

# In Memory of the Virologist Jianguo Wu, 1957–2022

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## 1. Biographical Introduction

It is with deep sorrow that we mourn the passing of the virologist Professor Jianguo Wu. He devoted his life to the research of viruses, and was still working until the end of his life. His death is a great loss to the international virology community. Here, we summarize his significant contributions to the development of virology, the construction of scientific research platforms, and social services in epidemic prevention and control. Through commemorating our beloved virologist, we are inspired to continue to work hard in his spirit of persistent struggle against viruses.

Professor Jianguo Wu was born in Jishui County, Ji'an, Jiangxi Province, China. From 1978 to 1985, he studied at Wuhan University and engaged in virology research. He went to the United States in 1989 and obtained his Ph.D. in biochemistry from the University of Idaho in 1992. From 1993 to 1996, he engaged in postdoctoral research in molecular biology at Princeton University, and he worked here as a research fellow for another 3 years. In 1999, he resolutely gave up the preferential treatment in the United States and went back to his motherland, China. He worked diligently at Wuhan University for more than 20 years. After retiring, he continued to engage in teaching and research at Jinan University, and also made remarkable achievements there. As soon as the COVID-19 pandemic broke out, he devoted himself to work on SARS-CoV-2 testing and research until the end of his life.

## 2. Academic Achievements

Professor Wu conducted virology research with an emphasis on elucidating the molecular mechanisms of infection, immunity, and the pathogenesis of important human viruses, and the molecular epidemiology of newly emerging viruses. He was devoted to the study of the pathogenesis of human hepatitis B virus (HBV) and hepatitis C virus (HCV). He revealed several important functions of hepatitis B virus x protein (HBx), like its roles in cell apoptosis, transformation, and tumorigenesis [1–3]. The association between HBV replication and innate immunity was investigated by his team [4]. He reported several host proteins that could suppress HBV replication [5–9], and found that HBV evolved a series of strategies to evade host immunity, consequently facilitating viral replication [5,10–15]. The role of HBV in promoting hepatocellular carcinoma development was studied and characterized by Prof. Wu too [16,17]. In studies of HCV, he revealed the functions of the HCV NS2 protein, NS3 protein, NS5A protein, and the envelope protein E2 in the pathogenesis of viral infection [18–23]. He studied the cross talk between HCV and human immunodeficiency virus 1 (HIV-1) and revealed that these two viruses could promote each other's replication in different ways [24–26].

The influenza virus has been endangering the life and health of human beings for a long time. Professor Wu was also committed to investigating the epidemiological characteristics of influenza viruses [27], exploring their pathogenesis [28,29] and developing new



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detection methods [30]. He provided several potential drugs that could effectively inhibit the infection of influenza virus [31–35], and also developed an effective new vaccine [36].

Enteroviruses, particularly Enterovirus 71 viruses, always attracted Prof. Wu's research interest. He made great achievements in studies about the epidemiological characteristics [37,38] and molecular mechanisms [39–44] of EV71. He also discovered some potential drugs against EV71 infection [45]. In particular, he made a breakthrough in the study of EV71-induced inflammatory response, in which the EV71 3D protein contributed to the activation of the NLRP3 inflammasome [46].

After retiring from Wuhan University, Professor Wu's focus shifted to the Pearl River Delta area in China, where Zika and Dengue, of flavivirus, are the more prevalent viruses in the region. He reported the molecular epidemiology and molecular mechanisms of the pathogenesis of Dengue virus [47], and revealed that infection with this virus could induce tissue injury and vascular leakage through its M and NS1 proteins [48–50]. Meanwhile, the regulatory mechanism of Zika virus infection in humans was also well elucidated by his team [51,52], especially the inflammation-promoting role of the Zika NS1 protein [53].

