CURRENT ANIMAL HEALTH SITUATION WORLDWIDE: ANALYSIS OF EVENTS AND TRENDS

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   - Infection with influenza A viruses of high pathogenicity in birds
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   - Infection with foot and mouth disease virus
   - Lumpy skin disease

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   - Submission of six-monthly reports
   - Information provided within reports
   - National Reference laboratory capacities

3. Update on the WAHIS renovation project (WAHIS+)
Chapter I

Global situation regarding five terrestrial OIE-listed diseases and infections of major interest
Member Countries having submitted their six monthly report on terrestrial animal diseases

As of 10 May 2017:

- **93%** (167/180) the 1st semester of 2016
- **75%** (135/180) for the 2nd semester of 2016

High rates!
Chapter I.1.

Infection with influenza A viruses of high pathogenicity in birds
Reported distribution of HPAI in 2016 and early 2017 in poultry

29% Member Countries and territories

*Data provided by Morocco*
Reported distribution of HPAI in 2016 and early 2017 in wild birds

26% Member Countries and territories

*Data provided by Morocco*
Percentage of the reporting countries that notified HPAI present (between 2006 and 2016)

\[ y = 0.0017x^2 - 0.0392x + 0.2849 \]
\[ R^2 = 0.7 \]

Number of countries vs % countries

<table>
<thead>
<tr>
<th>1st sem.</th>
<th>2nd sem.</th>
<th>1st sem.</th>
<th>2nd sem.</th>
<th>1st sem.</th>
<th>2nd sem.</th>
<th>1st sem.</th>
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<th>1st sem.</th>
<th>2nd sem.</th>
<th>1st sem.</th>
<th>2nd sem.</th>
<th>1st sem.</th>
<th>2nd sem.</th>
</tr>
</thead>
</table>

- **31%** 1 serotype
- **28%** 11 serotypes

Countries reporting the disease present
Countries reporting the disease absent
% Affected reporting countries with 95% C. I.
Analysis of WAHIS data (1)

Dynamic of H5N8 subtype in the last four years: time evolution?
Methodology (1)

Period 1  

Period 2  
Sept. 2014 – Aug. 2015

Period 3  

Period 4  
Sept. 2016 – May 2017

Epidemic curve

Outbreaks

Cases
Results (2): epidemic curves

Period 2: Sept 2014 – Aug 2015
327 770 CASES

Period 4: Sept. 2016 – May 2017
1 103 314 CASES
Analysis of WAHIS data (2)

Dynamic of H5N8 subtype in the last four years: spatial spread?
Methodology (2)

Period 1

Period 2
Sept. 2014 – Aug. 2015

Period 3

Period 4
Sept. 2016 – May 2017

2,784 outbreaks

Kernel density estimator

Relative IPV utilization observed using Kemp Ring requests
Results (2): Kernel estimation of H5N8 spread in period 2 and period 4

(data based on reports received up to 10 May 2017)
Conclusion

- **Maximum number of countries** reporting the disease present since 2006

- New subtypes: **H5N8** (higher spread capacity), **H5N5** and **H7N9** (more aggressive variant)

- More link with genetic data to better understand current and potential evolution of the disease, **WAHIS+**

- **H5N8** dynamic as a model of the potential evolution in the epidemiology of a changing subtype

- The OIE encourages its Member Countries to improve surveillance in **wildlife** and provide timely and accurate information.

- The collection of high quality information allows for more advanced epidemiological analysis, and consequently the adoption of proper biosecurity measures:
  
  i) to avoid the spread of the disease  
  ii) to limit contact between poultry and wild birds.
Chapter 1.2.

Infection with rabies virus
Reported distribution of infection with rabies virus in 2016 and early 2017

(data based on reports received up to 10 May 2017)
Percentage of the reporting countries that notified rabies present in dogs

between 2005 and 2016

(data based on reports received up to 10 May 2017)

\[ y = -0.0031x + 0.5055 \]
\[ R^2 = 0.7 \]

Rabies present in dogs
Rabies absent in dogs
% Affected reporting countries with 95% C.I.

