Viet Nam Coordinated Surveillance for Influenza and Other Viruses with Pandemic Potential

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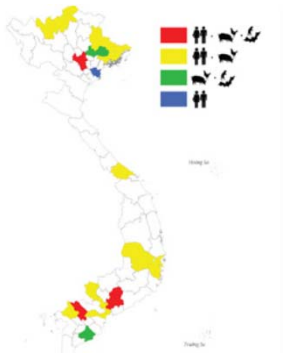
ABSTRACT

A comprehensive understanding of the burden of various priority pathogens, animal/livestock market chains and the evolution of influenza viruses in Viet Nam requires coordination of animal-human interface surveillance outputs. In 2016, U.S. CDC, FAO, WHO and WCS collaborated with Ministry of Health (MOH) and Ministry of Agriculture and Rural Development (MARD) to enhance detection and characterization of influenza and other viruses with pandemic potential in Viet Nam by linking components of existing influenza surveillance in domestic animals (poultry and swine), wildlife and humans. Quang Ninh and Dong Thap were selected as pilot provinces based on the animal value chain and on-going surveillance programmes in humans, domestic animals and wildlife. During the surveillance period, 10 human Severe Acute Respiratory Infection (SARI) samples per week from each sentinel hospital in Quang Ninh and Dong Thap will be tested for influenza and other priority respiratory pathogens. Human SARI samples testing negative for influenza and respiratory pathogens will be screened with consensus PCR assays for viral families with pandemic potential developed by USAID's PREDICT project. Samples from healthy appearing poultry (200) and swine (200) in the same area will be similarly tested. Influenza viruses will be characterized by genus, hemagglutinin and neuraminidase protein and genetic sequence. Wildlife surveillance in Quang Ninh and Dong Thap will target high-risk interfaces for viral spillover from wildlife to domestic animals or humans. Wildlife surveillance sites will include live animal markets, bat guano collection sites, and wildlife restaurants. All results will be shared across sectors for joint situation analysis and risk assessment. FAO and WCS surveillance also include livestock, human and wildlife samples from Dong Nai (DN) for testing.

INTRODUCTION



LISN (Longitudinal Influenza Surveillance Network) is built on the already existing surveillance systems and networks. It is specifically designed as an extension of on-going surveillance in livestock, wildlife and human population. The existing capacity will be enhanced so that it could be sustained without donor support in the future (FIGURE 1).

➢ *FIGURE 1. Location of existing surveillance activities in human, livestock and wildlife*

MATERIALS AND METHODS

Coordinated Surveillance is conducted in livestock, wildlife and humans at their interface or points of contact to identify influenza A virus and other potential pandemic threats. Coordination is achieved in two ways;
-(1) focusing on areas where disease surveillance systems in livestock, wildlife, and humans geographically overlap, and
-(2) joint analysis of virological and epidemiological data from the different systems operating in these areas.

Quang Ninh (QN) and Dong Thap (DT) were selected as pilot provinces based on the animal value chain and on-going surveillance programmes in humans, domestic animals and wildlife (Figure 1). FAO and WCS surveillance also include livestock, human and wildlife samples from Dong Nai (DN) for testing. Information relevance to each population were collected for risk factors analysis (Table 1).

Source	Data
Human	• Demographic info, clinical info, geographic location • Risk factors
Livestock	• Poultry LBM – Species, number, source, traders • Pig farm – Vaccination and clinical history
Wildlife	• Wildlife trade value chains (species, trade actors, routes) and behavioral risk factors for zoonotic disease transmission from wildlife to humans

Table 1 Other Data Collected

During the surveillance period, human Severe Acute Respiratory Infection (SARI) samples from each sentinel hospital in Quang Ninh and Dong Thap will be tested for influenza and other priority respiratory pathogens. Human SARI samples testing negative for influenza and respiratory pathogens will be screened with consensus PCR assays for viral families with pandemic potential developed by USAID's PREDICT project.

Samples from healthy appearing poultry (200) and swine (200) in the same area will be similarly tested. Influenza viruses will be characterized by genus, hemagglutinin and neuraminidase protein and genetic sequence.

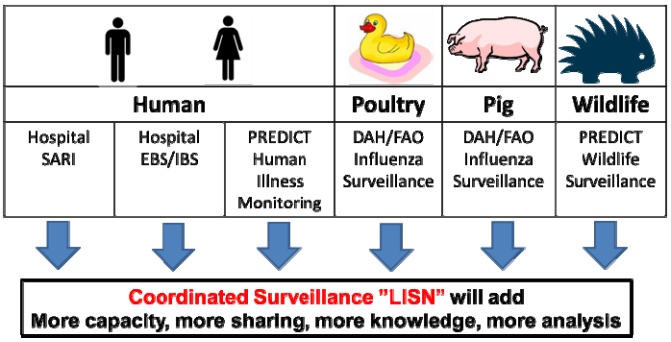
Wildlife surveillance in Quang Ninh and Dong Thap will target high-risk interfaces for viral spillover from wildlife to domestic animals or humans. Wildlife surveillance sites will include live animal markets, bat guano collection sites, and wildlife restaurants (Figure 2).

Based on the laboratory test results, situation analysis would be conducted to

1. Identify new or rare influenza virus
2. Describe event and pathogen
3. Document epidemiological and clinical features
4. Inform control and response strategies

Risk assessment is conducted based on different risk questions relevance to each population (Table 2).
Regular information sharing meetings were organized to share influenza situation and laboratory results.

➢ *FIGURE 2. Surveillance Systems Contributing Samples to LISN*



	Non-influenza	Zoonotic influenza	Seasonal Influenza
Human	New virus presence?	Re-emergence of AI case? Increased severity?	Risk of severe season? Vaccine mismatch?
Livestock	New virus presence?	Emergence of pandemic virus? Production and economic impact?	
Wildlife	New virus presence?	Spill over?	

TABLE 2. Risk Assessment Questions

RESULTS

Number of samples generated by each surveillance available for testing under LISN is shown in Table 3.

Protocol	Type / Subtype	Human		Poultry			Pig			WCS		
		QN	DT	QN 2017	DN 2017	DT 2017	QN	DN	DT	DN	DT	DN2 (Human)
Influenza	Type A	50/308	87/422	42/144	18/40	25/28	19/84	6/96	0/96			
	Type B	19/308	27/422									
	H1	8/50	59/87				n/19	n/6	0/0			
	H3	42/50	28/87				n/19	n/6	0/0			
	H5	0/50	0/87	2/42	0/18	0/25						
	H7	0/50	0/87	0/42	0/18	0/25						
	H9			4/42	4/18	19/25						
	H6											
	H10											
	Others											
PREDICT	Filo			n/60	n/60	n/60	n/60	n/60	n/60	n/350		n/100
	Corona	n/88	n/100	n/60	n/60	n/60	n/60	n/60	n/60	n/350	n/399	n/100
	Paramyxo	n/88	n/100	n/60	n/60	n/60	n/60	n/60	n/60	n/350		n/100
	Flavi			n/60	n/60	n/60	n/60	n/60	n/60	n/350		n/100
	Influenza			n/60	n/60	n/60	n/60	n/60	n/60	n/350	n/399	n/100

TABLE 3. Numbers of samples tested

CONCLUSION & RECOMMENDATION

- There is good collaboration and data sharing between all partners.
- Laboratory capacity for testing and characterization have been improved in both human and animal health laboratory systems.
- The ultimate goal of LISN is drawing a phylogenetic tree to support further risk assessment once laboratory testing is completed and all results are available.

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