

October 15, 2020

Maxell Holdings, Ltd.

## Confirmation of the novel coronavirus (SARS-CoV-2) inactivation effect of low-concentration ozone water generated by Maxell's ozone water generator Implementation of a cooperative investigation with Nara Medical University

Maxell, Ltd. (company president: Keiji NAKAMURA, hereafter referred to as "Maxell") confirmed the novel coronavirus (SARS-CoV-2) inactivation effect of low-concentration ozone water generated by Maxell's "OZONEO AQUA Watermix (MXZW-WM100J)"<sup>\*1</sup> professional-use ozone water generator (hereafter referred to as "the equipment") in a joint study with Nara Medical University (Professor Hisakazu YANO, Associate Professor Ryuichi NAKANO, Department of Microbiology and Infectious Diseases) (hereafter referred to as "the study").

The study confirmed the inactivation effect on the novel coronavirus of approx. 0.2 mg/l of low-concentration ozone water (hereafter referred to as "the ozone water") generated using an actual production model of the equipment to infuse tap water with ozone gas from a nozzle directly connected to the faucet.

The test and confirmation of effectiveness in the study were implemented under proper pathogen containment measures ex situ at bio-safety level 3 (BSL3), and do not constitute proof of effectiveness in an actual-use environment using the equipment.

Since entering the sterilization and deodorant equipment field in 2015, Maxell has validated the effects of its products through joint studies with third-party institutions, universities, and research institutions, and has contributed its energy to the establishment and disclosure of evidence so that customers can use its products with a sense of security. This study is also positioned as one of those studies.

Moreover, Maxell is a member of the MBT Consortium Association<sup>\*2</sup> (administrative director: Hiroshi HOSOI, hereafter referred to as "MBT Consortium") and will utilize the results of the study for the development of products and provision of services with the intent to establish a consortium called "urban development based on medical science."

\*1. "OZONEO Aqua Watermix (MXZW-WM100J)" professional-use ozone water generator:

[https://biz.maxell.com/ja/living\\_life\\_equipment/mxzw-wm100j.html](https://biz.maxell.com/ja/living_life_equipment/mxzw-wm100j.html).

\*2. MBT Consortium: <http://mbt.or.jp/>.

### ■ Evaluation test of inactivation effect of ozone water on the novel coronavirus in the study

#### - Test ozone water

Ozone water (the ozone water) generated by MXZW-WM100J professional-use ozone water generator (the equipment)

#### - Test virus

Novel coronavirus (SARS-CoV-2)

- Content of the test

A total of 190 µl of the ozone water and 10 µl of virus fluid were mixed and allowed to react with each other for a fixed time. As a control group, the same amount of phosphate-buffered saline (PBS) and virus fluid were mixed and allowed to react in the same way. After reaction, 800 µl of culture medium containing 10 mM of sodium thiosulfate was added to each fluid to stop the reaction, the fluid was collected, and the amount of virus was then calculated using the plaque assay technique. The test was conducted twice for each fluid.

The virus reduction rate was calculated using a logarithmic decrease value and the following formula.

$$\text{Reduction rate [\%]} = (1 - 1/10^{\text{logarithmic decrease value}}) \times 100$$



Scene of an experiment during the study

Left: Generation of the ozone water; Right: Mixing the ozone water and virus fluid

