



Periodic global One Health threats update



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ABSTRACT

Emerging infectious diseases continue to impose unpredictable burdens on global health and economy. Infectious disease surveillance and pandemic preparedness are essential to mitigate the impact of future threats. Global surveillance networks provide unprecedented monitoring data on plant, animal and human infectious diseases. Using such sources, we report on current major One Health threats and update on their epidemiological status.

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Text

Globally, environmental and anthropogenic changes are impacting ecosystems, and perturbing plant and animal demographics and behaviors. These changes contribute to the increasing pace of infectious disease emergence worldwide, largely driven by increasing contacts between and among species [1,2]. Drivers of disease emergence include mobility and trade, encroachment of natural habitats and climate change, as well as intrinsic characteristics of pathogens, such as wide host range for animal pathogens and the ability of plant pathogens to hybridize [2].

The vast majority of emerging infectious diseases in humans are zoonotic in nature [3,4]. Often, they escape their natural wildlife reservoirs and infect captive or domestic animals and humans upon cross-species transmission. While the majority of zoonotic pathogens spread limitedly among humans, occasionally some do evolve the ability to efficiently transmit [5]. These may cause devastating epidemics, if not pandemics, and may establish as novel human pathogens. Emerging infectious diseases of animals likewise have typically the ability to cross species barriers and invade new host species. In contrast, introduction of pathogens into new geographical areas and climate change play an essential role in the emergence of plant diseases, and the hybridization of plant pathogens that are not naturally sympatric is repeatedly reported to be involved in plant disease emergence events [2]. The consequences of emerging pathogens in newly infected species, be it wild or domestic, or in new geographical areas, can have dire repercussions on human welfare, for example, through the disruption of ecosystem services or from large agricultural economic losses [2,6]. As such,

emerging infectious diseases are One Health threats to the global community.

Despite progress in our understanding of the mechanisms and drivers of pathogen emergence and adaptation, infectious disease emergence and associated health and economic burdens remain essentially unpredictable. They continue to impose heavy burdens on the global community, as most recently painfully demonstrated by the emergence of MERS coronavirus in the Middle East and Ebola virus in West Africa. Because the nature, time and location of the next One Health threat cannot be forecasted, preparedness and responsiveness are essential to curb future emerging infectious disease burdens.

Surveillance is key to preparedness by identifying and monitoring new threats to plant, animal and human health, and raising early-warning flags upon changing epidemiology. Major global initiatives have profoundly revolutionized the scope of infectious disease surveillance in plants, animals and humans. These include the World Animal Health Information Database (WAHID) Interface of the OIE, the Global Animal Disease Information system EMPRES-i of the FAO, the situation assessments and reports of the WHO, and the internet-based Program for Monitoring Emerging Diseases (ProMED) of the International Society for Infectious Diseases.

Using the data collected from these different sources, we present the current status of major One Health threats. In this update, the current status of low pathogenic avian influenza virus (LPAIV) H7N9, highly pathogenic avian influenza viruses (HPAIVs) of the H5 subtype, MERS coronavirus and Ebola virus are summarized. The present report will be updated every three months, with newly acquired data on the diseases listed above, as well as with data on any new One Health threat that would have emerged during that period.

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Table 1
Number of animal outbreaks and zoonotic cases of low pathogenic avian influenza virus H7N9 infection from 1 January 2013 to 30 September 2015.

Country	Humans	Poultry	Wild birds
Canada	2		
China	657	554	1
Hong Kong SAR	16	2	
Malaysia	1		
Taiwan (Province of China)	4		1
Total	680	556	2

Low pathogenic avian influenza virus H7N9

LPAIV H7N9 was identified as a newly emerging zoonotic pathogen in early 2013. It has caused since then a total of 680 cases of zoonotic infection, with a case-fatality rate of about 20%, principally in adult and elderly individuals [7]. With an incubation time of 2–8 days, H7N9 virus infection can progress from initial symptoms of high fever and other influenza-like signs to more severe lower respiratory tract infection,

