

# SARS-Cov-2 Delayed Tokyo 2020 Olympics: Very Recent Advances in COVID-19 Detection, Treatment, and Vaccine Development Useful Conducting the Games in 2021

Zameer Shervani<sup>1\*</sup> , Intazam Khan<sup>2,3</sup>, Umair Yaqub Qazi<sup>4</sup>

<sup>1</sup>Nanomaterials Production Division, Food and Energy Security Research and Product Centre, Sendai, Japan

<sup>2</sup>Department of Neurology, North Shore University Hospital, New York, USA

<sup>3</sup>Department of Neurology and Neuroscience, Weill Cornell Medical, Cornell University, New York, USA

<sup>4</sup>Chemistry Department, College of Science, University of Hafar Al Batin, Hafar Al Batin, KSA

Email: \*shervani.nanotek@gmail.com

**How to cite this paper:** Shervani, Z., Khan, I. and Qazi, U.Y. (2020) SARS-Cov-2 Delayed Tokyo 2020 Olympics: Very Recent Advances in COVID-19 Detection, Treatment, and Vaccine Development Useful Conducting the Games in 2021. *Advances in Infectious Diseases*, 10, 56-66.

<https://doi.org/10.4236/aid.2020.103007>

**Received:** June 5, 2020

**Accepted:** July 3, 2020

**Published:** July 6, 2020

Copyright © 2020 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

---

## Abstract

The novel coronavirus (SARS-Cov-2) delayed the Tokyo 2020 Games. The traveling by air, rail, road, and sea inside and outside the countries has stopped to contain the virus. The amount of money lost and assistance needed to re-schedule and conduct the Games in 2021 have been estimated. With more than one billion population is under the semi-locked down and movement of people is restricted, athletes cannot prepare at home and participate in the Games. The COVID-19 outbreak has spread around the world; it has already infected 5.7 million people and caused 355,000 deaths reported on May 28, 2020 and the figures increasing every day. The publication of this article is important as the postponement of the Olympics has costed Japan \$6 billion and the organizers have worked very hard for seven years. If the Games are conducted in 2021, it will be the—beginning of the world recovery—from big COVID-19 pandemic. In this communication, the development in testing, treatment, and vaccine preparation for SARS-Cov-2 have occurred so far in different countries and companies have been discussed to know the possibilities if the pandemic can be overcome and the Games can be conducted in 2021.

## Keywords

COVID-19, SARS-Cov-2, Tokyo 2020 Olympics, COVID-19 Detection, SARS-Cov-2 Treatment, COVID-19 Vaccine

---

## 1. Introduction

SARS-Cov-2, a novel coronavirus was first reported in Wuhan city in Hubei province, China in December 2019. The pandemic has claimed 355,000 lives while 5.7 million people infected till May 28, 2020 and over one billion people movement is restricted. Olympics are the biggest international multi-sport event in the world. There is a chance for Japan by hosting the Tokyo 2020 Olympics to show the world that it has overcome the triple disaster occurred in 2011. The delay in the Games for 2021 has costed Japan \$6 billion already. It took seven long years of hard work to prepare for the Games. Rescheduling the Olympics, however, is a challenging task as hotels, venues, and Olympics tickets cancellation and re-booking are difficult. Leaving behind the sad memories of 2011 great earthquake, tsunami, and melting down of Fukushima nuclear reactor occurred in Japan, now a new pandemic crisis of COVID-19 has become a bigger challenge not only for Japan but also for the entire world community. Such a crisis has never seen before in human history. Until a proper vaccine is developed, it will not be possible to conduct the Tokyo 2020 Olympics in 2021 from the health concern of players, organizers, participants, and hosting country Japan's population. Therefore in this article, we have described the infectious aspect of the COVID-19 SARS-Cov-2 virus, testing, treatment, and the progress made so far in developing a proper vaccine.

