



Spotlight

How bats carry viruses without getting sick

Bats are known to harbor highly pathogenic viruses like Ebola, Marburg, Hendra, Nipah, and SARS-CoV, and yet they do not show clinical signs of disease. In a paper published in the journal *Cell Host & Microbe* on February 22, scientists at the Wuhan Institute of Virology in China find that in bats, an antiviral immune pathway called the STING-interferon pathway is dampened, and bats can maintain just enough defense against illness without triggering a heightened immune reaction.

"We believe there is a balance between bats and the pathogens they carry," says senior author Peng Zhou. "This work demonstrated that in order to maintain a balance with viruses, bats may have evolved to dampen certain pathways."

In humans and other mammals, an immune-based over-response to one of these and other pathogenic viruses can trigger severe illness. For example, in humans, an activated STING pathway is linked with severe autoimmune diseases.

"In human history, we have been chasing infectious diseases one after another," says Zhou, "but bats appear to be a 'super-mammal' to these deadly viruses." By identifying a weakened but not defunct STING pathway, researchers have some new insight



into how bats fine-tune antiviral defenses to balance an effective, but not an overt, response against viruses.

The authors hypothesize that this defense strategy evolved as part of three interconnected features of bat biology: they are flying mammals, have a long lifespan, and host a large viral reservoir. "Adaptation to flight likely caused positive selection of multiple bat innate immune and DNA damage repair genes," Zhou says. These adaptations may have shaped certain antiviral pathways (STING, interferon, and others) to make them good viral reservoir hosts and achieve a tolerable balance.

This work was supported by the China Natural Science Foundation, the Strategic Priority Research Program of the Chinese Academy of Sciences, and the CAS Pioneer Hundred Talents Program. (Eurekalert!)

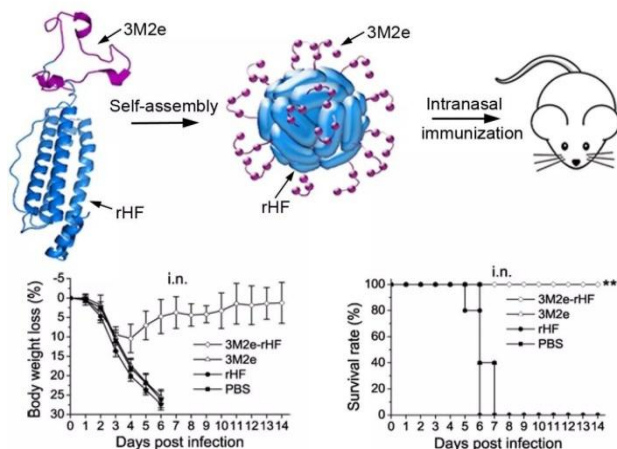


Research Progress

Chinese scientists develop new flu vaccine

A research group from Wuhan Institute of Virology, Chinese Academy of Sciences, announced that they have developed a new type of flu vaccine using nano-technology.

The intranasal nano-vaccine can target broad-spectrum flu viruses and induces robust immune responses, said Cui Zongqiang, leader of the research group.



"In our study, an intranasal nanovaccine worked well against infections of H1N1 and H9N2 virus in mice," Cui said.

"The results suggest that the 3M2e-rHF nanoparticle is a promising, needle-free, intranasally administered, cross-protective influenza vaccine," he said.

Across China, measures have been taken contain the winter flu outbreak. Experts said flu infections this winter are 71 percent above the average for the same period in the previous three years, with child cases rising sharply.

Flu outbreaks have been also reported worldwide including the United States, Canada, Britain, Italy, North Africa, Japan, and the Republic of Korea since winter last year. (Xinhua)

Link: <http://onlinelibrary.wiley.com/doi/10.1002/sml.201502207/abstract>

WDR5 represents interesting regulatory mechanism and a potential antiviral target

Human cytomegalovirus (HCMV) has a large (~25-kb) genome with over 170 ORFs and exploits numerous cellular factors to facilitate its replication. HCMV infection increases protein levels of WD repeat-containing protein 5 (WDR5) during infection, overexpression of WDR5 enhances viral replication, and knockdown of WDR5 dramatically attenuates viral replication. WDR5 is essential for assembling the VISA-associated complex to induce a type I interferon antiviral response to Sendai virus

infection. However, the roles of WDR5 in DNA virus infections are not well described.

