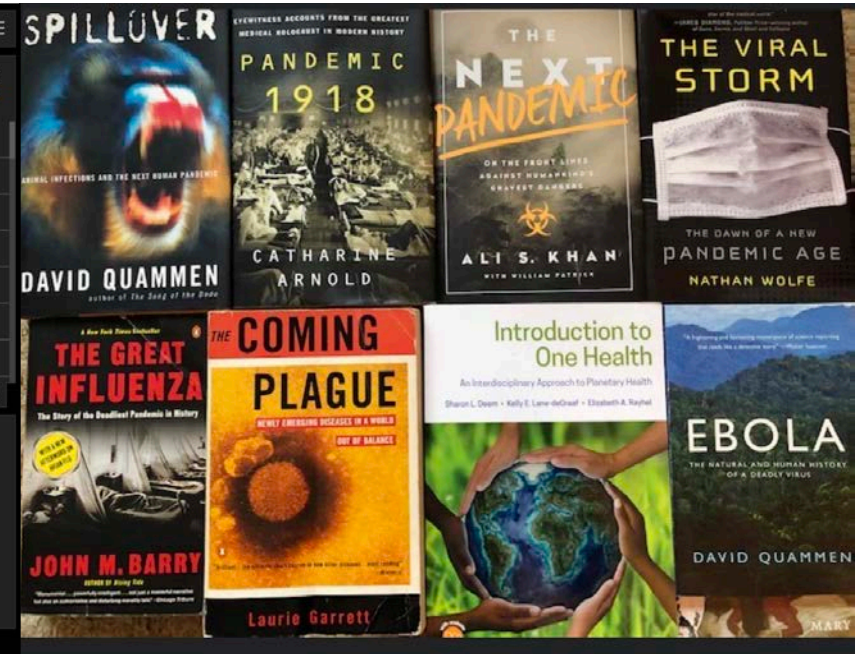
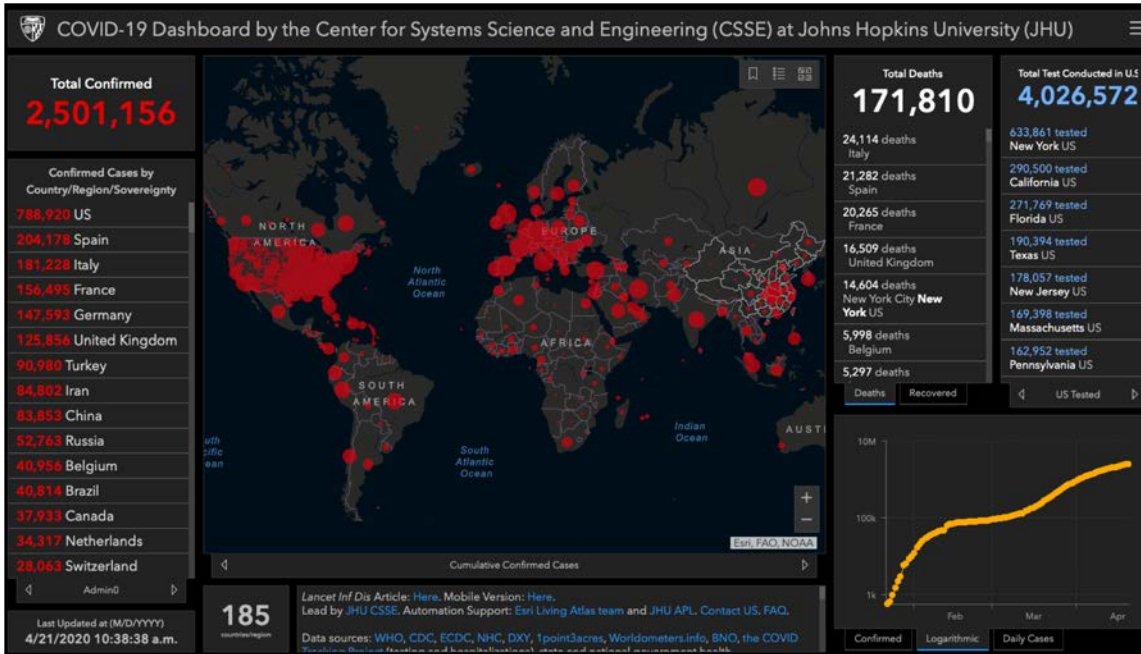




Spillover: Rethinking our
Relationship with Wildlife and
Wild Places

Chris Walzer Wildlife Conservation Society



What do we know?