## 2. Data, Facts, and Discussion

### 2.1. Sporting, Financial, and Management and Administrative Aspect of the Olympics Tokyo 2020

For Tokyo 2020 Games, in the last one year, 4.47 million tickets were sold [1]. More than 11,000 athletes were expected to participate with 90,000 volunteers and hundreds of thousands of officials and spectators were to attend the events from all over the world. On March 24, 2020, Japan's Prime Minister Shinzo Abe and the International Olympic Committee (IOC) President Thomas Bach agreed [2] to postpone the Tokyo 2020 Games by a year to protect the athletes and spectator and organizers from SARS-Cov-2 pandemic. The IOC President Thomas Bach said the postponement was about protecting human life. The conversation rescheduled to a date beyond 2020 but not later than summer 2021—occurred between IOC president Thomas Bach and Prime Minister Abe. Tokyo 2020 Olympics now will be conducted [3] from July 23 to August 8 in 2021 as announced by the Chief of Tokyo 2020 organizing committee Toshiro Muto in a meeting.

The stage was set to postpone the 2020 Olympics when US President Trump announced [4] in-person cancellation G7 meeting (June 2020) at Camp David over the novel coronavirus spread. The announcement was made by the White House on 19<sup>th</sup> March 2020. The G7 will be conducted via videoconference as countries have sealed the borders and put travel ban to contain the SARS-Cov-2 virus.

The suggestions to postpone the Games came from participating countries where local preparations for athletes could not be conducted due to a virus outbreak which could expose the athletes and spread the disease. The delay also became imminent as the domestic and international travel by road, rail, air, and sea was severely limited. With 1.7 billion people movement is restricted, to stop the spread of virus, across the globe, the IOC was under the pressure to postpone the Game which was to start from July 24. Initially, Canada and Australia announced the withdrawal of their participation later the United States, and many more joined the countries who proposed the postponement. The postponement of the Games became unavoidable as the Japanese health Officials feared [5] the virus will multiply in Olympics' gathering at home and around the world. In Japan, large sports and cultural gatherings have been postponed or canceled. The Schools have been closed already.

Athletes have mixed feelings. They should think positively, reset their mind, and prepare for the 2021 Olympics as Yasuhiro Yamashita the President of the Japanese Olympic Committee advised the athletes. Some athletes like 30 years old Akiko Noguchi who has won a berth in 2020 Olympics was very positive for the unfortunate delay in the Games. According to him, athletes' career has been extended due to the delay. Japan's Prime Minister Shinzo Abe was, however, initially reluctant to scale back or organize the 2020 Olympics without the crowd. Prime Minister Abe wanted to keep the Olympics' schedule as well as athletes' and spectators' safety and security from the virus was the reason of initial reluctance to postpone the Games and later agreed for the delay till 2021 of the Games on Tuesday (24<sup>th</sup> March 2020) as other major international and Japan's sporting events either canceled or postponed.

Tokyo 2020 Olympics is the most high profile event affected by the novel coronavirus SARS-Cov-2. In peacetime, it has been the first time that any Olympics event has been postponed. The move is an overwhelming blow for the Tokyo city which is known for its well-known and proven organization skill as all the venues and preparations were done much ahead the time and tickets were overbooked. It will be difficult to fix a new date in 2021 for Tokyo Olympics which may not suit many participating countries and athletes as all the sports will face challenges on a new date. For example, the 2021 World Athletics Championships are in August 2021 in Eugene, USA.

Japan has framed Tokyo 2020 as the—Recovery Games—: a chance to show the world it has bounced back from the triple disaster in 2011 when a massive earthquake sparked a tsunami and the Fukushima nuclear meltdown. The purpose of hosting the Tokyo 2020 Olympics is to show the world that Japan has overcome the 2011 disaster. The delay in the Games is a bit disappointing but when conducted it will give a positive hope and proof that Japan can come out from such natural disasters. The 2021 delayed Games when conducted will be the new start and that will light Flame of Hope and the Flame of Revival from 2011 Japan disaster and now a bigger pandemic “novel coronavirus SARS-Cov-2”

outbreaks.

