

PRESS RELEASE

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**Joint research to assess the comfort and protective effects of a mask that combines
high breathability with a robust suppression of oral droplets
- Demonstration tests to be conducted at Kashima Stadium -**

To perform at its best in an environment where no end to the COVID-19 pandemic is in sight, the J-League professional football league takes comprehensive measures to stop the transmission and spread of viral infection. The suppression of oral droplets is a key target in combatting infection, and the wearing of masks is considered the most effective method of containing transmission. While extensive research has confirmed that tight-fitting, non-woven fabric masks suppress droplets, many of the non-woven masks in use nowadays have poor breathability. And when these masks are worn in the inappropriate way, their protective function is likely to be lost.

Kao Corporation has been collaborating with several researchers and organizations (Professor Tomoaki Okuda of the Faculty of Science and Technology at Keio University, Kashima Antlers F.C. Co., Ltd., and the National Institute of Advanced Industrial Science and Technology) to jointly develop a mask that combines high breathability with a robust ability to suppress the spread of oral droplets. Based on the assessment of its efficacy and comfort, this joint research aims to enhance the safety of large-scale events during the pandemic. Demonstration tests involving athletes, coaches, spectators, and other participants started on May 26 at a J1 League match between the Kashima Antlers and Cerezo Osaka. If the tests progress as planned, the first results will come in by September 2021.

1. Background

J-League has drawn up a set of “Guidelines in Response to Covid-19 Infection” to ensure that thorough measures are in place to prevent the spread of infection among players and club staff. The aim is to hold safe football matches by restricting the number of spectators allowed into a stadium and taking comprehensive measures such as hand disinfection and

the wearing of masks by players, spectators, and other persons physically present at the scene.

Extensive studies have been performed to assess the performance of masks in suppressing the spread of oral droplets, an essential function for infection prevention. Earlier research has shown that masks made of polyurethane and other highly breathable materials are less effective than non-woven fabric masks in suppressing oral droplets. Yet non-woven masks have several flaws that hinder their adoption. The tight fit required, with minimized gaps between the skin and fabric, aggravates the already poor breathability of the non-woven fabric. This trade-off in terms of comfort makes non-woven masks an impractical choice, in particular in hot and humid environments, or when the wearer is talking or engaging in physical activities that quicken the breathing. Many mask wearers pull their masks down under their noses or chins when they feel discomfort, removing the benefits that the masks confer.

Researchers from Kao and collaborating institutions considered that the best way to safeguard sporting events at stadiums and public events with large gatherings would be to develop a mask that effectively suppressed the spread of oral droplets while retaining wearing comfort and high breathability.

2. About the tests

Masks made of several types of non-woven fabric are being examined, including a prototype developed by Kao in a research project to enhance the comfort of non-woven masks made from different materials. Kao and collaborators have been working to improve masks by assessing their effectiveness in preventing the spread of oral droplets under laboratory conditions. Demonstration tests at the Prefectural Kashima Stadium are being conducted to evaluate the comfort of masks under real-life conditions. Five stages of testing and development have been underway in the past months.

1) First, the droplets that pass through masks when the wearers emit vocal sounds were quantified visually by image analysis. Several masks made from different non-woven fabrics were examined, including the Kao prototype (Fig. 1). Professor Tomoaki Okuda from the Faculty of Science and Technology at Keio University then used a particle counter (Fig. 2) and other quantification methods to examine the effectiveness of the masks in various scenes of actual use. Mask wearers were also asked to evaluate the masks for comfort by a questionnaire.

2) Next, Kao is examining the effectiveness of non-woven fabric masks in preventing the spread of oral droplets during simulated breathing (Fig. 3) by analyzing aerosolized fluids collected from gaps in the masks.

3) The Kashima Antlers and Kao asked several hundred staff members and security personnel to wear the prototype mask about once a month at Kashima Antlers football matches held at the Prefectural Kashima Stadium. The comfort of the masks was assessed under various weather conditions, and how they were worn was observed.

4) Kao then made improvements in the prototype mask based on the data obtained in 1) to 3) above. The improved prototype is set to be tested in September at the Kashima Stadium.

5) Using a risk assessment model, the National Institute of Advanced Industrial Science and Technology will assess the effectiveness of masks made from different non-woven fabric in reducing the risk of infection, based on the data obtained in 1) to 3) above.



Fig. 1: Particle visualization system



Fig. 2: Particle counter

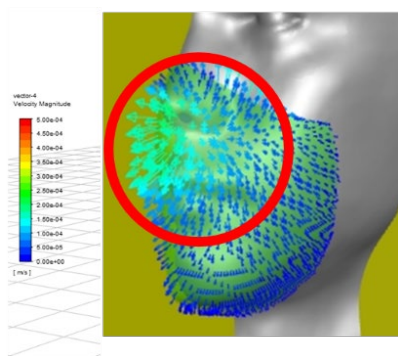


Fig. 3: Breathing simulation

The final aim of this research is to create safer conditions for large-scale events by assessing the comfort spectators feel when wearing the prototype mask and how the comfort influences the way they wear the mask. The results of the research will be reported to J-League and related organizations, and later published.

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