Improvement!
Analysis of WAHIS data

What are the regional differences in terms of rabies occurrence, impact and control?
Methodology

By Region

Annual reports
- 2015/2016
- % reporting countries notifying rabies in Humans

Six-monthly reports
- 2005-2016
- % reporting countries reporting vaccination of dogs per year

Relative risk
(cases notified in humans if cases notified in dogs)

Trend
(Spearman’s rank correlation test)
Results: Regional differences in the % countries notifying rabies in dogs

% countries

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>86%</td>
<td>89%</td>
</tr>
<tr>
<td>Americas</td>
<td>29%</td>
<td>36%</td>
</tr>
<tr>
<td>Asia</td>
<td>56%</td>
<td>69%</td>
</tr>
<tr>
<td>Europe</td>
<td>11%</td>
<td>36%</td>
</tr>
<tr>
<td>Middle East</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>Oceania</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

RR = 3.7

Differences in terms of rabies occurrence & impact
Results: Median & trend of official vaccination of dogs (2005-2016)

Differences in terms of control strategies

- **High % of countries reporting dog-mediated rabies**
  - Africa: 69%
  - Asia: 70%
  - Middle East: 57%

- **Lower % of countries reporting dog-mediated rabies**
  - Americas: 49%
  - Europe: 70%

- **No reported dog-mediated rabies**
  - Oceania: 0%

Increasing trend

Median % of countries reporting official dog vaccination
Conclusion

- **Improvement** of the global situation since 2005 but strong regional differences

- **OIE programmes & initiatives** to support national dog-mediated rabies elimination programmes

- Recommendations highlighted at the **Conference on Global Elimination of Dog-mediated Human Rabies** & in **Resolution No. 26** (84th OIE General Session) to achieve 0 human deaths from dog-mediated rabies by 2030

- WAHIS useful to **measure progress**
Chapter I.3.

Infection with peste des petits ruminants virus
Reported distribution of PPR in 2016 and early 2017

(data based on reports received up to 10 May 2017)

First occurrence in Georgia
January 2016

First occurrence in Mongolia
August 2016

29% countries/territories

*Data provided by Morocco*
PPR in Mongolia
(December 2016)

- More than 3000 deaths in Mongolian Saigas (critically endangered)
- Reinforces the need to investigate the role of wildlife in PPR epidemiology
- OIE/FAO Crisis Management Centre – Animal Health assists the Government of Mongolia in dealing with the PPR outbreaks
OIE Member Countries’ official status 2016 for PPR

(last update May 2016)

54 Member Countries
Percentage of the reporting countries that notified PPR present
(between 2005 and 2016)
(data based on reports received up to 10 May 2017)

\[ y = -0.0004x^2 + 0.013x + 0.1516 \]

\[ R^2 = 0.8 \]
Analysis of WAHIS data

Role of regulated vs. unregulated international trade of small ruminants in PPR spread over the past 11 years?
Methodology (1)

**UN** repository of official international trade statistics (2005-2015)

Regulated trade network of live small ruminants
*(social network analysis techniques)*

Yearly monetary value    Yearly network density

**Trends**
*(Spearman’s rank correlation test)*
Results (1): Trend of regulated international trade in small ruminants from 2005 to 2015

(data based on UN Comtrade data)

Spearman’s rank correlation test

\[
rho = 0.8; \ p < 0.005 \ for \ monetary \ value \\
\rho = 0.8, \ p = 0.001 \ for \ network \ density
\]

Increase of regulated international trade

- Monetary value global trade (billion USD)
- Network density
Methodology (2)

PPR events reported to the OIE as first occurrences in countries since 2005

Genetic links with previously existing viruses

(bibliographical research)

Regulated trade routes

Comparison
Results (2): Compiled trade movements between PPR-affected countries since 2007 and potential PPR spread routes

For 9 events/10: PPR spread could not be explained by regulated trade
Conclusion

- **Deterioration** of the global PPR situation in the past 12 years
- Event **in Mongolia** raises the question of the role of wildlife
- Recommendations in the **Global Strategy** to achieve PPR eradication by 2030
- Implementation of the OIE standards (recognised by the WTO) effective but PPR spread through **unregulated international animal movements** needs to be better controlled
- High **value of genetic information** in helping to understand disease spread (next version of WAHIS)
Chapter I.4.