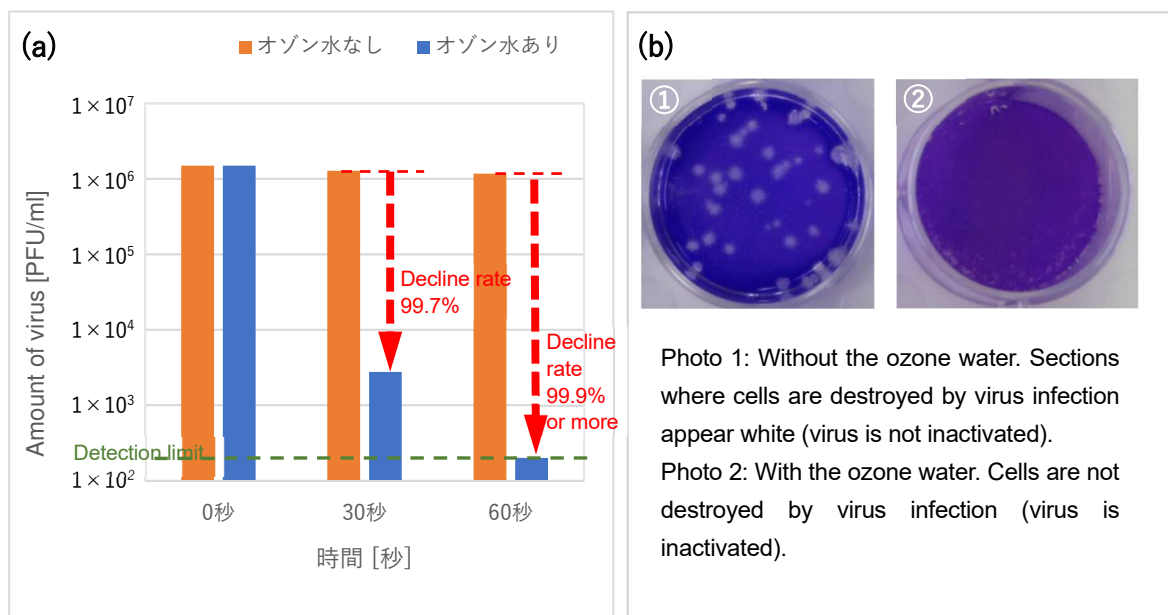
- Result

After mixing the ozone water with the virus fluid, a virus amount of  $1.49 \times 10^6$  PFU/ml decreased to  $2.75 \times 10^3$  PFU/ml in 30 seconds, then decreased to within the detection limit of  $2.00 \times 10^2$  PFU/ml in 60 seconds. The virus reduction rate at this time was 99.7% and at least 99.9% respectively. These values are the average values of two tests.

	0 seconds	30 seconds	60 seconds
Without the ozone water	$1.49 \times 10^6$	$1.28 \times 10^6$	$1.17 \times 10^6$
With the ozone water	$1.49 \times 10^6$	$2.75 \times 10^3$	$< 2.00 \times 10^2$
Decline rate (%)	-	99.7 %	> 99.9 %

\* Detection limit value:  $< 2.00 \times 10^2$ ; decline rate (%) is rounded down to two decimal places.

Changes in amount of virus due to the ozone water (units: PFU/ml)



Orange(Left bar) : Without ozone water, Blue(Right bar) : With ozone water  
 Time[seconds] : 0 seconds, 30 seconds, 60 seconds

Examples of change of the virus amount by this ozone water (a) and virus infection evaluation result (b)

■ Test results

The test results confirmed that the ozone water renders the novel coronavirus inactive. They indicate that cleaning with the ozone water may be effective for preventing contact infection via substances infected with the novel coronavirus.

Note that an actual production model of the equipment was used for the generation of the ozone water. However, the effect was confirmed ex situ. This result does not constitute proof of effectiveness in an actual-use environment.

■ Meaning of the confirmation of inactivation effect of the ozone water

Confirmation of the effects of high concentrations (10 mg/l)<sup>\*3</sup> and low concentrations (2 to 0.4 mg/l)<sup>\*4</sup> of ozone water on the novel coronavirus have already been reported. Generation of ozone water is broadly classified into generation by electrolysis and generation by mixing ozone gas into water using an ejector. With the latter method, using an ejector, ozone concentration is low. However, it is a simple method and can generate ozone water at a comparatively low cost.

In the study, the effect of low-concentration (0.2 mg/l) ozone water generated by an actual production model of the equipment employing this ejector method was confirmed. Maxell thus believes that ozone water need not be limited to high-concentration use for medical equipment, etc., and that low-concentration ozone water may be sufficiently and widely utilized for general public sanitation use with regard to the novel coronavirus.

\*3. Report on high concentration (10 mg/l): released by the University of Miyazaki, Medical Department, " Collaboration Labo. M&N Medical Environment Innovation Lecture" joint study lecture:  
<http://www.med.miyazaki-u.ac.jp/home/mei/2020/08/18/オゾン水による新型コロナウイルスの不活化効果/>.

\*4. Report on low concentrations (2 to 0.4 mg/l): released by Fujita Health University:  
<https://www.fujita-hu.ac.jp/news/f93sdv0000007fdg.html>.

■ Activities of Maxell

Maxell is engaged in the development of sterilization and deodorization technology and equipment as one of its health and beauty sector product groups in its electricity and consumer business. Maxell believes that the social roles and needs for sterilization and deodorization in this field will expand due to social conditions taking "with corona" and "after corona" into account, and that it can increasingly contribute to society by developing new technologies that respond to this problem and equipment with clearly verified and proven effects, and providing these to its customers in the form of products.

For the third goal of the 17 SDGs (Sustainable Development Goals) established by the United Nations, "Good Health and Well-Being - Ensuring healthy lives and promoting well-being at all ages," Maxell will continuously develop sterilization and deodorization technology and equipment utilizing the characteristics of ozone as one of the methods for accomplishing this goal.

Maxell is a member of the MBT Consortium and contributes to society by developing products and providing services that contribute to urban development for a low-birth-rate, aging society, the creation of new industries, and regional revitalization based on the Consortium's purpose to establish "urban development based on medical science."

■ Announcement related to the study from Nara Medical University:

<http://www.named-u.ac.jp/university/kenkyu-sangakukan/oshirase/mbtsars-cov-2.html>