- Zoonoses are diseases that move between animals and humans
- Emerging Infectious Diseases [EID] are dominated by zoonoses
- 72% of all zoonotic EIDs originate in wildlife
- EID frequency is increasing
 - HIV, EBOLA, H1N1, SARS, NIPAH, HENDRA, H7N9



Furuse et al. *Virology Journal* 2010, **7**:52
<http://www.virologyjournal.com/content/7/1/52>



SHORT REPORT

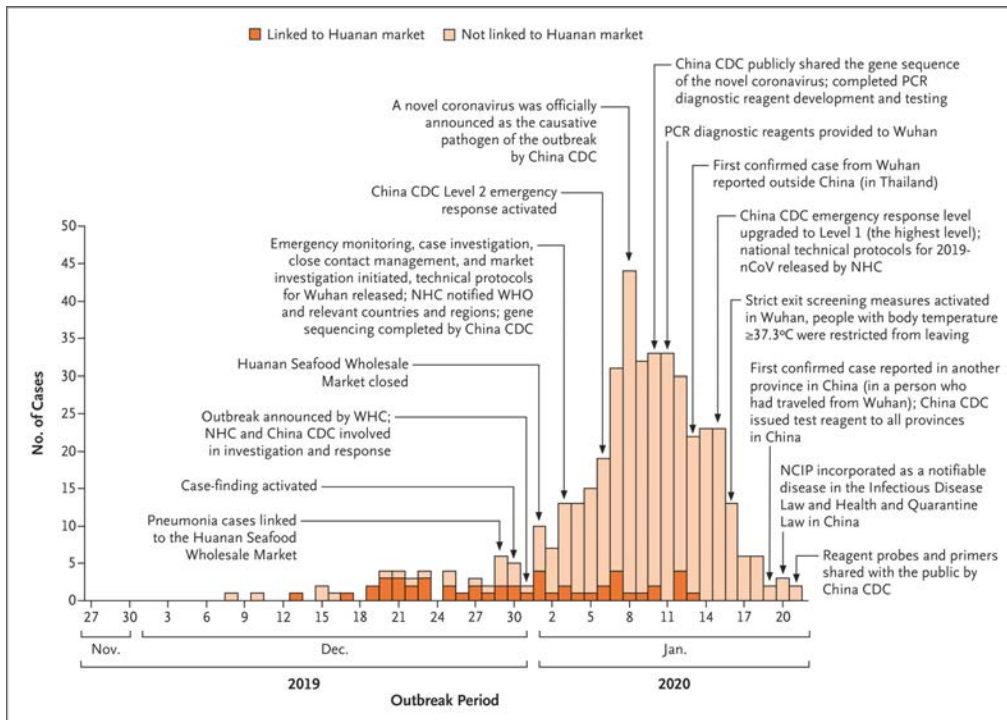
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Origin of measles virus: divergence from rinderpest virus between the 11th and 12th centuries

Yuki Furuse, Akira Suzuki, Hitoshi Oshitani*



What do we know?



Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study



Nanshan Chen*, Min Zhou*, Xuan Dong*, Jieming Qu*, Fengyun Gong, Yang Han, Yang Qiu, Jingli Wang, Ying Liu, Yuan Wei, Jia'an Xia, Ting Yu, Xinyin Zhang, Li Zhang

Summary

Background In December, 2019, a pneumonia associated with the 2019 novel coronavirus (2019-nCoV) emerged in Wuhan, China. We aimed to further clarify the epidemiological and clinical characteristics of 2019-nCoV pneumonia.

Methods In this retrospective, single-centre study, we included all confirmed cases of 2019-nCoV in Wuhan Jinyintan Hospital from Jan 1 to Jan 20, 2020. Cases were confirmed by real-time RT-PCR and were analysed for epidemiological, demographic, clinical, and radiological features and laboratory data. Outcomes were followed up until Jan 25, 2020.