Infection with foot and mouth disease virus
Reported distribution of FMD in 2016 and early 2017, serotype A

(data based on reports received up to 10 May 2017)

23 countries

*Data provided by Morocco*
Reported distribution of FMD in 2016 and early 2017, serotype O

(data based on reports received up to 10 May 2017)

37 countries and territories

*Data provided by Morocco*
Reported distribution of FMD in 2016 and early 2017, serotype Asia 1

*(data based on reports received up to 10 May 2017)*

*Data provided by Morocco*
Reported distribution of FMD in 2016 and early 2017, serotype SAT 1
(data based on reports received up to 10 May 2017)

9 countries

*Data provided by Morocco*
Reported distribution of FMD in 2016 and early 2017, serotype SAT 2

(data based on reports received up to 10 May 2017)

11 countries

*Data provided by Morocco
Reported distribution of FMD in 2016 and early 2017, serotype SAT 3

(data based on reports received up to 10 May 2017)

2 countries

*Data provided by Morocco
Reported distribution of FMD in 2016 and early 2017, serotype not specified
(data based on reports received up to 10 May 2017)

18 countries

*Data provided by Morocco
82 MC are officially recognized as free or having an FMD free zone
Percentage of the reporting countries that notified FMD present

(between 2005 and 2016)

(data based on reports received up to 10 May 2017)

\[ y = 2 \times 10^{-5}x^3 - 0.0011x^2 + 0.0146x + 0.2586 \]

\[ R^2 = 0.3759 \]

Number of countries

% affected countries

0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50%

0 20 40 60 80 100 120 140 160 180 200


Countries reporting the disease present
Countries reporting the disease absent
% affected reporting countries with 95% C.I.
Analysis of WAHIS data

Exploring the regional differences for the occurrence of FMD
Methodology (1)

Regional analysis of data (2005 – 2016)

Defining regional prevalence in 12 years
(countries reporting disease presence/total countries reporting)

Analysis focus in 4 regions:

- 0% Oceania
- 1% Europe
- 5% The Americas
- 57% Africa
- 58% Asia
- 65% Middle East
Results (1): Percentage of the reporting countries that notified FMD present by region (between 2005 and 2016)
(data based on reports received up to 10 May 2017)
Results (2): Sub-regional differences in Africa

% of reporting FMD present in Africa
Analysis of WAHIS data
Methodology (2)

Exploring the evolution
of serotype C reporting in the last 37 years &
the capacity to provide information by serotype
Methodology (2)

Exploring the global trend of reporting serotypes

Focus on Serotype C occurrence

Providing information on serotype

Data from three periods

**WAH e-format**
1981 – 1995

**Handistatus**
1996 – 2004

**WAHIS**
2005 – 2016
Results (3): Percentage of reporting countries that notified FMD serotype C (between 1981 and 2016) (data based on reports received up to 10 May 2017)

7 countries
Results (4): The capacity to provide information by serotype

(between 2005 and 2016)

(data based on reports received up to 10 May 2017)

\[ y = 0.0002x^2 - 0.0192x + 0.5826 \]

\[ R^2 = 0.900 \]

Average of 56% 

Observed improvement in serotyping 

Average of 29% 

| Year | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. | 1st sem. | 2nd sem. |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 2005 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2006 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2007 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2008 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2009 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2010 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2011 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2012 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2013 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2014 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2015 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 2016 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
Conclusion

- Observed significant improvements in the epidemiological situation in the Americas and subregional differences in Africa
- Significant decrease of serotype C reporting
- Number of countries not reporting serotype is decreasing in the last 12 years, but there is still room for improvement
- Coordinate effort to ensure adequate sampling of FMD serotypes to improve confidence of absence of serotype C
- “WAHIS +” will include genetic typing to investigate evolution and spatial pathways of FMD
Lumpy skin disease
Reported distribution of LSD in 2016 and early 2017

(data based on reports received up to 10 May 2017)

27% Member Countries

*Data provided by Morocco*
Percentage of the reporting countries that notified LSD present

(between 2005 and 2016)

(data based on reports received up to 10 May 2017)

\[ y = 5E-05x^3 - 0.0016x^2 + 0.0151x + 0.1291 \]
\[ R^2 = 0.8229 \]
Analysis of WAHIS data (1)

LSD significantly spread to new areas since 2006?
Methodology (1)

Outbreaks location (N=1838)

Latitude extraction

Plotting latitude vs years

Plotting latitude vs years
Results (1): Trend in the average latitude of LSD outbreaks between 2005 and 2016