The spending estimate for hosting the Game was \$12.6 billion [6] and experts in Tokyo have the opinion the delay will cost \$6 billion [7] from foreign tourists and advertising revenue loss. There is also complexity for organizers in shifting the Games. If the venues will be available and hotel facilities will be cancelled and rebooked, apart from the loss of the revenue and security arrangements and tickets cancellation and re-ticketing. Japan has been preparing for the last seven years to organize the world's biggest events, the Olympics. Moreover, in 2021 Japan's domestic sporting calendar is already crowded with swimming and athletics events separately. Similarly, other world events will also be needed to be rescheduled for the delay in the 2020 Olympics to 2021 over coronavirus. The FINA (Fédération internationale de natation) international swimming federation world championship is scheduled for July 16 till August 1 in 2021 in the city of Fukuoka (Japan) which will overlap with postponed 2020 Olympics. The organizing committee of the Olympics has decided [1] that the ticket bought for the postponed Games will remain valid for the delayed events and refund of purchased tickets will be possible thus the planned participants will not lose their money. Till the delay of the Olympics was announced for the Olympics and Paralympics a total of 5.44 million tickets were sold and they are good for delayed 2021 Olympics or refund and resale are also possible.

We hope the current locked down of billions of people around the globe due to SARS-Cov-2 will open and travelling by air, rail, road, and sea will become normal in the coming months leading to normal business, education, and sports activities inside and outside the countries. The world community will overcome the new coronavirus earliest in the coming months if not in weeks and the Tokyo 2020 Olympics will be successfully conducted in 2021 which will prove a farewell to the unprecedented disaster novel coronavirus has caused in the human history. The success of the Tokyo 2020 Games in 2021 will prove an opportunity to revive the global economy from the unavoidable great global economic recession which is well due in the aftermath of coronavirus. Japan will be seen as a "world leader" in overcoming the novel coronavirus disaster. The world will see a—new start—and—flame of hope—with the Tokyo 2020 Olympics flame lightning in 2021.

Conducting the Tokyo 2020 Olympics in 2021 will be difficult until a vaccine is developed from the health viewpoint of athletes, participants, and organizers. Such opinion was expressed [8] by the Japan Medical Association (JMA) President Yoshitake Yokokura. Japan's Prime Minister Shinzo Abe also has concerns about next year's Olympics saying it will not be possible to conduct the Games until SARS-Cov-2 is contained [9]. Yoshiro Mori the Tokyo 2020 President said the Games will be cancelled if could not be conducted in summer 2021 [10]. IOC President Thomas Bach announced \$800 million for loans and payments to make up the loss resulted from the pandemic that caused the postponement of Tokyo 2020 Games [11].

## 2.2. Infectious Aspect of the SARS-Cov-2

Covid-19 spreads by the human to human transmission, inhaling contaminated air, and touching surfaces. When a SARS-Cov-2 carrier expels virus particles droplets when sneezing or coughing, a healthy population in the vicinity exposed to the virus and in breathing particles gets sucked in the lungs or stick to the nasal mucus. Though to infect a person sneezing or coughing is always not necessary, the asymptomatic or person having symptoms can infect a person by breathing or talking also. The virus comes out from a carrier person and attached to a dust particle in the atmosphere and remained suspended in air can infect a person at any distance depending on the weather and the air movement or moisture. The person showing symptoms of COVID-19 depends on the amount of virus inhaled, if the amount accedes the viral load dose and person's immunity is unable to fight the virus then virus multiplies and symptoms appear. But chances of transmission by talking or breathing are less than sneezing or coughing as the former cannot obtain infectious dose. COVID-19 symptoms are well known: shortness of breath, cough, fever, loss of taste, and smell are major and very apparent. Some infected persons do not show symptoms at all, for others it causes symptoms and cured by treatment or just isolation. Only in marginally fewer cases, unfortunately, the COVID-19 is fatal when a patient has low immunity and develops organs' failure. The doctors and supporting health staff who treat full-blown SARS-Cov-2 patients are at higher risk. Thus wearing PPE (Personal Protective Equipment) suits are absolutely necessary for them. The SARS-Cov-2 virus causing the COVID-19 disease can spread [12] to cats. Researchers have identified the animals to test the vaccine, during the investigation they found cats and another animal ferrets are infected with airborne Covid-19 causing virus. Dogs were less likely to get infected with the virus than cats, therefore it is advised for Covid-19 virus infected persons to keep a distance from family members and also stay far from pets. The COVID-19 virus remains alive on cardboard surfaces for 24 hours and plastic or steel for 48 to 72 hours. The virus can be transmitted by touching the contaminated surfaces as well.