In a present study, the research group led by Prof. LUO Minhua in Wuhan Institute of Virology of the Chinese Academy of Sciences indicated that WDR5 promotes nuclear egress of viral capsids, resulting in significant decrease in production of infectious virions. This is the first report that WDR5 favors HCMV, a DNA virus replication, and highlights a novel target for anti-viral therapy.

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In this study, the scientists found that WDR5 expression increases during HCMV infection and this serves to enhance HCMV replication. Furthermore, knockdown of WDR5 resulted in defects in capsid nuclear egress and reduced production of infectious virions. Their findings suggest that WDR5 contributes to HCMV replication.

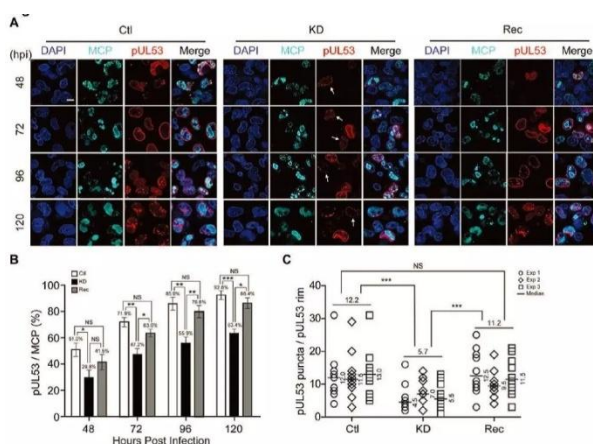
They found that HCMV infection increased expression and stabilized the cellular protein WDR5. Overexpression of WDR5 slightly enhanced HCMV replication while knockdown significantly attenuated HCMV replication. To identify the steps in which WDR5 is involved, the replicative cycle of HCMV replication was investigated in WDR5-depleted cells. Their data indicate that formation of the NEC and IINMs were significantly impaired, suggesting that nuclear egress of HCMV capsids is a key step in which WDR5 is involved.

In summary, depletion of WDR5 significantly attenuates HCMV replication by decreasing NEC and IINM formation, thereby impairing capsid nuclear egress and, consequently, virion maturation in cytoplasm. These results indicate that WDR5 contributes to HCMV replication via promoting nuclear egress.

The results have been published in Journal of Virology entitled "WDR5 Facilitates Human Cytomegalovirus Replication by Promoting Capsid Nuclear Egress".

This work was supported by grants from the National Natural Science Foundation of China, Key Basic Research Project from MOST, Sino-Africa Joint Research Center, Chinese Academy of Sciences, and the Key Program of Guangzhou Joint Healthcare Innovation Foundation.

Link: https://www.researchgate.net/publication/323023094_WDR5_Facilitates_Human_Cytomegalovirus_Replication_by_Promoting_Capsid_Nuclear_Egress?ev=auth_pub



Search to prevent next human pandemic

To play good defense against the next viral pandemic, it helps to know the other team's offense. But the 263 known viruses that circulate in humans represent less than 0.1 percent of the viruses suspected to be lurking out there that could infect people, researchers report in the Feb. 23 Science.

The Global Virome Project, to be launched in 2018, aims to close that gap. The international collaboration will survey viruses harbored by birds and mammals to identify

candidates that might be zoonotic, or able to jump to humans. Based on the viral diversity in two species known to host emerging human diseases — Indian flying foxes and rhesus macaques — the team estimates there are about 1.67 million unknown viruses still to be discovered in the 25 virus families surveyed. Of those, between 631,000 and 827,000 might be able to infect humans.

The \$1.2 billion project aims to identify roughly 70 percent of these potential threats



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within the next 10 years, focusing on animals in places known to be hot spots for the emergence of human-infecting viruses. That data will be made publicly available to help scientists prepare for future virus outbreaks — or, ideally, to quash threats as they emerge.

"It is ambitious," says Peter Daszak, president of EcoHealth Alliance in New York City and a member of the Global Virome Project's steering committee. But it's more cost effective to head off pandemics than to deal with the aftermath, he says. "We believe we're going to get ahead of this pandemic threat."

Meanwhile, bats drink blood and dwell in caves, but they are perhaps most feared as vectors of disease.

While Ebola would kill a person within days, a bat could carry the virus for years without triggering any symptoms — transmitting it to humans along the way.