(data based on reports received up to 10 May 2017)

Significant increase of average latitude (p-value < 0.001; rho=0.8)
Analysis of WAHIS data (2)

Do environmental, climatic and animal population variables affect disease distribution? Can they help in predicting disease occurrence?
Methodology (2)

- **24 Climatic variables**
- **4 Density and livestock production system variables**
- **13 Land cover and NDVI variables**

**Analysis Methods**
- Generalized Variance Inflation Factor
- Stepwise selection

**General Linear model**

**Risk map**
- **High risk**
- **Moderate risk**
- **Low risk**
Results (2): Environmental variables selected in the final model

(data based on reports received up to 10 May 2017)

16 variables

May

November
Results (2): Distribution of LSD predicted risk areas
(data based on reports received up to 10 May 2017)
Conclusion

- LSD is an **emerging threat** to free countries

- Role of **environmental and climatic** factors

- Modelling disease spread to improves **control and prevention**

- Importance of linking the data provided through **WAHIS** with international databases to improve epidemiological analysis: role of **WAHIS+**
Chapter II

Global situation regarding diseases of aquatic animals: worldwide diagnostic capabilities
Chapter II.1.

Submission of six-monthly reports
Member Countries having submitted their six monthly report on aquatic animal diseases

As of 10 May 2017:
- **67%** (121/180) the 1\textsuperscript{st} semester of 2016
- **57%** (102/180) for the 2\textsuperscript{nd} semester of 2016

Comparable to previous years & Much lower than for terrestrial animals
Analysis of WAHIS data

Identifying factors influencing the notification of aquatic animal diseases?
Methodology

Submission of six-monthly reports by Member Countries (binary variable)

As of 10 May 2017

by OIE Region

By 2015 aquaculture production

(FAO Global Aquaculture Production)

Comparison of percentages

(Median comparison using Wilcoxon rank sum)
## Results: Submission of reports for 2016, by OIE Region

*(data based on reports received up to 10 May 2017)*

<table>
<thead>
<tr>
<th>OIE Region</th>
<th>% of Members in the Region that submitted information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>44%</td>
</tr>
<tr>
<td>Americas</td>
<td>80%</td>
</tr>
<tr>
<td>Asia, Far East and Oceania</td>
<td>61%</td>
</tr>
<tr>
<td>Europe</td>
<td>92%</td>
</tr>
<tr>
<td>Middle East</td>
<td>60%</td>
</tr>
</tbody>
</table>
Results: National 2015 aquaculture production and submission of reports for 2016
(data based on reports received up to 10 May 2017)

Countries that are not submitting reports have a significantly lower aquaculture production than those submitting information (Wilcoxon rank sum test)

Annual aquaculture production (tonnes)

<table>
<thead>
<tr>
<th>No</th>
<th>Median = 991 tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Median = 12 020 tonnes</td>
</tr>
</tbody>
</table>

Reports submitted
Information provided within reports
Reported distribution of OIE-listed diseases in 2016 and early 2017 - Fish

(data based on reports received up to 10 May 2017)

- Koi herpesvirus disease
  - First occurrence in Croatia
  - June 2016

- Infect. haematopoietic necrosis
  - First occurrence in Kenya
  - February 2016

- Epizootic ulcerative syndrome
  - First occurrence in Zimbabwe
  - August 2016
Reported distribution of OIE-listed diseases in 2016 and early 2017 - Molluscs

(data based on reports received up to 10 May 2017)

Infection with *Bonamia exitiosa*
First occurrence in Croatia
May 2016

*Data provided by Morocco*
Reported distribution of OIE-listed diseases in 2016 and early 2017 - Crustaceans

(data based on reports received up to 10 May 2017)

Hepatopancreatitis in prawns
Emerging disease in Australia
Notified February 2016

*Data provided by Morocco
Reported distribution of OIE-listed diseases in 2016 and early 2017 - Amphibians

(data based on reports received up to 10 May 2017)

*Data provided by Morocco*
Analysis of WAHIS data

Distribution of countries reporting diseases present?
Results: Presence of aquatic animal diseases in OIE-validated six monthly reports for 2016

*(data based on reports received up to 10 May 2017)*

<table>
<thead>
<tr>
<th>OIE Region</th>
<th>% of Member Countries that reported the presence of at least one disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>42%</td>
</tr>
<tr>
<td>Americas</td>
<td>67%</td>
</tr>
<tr>
<td>Asia, the Far East and Oceania</td>
<td>59%</td>
</tr>
<tr>
<td>Europe</td>
<td>54%</td>
</tr>
<tr>
<td>Middle East</td>
<td>8%</td>
</tr>
</tbody>
</table>
Chapter II.3.

