



V
b
o
r
n
Net

VBORNET

"European Network for Arthropod Vector
Surveillance for Human Public Health"

AGM Antwerp 2010



Vector borne diseases in Europe

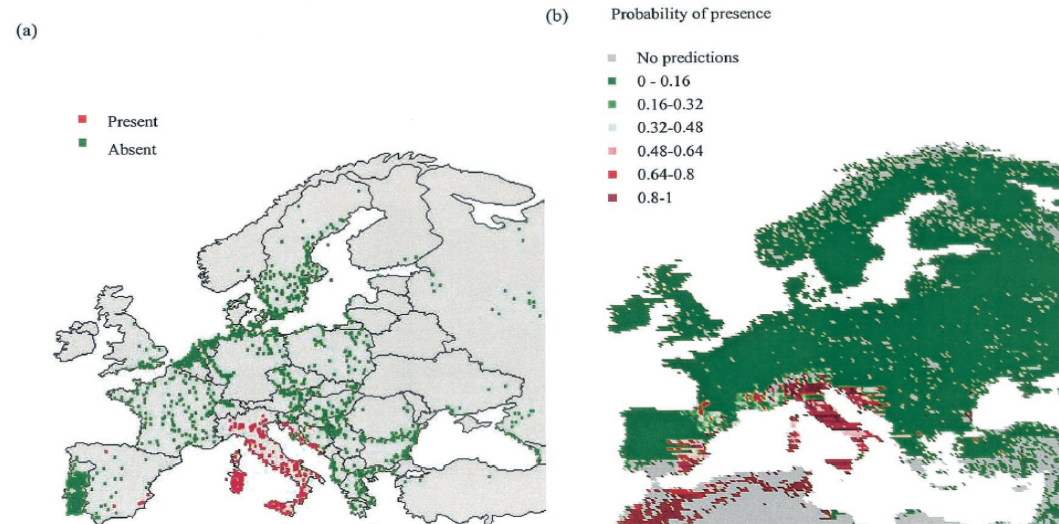
- **Mosquitoes**

- **Arboviroses**

- West Nile Virus
- Chikungunya
- Dengue
- Rift Valley Fever
- Tahyna Virus
- Batai virus
- Inkoo virus
- Sindbis virus (Ockelbo)

- **Malaria**

- *Plasmodium vivax*
 - *An. atroparvus*, *An. claviger*, *An. labranchiae*, *An. messae*, *An. maculipennis s.s.*, *An. superpictus*
- *Plasmodium falciparum*
 - *An. labranchiae*, *An plumbeus*?



Observed (a) and predicted (b) presence of *An. labranchiae* in Europe (Kuhn et al 2002)

Vector borne diseases in Europe

• Ticks

– Arboviroses

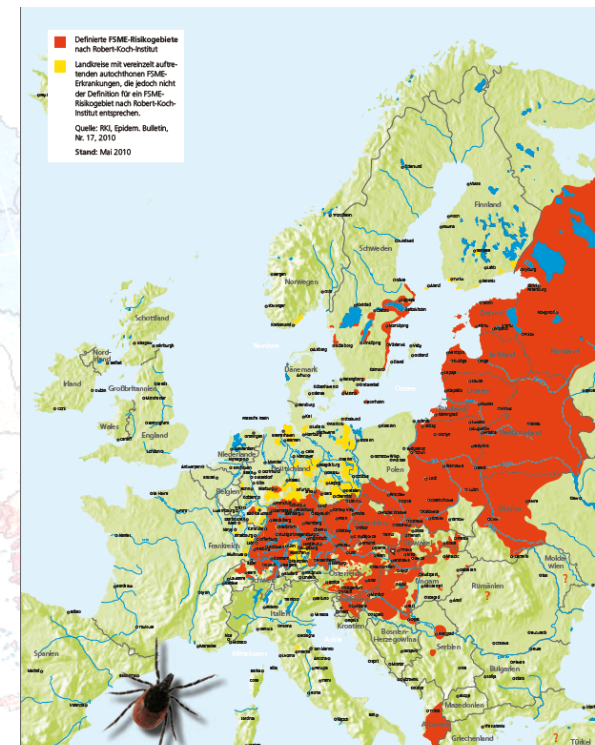
- Tick-borne encephalitis (eastern & western)
- Congo-Crimean hemorrhagic fever (e.g. Albania)
- Eyach virus, Erve virus (W-Europe)
- ...

