



GODA - CERVA



Monitoring and Surveillance System-MoSS

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.be

Bluetongue, Belgium, 2006



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- **Unknown disease** (spatiotemporal context)
- Shown in cattle instead of sheep
- **Several experts** contacted in parallel by different Vets and gave different explanations
- Disease not identified => notifiable or not ?
- **Lack of focal point** to centralize all the information
- Consequence : **late identification** of the pathogen (6weeks)
- Reaction of the Belgian health authorities : "No more this !"

Walk through the problem (1)

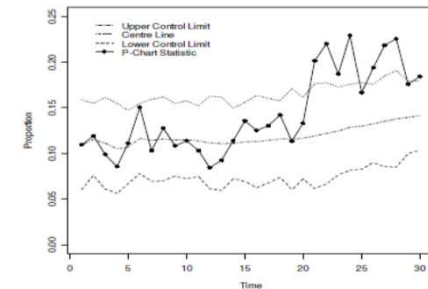
- Need a system helping to **reduce the delay** between detection of first clinical signs and identification of causative agent
- Avoid unstructured communication
 - *Identified specific network (s)*
 - Field Veterinarians – Aware animal Owners
 - Field Experts
 - Experts (bird eye view : Universities)
 - Diagnostic Labs
 - *Communication tools valid on all sides of any frontiers*
 - *'People in charge' of the problem*

Walk through the problem (3)

- Need of system allowing for an **automated detection** of the « problem » = device that alerts each « ad hoc network » when the decision threshold is crossed
 - *Ad hoc Network*
 - Specific by animal species
 - Flexible
 - Interactive
 - Structured
 - Result-orientated thanks to leadership of « Leading-Expert » and collaboration of all the contributors
 - *Alert ? Threshold ?*

Scope of the system

- **Unknown** diseases revealed to **our** cognition
- **Known** disease but never identified in a specific spatio-temporal context (ex: BLT virus Belgium, 2006)
- Diseases showing **increased reporting frequency** compared to usual level
 - *Spatio-temporal comparison*
 - « *historical data* »
- **Known** diseases showing alarming clinical patterns :
 - *Intensity of the symptoms*
 - *Unusual mortality*
 - *Increased morbidity,...*
- Diseases not 'responding' to usual treatment



Walk through the problem (4)

Aggregation of records

- Are there **similar records** in the dataset ?
- Is the same disease occurring in the **same spatiotemporal context** ?
- Do we have prior information ? No
- Can we 'model' something ? No

Only acceptable grouping procedure taking into account the present constrains : **Hierarchical Ascending Clustering Process** (but parametrable !)

Focal point & Network

- Unique place where
 - *Cases are reported*
 - *Alert is generated*
 - *Case is 'grasped' by competent persons*
 - *On-line structured communication by Cluster*
 - *Maximum interaction is possible*
- => Unique and efficient Network

Operational answer : MoSS



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emergences2.be



Objectives MoSS-emergences²

- Early detection of clusters showing **atypical syndromes** in the field
- Early identification of **causative agent**
- Creation, organisation and coordination of a **Network** of collaborative Field Practitioners & Experts

MoSS-emergence² website

- PHP-MySQL application (freeware)
- Multi-browser (better not use Explorer 8)
- Dedicated to Veterinarians (login)
- Multi-lingual
 - *English*
 - *Dutch*
 - *French*
 - *Open to any other language !*
- Questionnaire 'fixed choice' allows for
 - *Multi-lingual managt*
 - *Clustering process*

MoSS-emergence² website (2)

- Dynamic clustering process (HACP)
 - *Parametrable*
 - *No prior information requested*
- Role based application
 - *Security, confidentiality*
- Profiles (increasing rights)
 - *Veterinarians, field Experts, administrator*
- User-friendly web application
 - *Webmaster /Administrator does not need to be a programmer*
 - *Balances time to record and needed information to work appropriately*
- Integrated GIS
 - *Google Map cartography*
 - *Lambert XY coordinates for the calculations of spatial proximity*