## 2.3. Recent Advances in SARS-Cov-2 Testing

The most commonly used SARS-Cov-2 virus test done until now is by collecting mucus from deep inside the nose by a swab which is painful and difficult also poses a risk of infection in the surroundings and medical staff. In Japan, a new PCR saliva test has been approved [13] which is safer for the medical staff and not painful for the sample donors who just have to give saliva in a tube or container. Using this saliva PCR method more tests can be conducted now. The method showed exactly the similar result as of the swab collection test. Japanese company Fujirebio Inc., has developed [14] kit to detect SARS-Cov-2 virus protein in just 15 minutes. The polymerase chain reaction (PCR) test used widely presently needs 4 - 6 hours to give the result. The new test kit will speed up to identify the infected person and help in controlling the virus spread. Fujirebio

Inc., has applied for approval already. Several other Japanese companies are also in the race to develop these kits. But maintaining the accuracy of the kits as good as the PCR method is a big challenge. Takara Bio Japanese drug company located in Dalian city of China supplied [15] reagents to 30 companies for manufacturing Covid-19 testing kits in Wuhan and other Chinese cities. The company increased its production capacity 50 times to keep the demand in coronavirus crises. Japanese company Takara Bio, Asia's largest reagent supplier company has increased its Covid-19 testing reagent product manufacturing enough to test two million people per month. The company has developed a new method to confirm the virus in one hour [16]. A chemical reagent has been developed [17] by Fujifilm Holdings that that can test coronavirus in 75 minutes. The new technique uses automated PCR method to detect the virus in a short time instead of a longer time of 4 - 6 hours needed in old PCR tests. Miraca Holdings, A Japanese diagnostics maker has also developed [18] coronavirus antigen testing kit that can give results in an hour, much faster than a conventional method. Riken, Japanese government institute and Kanagawa Prefecture of Japan have prepared coronavirus testing method that can detect the virus in 30 minutes [19] much shorter than six hours needed in the present method. To develop these kits, infected passengers from stranded Diamond Princess quarantined cruise ship were used. The test will be available as early as possible. The new method does not require heating and cooling that is used in the PCR test, thus reduces time to 30 minutes. Other Japanese research partners the Kyorin Pharmaceutical Co. and the National Institute of Advanced Industrial Science and Technology (NIAIST) have developed a kit which can detect the Covid-19 virus in just 15 minutes. Fujifilm Wako Pure Chemical Corp. and Tosoh Corp. chemical company is undertaking to develop a faster coronavirus detection kit.

#### **2.4. Recent Advances in SARS-Cov-2 Treatment**

A potential Japanese anti-flu Avigan drug is being considered for SARS-Cov-2 virus treatment and encouraging results are expected. The Fujifilm Holdings Corp., the maker of the Avigan drug, has increased [20] the drug's manufacturing capacity substantially enough up to one hundred thousand treatment doses. The production will be further increased up to three hundred thousand doses till September 2020. The Fujifilm Wako Pure Chemical Co. located in Japan will provide the necessary raw materials needed to produce the drug Avigan.

The Fujifilm has established collaboration with other domestic and international companies for overseas production. The trials on new coronavirus patients are underway in Japan and the USA. We described some of the therapeutic agents so far tried for SARS-Cov-2 but none of them are successful. To help overcome the new coronavirus crises Japan will give [14] for free the well-known anti-flu drug Avigan to 38 countries. Six countries are from Asia including the Philippines, Malaysia, and Kuwait and others are East European countries. Japan is conducting the test for the drug efficacy, the drug has already shown promis-