Findings Of the 99 patients with 2019-nCoV pneumonia, 49 (49%) had a history of exposure to the Huanan seafood market. The average age of the patients was 55.5 years (SD 13.1), including 67 men and 32 women. 2019-nCoV was detected in all patients by real-time RT-PCR. 50 (51%) patients had chronic diseases. Patients had clinical manifestations of fever (82 [83%] patients), cough (81 [82%] patients), shortness of breath (31 [31%] patients), muscle ache

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THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia

Qun Li, M.Med., Xuhua Guan, Ph.D., Peng Wu, Ph.D., Xiaoye Wang, M.P.H., Lei Zhou, M.Med., Yeqing Tong, Ph.D., Ruiqi Ren, M.Med., Kathy S.M. Leung, Ph.D., Eric H.Y. Lau, Ph.D., Jessica Y. Wong, Ph.D., Xuesen Xing, Ph.D., Nijuan Xiang, M.Med., Yang Wu, M.Sc., Chao Li, M.P.H., Qi Chen, M.Sc., Dan Li, M.P.H., Tian Liu, B.Med., Jing Zhao, M.Sc., Man Liu, M.Sc., Wenxiao Tu, M.Med., Chuding Chen, M.Sc., Lianmei Jin, M.Med., Rui Yang, M.Med., Qi Wang, M.P.H., Suhua Zhou, M.Med., Rui Wang, M.D., Hui Liu, M.Med., Yingbo Luo, M.Sc., Yuan Liu, M.Med., Ge Shao, B.Med., Huan Li, M.P.H., Zhongfa Tao, M.P.H., Yang Yang, M.Med., Zhiqiang Deng, M.Med., Boxi Liu, M.P.H., Zhitao Ma, M.Med., Yanping Zhang, M.Med., Guoqing Shi, M.P.H., Tommy T.Y. Lam, Ph.D., Joseph T. Wu, Ph.D., George F. Gao, D.Phil., Benjamin J. Cowling, Ph.D., Bo Yang, M.Sc., Gabriel M. Leung, M.D., and Zijian Feng, M.Med.

ABSTRACT



What do we know?



Contents lists available at ScienceDirect
Infection, Genetics and Evolution
 journal homepage: www.elsevier.com/locate/meegid