Atypical syndrome recording

o Questionnaire

- *Date of observation*
- *Location*
- *Animal / Farm typology*
- ***Clinical signs / affected organs***
- *Epidemiology*
- *Factors possible occurrence*
- *Pictures?*



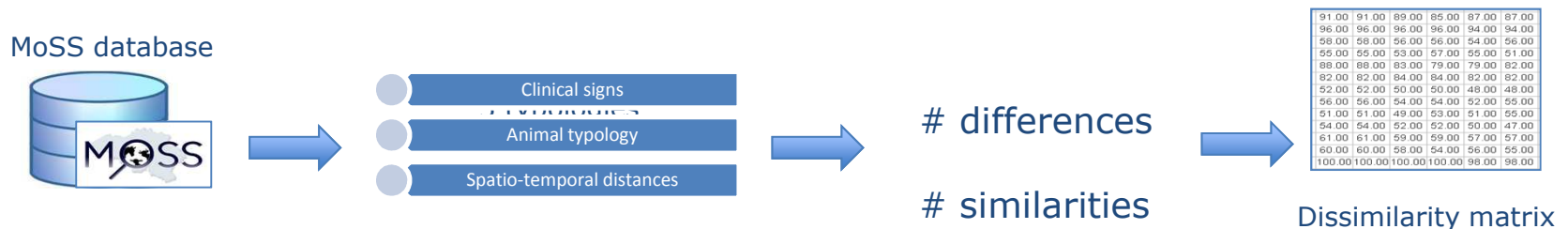
Notification Atypical Disease	
-1- Date of first observation clinical signs:	Date first observation clinical signs (dd/mm/yyyy) (*) 19/10/2010
-2- Type of organisation / environment concerned by the observation:	Type (*) Choose
-3- Identification of organisation / environment concerned by the observation:	Name of structure / environment (#) _____ Manager name (#) _____ Manager phone number (#) _____ Manager Email (#) _____ Identification(number) of the structure / environment (#) _____
-4- Animal species present in the organisation / environment concerned by the observation:	Main species (*) Choose Main species: predominant (production)type (*) - Unspecified Other species present (max = 6): None
-5- Elements leading to notification of the atypical disease:	<input type="checkbox"/> Unsuspected / strange / very specific clinical symptoms: <input type="checkbox"/> Observed syndrome not in accordance with any known disease: <input type="checkbox"/> Prior known disease(*), but absent / very rare in the species: <input type="checkbox"/> Prior known disease(*), but absent / very rare in this period: <input type="checkbox"/> Prior known disease(*), but very severe disease: <input type="checkbox"/> Prior known disease(*), but not responding to the commonly used treatment:
(*) : please provide the name of the suspected disease in heading no. 10	



! Sensitive data (exact location, herd id) optional + hidden for other users !

Analysis atypical syndrome records

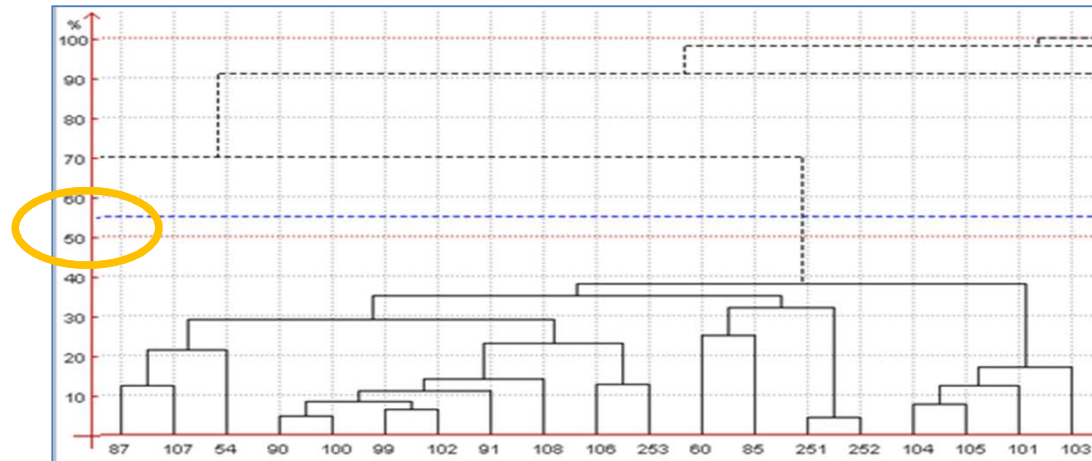
- Based on real-time comparison of new records with all previously made records
- **Hierarchical Ascending Clustering Process** identifies clusters of similar notifications, without prior information
 - *Based on clinical signs / affected animal categories / distance*



