WIV Newsletter
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New progress is achieved in research fields of virology and nanotechnology

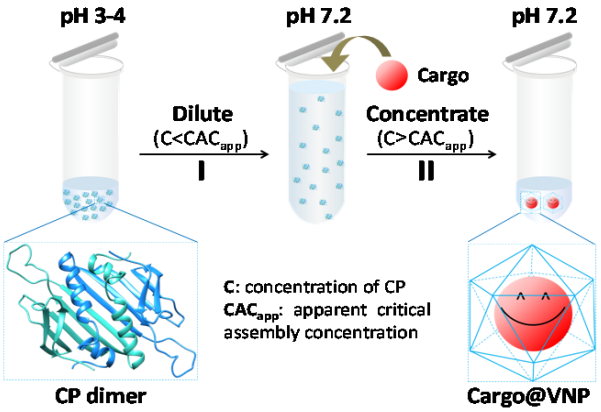
Molecule encapsulation in virus-based nanoparticles (VNPs) is an emerging bioinspired way to design novel functional nanostructures and devices.

In a joint study, the research groups led by Prof. LI Feng from Wuhan Institute of Virology of the Chinese Academy of Sciences and Prof. ZHANG Xian'en from Institute of Biophysics of the Chinese Academy of Sciences reported a general cargo-compatible approach to encapsulate guest materials based on the apparent critical assembly concentration (CACapp) of VNPs.

Different from the conventional buffer-exchange method, the new method drives the reassembly of VNPs to encapsulate cargoes by simply concentrating an adequately diluted mixture of VNP building blocks and cargoes to a concentration above the CACapp.

This method has been proved to work well on different types of cargoes (including inorganic nanoparticles and proteins) and VNPs.

The major advantage of this method is that it can maximally preserve cargo stability and activity by providing the freedom to choose cargo-friendly buffer conditions throughout the encapsulation process.



This method would benefit the realization of the potentials of VNPs and other protein nanocages as nanomaterials in diverse fields of nanotechnology.

The results have been published in Nano Letters entitled "Cargo-Compatible Encapsulation in Virus-Based Nanoparticles".

This work was supported by grants from the National Natural Science Foundation of China, Science and Technology Program of Guangzhou, China and etc.

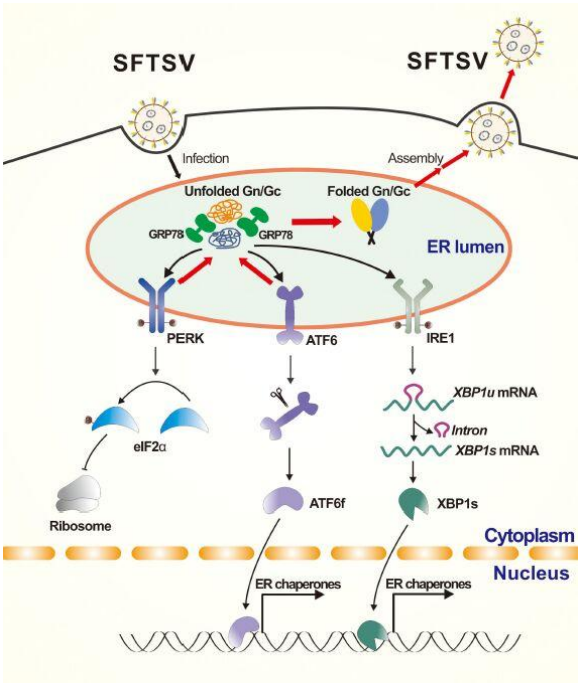
Link: *https://pubs.acs.org.ccindex.cn/doi/abs/10.1021/acs.nanolett.9b00679?journalCode=nalefd*

Researchers provide a global view on how host cells respond to SFTSV infection

Severe fever with thrombocytopenia syndrome virus (SFTSV) is an emerging tick-borne virus that causes severe fever with thrombocytopenia syndrome (SFTS). Since the first report in China in 2009, SFTSV has spread over China, South Korea and Japan, with a mortality rate reaching up to 30%.

To establish successful infection, SFTSV must manipulate host proteins to favor its own replication. However, there lacks a comprehensive understanding of the molecular interactions occurring between SFTSV and host cells.