Now, for the first time, researchers have offered an explanation: the tiny flying mammals have the same immune pathway as humans, but it is dampened.

It means that pathogens trigger an immune response in humans that can prove fatal, but in bats their systems are tuned to such a low level that they are protected from disease but barely respond to it.

The secrets behind the vampire bats' ability to survive on such an unusual diet — which is poor in nutrients and carries the risk of transmitting disease — has eluded scientists.

This week, researchers revealed new insight on the adaptations that opened the door to the bizarre diet, in what experts say is a 'big evolutionary win.'

"Vampire bats have an 'extreme' diet, in the sense that it requires many adaptations in the organism," lead author Lisandra Zepeda Mendoza, a biogeneticist at the University of Copenhagen, told AFP.

To better understand how these creatures are able to survive only on blood, an international team of scientists analyzed the genome of the common vampire bat along with its microbiome.

They discovered that the vampire bat's microbiome is unlike carnivorous, insectivorous, and frugivorous bats.

Adaptations in the genome and microbiome linked with processes in metabolism and the immune system were dramatically different than the other species.

Vampire bats are equipped with a high number of protective bacteria, which produce antiviral substances to shield them from pathogens, they found.

The new study by Wuhan Institute of Virology in China is the latest in a recent slew of developments in bat research.

In 2016, scientists sequenced the bat genome for the first time, revealing that bats have the lowest number of interferons (virus-fighting proteins) of any mammal species, but that those proteins remain 'active' even when they aren't diseased.



Research Progress

Earlier this week, Danish scientists revealed they had mapped the genome of the vampire bat to show that their unique microbiome allows them to live exclusively off blood without side effects.

Now, the Chinese team has looked at 30 bats from various sub-types to find that their STING-interferon pathway, present in all mammals, is unlike any other.

The STING (STimulator of INTERferon Genes) pathway is overly heightened in humans with autoimmune diseases. It triggers an overt reaction to external elements in the body – or things the STING perceives as external elements – which cripples the sufferer.

Comparing bats with 10 other mammal types, including humans and cats and dogs, the researchers found the vilified creatures have the weakest STING of all, giving them an

effective defense against disease.

"We believe there is a balance between bats and the pathogens they carry," says senior author Peng Zhou.

"This work demonstrated that in order to maintain a balance with viruses, bats may have evolved to dampen certain pathways." He added: "In human history, we have been chasing infectious diseases one after another, but bats appear to be a 'super-mammal' to these deadly viruses."

Zhou believes this is likely the result of the creatures evolving to be more resistant to disease, since they fly, have long lives and are exposed to many pathogens.

"Adaptation to flight likely caused positive selection of multiple bat innate immune and DNA damage repair genes," Zhou suggested. (The Guardian)

Cooperation

CHEN Anli investigated Wuhan Institute of Virology, CAS

On March 6, a delegation led by CHEN Anli, the Vice Governor of Hubei Province investigated Wuhan Institute of Virology (WIV), Chinese Academy of Sciences (CAS).

The delegation visited Wuhan National Biosafety Level-4 Laboratory (Wuhan P4 Laboratory), specifically understood the construction and development of Wuhan P4 Laboratory, and listened to report on construction programs of Biosafety Mega-science Center and Hubei Laboratory on Biosafety and Technology delivered by CHEN Xinwen, the Director General of WIV, CAS. Then the participants exchanged and



discussed in depth.

CHEN Anli pointed out that Wuhan P4 Laboratory is significant to maintain the stability of public safety, and the development



Cooperation

and increase of the laboratory need joint efforts. She emphasized that we shall complete the signatures of strategic cooperation agreement between Hubei Province and CAS in the near future. The both sides shall positively promote the talents introduction and attract the cream of the crop in globe. CHEN Anli hoped that the research areas of WIV will combine closely with the economic development of Hubei Province. The institute shall stir up the researchers' enthusiasm, and accelerate the

transfer and transformation of scientific and technological achievements.