- Pair-wise matrix of 'dissimilarity' is used as input for the algorithm to find clusters of records that are most similar

Analysis (2)

- Clusters that do not exceed the chosen **intra-cluster dissimilarity** threshold) are being displayed on a map (powered by Google™Maps) and dendrogram



- Algorithm keeps combining clusters until threshold is met
- Parameter settings of clustering method fully adjustable (relative weight of typologies, differences vs. similarities, etc.)
 - leads to other classification results: optimal combination needed!

Analysis: (3)

Clustering profile management: hierarchical classification

In *MoSS-emergences2*, a profile is a tool to **give weights to the various variables** which are needed to calculate the **ascending hierarchical classifications**.

The hierarchical clustering, as data analysis method, makes it possible to detect clusters of cases having clinical and/or spatio-temporal similarities. To analyze the significance of the clusters detected via *MoSS-emergences2*, so called **work profiles** are used (one for atypical diseases, one for supervised diseases), but experts can also create a personal, custom profile (which can relate to a selection of notifications: see filter below).

Note: Only the administrator of *MoSS-emergences2* can modify the work profiles.

Filter notifications

User: Disease type:

Id-profile	User	Label	Type of profile	Type of disease	Creation date
<input type="checkbox"/> 23	38	Profile n° 23	Normal profile	Atypical	2010-11-10 15:42:48
<input type="checkbox"/> 22	38	Profile n° 22	Normal profile	Atypical	2010-10-18 23:57:49
<input type="checkbox"/> 21	3	Bleeding Calves	Normal profile	Atypical	2010-10-08 14:18:04
<input type="checkbox"/> 20	38	Pancytopenie néonata	Normal profile	Atypical	2010-01-16 14:19:34
<input type="checkbox"/> 18	31	Madis	Normal profile	Atypical	2009-07-30 12:44:55
<input type="checkbox"/> 17	35	Profile n° 17	Normal profile	Atypical	2009-07-30 12:03:51
<input type="checkbox"/> 16	35	Profile n° 16	Normal profile	Atypical	2009-07-30 12:03:41
<input type="checkbox"/> 15	35	Profil Dédé	Normal profile	Atypical	2009-07-30 12:01:42
<input type="checkbox"/> 14	3	Profile n° 14	Normal profile	Atypical	2009-06-23 15:17:13
<input type="checkbox"/> 13	3	Profil n° 3	Normal profile	Atypical	2009-06-23 15:16:44
<input type="checkbox"/> 12	3	Profil n° 12	Normal profile	Atypical	2009-05-13 12:48:46
<input type="checkbox"/> 11	3	Profil n° 11	Normal profile	Atypical	2009-04-13 00:09:04
<input type="checkbox"/> 10	3	Profil n° 10 (Chevaux)	Normal profile	Atypical	2009-04-06 15:55:56
<input type="checkbox"/> 9	3	Profil n° 9	Normal profile	Atypical	2009-04-06 15:55:28
<input type="checkbox"/> 8	3	Profil n° 8	Normal profile	Atypical	2008-11-04 21:39:10
<input type="checkbox"/> 7	3	Profil n° 7	Normal profile	Atypical	2008-11-04 21:38:48
<input type="checkbox"/> 6	3	Profil n° 6	Normal profile	Atypical	2008-11-04 21:36:33
<input type="checkbox"/> 5	3	Profil n° 5	Work profile	Monitored	2008-09-12 10:48:11
<input type="checkbox"/> 3	3	Profil n° 3	Normal profile	Atypical	2008-09-04 10:13:01
<input type="checkbox"/> 2	3	Profil n° 2	Work profile	Atypical	2008-09-03 15:50:57

→ Click here and the selected profile will become the "work profile"

Navigation icons: back, forward, search, etc.