National Reference Laboratories capacities
Analysis of WAHIS data

Use of national laboratories and OIE Reference Laboratories for diagnosis of OIE-listed aquatic animal diseases?
Methodology

Member Countries’ latest annual reports
As of 10 May 2017

% of countries reporting availability of diagnostic tests in their national laboratories

by OIE Region

Potential gaps?

Exceptional epidemiological events reported since 2005

Use made of OIE Reference Laboratories vs. other kind or laboratories?
Results: Percentage of Member Countries that reported on the availability of diagnostic tests for OIE-listed aquatic animal diseases

(data based on reports received up to 10 May 2017)

Gaps in national diagnostic capabilities for aquatic animal diseases
Results: Use of laboratories for confirmation of exceptional epidemiological events of OIE-listed aquatic animal diseases

142 events
from 1 January 2005 to 10 May 2017

- National Reference laboratory only: 77%
- OIE Reference Laboratory only: 12%
- National Reference laboratory and OIE Reference Laboratory: 4%
- Other: 7%

Importance of capacity building within countries and of the network of OIE Reference Laboratories

142 events from 1 January 2005 to 10 May 2017
Conclusion

- Despite the importance of aquatic animal diseases, the level of global **reporting is much lower** than for terrestrial animal diseases.

- Partially explained by the **lack of diagnostic capabilities in certain Regions** and by aquatic animal production data.

- Provision of **support by OIE Reference Laboratories** in case of specific need & **Twinning** programmes.

- OIE encouraging the nomination of **National Focal Points for Aquatic Animals**, giving them access to WAHIS & providing regular training.
Chapter III

Update on the WAHIS renovation project

Dr Neo Mapitse
Deputy Head,
World Animal Health Information and Analysis Department
Intuitive New features

PVS

AMR

Dynamic

Official disease status

Genomic

Mapping system

Data mining

Regional/National databases

WAHIS+
Project Implementation: status and main accomplishments

Initiation phase (Jan – Nov 2016)

- WAHIS+ Think Tank
- WAHIS+ business plan
- Survey WAHIS Evaluation
- Consultancy firm

Functional requirements phase (Nov 2016 – Aug 2017)

- Users needs assessment
- Functional specifications
- Technical project manager recruitment

Upcoming activities
Upcoming activities

IT company
- Request for Information (RFI)
- International call for Tender

Development
- Module by module
- Functionalities

3 stages
- Foundation stage (18 months)
- Evolutive stage (10 months)
- Advanced stage (6+ months)
WAHIS+ roll-out strategy

**FOUNDATION STAGE (18 MONTHS)**

- Immediate notification and FUR
- Six-monthly reports
- Annual report/data

**NEW ADDITIONAL FEATURES (10 MONTHS)**

- WAHIS+ wild interface
- WAHIS+ interface
- Genomic data
- WAHIS+ alert application
- E-learning platform

**DATA MIGRATION (6+ MONTHS)**

- Data migration
- Interoperability
- Data mining
- Dashboards production
Broad participation in the identification of users needs

- 206 Delegates and Focal points from 167 countries in 2016.
- 739 stakeholders from 143 countries in 2017.
Consultation with stakeholders

What is your vision for the future of WAHIS?

- Public organisations (e.g. National Veterinary Services, Ministry of Health, Ministry of Agriculture) 53%
- International organisations 4%
- Regional organisations 4%
- Academic/research institutions 18%
- Private sector (e.g. clinic, pharmaceutical industry) 13%
- NGO (non-governmental organisations) 4%
- Trade services 0.4%
- Press (e.g. newspapers, TV) 0.5%
- Others 4.4%
- Others 4.4%
GOVERNANCE

Steering Committee (monthly)

Operational Committee (weekly)

Strategic Advisory Committee

Technical Advisory Committee
Thank you for your attention