In a joint study, to systematically identify host proteins involved in SFTSV-host interactions, the research groups led by Prof. HU Zhihong and Prof. XIAO Gengfu from Wuhan Institute of Virology of the Chinese Academy of Sciences investigated the dynamic host cellular responses to SFTSV infection by isobaric tag for relative and absolute quantification (iTRAQ)-based quantitative proteomic analysis.



iTRAQ is an isobaric labeling method employed in quantitative proteomics by tandem mass spectrometry for the identification and quantitation of proteins from different sources in a single experiment.

Human embryonic kidney (HEK 293) 293 cells are highly permissive to SFTSV infection and in vivo model showed that SFTSV replicated and caused pathological changes or lesions in kidney cells in mice and macaques.

In addition, a wide variety of functional studies of SFTSV have been performed in this cell line, the researchers decided to choose HEK 293 cells for proteomic study. Their results provide a global map showing how host cells respond to SFTSV infection and highlight multiple biological processes being regulated by SFTSV infection.

Among these, they focused on exploration of the mechanism of how SFTSV infection stimulates host cell UPR and, in

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turn, how the three classical pathways of UPR affect SFTSV infection.

The results have been published in Journal of Virology entitled "Quantitative proteomic analysis reveals unfolded protein response involved in severe fever with thrombocytopenia syndrome virus infection".

This work was supported by grants from the National Natural Science Foundation of China, the National Key R&D Program of China, and Youth Innovation Promotion Association CAS.

Link: *https://jvi.asm.org/content/early/2019/03/01/JVI.00308-19*

Cooperation

Delegation from Ministry of Education of Kenya visited WIV and promoted the development of the Sino-Africa Joint Research Center, CAS

On Feb 23, under the organization and coordination of Sino-Africa Joint Research Center, Chinese Academy of Sciences (CAS), Prof. Muhammad Hussein Abdille, the Senior Advisor of the Cabinet Secretary on International Partnership and Collaborations of the Ministry of Education of Kenya and other five delegates, accompanied by Prof. WANG Qingfeng, the Director of the Sino-Africa Joint Research Center, paid a visit to Wuhan Institute of Virology (WIV), Chinese Academy of Sciences (CAS).

The delegation hopes that this trip will further strengthen the bilateral cooperation in virology research, prevention and control of infectious diseases, epidemics investigation and biosafety.

The delegation visited Wuhan National

Biosafety Laboratory (Wuhan P4 Laboratory) and participated in the seminar.

During the discussions, the two sides had reached consensus to promote the cooperation under the framework of Sino-Africa Joint Research Center, including joint research collaboration, personnel training, students' exchanges and etc.

Cooperation

Prof. YUAN Zhiming was interviewed by French Challenges Magazine

On Feb 20, Prof. YUAN Zhiming, the Director of Wuhan National Biosafety Laboratory (Wuhan P4 Laboratory), Chinese Academy of Sciences (CAS), was interviewed by Mr. Antoine Izambard, a journalist from French Challenges magazine. Challenges magazine is one of the well-known French publications, mainly covering economic, commercial, political and world affairs. In the field of international news media, it has a very important influence.

During the interview, Prof. YUAN Zhiming introduced the layout and structure of the Wuhan P4 Laboratory, and the characteristics and advantages of its construction design. He reviewed the cooperation process between China and France in the field of prevention and control of emerging infectious diseases since 2003, and expressed sincere gratitude to the French side for their support and assistance in the construction of high-level biosafety laboratory and the joint comparative research on biosafety laws and regulations. He said that in the future, China and France will continue to make full use of the laboratory as a platform to carry out cutting-edge joint research, and to make outstanding contributions together to biosafety and public health.

In addition, Mr. Rene Courcol, the French expert involved in the operation of the Wuhan P4 laboratory, also briefed the journalist on the construction of the laboratory's quality control system.

Science Tips

A second HIV patient has gone into remission after a stem cell transplant

For only the second time in recorded medical history, a man's HIV infection has gone into remission.

