

“Demonstration experiment to visualize the scattering situation of the droplets made by blowing darts was carried out.”

「The Droplets do not scatter by blowing darts?!」

Demonstration Experiment carried out by: Japan Sport Wellness Fukiya Association

Experiment Collaborator: Shin Nippon Air Technologies Co., Ltd.

Supervised by: Mr. Hiroyuki IMAI, Doctor of Medicine

In order to play Sport Wellness Fukiya safely under executing the infection control measures for COVID-19, Japan Sport Wellness Fukiya Association carried out the demonstration experiment of visualizing the scattering reality of the droplets made by blowing darts. To confirm the safety of playing Sport Wellness Fukiya and to know the correct countermeasures are the purposes of carrying out this demonstration experiment.

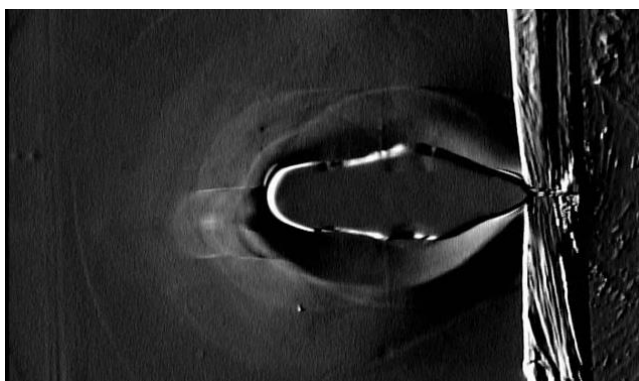
Outline of Experiment

Three players blew darts for several experiments in the clean room of Shin Nippon Air Technologies, who is the pioneer of Clean Room in Japan, and observed scattering situation of the droplets made by blowing darts.

◇ Image of clean room



◇ Image of targets wrapped by industrial plastic wrap (because we observed a lot of dust came out from the target when darts stuck in the target)



“What we understood from the demonstration experiment”

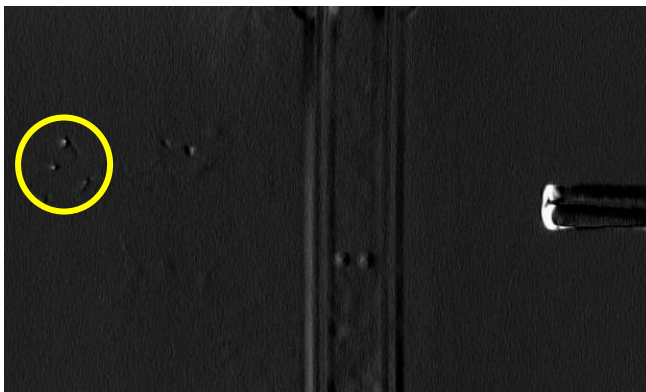
Dr. Imai’s comments are as follows:

- We understand that there are almost no droplets scattered from the muzzle of blowing pipe. The droplets out of the muzzle of blowing pipe are less than the droplets made by the normal conversation without mask and we could say that there is almost no possibility of spreading droplets infection by Sport Wellness Fukiya.
- Main infection routes of COVID-19 are known “Droplets Infection” and “Contagion”, but they say recently that there may be some possibility of “Airborne Infection”. Thus, it is advisable that we should keep normal cautions, such as, frequent changing of air, having mask etc.
- There are some images showing that something dropped from the end of the dart when sticking in the target. I cannot say completely that these are the droplets, but there may be slight possibility that the droplets are conveyed to the target by the dart. Therefore, it is necessary to wipe (disinfect) the surface of target.

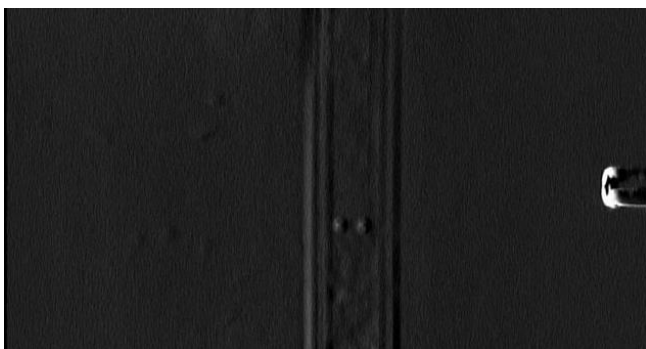
Blowing without dart

After cleaning the inside of blowing pipe, players blew without dart. At the first blow, we could see slight particle, however there were no particle from the second blow and onwards. We judged these were not the droplets.

