have seen a greater focus on scalp care for stimulating hair growth and improving hair problems brought on by aging. 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 beautiful skin effects (moisture retention*⁶, resilience improvement*⁷, smoothness and radiance improvement*⁷, and sebum 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 has shown beautifying effects, such as beautification of skin and hair, through tests on human subjects with numerous third-party test institutes*⁹, and Sharp has 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 who were undergoing mesotherapy for hair growth and who were 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. It is thus very probable that Plasmacluster ion technology can help improve the scalp environment and stimulate hair growth.

Comment from Tomohiro Sugino, CEO, Soiken Inc.

In double-blind tests, Plasmacluster ion technology was found to improve scalp functions. Test subjects surveyed after the tests said that it felt like their hair had more volume and that they no longer had problems with an itchy scalp. This shows that Plasmacluster ion technology constitutes an effective treatment in the field of hair and beauty care. We expect that improving the scalp environment will promote hair and beauty care that is healthy and sanitary.

*1 Plasmacluster is a registered trademark of Sharp Corporation.

*2 The function of retaining moisture in the scalp.

*3 A type of thin hair 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/cm³) 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 mm²) 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 approx.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 | Initially | After 1 month | After 2 months | After 3 months | (Hair/160 mm ²) 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 in her 50s



Test result 2—Subject: Male in his 30s



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 sebum, 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/cm³) 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, sebum, 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.

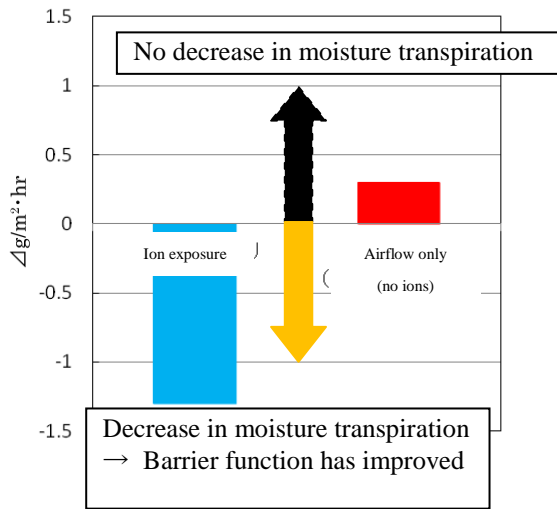


Chart 1: Comparison of transpiration of moisture from scalp (scalp barrier function)

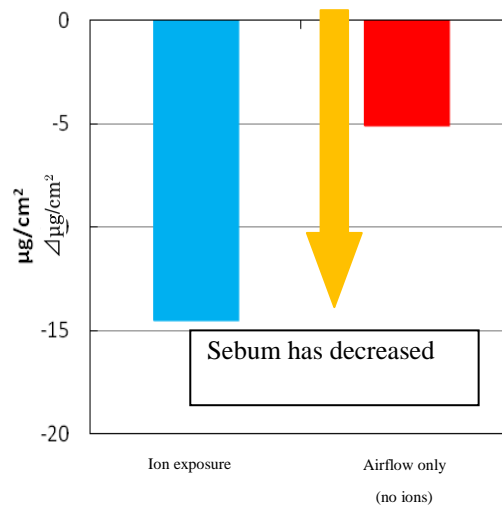


Chart 2: Comparison of amount of sebum

- *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 examines the effect of the intervention objectively.
- *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 startups, and business succession.

■ Shinjuku Ouka Clinic, HARG Treatment Center

Opened in 2012 as the Ouka Clinic, Oukaikai Medical Corporation. Specializes in HARG*¹⁵ (Hair Re-Generative) 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 which is 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.

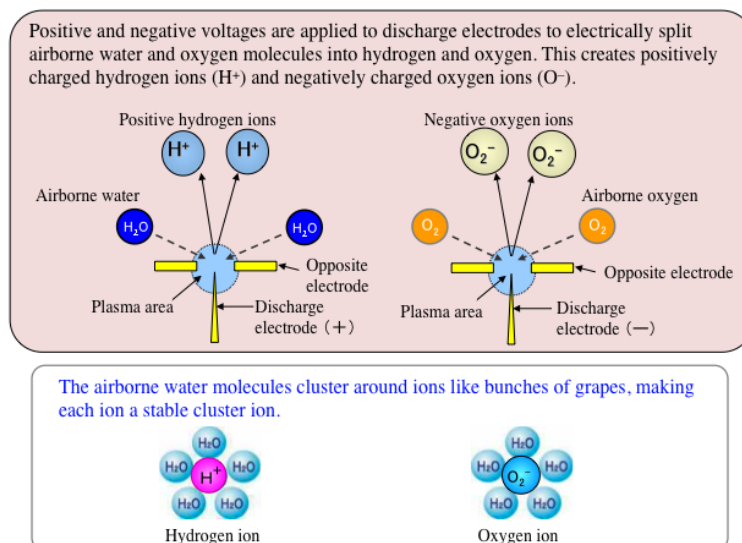
■ Soiken Inc.

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.

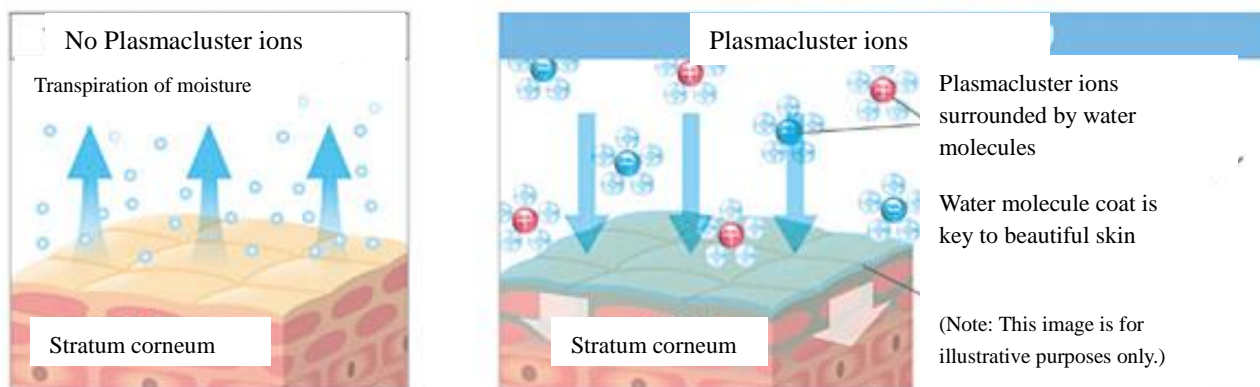
■ About Plasmacluster Technology

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 |

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| | 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 |