The patient — positive for the virus that causes AIDS since 2003 — had received a blood stem cell transplant in 2016 as

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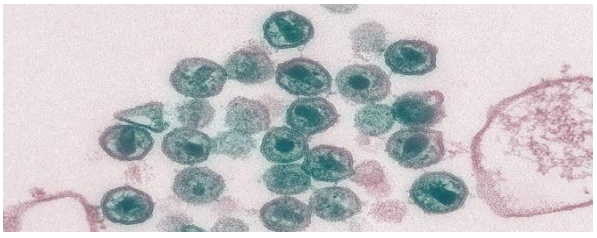
treatment for Hodgkin's lymphoma, a cancer of the lymphatic system. The blood stem cells came from a donor with a mutation that makes cells resistant to an HIV infection.

Subsequent testing over 12 months showed the patient's HIV had fallen to undetectable levels. So 16 months after the procedure, the patient stopped taking antiretroviral medication under medical supervision. He has remained in remission ever since, with HIV levels measuring less than one copy per milliliter of plasma, researchers report online in Nature March 5. Although it's too early to call the patient cured, "it's pointing in that direction," says coauthor Ravindra Gupta, an infectious disease specialist at the University of Cambridge.

Nearly 37 million people worldwide were living with HIV in 2017, with 1.8 million people newly infected that year, according to UNAIDS. Antiretroviral therapy, or ART, has helped many patients live longer by reducing virus levels in the blood, but the drugs need to be taken for life. During an HIV infection, the virus ambushes immune cells called T cells and makes copies of itself. To enter the T cell, HIV first binds to a cell surface protein called CD4 and then grabs onto another surface protein. Most HIV binds to one called CCR5, although some HIV variants grab one called CXCR4 — or are capable of using either protein.

Once it was clear that the patient, who has chosen to remain anonymous, would undergo a stem cell transplant for Hodgkin's lymphoma, physicians were able to locate a donor with a defect in both copies of the CCR5 gene. That meant the donor's T cells couldn't make the CCR5 protein. And without this protein, most HIV variants can't get into the cells. The doctors determined that the patient had CCR5-using HIV, and so they suspected — correctly — that the transplant might halt the HIV infection. The case provides "solid evidence for remission," says Hans-Peter Kiem, a physician who studies cell and gene therapy at the Fred Hutchinson Cancer Research Center in Seattle, and was not involved in the research. The "only way to tell whether [this is a] long-term remission or cure is longer follow-up." The first case to hint that an HIV cure may be possible was reported in 2009 in the New England Journal of Medicine. That case involved the "Berlin patient," later identified as Timothy Ray Brown, who had undergone a cancer treatment that was similar to but more severe than what the patient in the Naturestudy received. Having a second person in remission means the first case "wasn't a chance event," Gupta says. Brown's cancer treatment included two blood stem cell transplants from a donor with a defect in both copies of the CCR5 gene along with two rounds of full



HIV needs two surface proteins to enter into immune cells called T cells and replicate. An HIV patient went into remission after getting a stem cell transplant with cells that can't make one of those surface proteins. Image by MAUREEN METCALFE, TOM HODGE/CDC

Science Tips

body irradiation. The second patient had chemotherapy and only one stem cell transplant. While these transplants appear to be effective at stopping HIV, they are not an option for most HIV patients. Naturally having the defect in both copies of the CCR5 gene is very rare and is more likely in those of Caucasian descent, making it extremely difficult to find transplant matches for most people.

Another approach may be to manipulate the ability of a patient's own T cells to make the CCR5 protein, and there are clinical trials under way in the United States testing different methods of preventing CCR5 from functioning in patients. "We need to learn how to make this work" with a patient's own cells in order for the approach to be available more widely, Kiem says.

Source: *Science News*

Express News

Call for application: CAS President's International Fellowship Initiative (PIFI)

CAS offers a package of international fellowships, collectively called the PIFI program to support highly-qualified international scientists and postgraduate students to work and study at CAS institutions and strengthen their scientific collaboration with CAS researchers. The PIFI program is available for seven categories of international researchers and students: distinguished scientists, visiting scientists, postdoctoral researchers and international PhD students. The first round of application in 2019 shall be submitted before April 15.

For more details: *http://english.cas.cn/cooperation/fellowships/201503/P020180904601127117142.jpg*