ing results in the tests conducted in China. The United Nations Office for Project Services is involved in such distribution and testing. Much talked an antiviral drug remdesivir [21] could only reduce hospitalization time for recovery of patients from 15 days to 11 days compared to placebo. The number of recovered patients was marginally better. Serious adverse effects such as acute respiratory failure, hypotension, viral pneumonia, and acute kidney injury were still noticed when treated with the drug remdesivir. The working principle of the drug remdesivir was based on interference with the enzyme responsible to copy the genetic material of the virus. The University of Tokyo Hospital has undertaken [22] clinical research of combination therapy of favipiravir (Avigan) and nafamostat mesylate (Futhan) to treat the patients of symptoms of SARS-Cov-2 virus. Researchers in Ashigarakami Hospital, Kangawa Prefecture administered [23] asthma steroid inhalant ciclesonide that helped patients recovering from SARS-Cov-2 infection pneumonia. The patients became healthy and no adverse effects were noticed. While the anti-HIV drug was not effective on these coronavirus patients rather caused side effects of loose bowels, lack of appetite, and the pneumonia symptoms still remained. Russia has recommended [24] a modified version of Avigan (Avifavir), a Japanese drug, to treat SARS-Cov-2 patients. Russia's RDIF claimed that the drug was successful in making the patients healthy in four days. They claimed the drug as a game changer. More trials are due in coming days and weeks. It was said that drug is useful to restore the economy of the country. On June 1, 2020; Russia had 405 843 cases, third highest number of infections in the world after Brazil and the United States but Russia had a surprisingly lower death toll of just 4693. The Russian Direct Investment Fund (RDIF) and ChemRar Group have spent \$4.3 million in conducting the trials of the drug. The above two companies have appreciated the handy data and results obtained by Fujifilm company who developed the original drug. Avigan is the original brand also known by the name Avifavir or favipiravir was developed in Japan. It works by interfering with the RNA reproduction in influenza virus. Russians have modified the drug to increase the potency for SARS-Cov-2 disease. Russian companies are willing to share the modification method with other companies. The modified drug is a success, 65% of patients took four days to recover. The drug is famous in Japan and \$ 128 million have been allotted to develop it for SARS-Cov-2 treatment.

## **2.5. Advances in SARS-Cov-2 Vaccine Development**

Japan's Prime Minister Shinzo Abe announced [25] \$300 million for the vaccine to developing countries. Japan will also extend financial support to Gavi, an international Vaccine Alliance for 2021 to 2026 for five years. To Gavi Vaccine Alliance, Japan gave already \$95 million for the period 2016-2020. Japan will also give access to the vaccine developed by Japan in future. The total amount of \$8.8 billion stands available for the vaccine program to the poor countries. Pharma companies around the globe are working overtime to develop vaccines and

treatments [26] for SARS-Cov-2 which has destroyed the world's economy and causing a large number of deaths and new cases of virus detected every day. The USA planned [27] to develop a safe and effective vaccine in the year 2020. At least six possible successful vaccines are underway for trial. More than one hundred thousand volunteers and leading researchers will participate in the project. The purpose of the project is to shorten the vaccine development time to a few months instead of ten years, a vaccine usually needs to prepare. The pandemic has destroyed the world economy and several million people infected and hundreds of thousand people are dead. The vaccine preparation companies have agreed to share their data and related infrastructures and facilities. The healthy health care workers and communities where virus spreading will be given the vaccine which finally passed all earlier tests to see if a vaccine works efficiently and effectively which can keep the population healthy in high concentration virus affected areas. Moderna Inc. claimed first that their company will conduct large-scale vaccine testing for SARS-Cov-2 in July this year (2020) later the company may collaborate with AstraZeneca PLC company. Moderna claimed they are already in the middle of human trials. The other companies Johnson & Johnson and Sanofi and Merck & Co are second to Moderna in the vaccine development race and results are expected for first the stage human trial in summer 2020.

Takeda Pharmaceutical Co., one of Japan's market leaders has started [28] work on plasma based therapy using the blood of healthy people who have recovered from SARS-Cov-2. The plan of the company also includes plasma-derived therapy from the vaccinated people after the vaccine is developed. Avigan an anti-flu drug of Fujifilm Holdings Corp. is under trial in China and other parts of the world. Another Japanese company AnGes Inc. and Osaka University have developed a DNA based vaccine for coronavirus and testing in animals is underway. DNA based vaccines use inactivated virus and can be prepared faster than protein-based vaccines as claimed by the company AnGes Inc. A Japanese company Shionogi & Co. expecting [29] to introduce the SARS-Cov-2 vaccine first to health care workers by the beginning of January 2021 and then to the general public in September 2021. Protein antigen based vaccine using insect's cells has been planned.