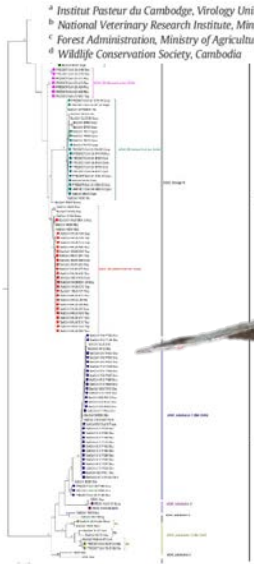
Research paper

Genetic diversity of coronaviruses in bats in Lao PDR and Cambodia

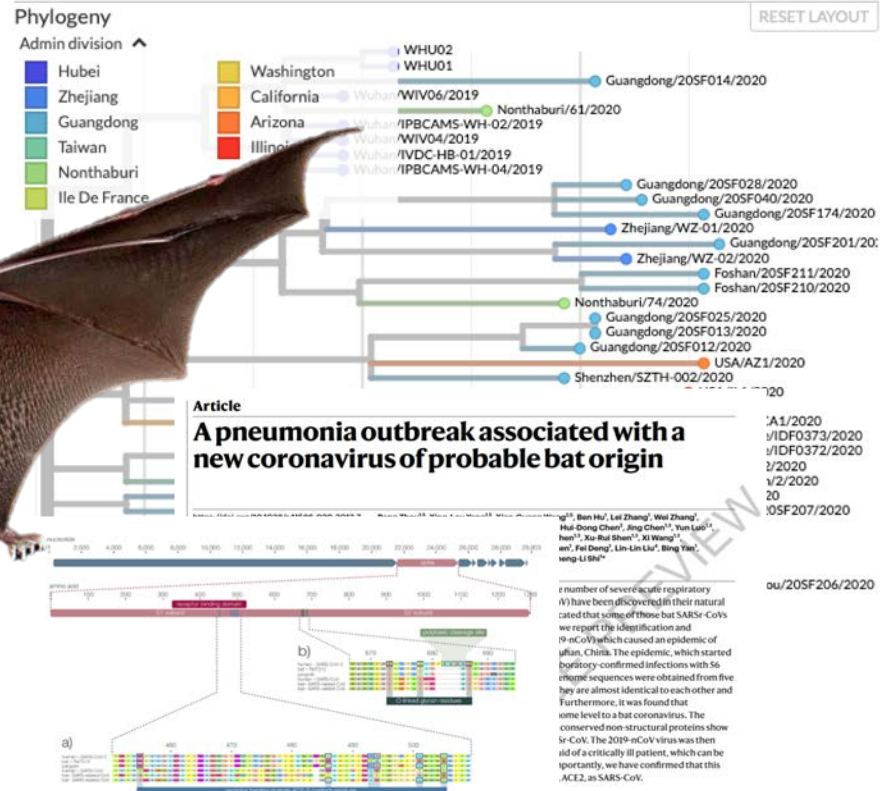


Audrey Lacroix ^a, Veasna Duong ^a, Vibol Hul ^a, Sorn San ^b, Hull Davun ^b, Keo Omaliss ^c, Sokha Chea ^d, Alexandre Hassanin ^e, Watthana Theppangna ^f, Soubanh Silihamavong ^{g,h}, Kongsy Khammavong ^g, Sinpakone Singhalath ^g, Zoe Greatorex ^g, Amanda E. Fine ⁱ, Tracey Goldstein ^j, Sarah Olson ^k, Damien O. Joly ^{k,l}, Lucy Keatts ^d, Philippe Dussart ^a, Aneta Afelt ^m, Roger Frutos ^{n,o,*}, Philippe Buchy ^{a,p,**}

^a Institut Pasteur du Cambodge, Virology Unit, Phnom Penh, Cambodia
^b National Veterinary Research Institute, Ministry of Agriculture Forestry and Fisheries, Cambodia
^c Forest Administration, Ministry of Agriculture Forestry and Fisheries, Cambodia
^d Wildlife Conservation Society, Cambodia



Showing 42 of 42 genomes sampled between Dec 2019 and Jan 2020.



What do we know?

- Across 25 high-risk viral families, there are estimated to be **1.7M unknown viruses**
- About **700k of which** likely have the potential to infect humans
- For example, for every known coronavirus, there are thousands of unknown coronaviruses circulating in wildlife



Carroll et al. (2018) Science



INFECTIOUS DISEASES

The Global Virome Project

Expanded viral discovery can improve mitigation

By Dennis Carroll, Peter Daszak, Nathan D. Wolfe, George F. Gao, Carlos M. Morel, Subhash Morzaria, Ariel Pablos-Méndez, Oyewale Tomori, Jonna A. K. Mazet

causing the next great pandemic (1, 2). However, if these viruses are our enemy, we do not yet know our enemy very well. Around 263 viruses from 25 viral families are known to infect humans (3) (see the figure), and given

Scientists prepare to collect a blood sample from a *Rousettus* sp. fruit bat in Thailand to test for novel viruses. The Global Virome Project aims to identify and characterize the majority of currently unknown viruses in key wildlife groups, including rodents, nonhuman primates, and bats.

Other previous studies had begun to conduct targeted viral discovery in wildlife (9), and develop mitigation strategies for the emergence of avian flu, for example. However, the USAID Emerging Pandemic Threats (EPT) PREDICT project is the first global-scale coordinated program designed to conduct viral discovery in wildlife reservoir hosts, and characterize ecological and socioeconomic factors that drive their risk of spillover, to mitigate their emergence in people (10).

Working with local partners and governments, wildlife and domestic animals and at-risk human populations in geographic hotspots of disease emergence (1) are sampled, and viral discovery conducted. A strategy to identify which novel viruses are most at risk of spillover has been developed (11), and further work is conducted on these to characterize them prior to, or in the early stages of, spillover. Metadata on the ecology of wildlife-livestock-human transmission interfaces, and on human behavioral patterns in communities, are concurrently analyzed so that strategies to reduce spillover can be developed (supplementary text). To date,



Downloaded from <http://science.sciencemag.org/>

What do we not know?



