



# ***Avian Influenza Viruses at the Animal Human Interface: Progress and Challenges in Under Resourced Countries***

**Giovanni Cattoli**

*Animal Production and Health Laboratory*

*Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture*

*International Atomic Energy Agency - Seibersdorf, Vienna*



**Joint FAO/IAEA Programme**  
Nuclear Techniques in Food and Agriculture

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# Zoonotic avian influenza viruses

(N. of human cases/fatalities)

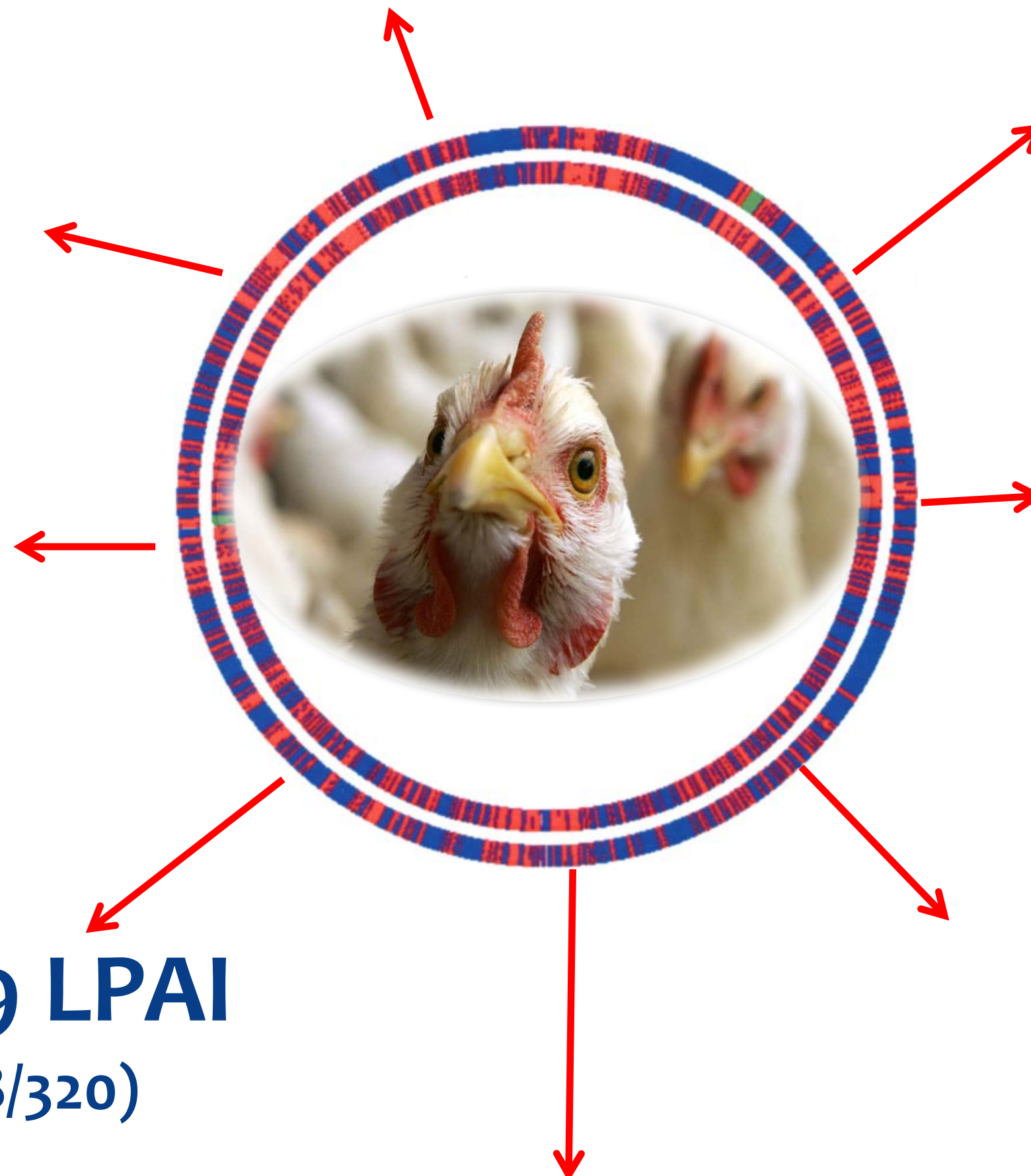