## 2.6. Other Measures and Means

By and large, travelers are afraid of coronavirus to use domestic and international flights as the passengers are confined in a narrow isolated space when in air. Japanese airlines are making efforts [30] to stop the virus spread so that passengers feel safe when getting onboard. Planes are being disinfected regularly and properly and the air inside the cabin is changed every three minutes. Boarding and luggage handling have been digitized to avoid human contact and personal sanitizers are being used to stop virus transmission. The use of masks has been made compulsory and in-flight services have been reduced. At the press conference [31] of Gunma's Governor Ichita Yamamoto, in Japan, the sign language

assistant wore a transparent mask to keep her lips and jaws movement clear for hearing impaired people. The people, who cannot hear, can get information about COVID-19 in sign language through the movement of mouth and jaws and facial expressions apart from hands' movement. If sign language is not used the hearing impaired people need someone to write for them that takes time. Transparent masks are prepared from transparent plastic that makes face clear. Transparent plastic is covered with antifogging film. An alcoholic and non-alcoholic beverage industry, the Global leader Suntory Group has put much global efforts to fight novel coronavirus as they are supplying materials used in making hand sanitizers [32] Suntory Holdings supplying nationwide neutral alcohol used as a liquid disinfectant in hospitals and hand sanitizers. Another Suntory group brand the Beam Suntory has head office in Chicago, USA, also a global leader supplying premium spirits supplying hand sanitizers produced in Clermont in Kentucky, USA.

### **3. Conclusion**

In the year 2020, the Tokyo 2020 Olympics could be a big event. It was a chance for Japan to show the world that it has overcome the 2011 triple disaster of the great northeast Japan earthquake followed by a tsunami and Fukushima nuclear reactor meltdown. The COVID-19 pandemic led to the postponement of the Games until 2021. We have described the sporting, financial, management, and administrative aspects of the delayed Games. In the hope that Tokyo 2020 Olympics will be conducted in 2021, the infection, and the recent updates of testing the SARS-Cov-2 virus, treatment, and possibilities of availability of a proper vaccine have been described to prepare the athletes, organizers, and participants of the Games. If a proper vaccine is available and Games are conducted in 2021 then it will be a New Start and Flame of Hope for the world to end COVID-19 crises.

### **Acknowledgements**

The corresponding author (Zameer Shervani) dedicated this COVID-19 research to his father Intisar Ahmad Khan.

### **Author Contribution**

All three authors contributed equally.