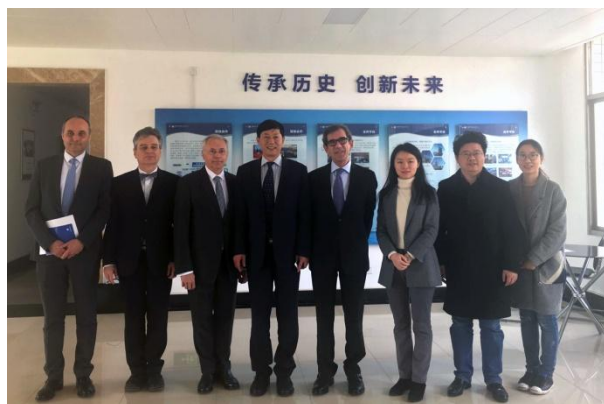
LIU Zhongchu, the Deputy Secretary-General of Hubei Provincial government and DU Yun, the Deputy Director General of Science and Technology Department of Hubei Province accompanied CHEN Anli to investigate. The relevant leaders from Wuhan Branch, CAS and WIV, CAS participated this activity.

The New French Ambassador paid a visit to Wuhan Institute of Virology, CAS

On March 26th, the new Ambassador of French Embassy in China, Mr. Jean-Maurice RIPERT, accompanied by Mr. Olivier GUYONVARCH, the Consul General of France in Wuhan, visited Wuhan Institute of Virology (WIV), Chinese Academy of Sciences (CAS) to learn about Sino-French cooperation in the field of prevention and control of emerging infectious diseases and the latest progress in the construction of Wuhan P4 laboratory. Prof. Yanyi WANG, the Deputy Director General of WIV, accompanied by Prof. Zhiming YUAN, the director of Wuhan P4 laboratory, met with the French delegation led by Mr. RIPERT.

During the meeting, Prof. YUAN made a progress report on the laboratory construction. The report reviewed the history of the Sino-French cooperation in the field of prevention and control of emerging infectious diseases, and introduced the current progress in the development of substantive scientific research cooperation between the both sides and the establishment of laboratory quality control systems. He hopes that in the future, with the support of the French Ministry of Foreign Affairs and the French Ministry of Science and Technology, we will further strengthen the scientific research cooperation in the field of prevention and control of emerging infectious diseases, establish a good partnership, and complete the application for related scientific research projects as soon as possible, so as to achieve more international frontier results.

Mr. RIPERT fully affirmed the positive contributions made by China and France in the cooperative project and stated that the French government attaches great importance to the Sino-French inter-governmental cooperation agreement and pays close attention to the future cooperation



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between the two sides intending to carry out scientific research in the prevention and control of emerging infectious diseases. The French government hopes that both China and France will continue to integrate resources and give full play to their advantages, consolidate the all-round strategic partnership, promote the scientific research, and ensure the continuous and effective promotion of intergovernmental cooperation.

Prof. Yanyi WANG expressed her warm welcome to the visit of French delegation and expressed the heartfelt gratitude to the French government and friends of all parties who have actively promoted and participated in Sino-French cooperation. She pointed out

that WIV attaches great importance to the construction of Wuhan P4 laboratory and hopes that both parties can further promote scientific research, personnel exchanges and strengthen project cooperation in the areas of health, medicine, etc., and continuously advance the cooperation on prevention and control of emerging infectious diseases between China and France. In the future, the Institute will further strengthen communication and contact with CAS and the Ministry of Science and Technology, to actively seek multi-channel supports, and contribute to the world public health.

Representatives from the French Embassy in Beijing, the Consulate General of France in Wuhan, and WIV attended the meeting.

The U.S. Counselor visited Wuhan Institute of Virology, CAS

On March 27th, Mr. Rick Switzer, Counselor of Environment, Science, Technology and Health Section of Embassy of the United States in China, accompanied by the U.S. Consul General in Wuhan, Mr. Jamison Fouss, visited Wuhan Institute of Virology (WIV), Chinese Academy of Sciences (CAS). Prof. Yanyi WANG, the Deputy Director General of the WIV, met with the U.S. delegation. Prof. Zhengli SHI, Director of Center for Emerging Infectious Diseases and Deputy Director of Wuhan P4 Laboratory, and Prof. Zhihong HU, Director of Center for Bacteria and Virus Resources and Application, participated the meeting.

Prof Yanyi WANG extended a warm welcome on behalf of the Institute. She pointed out that for a long time the American scientific research institution is one of the major strategic partners that WIV continues to carry out international cooperation with. The Institute has established the close



cooperation with a number of well-known U.S. organizations including the National Science Foundation, the EcoHealth Alliance, University of Texas Medical Branch, and the Galveston National Laboratory, and has achieved a series of academic exchanges.