◇ Image of the 1st blow



◇ Image of the 2nd blow



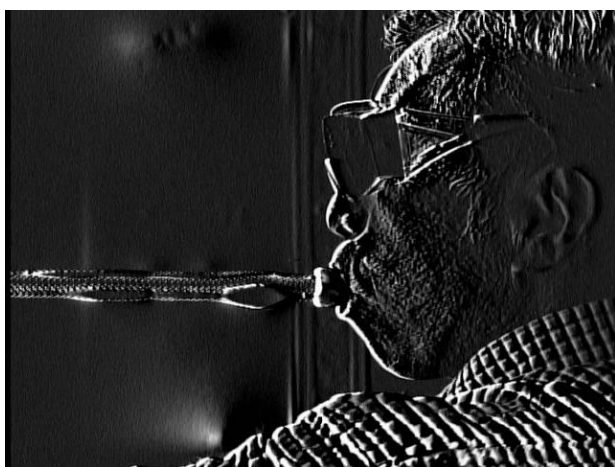
How much droplets leak from the mouth, when blowing darts?

In case players held the blowing pipe deeply in their mouth, we could not see any droplet scattered from the mouth of all three players. Even if they blew with the corner of the mouth opening, we could not see any droplet scattered from the mouth. However, in case some player held the blowing pipe shallowly, which is out of basic motions, there might be a possibility that a very few droplet leak from the mouth. Thus it is important that players should hold the blowing pipe deeply and tightly in the mouth as prescribed in the basic motions of Sport Wellness Fukiya.

Evaluation by Shin Nippon Air Technologies:

“We could see almost no particles when blowing darts.”

◇ Image of holding the blowing pipe deeply



◇ Image of holding the blowing pipe shallowly



How much droplets leak from the muzzle of blowing pipe when darts coming out?

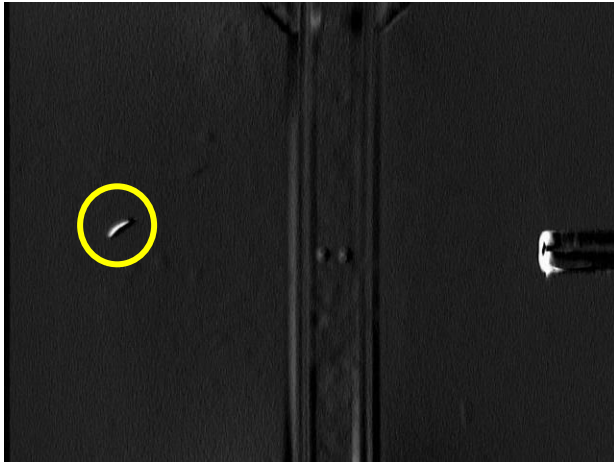
At the first blow just after cleaning inside of the blowing pipe by cloth, we could confirm some particles came out from the muzzle of the blowing pipe together with the dart. However, the particles decreased from the second blow onward and we could not see any particles at the fifth blow. From this result, we believed that these particles were not the

droplet but the dust or fiber attached inside of the blowing pipe.

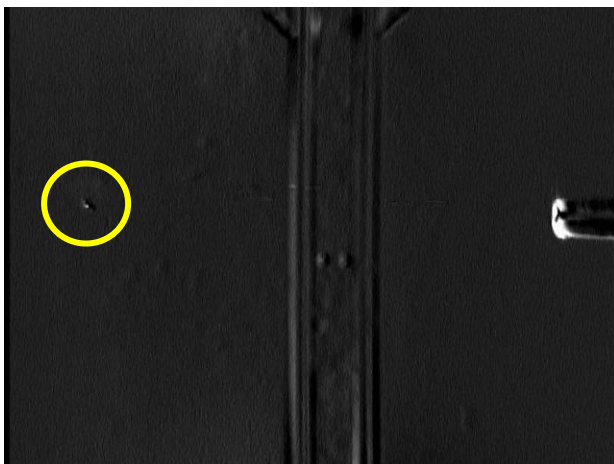
Evaluation by Shin Nippon Air Technologies:

“We could see some particles at the first blow of all three players. But, particles were getting fewer and no particles were found at the fifth blow of all three players.”

