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Editorial Note

Expeditious responses to COVID-19 crisis: From governmental management to laboratory approach

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On the basis of recently published literatures about COVID-19 in *Biomedical Journal*, we are bringing together this collection of News, Short Communication, Reviews and Original Articles and highlighting the prompt, direct responses of the Taiwanese government in managing this crisis and several thorough reviews and fundamental research on COVID-19. Taiwan is so close to Mainland China and was expected to have a very high incidence and number of COVID-19 cases in 2020. However, given a painful experience and lesion learnt from SARS 17 years ago, the Taiwanese government has been on constant alert and ready to promptly respond to this pandemic arising from China. At the beginning of the COVID-19 outbreak, the National Health Command Center (NHCC) of Taiwan, unifying a central command system that is composed of the Central Epidemic Command Center (CECC), the Biological Pathogen Disaster Command Center, the Central Medical Emergency Operations Center and the Counter-Bioterrorism Command Center, rapidly established several critical and timely actions including border control from the air and sea in early January, big data- and technology-based identification of cases, systematic quarantine of suspected cases, proactive case finding, resource allocation, daily press conference and extensive public education, negotiation with other countries and regions, formulation of policies for schools, childcare and nursing homes, and relief to businesses [1]. Apparently, the CECC effectively coordinated different efforts by various ministries, including the ministries of transportation, economics, labor, education, and environmental protection to comprehensively counteract the emerging public health crisis, allowing Taiwan to manage the outbreak exceptionally well. In addition to these strategies mentioned above, the commander of CECC requested National Health Research Institutes (NHRI), the only mission-oriented medical and health research center in Taiwan, to take the responsibility in coordinating clinical resources and provide a national technology platform for COVID-19 research. In order to develop rapid diagnostic reagents or new drugs, high quality human samples with comprehensive clinical data for testing and verification prior to real clinical application are extremely critical. Those bio-specimens are also essential for the basic research and epidemiological analyses. Within two weeks, the NHRI Biobank completed all the ethical and regulatory processes, and the National Biobank Consortium of Taiwan (NBCT), also operated by NHRI, started to recruit patients and collect their blood samples [2]. Meanwhile, the Taiwanese government made several endeavors to improve the current practice of epidemiological investigation by introducing new technologies in digital platform and knowledge graphs [3]. Contact tracing is an important control measure to contain the spread, especially in the early stage of an infectious disease outbreak. In this issue, a swift development of an *e-Outbreak Platform*

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that provides a semi-structured, multifaceted and computer-aided questionnaire to reinforce disease control and contact tracing was described by Chen and his colleagues. Furthermore, Dr. Seak presented very proactive strategies implemented by Lin-Kou Chang Gung Memorial Hospital (LCGMH) to effectively prevent spread of COVID-19 among healthcare workers of emergency department (ED) during outbreak [4]. LCGMH is one of the largest hospitals in the world and the nearest tertiary hospital to Taiwan Taoyuan International Airport, the largest and busiest airport in Taiwan. Its ED, with approximately 15,000 visits per month, is also one of the largest and busiest EDs in the world. During the COVID-19 outbreak, they have successfully managed to maintain a "zero-infection" rate among their ED healthcare workers through various, systematic approaches including a clear flowchart with route planning, strict infection control policies and regulation of medical equipment, and team-based segregation in the workplace. The meticulous implementation of these strategies in LCGMH is certainly the key to contribute the successful management against COVID-19.

In this special issue of the *Biomedical Journal,* we collected three Review Articles by Drs. Shih, Chauhan and Chi et al., respectively [5–7]. Dr. Shih and her colleagues provide a very comprehensive review on the basic properties, potential origin, and evolution of the novel human coronavirus. These virology-based knowledge and viewpoints will be critical for the studies of pathogenicity, antiviral designs, and vaccine development against this highly pathogenic and transmitted virus. Dr. Chauhan provides an update on a rapidly evolving global pandemic. Facing the tremendous threat of emerging and re-emerging infectious diseases, governments all around the world should be well aware that more investments in public health, climate change countermeasures, a global health surveillance system, an effective research into identifying pathogens, subsequent treatment, vaccine development and effective health delivery systems are needed. Dr. Chi and her colleagues also provide a quick review on COVID-19, putting emphases on the necessity of urgent development of accurate diagnostic methods, effective treatments, and potential vaccines. Apparently, strong, extensive international coordination and collaboration among research institutes, pharmaceutical companies, regulators, and governments are all needed to achieve this goal.

Given a fact that the highly pathogenic viruses need to be operated in a high level of biosafety containment, it severely hinders the developmental process of drugs, therapeutic antibodies and vaccines. To shorten the timeframe, the pseudoviral systems have been widely applied to verify the potential efficacy and/or immunogenicity of vaccines against those emerging and re-emerging viruses. Here Dr. Wang and her colleagues quickly developed two pseudoviral systems for emerging SARS coronavirus 2 (SARS-CoV-2) and re-emerging avian influenza virus H5 subtypes which can be handled in biosafety level-2 facility, facilitating the process in vaccine development in Taiwan [8]. In this issue, Dr. Ojcius and his colleagues provide an interesting hypothesis that improving oral health could decrease the severity of COVID-19 symptoms and reduce the associated morbidity as well [9]. On the basis that improving oral health in people of any age effectively reduces their risk of developing non-oral systemic diseases such as diabetes, heart and lung diseases, which have been reported to exacerbate the pathogenesis of SARS-CoV-2 infection, the association between oral health and severity of COVID-19 symptoms seems logical. However, more in-depth research is needed to demonstrate its causal relation.

With the rapid emergence of new virus strains, there is an urgent requirement for the development of the novel and effective antiviral drugs for the treatment of COVID-19. In this special issue, Drs. Dubey presented a computational approach to identify the potential flavones inhibitor narcissoside that binds to coronavirus for the treatment of COVID-19 [10]. Structure-based drug design with molecular docking approach has been a promising technique to expeditiously discover potential inhibitors and has become one of the mainstream practices in modern drug discovery. Another quick-to-be-identified cure for COVID-19 will be based on the artificial intelligence (AI) technology. Dr. Ke and his colleagues have fully taken advantage of this AI-based approach and identified 8 marketed drugs with strong activities against feline infectious peritonitis (FIP) coronavirus [11]. These potential candidates are currently screened by SARS-CoV-2 assay system. Furthermore, Dr. Lee and her research team presented another strategy by the repurposing of existing drugs approved for other indications as antiviral agents for SARS-CoV-2 [12]. Strikingly, 15 out of 252 drugs or pharmacologically active compounds screened were found to be active against both FIP coronavirus and HCoV-OC43, with EC_{50} values ranging from 11 nM to 75 μM, providing the feasibility of an "immediate" use for COVID-19 patients, in case their anti-SARS-CoV-2 activity has been confirmed. All the information collected in this special issue would improve our understanding of the unique features of COVID-19 and enhance our control strategies in the future.

Conflicts of interest

The author declares no conflicts of interest.

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