**H5N1 HPAI (856/452)**

**H5N6 HPAI**

**H7N7 HPAI**

**H7N3 HPAI**

**H10N7/N8 LPAI**



**H7N9 LPAI**  
(798/320)

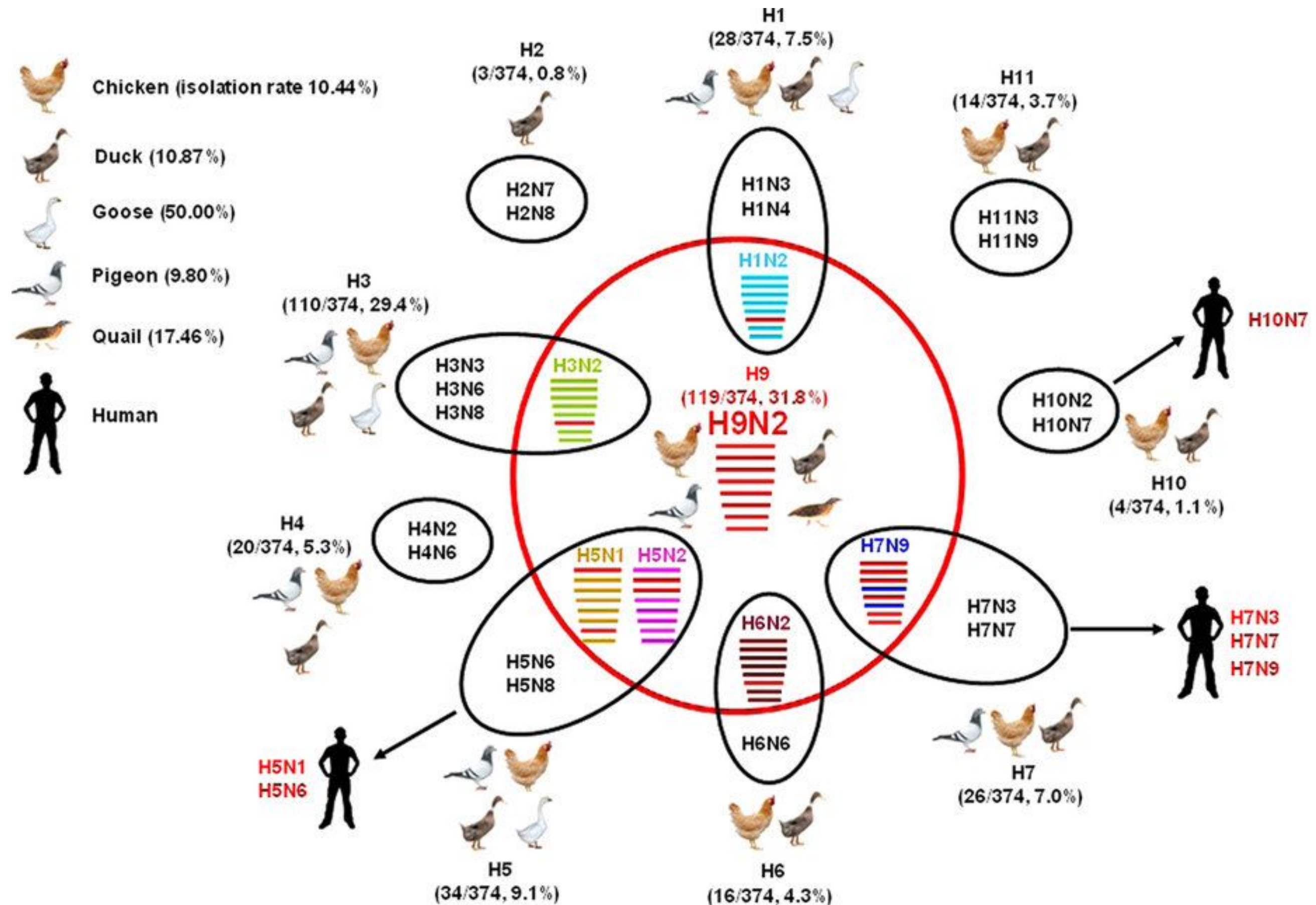
**H6N1 LPAI**

**H9N2 LPAI (37/1)**





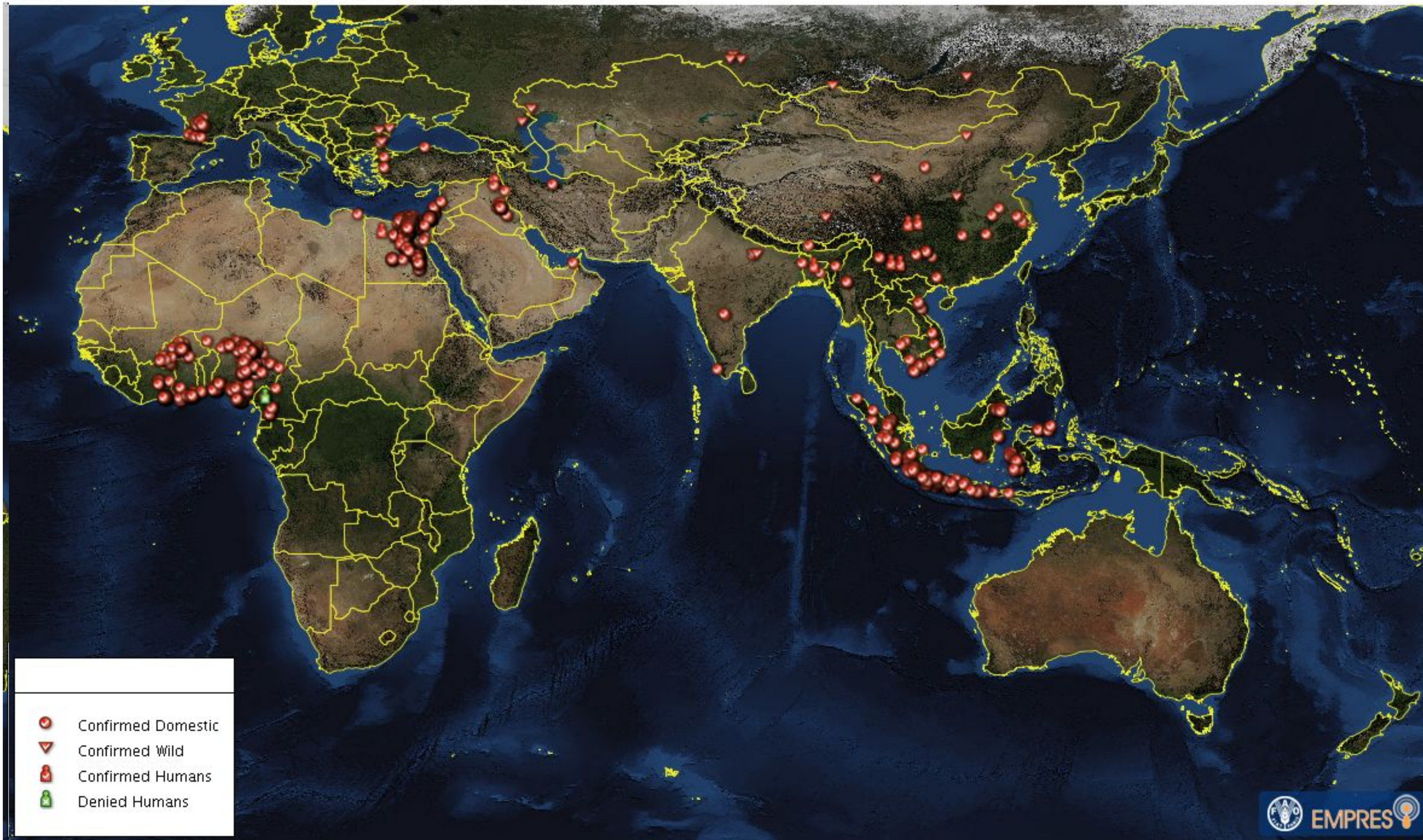
# H9N2 and zoonotic avian influenza viruses