### **Statement of Human and Animal Rights**

No animal and human right issues exist in this research. No animal or human experiments were conducted in this research.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] Ticket Bought for 2020 Games to Be Honored in 2021. *Yomiuri Shimbun*, March 26, 2020.
- [2] Japan PM Abe Says in Full Agreement on Olympics Delay with IOC's Bach. *The Asahi Shimbun*, March 24, 2020.
- [3] Tokyo Olympics Rescheduled for July 23-Aug. 8 in 2021. *The Asahi Shimbun*, March 31, 2020.
- [4] Trump Cancel G7 at Camp David over Coronavirus, to Hold Videoconference Instead. *The Asahi Shimbun*, March 22, 2020.
- [5] What to Call 2021 Olympics? Just One of Many Challenges for Japan. *The Asahi Shimbun*, March 26, 2020.
- [6] Balmer, Etienne; What Would Olympics Cancellation Cost Japan? *Asia Times*, March 12, 2020.
- [7] Olympics Delay to Cost Japan \$ 6 bn in Economic Losses; Rurika Imahashi, Francesca Regalado; Nikkei Staff Writers. *Nikkei Asian Review*, March 24, 2020.
- [8] Hosting Tokyo Olympics Next Year Difficult without Vaccine, Says Japan Medical Association Chief. *The Japan Times*, April 28, 2020.
- [9] David Coverdale, Japanese Prime Minister Shinzo Abe Admits It Will Be "Impossible" to Hold the Olympic Games in 2021 "Unless the Coronavirus Pandemic Is Contained". *Mail Online*, April 29, 2020.
- [10] Jack Tarrant; Tokyo 2020 Olympic Games Will Be "Scrapped" If Delayed Again, Organizers Warn. *The Independent*, April 28, 2020.
- [11] OLYMPICS/IOC Sets Aside \$ 800M for Loans, Payments Linked to Pandemic. *The Asahi Shimbun*, May 15, 2020.
- [12] Cats Can Catch Coronavirus, Study Finds, Prompting WHO Investigation. *The Asahi Shimbun*, April 25, 2020.
- [13] Japan Approves Safer, Easier PCR Virus Test Using Saliva. *The Japan Times*, June 2, 2020.
- [14] Japan to Offer Anti-Flu Drug Avigan to 38 Countries as Early as This Week. *Japan Times*, April 29, 2020.
- [15] Kenya Akama (Nikkei Staff Writer), Takara Bio Ramps Up Production of Coronavirus Test Reagent 50-Fold. *Nikkei Asian Review*, February 6, 2020.
- [16] Japan's Takara Bio Cuts Coronavirus Test Time in Half. *Nikkei Asian Review*, April 30, 2020.
- [17] Yukinori Hanada (Nikkei Staff Writer) No Specialist Needed: Fujifilm Cuts Coronavirus Test to 75 Minutes. *Nikkei Asian Review*, May 8, 2020.
- [18] Miwa Yoshida (Nikkei Staff Reporter), Faster Coronavirus Test Submitted for Approval in Japan. *Nikkei Asian Review*, April 28, 2020.
- [19] Riken, Kanagawa Pref. Create Test to Detect Coronavirus in 30 Min. *Kyodo News*, February 27, 2020.
- [20] Fujifilm Expands Capacity for COVID-19 Drug Avigan. *The Asahi Shimbun*, April 25, 2020.
- [21] Beigel, J.H., Tomashek, K.M., Dodd, L.E., Mehta, A.K., Zingman, B.S., Kalil, A.C., Hohmann, E., Chu, H.Y., Luetkemeyer, A., Kline, S., Lopez de Castilla, D., Finberg, R.W., Dierberg, K., Tapson, V., Hsieh, L., Patterson, T.F., Paredes, R., Sweeney, D.A., Short, W.R., Touloumi, G., Lye, D.C., Ohmagari, N., Oh, M., Ruiz-Palacios,

G.M., Benfield, T., Fätkenheuer, G., Kortepeter, M.G., Atmar, R.L., Creech, C.B., Lundgren, J., Babiker, A.G., Pett, S., Neaton, J.D., Burgess, T.H., Bonnett, T., Green, M., Makowski, M., Osinusi, A., Nayak, S. and Lane, H.C. (2020) Remdesivir for the Treatment of Covid-19—Preliminary Report. *The New England Journal of Medicine*. <https://doi.org/10.1056/NEJMoa2007764>

- [22] Clinical Research for Combination Use of Avigan and Futhan Start in Japan. *Yomiuri Shimbun*, May 9, 2020.
- [23] Ryosuke Nonaka, Researchers Find Asthma Medicine Helps Patients Hit by Coronavirus. *The Asahi Shimbun*, March 16, 2020.
- [24] After Fast-Tracking Japanese COVID-19 Drug, Russia to Roll out “Game Changer” Next Week. *The Japan Times*, June 1, 2020.
- [25] Japan to Give \$300 Million for Vaccinations in Developing Countries. *The Mainichi*, June 4, 2020.
- [26] Pharma Firm AnGes and Osaka Univ. to Begin Virus Vaccine Tests. *The Asahi Shimbun*, March 24, 2020.
- [27] U.S. Plans Massive Coronavirus Vaccine Testing Effort to Meet Year-End Deadline. *The Japan Times*, May 23, 2020.
- [28] Takeda Pharma Says It Is Developing Coronavirus Drug. *The Asahi Shimbun*, March 4, 2020.
- [29] Japan Pharmaceutical Firm Aiming for Coronavirus Vaccine in January 2021. *Yomiuri Shimbun*, June 4, 2020.
- [30] Japanese Airlines Promote Anti-Virus Measures to Get Wary Passengers Back on Board. *The Japan Times*, June 7, 2020.
- [31] Interpreters in Japan Don Transparent Masks during Press Conference. *Yomiuri Shimbun*, May 04, 2020.
- [32] Suntory Group to Start Providing Sanitizing Solutions in Japan to Fight against the Spread of COVID-19. *The Japan Times*, May 1, 2020.