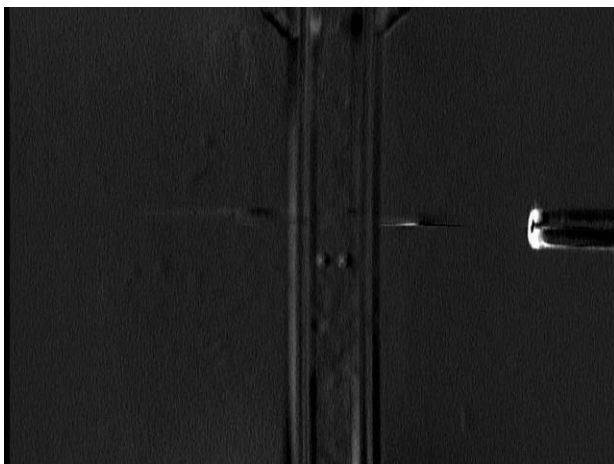
✧ Image of the 1st blow



✧ Image of the 2nd blow



✧ Image of the 5th blow

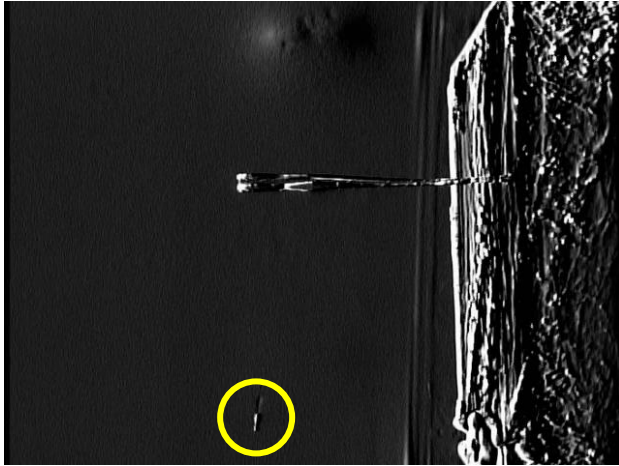


How is the condition of droplets at the surface of target when the dart sticking in?

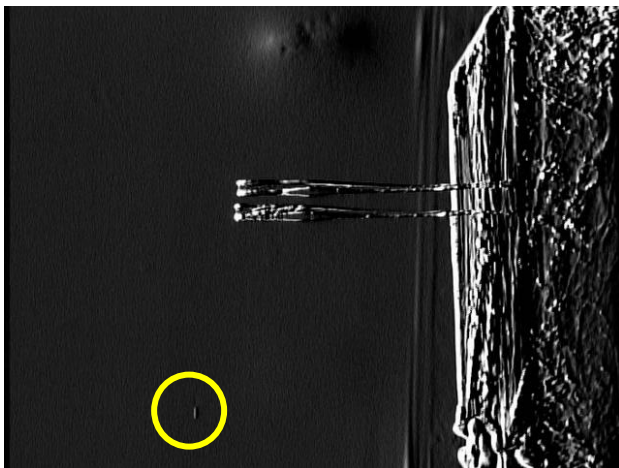
- Comparison of droplet of the 1st dart with the 2nd dart (5m distance):

Floating matter confirmed at the 1st blow was getting extremely fewer at the 2nd blow and onward. Thus, it is considered that fibers of the cleaning cloth came out together with the dart at the 1st blow.