# H5N1 outbreaks worldwide 2015-2018

DISEASE EVENTS - Observation date from 01/01/2015 to 13/10/2016 (more filters)

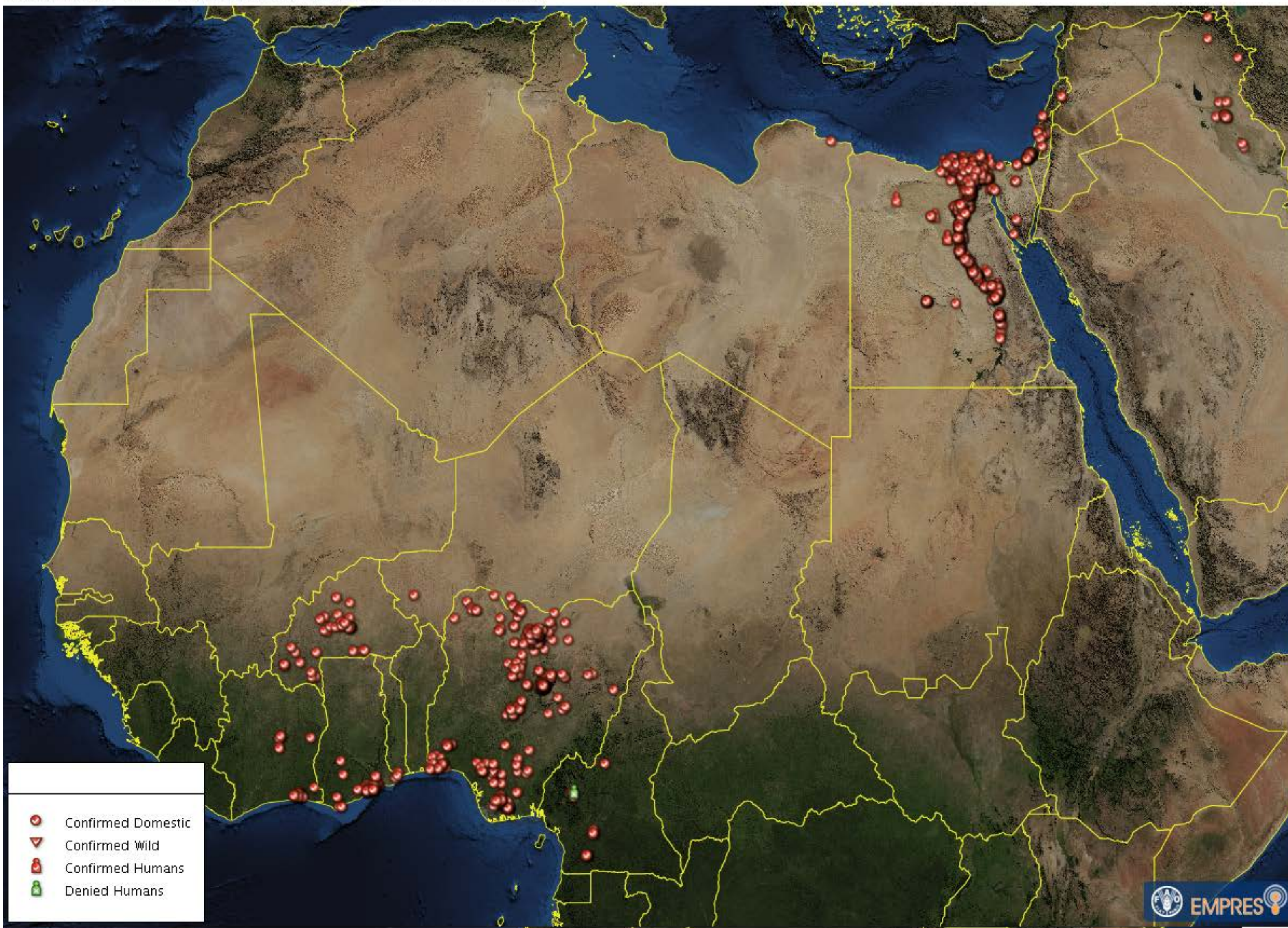