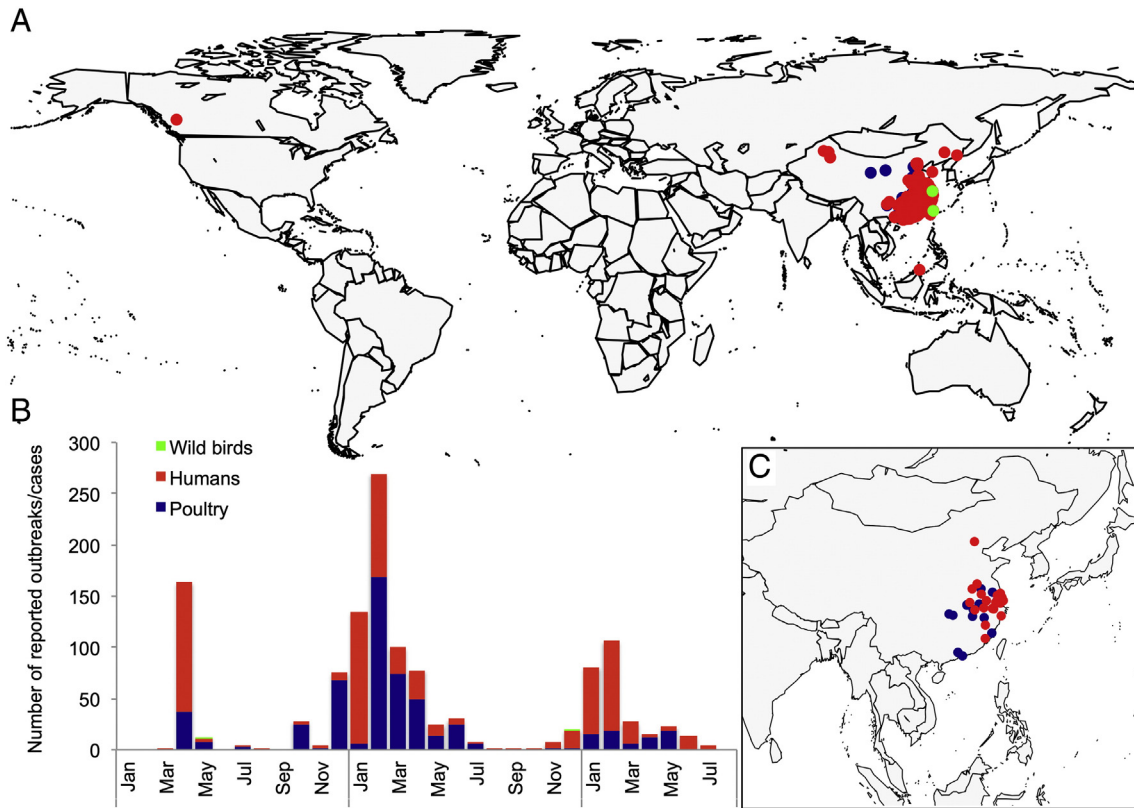


Fig. 1. Current status of low pathogenic avian influenza virus H7N9 in animals and humans: A. Global geographical distribution of animal outbreaks and zoonotic cases of infection reported from 1 January 2013 to 30 September 2015; B. Number of reported animal outbreaks and zoonotic cases of infection from 1 January 2013 to 30 September 2015; C. Geographical distribution of animal outbreaks and zoonotic cases of infection reported from 1 April 2015 to 30 September 2015.

Table 2
Number of reported zoonotic cases of highly pathogenic avian influenza virus H5N1 infection from 1 January 2003 to 30 September 2015.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Azerbaijan				3										3
Bangladesh						1			2	2				5
Cambodia			5	2	1	1	1	1	8	3	26	8		56
Canada												1		1
China	1		7	14	6	3	8	1		3	2	2	5	53
Djibouti				1										1
Egypt				18	23	10	37	24	42	12	5	24	145	340
Hong Kong								1						1
Indonesia			16	59	40	21	23	10	11	10	3	1		194
Iraq				2										2
LPDR ^a		2												2
Myanmar					1									1
Nigeria					1									1
Pakistan					3									3
Thailand		17	7	3										27
Turkey				8										8
Viet Nam	3	31	68		8	5	6	7		4	2	2		136
West Bank									1					1
Total	4	48	103	110	85	41	75	44	64	34	38	38	150	834

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