- ◇ Image of the 1st dart



- ◇ Image of the 2nd dart



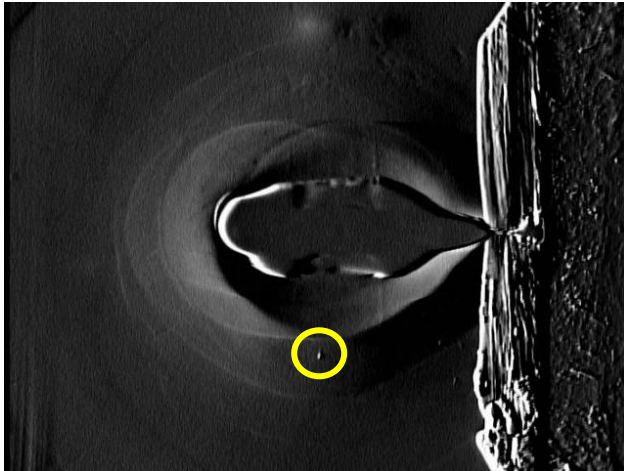
- Comparison of the surface by blowing from 5m distance with 8m distance:

At the moment of the dart stuck in the target, we confirmed that something dropped from end of the dart, but it dropped immediately and did not scatter. We could not see any difference due to the blowing difference. It is advisable that we had better wipe (disinfect) the target surface because we usually touch the target when pulling out darts.

Evaluation by Shin Nippon Air Technologies:

“We could not see any outstanding difference due to the blowing distance. We could realize the tendency that particles (we cannot completely say that these are droplets) of the first half were more than those of the second half.”

✧ Image from 5m distance



✧ Image from 8m distance

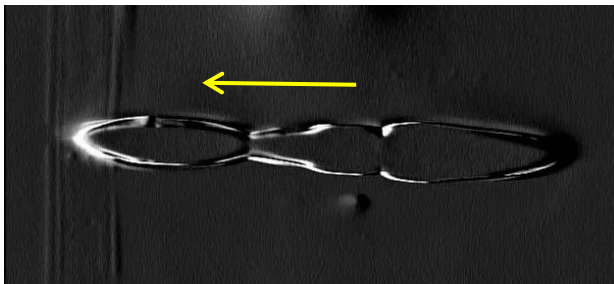


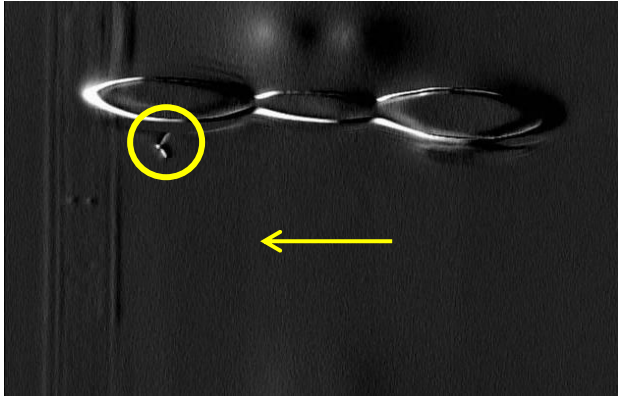
✓ Due to high-illumination exposure on the target, images showed that darts expanded because of halation.

How is the condition of the space at about 2m apart from the muzzle of the blowing pipe?

From the images of the darts at the space of about 2m from the muzzle of the blowing pipe, we could see only a few floating material. We cannot say completely that this must be droplets.

✧ Images at the space of 2m



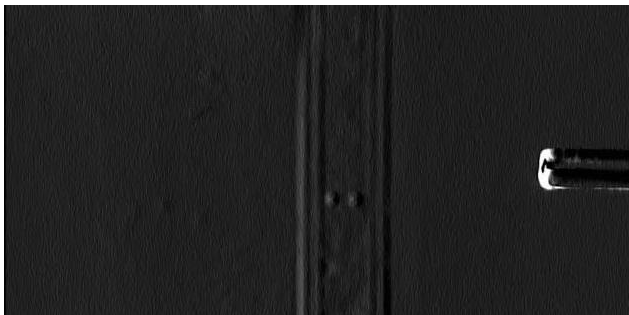


- ✓ Due to using three lightings, images showed a dart as three rings because of halation after image.