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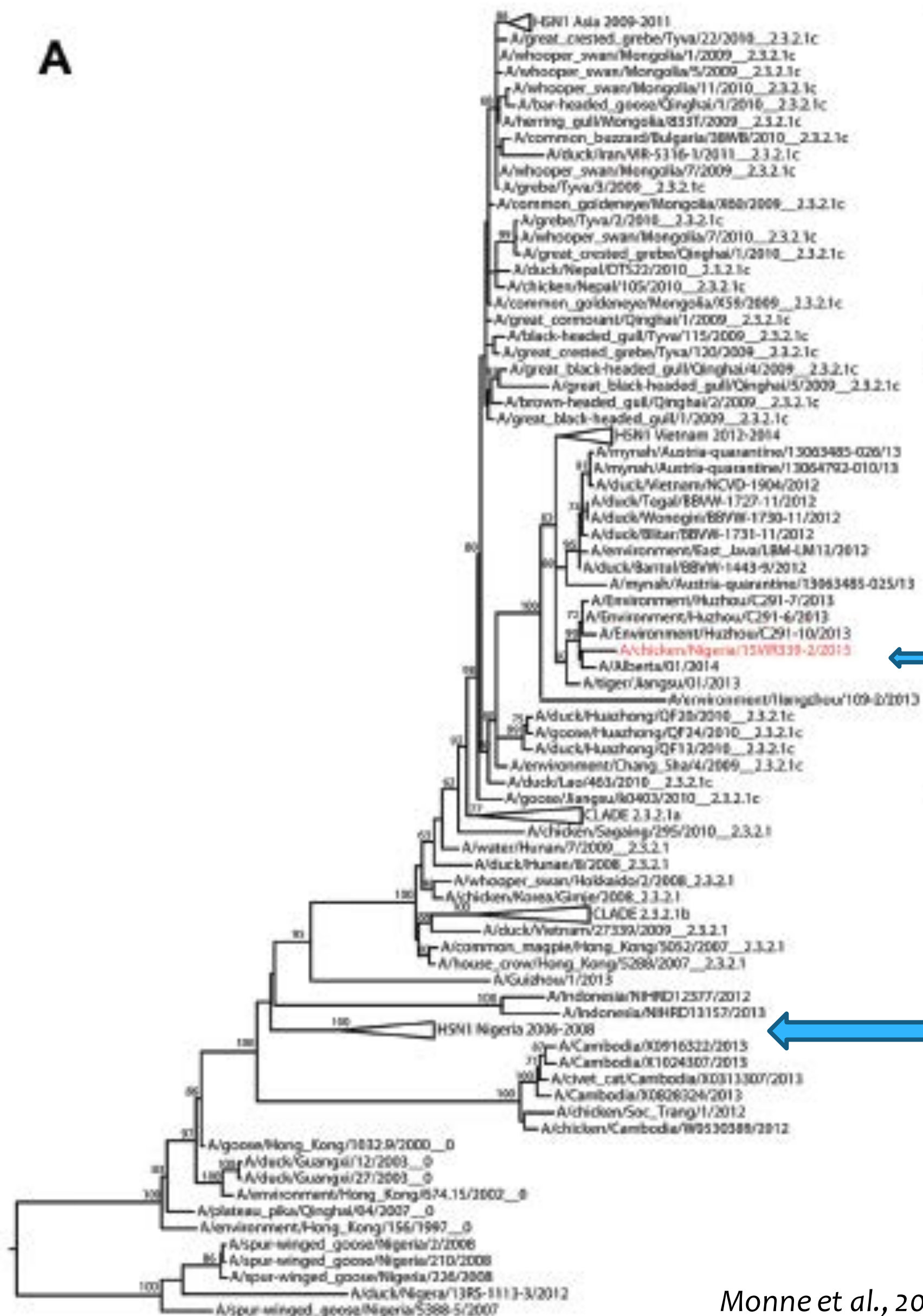
# H5N1 outbreaks in Africa 2015-2016