All diseases

Create profile

Display profile

Modify profile

Remove profile

Apply profile

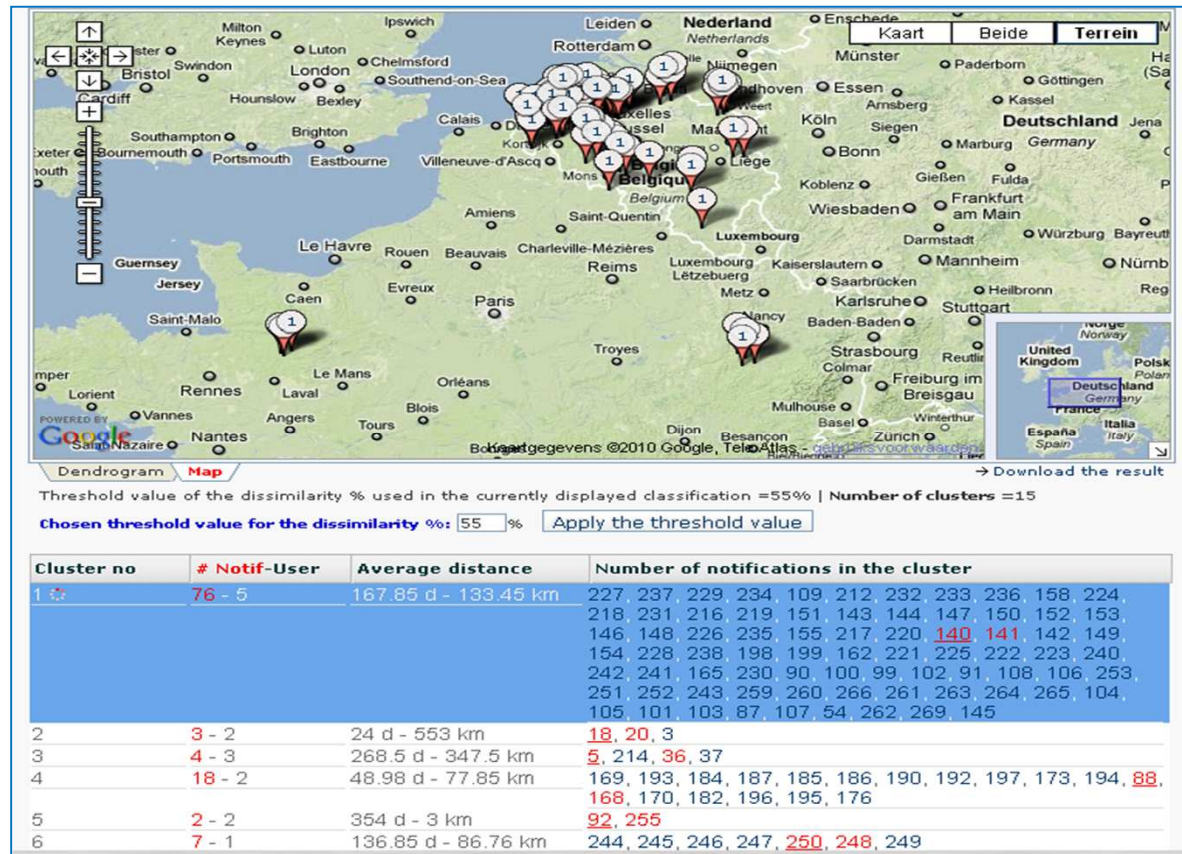
Results: Bovine Neonatal Leuko-cytopenia