CNN health Food Fitness Wellness Parenting Vital Signs • LIVE TV

Snakes could be the source of the Wuhan coronavirus outbreak

THE CONVERSATION By Haitao Guo, Guangxiang "George" Luo and Shou-Jiang Gao, The Conversation
Updated 3:41 PM ET, Fri January 24, 2020

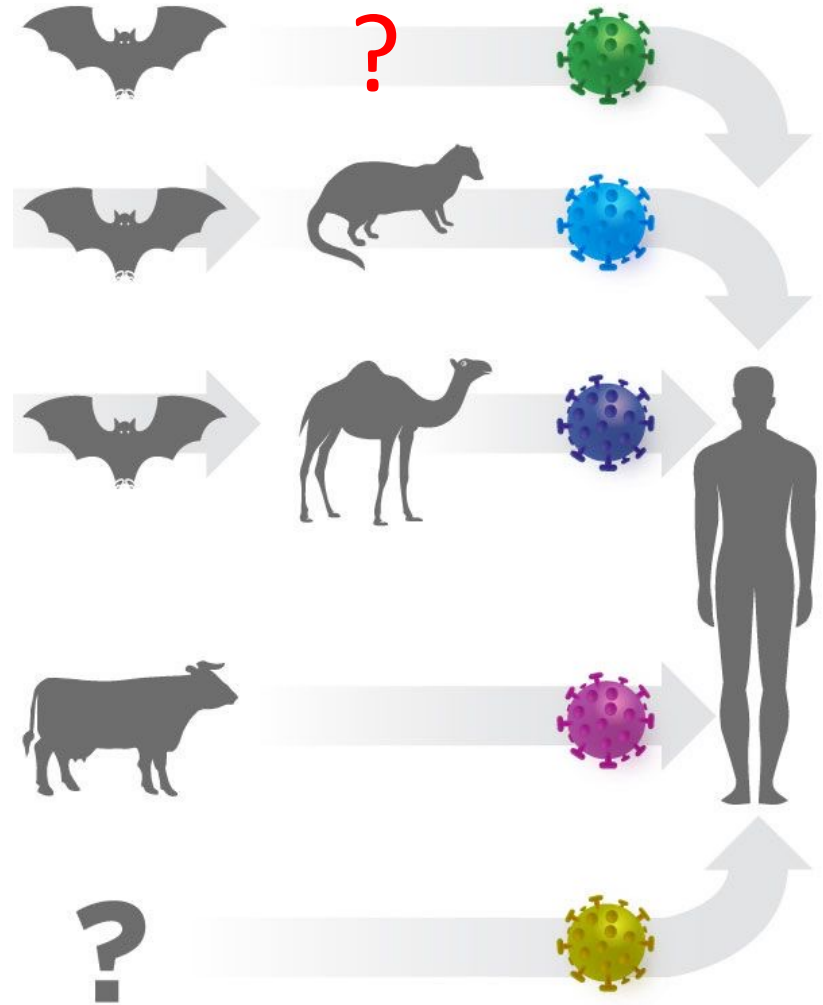


TUSK *International Institute for Technology and Innovation*

Coronavirus from Space?

A helminth coronavirus isolated from *Chondria wickramasinghe* to the labcoot

February 4, 2020 4 Comments



It is not about bat-soup,
civets or pangolins







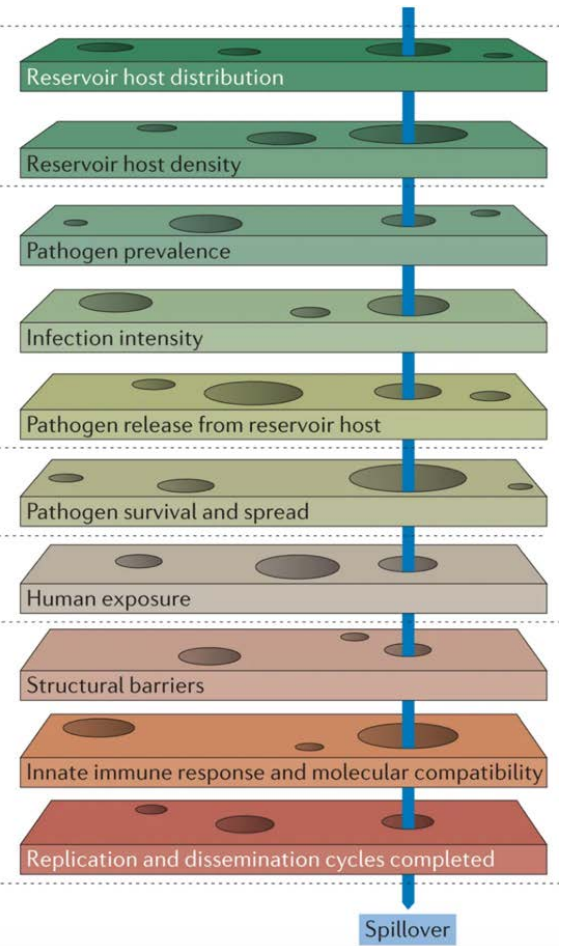
Animal ecology, population biology, biogeography, behavioural ecology, landscape ecology, agricultural sciences