DISEASE EVENTS - Observation date from 01/01/2015 to 13/10/2016 (more filters)





A



**H5N1 in 2015/2016 is  
a new introduction  
in Africa**



***Were under resourced countries prepared?***





# WHY ?

- ❑ Lack of early warning systems in several countries
- ❑ Veterinary services were unfamiliar with the disease and its epidemiology, thus unprepared to diagnose and report AI
- ❑ Other lethal infections of birds common (e.g. ND, IBD)
- ❑ *Other priorities*





# H5N1 outbreaks in Africa (OIE notified, Egypt excl.)

	2006	2007	2008	2014	2105	2016
Benin	/	5	/	/	/	/
Burkina Faso	4	/	/	/	38	/
Cameroon	1	/	/	/	/	18
Cote d'Ivoire	5	/	/	/	29	13
Djibouti	1	/	/	/	/	/
Ghana	/	6	/	/	34	23
Libya	/	/	/	1	1	/
Niger	2	/	/	/	1	/
Nigeria	59	1	2	/	192	201
Sudan	18	/	/	/	/	/
Togo	/	3	1	/	/	2

108

553



# Confirmation and reporting

## Resourced countries

Country	Start of the event	Confirmation	Days Start/Confirmation	Report	Days Total
Europe 1	8/02/2006	14/02/2006	6	16/02/2006	8
Europe 2	13/02/2006	17/02/2006	4	20/02/2006	7
Europe 3	10/08/2013	14/08/2013	4	15/08/2013	5
Europe 3	29/04/2016	02/05/2016	3	02/05/2016	3
Asia 1	04/01/2007	13/01/2007	9	13/01/2007	9
Asia 6	22/11/2006	23/11/2006	1	26/11/2006	4





# Confirmation and reporting Under resourced countries - Asia

Country	Start of the event	Confirmation	Days Start/Confirmation	Report	Days Total
Asia 2	20/03/2006	23/03/2006	3	13/04/2006	24
Asia 2	04/05/2016	10/05/2016	6	17/05/2016	<b>13</b>
Asia 3	06/12/2006	19/12/2006	13	19/12/2006	13
Asia 3	12/03/2015	14/03/2015	2	19/03/2015	<b>7</b>
Asia 4	18/01/2006	01/02/2006	14	03/02/2006	16
Asia 4*	16/12/2015	15/04/2016	120	25/04/2015	<b>130</b>
Asia 5	20/04/2016	22/04/2016	2	23/04/2016	<b>3</b>

\* Conflict area



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[http://www.oie.int/wahis\\_2/public/wahid.php/Countryinformation/Countryreports](http://www.oie.int/wahis_2/public/wahid.php/Countryinformation/Countryreports)