The outbreak of SARS and COVID-19 brought great harm to society, and Prof. Wu conducted in-depth and systematic research on SARS-CoV and SARS-CoV-2 [54,55]. Their pathogenesis and epidemiology were identified by his team through an isolation of the virus from a SARS patient [56]. He also revealed the molecular mechanisms of the pathogenesis of SARS-CoV, such as the stimulation of cyclooxygenase-2 expression by spike proteins [57] and the activation of interleukin-6 (IL-6) and cyclooxygenase-2 (COX-2) expression by the viral nucleocapsid protein [58,59]. Due to the good foundation of SARS-CoV research, Professor Wu carried out deeper studies on SARS-CoV-2's epidemiological characteristics, pathogenic molecular mechanisms, and detection methods. He and his team revealed that the SARS-CoV-2 nucleocapsid protein plays important roles in the repression of IFN- $\beta$  [60], activation of the NLRP3 inflammasome [61], regulation of apoptosis [62], and the induction of acute kidney injury [63]. He reported that HIF-1 $\alpha$  could promote SARS-CoV-2 infection and deepen inflammatory responses [64]. A robust and visual detection of SARS-CoV-2 and emerging variants called loop-mediated isothermal amplification (LAMP) was also developed by Prof. Wu's team [65].

In addition to the studies on the viruses mentioned above, Wu's team also explored the molecular pathogenesis of viruses including Epstein–Barr virus (EBV) [66], HIV-1 [67], mumps virus [68], Borna disease virus [69,70], and so on. In short, Wu devoted his life to virology research and made great contributions to the development of the field.

### 3. Construction of Scientific Research Platform

As a national high-level talent introduction, Professor Wu's scientific research career was supported by governments at all levels. He presided over more than 30 scientific research projects, including major national science and technology projects, 973 national program projects, and key projects of the National Natural Science Foundation of China. When returning to China and taking up his post at Wuhan University, he devoted himself to the establishment of the State Key Laboratory of Virology (SKLV), played an extremely important role in the establishment of the SKLV, and worked as its director from 2006 to 2016. After retiring, Prof. Wu continued to shine in the virology field. He worked as the president of the Institute of Medical Microbiology at Jinan University (Figure 1). He and his team successively established the Key Laboratory of Virology in Guangzhou and the Key Laboratory of Virology in Guangdong Province at Jinan University. In order to facilitate industrial transformation, Prof. Wu established the Biomedical Industry Park of Jinan University and the Foshan Institute of Medical Microbiology with support from the Foshan Municipal government and the Shunde District government, respectively.

Under the leadership of Prof. Wu, these research platforms have produced good scientific output, served local education and scientific research, and contributed to local economic development.



**Figure 1.** Jianguo Wu and his team at the Institute of Medical Microbiology, Jinan University: Yuanyuan Duan, Heng Xiao, Zhen Luo, Xulin Chen, Jianguo Wu, Qiuping Tan, Qiwei Zhang, Yongkui Li, Jun Chen, Yang Yu, Jinbiao Liu, and Xin Chen.

#### 4. Social Contribution and Personal Honor

Throughout his career, Prof. Wu made outstanding achievements. He published over 230 papers in scientific journals, and he was selected as one of the most cited Chinese Researchers in 2021 by Elsevier. He was also granted 32 authorized national invention patents. During the COVID-19 pandemic, Professor Wu's company (Longfan Biotechnology Co., Ltd.) donated free disinfection and sterilization products to the community, which solved the problem of supply shortage. This selfless dedication received praise from the local government (Figure 2).



**Figure 2.** (Left) the local government awarded Wu's company a medal for meritorious efforts in combating the epidemic. (Right) Wu's company donated epidemic prevention materials.

In recognition of his outstanding contribution, he received 30 awards in the last 25 years. They included the first prize for Natural Science in Hubei Province, the second prize for Natural Science in Yunnan Province, the second prize for life chemistry research in Yaoming Kant, the first prize for outstanding team in the implementation of national science and technology plan, and the first prize for excellent academic papers in Natural Science in Hubei Province. His honors also include a special allowance provided by the government of the State Council, Excellent Foreign Experts of the People's Government of Hubei



Province, Top Ten Young and Middle-Aged Experts with Outstanding Contributions in Hubei Province, Advanced Individuals of New Overseas Chinese Entrepreneurship in Hubei Province, etc.

## 5. Conclusions

In short, Prof. Wu made indelible contributions to education, virology research, and the welfare of society. He achieved many great things in his short life. We pay tribute to our beloved teacher with this article to express our deep thoughts for him.

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