Atypical syndrome analysis

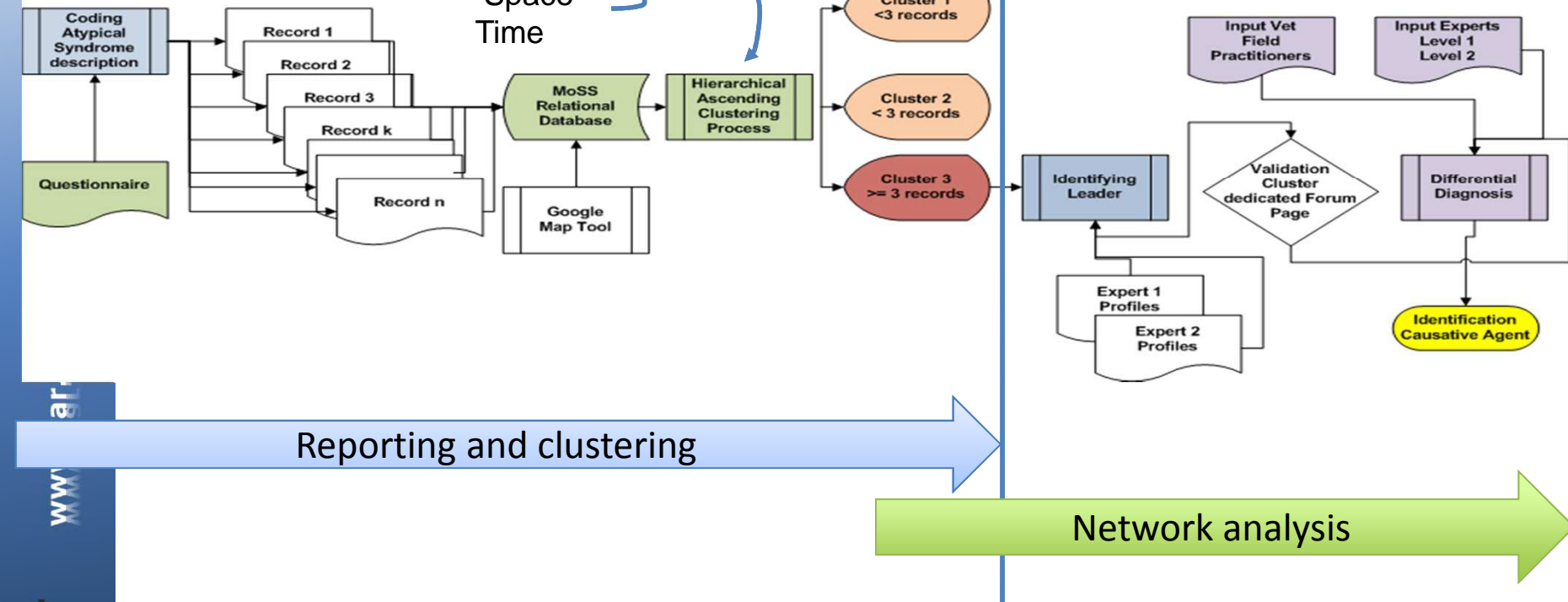
- Number of records on atypical syndromes have been made based on real observations
- BNL data used in MoSS to test clustering and mapping processes
 - *Clustering method compares individual BNL records (from different observers) with surrounding "noise"*

Results: BNL (2)

- 76 cases
- 5 observers
- *System has potential to recognize BNL cases as a cluster irrespective of personal variation*
- Remaining records do not concern BNL and stay outside cluster no. 1