# Confirmation and reporting Under resourced countries - Africa

Country	Start of the event	Confirmation	Days Start/Confirmation	Report	Days Total
Africa 1	10/01/2006	06/02/2006	27	08/02/2006	29
Africa 1	02/01/2015	08/01/2015	6	09/01/2015	7
Africa 2	21/02/2006	11/03/2006	18	12/03/2006	19
Africa 2	20/05/2016	24/05/2016	4	27/05/2016	7
Africa 3	13/02/2006	27/02/2006	14	28/02/2006	15
Africa 3	02/04/2015	21/04/2015	19	21/04/2015	19
Africa 4	14/04/2007	28/04/2007	14	03/05/2007	19
Africa 4	13/04/2015	12/05/2015	30	02/06/2015	52





# Sharing of data & information

Country	Whole genome 2015	HA gene 2015	Whole genome 2016	HA gene 2016
<b>Burkina Faso</b>	10	2	NA	NA
<b>Cote d'Ivoire</b>	3	2	0	0
<b>Ghana</b>	27	2	0	2
<b>Niger</b>	7	1	0	1
<b>Nigeria</b>	2	0	0	0
<b>Total WGS</b>	49			
<b>Total HA</b>	10			

**5 / 7 African countries newly affected in 2015/2016 shared virus sequences in public databases**



# Sharing of data & information

## Number of publications on H5N1 in sub-saharan Africa with at least 1 African affiliation

Source: NCBI-PubMed  
Data up to date 18 Oct 2016

Year	Open Access	Not open Access	Total
2006	0	2	2
2007	2	3	5
2008	2	1	3
2009	2	1	3
2010	0	0	0
2011	0	1	1
2012	0	0	0
2013	0	1	1
2014	1	0	1
2015	0	0	0
2016	2	1	3
<b>Total</b>	<b>9</b>	<b>10</b>	<b>19</b>



# Avian influenza progress in under resourced countries

*Donors, international organizations (e.g. OIE, FAO, IAEA, WHO...) and Reference Laboratories have been instrumental in the progress made to fight and control AI in several under resource countries*

- ❑ Veterinary services now **better prepared** compared to 2006
- ❑ Veterinary **networking** (e.g. Offlu, VETLAB, RESOlab) **supported** with
- ❑ Data and **information on AI available/accessible** in several countries
- ❑ Increased number of veterinary **laboratories equipped** and trained for AI
- ❑ **Time** needed for detection, confirmation and notification of the disease has been **reduced** in several instances



# H5N1 outbreaks in Africa

	2006-2008	2015-2016
Benin	Infected/free	Not reported
Burkina Faso	Infected/free	Infected
Cameroon	Infected/free	Infected
Cote d'Ivoire	Infected/free	Infected
Egypt	Infected/Endemic	Endemic
Ghana	Infected/free	Infected
Libya	Not reported	Infected
Niger	Infected/free	Infected
Nigeria	Infected/free	Infected
Sudan	Infected/free	Not reported
Togo	Infected/free	Infected