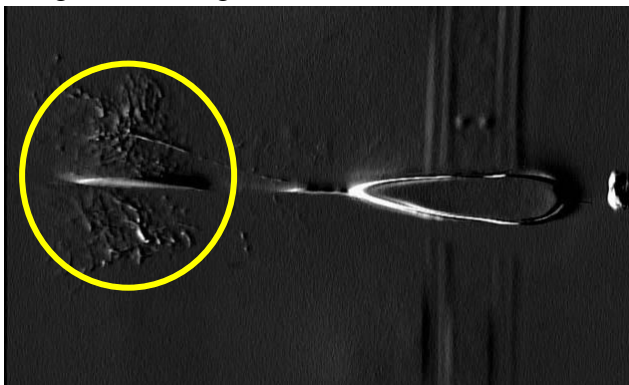
Differences of the particles out of the muzzle of the blowing pipes due to the diameter of the darts:

We could see more particles when blowing 13.00mm diameter dart than blowing 12.85mm diameter dart. It is considered that in case we blow a dart with a bit bigger diameter than normally used, we may blow stronger and the dart may be rubbed against inside of the blowing pipe which causes more particles. We would like to recommend using a bit smaller diameter darts.

- ◇ Image of blowing 12.85mm diameter dart



- ◇ Image of blowing 13.00mm diameter dart



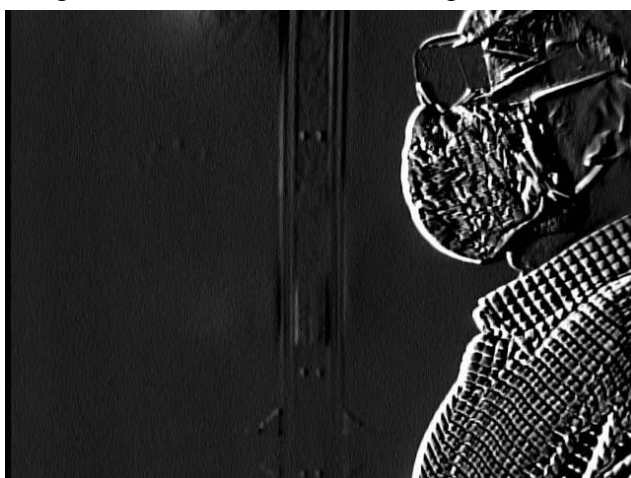
Vocalization/Wearing mask

Many droplets were confirmed by the conversation without wearing mask which are much more than the particles out of muzzle of the blowing pipe and looks scattered. We would never blow darts towards persons, risk of sport Wellness Fukiya infecting COVID-19 is much less than that of normal conversation without mask. As the efficiency of wearing mask is very high, we strongly suggest wearing mask except when we blow darts.

◇ Image of vocalization without wearing mask



◇ Image of vocalization with wearing mask



Comments from Mr. Takashi ARAI, Doctor of Medicine, Advisor of Japan Sport Wellness Fukiya Association:

By this demonstration experiment, it is confirmed that droplets made by blowing darts are much less than those made by the normal conversation without mask. I would like to keep myself in good health by continuing Sport Wellness Fukiya with the correct countermeasures for viral infection. I appreciate Dr. Imai's supervising this valuable demonstration experiment.

Overall Summary

From the result of this demonstration experiment:

- ① **No droplets came out from the mouth.** However, in case holding the blowing pipe shallowly, which is out of the basic motions, a few droplets were found. It is important for all of us to be faithful to the basic motions.
- ② **A few particles came out from the muzzle of the blowing pipe together with the dart, but did not scatter.**
- ③ **We could not confirm that particles reached the target even for 5m blowing distance.**
- ④ From the above ① through ③, we could say that **droplets did not come out by blowing darts.** Even if we consider that all particles are droplets, they are much less than those made by normal conversation.

The most important matters under the current new way of life with COVID-19:

- Participants must keep health care regularly, such as measuring temperature;
- Checking health condition and measuring temperature of participants;
- Keeping habits of preventing infection, such as disinfection of hands and fingers, wearing mask, avoiding close contact and crowd together; and
- Changing air of the venue every 20 to 30 minutes.

It is really important that we should keep the above and follow “The suggestion of Dr. Imai” (announced in May 2020).