Mr. Switzer said that this time he came to WIV, and discussed with the institute's colleagues in depth to enhance consensus, and understand demands from both sides. He hopes that with the efforts of both parties,



Cooperation

cooperation and exchanges in the field of health will proceed smoothly. Mr. Fouss emphasized that the work focus of the U.S. Consulate General in Wuhan will further point to cooperation in the medical and health field in the future, and the relevant departments will also invest more support in promoting the development. He believes that both

parties will continue to achieve more and greater achievements in cooperation in related fields.

Afterwards, the participants discussed in depth the issues of the two sides in terms of development needs, their own advantages, project cooperation and promotion plans.

Science Tips

Global Virome Project is hunting for more than 1 million unknown viruses



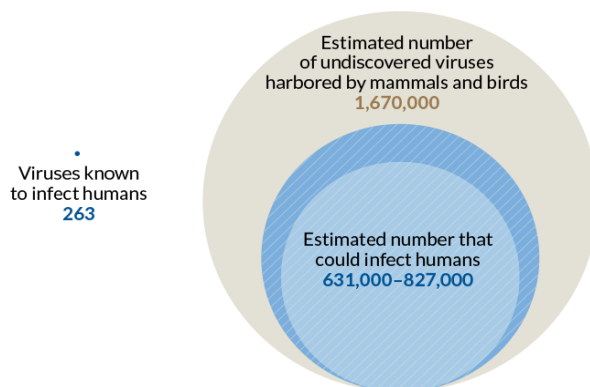
GOING VIRAL The diversity of viruses carried by such animals as rhesus macaques (one shown) hints at the number of viruses capable of infecting humans that are yet to be discovered. J.M.GARG/WIKIMEDIA COMMONS (CC BY-SA 4.0)

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The \$1.2 billion project aims to identify roughly 70 percent of these potential threats within the next 10 years, focusing on animals in places known to be hot spots for the emergence of human-infecting viruses. That



WIDENING THE CIRCLE The number of viruses known to infect people is less than 0.1 percent of the total that could potentially do so. E. OTWELL; SOURCE: D. CARROLL ET AL/SCIENCE 2018



Science Tips

data will be made publicly available to help scientists prepare for future virus outbreaks — or, ideally, to quash threats as they emerge.

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City and a member of the Global Virome Project's steering committee. But it's more cost effective to head off pandemics than to deal with the aftermath, he says. “We believe we're going to get ahead of this pandemic threat.”

Source: *SCIENCENEWS*

Meet the giants among viruses

For decades, the name “virus” meant small and simple. Not anymore. Meet the giants.

Today, scientists are finding ever bigger viruses that pack impressive amounts of genetic material. The era of the giant virus began in 2003 with the discovery of the first Mimivirus (SN: 5/23/09, p. 9). The viral titan is about 750 nanometers across with a genetic pantry boasting around 1.2 million base pairs of DNA, the information-toting bits often represented with A, T, C and G. Influenza A, for example, is roughly 100 nanometers across with only about 13,500 base pairs of genetic material.

In 2009, another giant virus called Marseillevirus was identified. It is different enough from mimiviruses to earn its own family. Since 2013, mega-sized viruses falling

into another eight potential virus families have been found, showcasing a long-unexplored viral diversity, researchers reported last year in Annual Review of Virology and in January in Frontiers in Microbiology.

Giant viruses mostly come in two shapes: polyhedral capsules and egglike ovals. But one, Mollivirus, skews more spherical. Pacmanvirus was named for the broken appearance of its outer shell. Both represent potential families. Two newly discovered members of the mimivirus family, both called tupanviruses and both with tails, have the most complete set of genes related to assembling proteins yet seen in viruses (SN Online: 2/27/18). Once unheard of, giant viruses may be common in water and soils worldwide. Only time — and more discoveries — will tell.

Source: *SCIENCENEWS*

Express News

Upcoming event – The 8th International Symposium on Emerging Viral Diseases

The 8th International Symposium on Emerging Viral Diseases will be held on October 20-22, 2018 in Wuhan, China.

- This symposium will focus on four aspects:
- Emerging Viral Pathogen
 - Virus-Host Interactions

- Antiviral Immunity
- Arbovirus

The registration website is coming soon. Please pay attention to our notice.