# Avian influenza

## Main challenges in under resourced countries

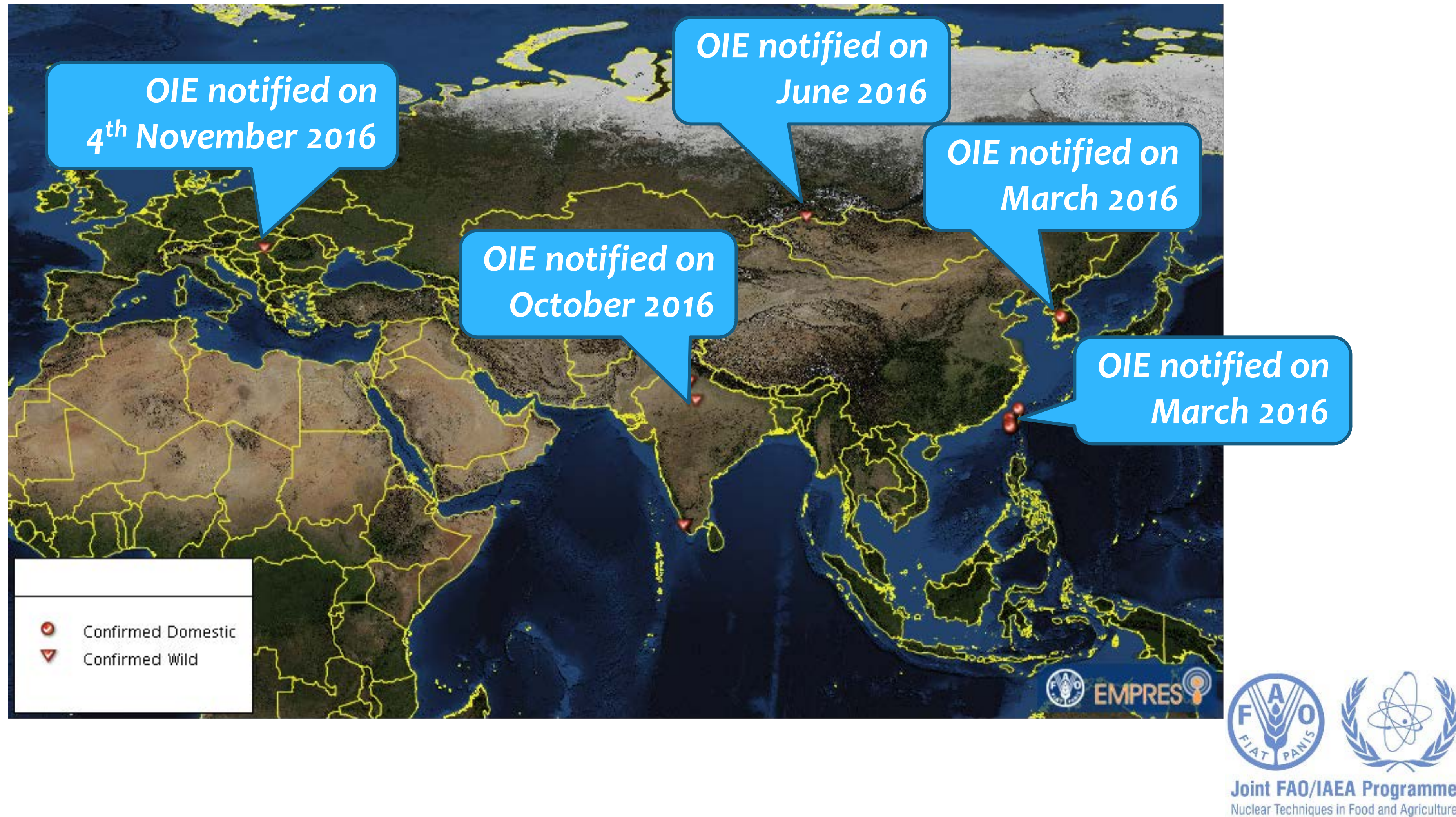
- ☐ Proper passive and active surveillance (early warning)
- ☐ Effective and timely **samples collection and submission** to national laboratories
- ☐ Timely **submission of samples to international reference** laboratories
- ☐ Availability of laboratory **reagents** and **maintenance** of equipment for prompt detection
- ☐ Proper **implementation of control strategies** including vaccination (in endemic countries)
- ☐ **Financial constrains** in under resource countries for surveillance and laboratories
- ☐ Stronger **veterinary policies** and **governance** needed



# H5N8 HPAI – 2016

## H5N8 highly pathogenic avian influenza detected in Hungary and in the Republic of India

[http://www.fao.org/ag/againfo/programmes/en/empres/news\\_031116b.html](http://www.fao.org/ag/againfo/programmes/en/empres/news_031116b.html)





# ***Thank You***

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*<http://www-naweb.iaea.org/nafa/about-nafa/animal-production-health-laboratory.html>*