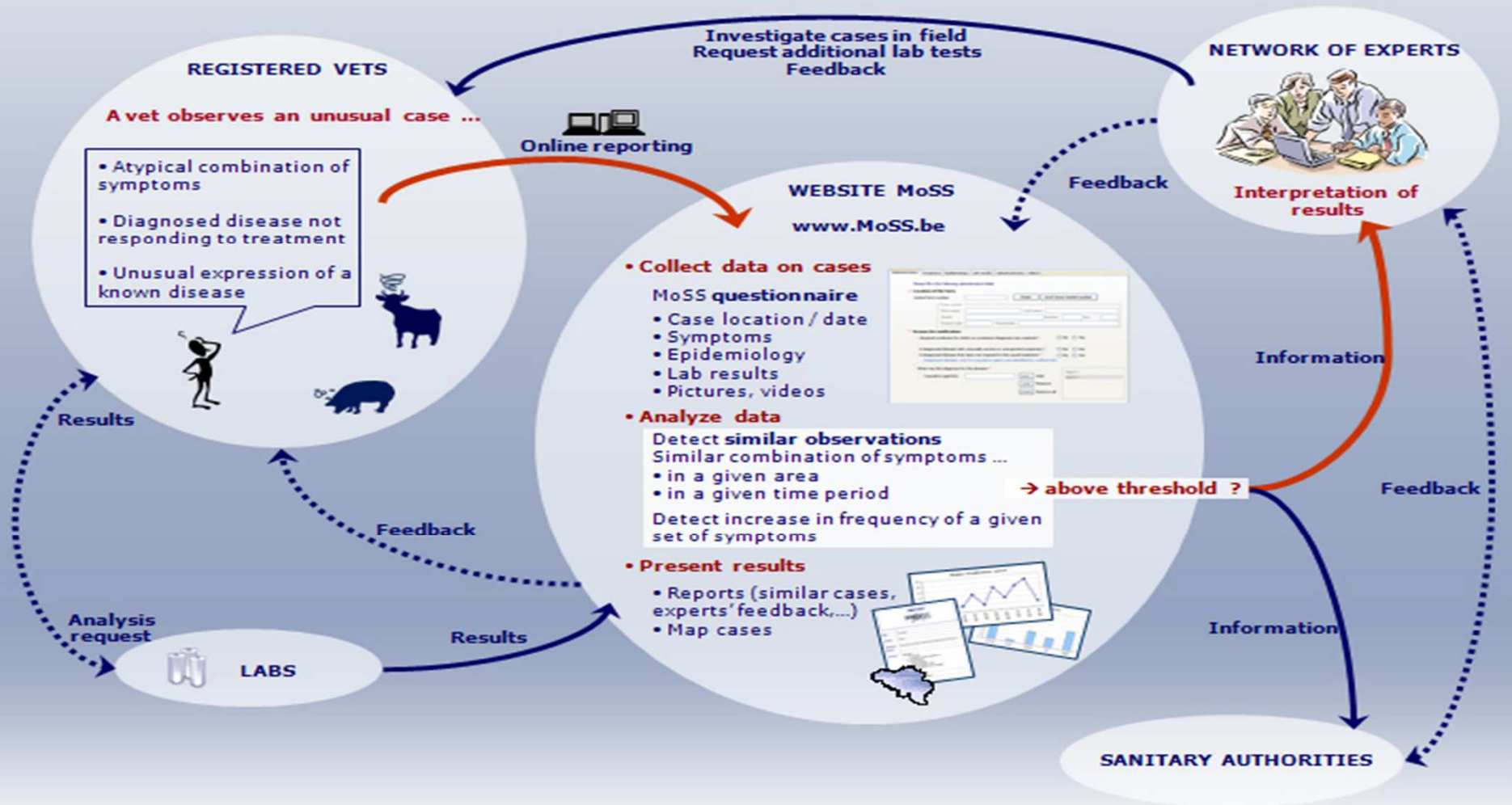


MoSS : cluster identification now achieved



29/04/2011

Web-based notification and reporting



Aknowledgements



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- INRA:



- *Jacques Barnouin*
- *Libo Ren*

- CODA-CERVA Veterinary and agrochemical research center:



- *Anouck Veldhuis*
- *Marc Dispas*

- Belgian Food safety Agency



The Food Agency

-  Federal Public service Public Health, safety of the food chain and environment

- First line laboratories:



DGZ-Vlaanderen



ARSIA

- Veterinary practitionnar associations