Disease ecology, animal epidemiology, infectious disease dynamics, immunology, microbiology, veterinary medicine

Microbiology, disease ecology, vector ecology, epidemiology, spatial ecology, infectious disease dynamics

Human epidemiology, medical anthropology, vector ecology, social sciences, behavioural ecology, infectious disease dynamics

Microbiology, innate and adaptive immunology, cell biology of pathogen–host interactions, pathology, genetics, evolutionary biology



Barriers to spillover. This figure was adapted from Plowright et al. 2017

Congo Basin – RoC

- Long-standing WHP program: 3 main pillars
 - Carcass monitoring [Ebola virus community engagement targeted 6,600 people living in northern RoC]
 - Community outreach
 - Research on EBV
- Developing field test kits to better understand causes of great ape mortality



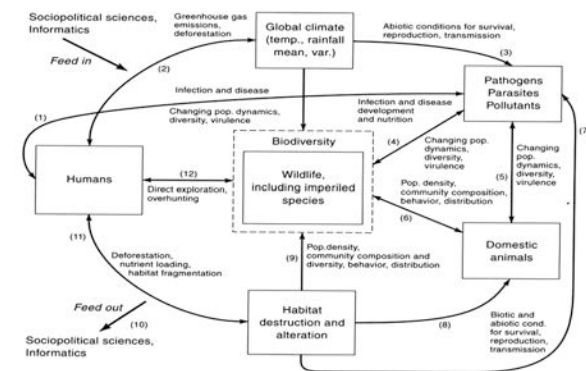


2019 Berlin Principles on One Health

- Recognize and take action to: retain the essential health links between humans, wildlife, domesticated animals and plants, and all nature; and ensure the conservation and protection of biodiversity which, interwoven with intact and functional ecosystems, provides the critical foundational infrastructure of life, health, and well-being on our planet



WCS.ORG ONE PLANET, ONE HEALTH, ONE FUTURE



Ostfeld et al. 2002 Mazet et al. JVME 33 2006

www.wcs.org/one-planet-one-health-one-future



What do we need to do?

- Permanently ban the commercial trade in wildlife for consumption
- Strengthen efforts to combat trafficking of wild animals within countries and across borders
- Work to change dangerous wildlife consumption behaviors, especially in cities
- Mainstream holistic One Health Approaches



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UPDATES

WCS ISSUES POLICY ON REDUCING RISK OF FUTURE ZOOONOTIC PANDEMIC

MARCH 28, 2020

[f](#) [t](#) [e](#)

A NEW PARADIGM URGENTLY NEEDED:

To prevent future major viral outbreaks such as the COVID-19 outbreak, impacting human health, well-being, economies, and security on a global scale, WCS recommends stopping all commercial trade in wildlife for human consumption (particularly of birds and mammals) and

The infographic consists of four panels arranged in a 2x2 grid. The top-left panel is yellow and titled 'Let's STOP WILDLIFE TRADE', showing a silhouette of a tiger and a dinosaur with a dollar sign. The top-right panel is light green and titled 'STOP WILDLIFE CONSUMPTION', showing a silhouette of a pig with a fork and knife. The bottom-left panel is light green and titled 'STOP DESTROYING NATURE', showing a tree, a bat, and a bird. The bottom-right panel is black and titled 'TO STOP PANDEMIC', showing silhouettes of people with virus icons.

The infographic titled 'Living Safely with Bats' shows a silhouette of a bat on the left and a person on the right. The person is wearing a mask and holding a shovel, standing next to a pile of earth. A red 'X' is over a person who is not wearing a mask.

The infographic shows a person digging a pit with a shovel. Below the pit, a person is standing next to it, and a red 'X' is over a person who is not wearing a mask. A distance of 1-2m is indicated between the person and the pit.

We Stand for Wildlife™