– Borreliosis

- Lyme disease (*B.burgdoferi sensu lato*)
- Relapsing fever (15 different *Borrelia*)
 - *Ornithodoros erraticus* (vector)

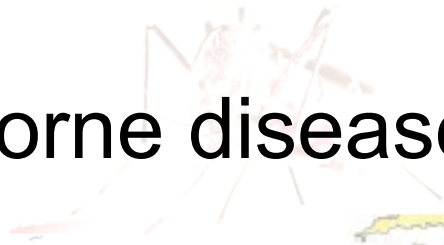
– Rickettsial Fevers

- Mediterranean Spotted Fevers
 - *Rickettsia conorii* (Mediterranean)
- Other Spotted Fevers
 - *R.helvetica*
 - *R. slovaca*
 - ...
- Ehrlichiose
 - granulocytic form -USA/Europe



TBE Europe (www.zecken.de)

Vector borne diseases in Europe



- **Phlebotomines**

- **Phleboviruses**

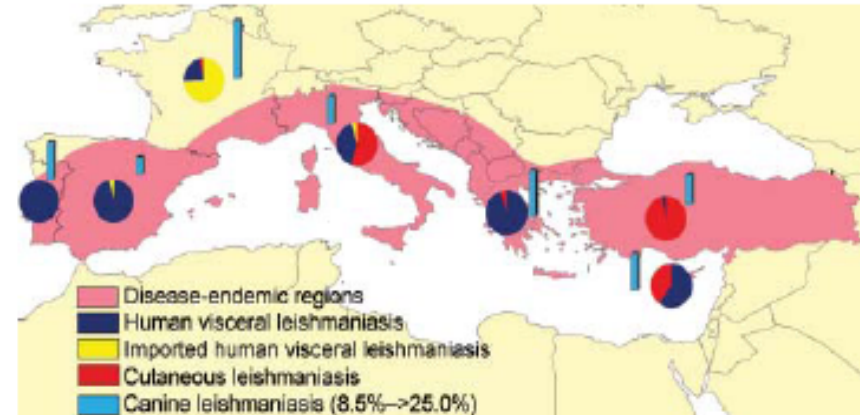
- Massilia virus
- New *Phlebovirus* ?
- Sandfly fever (Sicilian & Naples)
- Toscana

- **Visceral leishmaniasis**

- *Leishmania infantum*

- **Cutaneous leishmaniasis**

- *Leishmania major* and *L. tropica* (e.g. Turkey, N-Africa)



Leishmaniasis in SE (Dujardin et al. 2008)

FIGURE 1

Distribution of (a) Toscana, (b) Sicilian, and (c) Naples viruses in the European Union and neighbouring countries around the Mediterranean Sea up to 2009



Countries with confirmed cases are depicted in mid grey, the estimated distribution limits are depicted with a dark grey line.

J Depaquit et al. 2010

Vector borne diseases in Europe



- Other arthropods

- Fleas

- Murine typhus (*Rickettsia typhi*)
- ELB agent (*Rickettsia felis*)
- Cat scratch disease (*Rickettsia henselae*)

- Louse

- Epidemic or louse-borne typhus (*Rickettsia prowazekii*)
- Trench fever (*Rickettsia quintana*)
- Relapsing fever

- Different dipteran families

- Drosophilidae (*Phortica* spp.) : oriental eyeworm
- Myiasis
 - Oestridae, Gasterophilidae, Sarcophagidae, Calliphoridae

- Bed bugs (?)

- Ceratopogonidae & Simuliidae (?)

- ...

Vector borne diseases in Europe

- Many vectors (mosquitoes, ticks, phlebotomes, fleas, dipteran,...) present
- Many possible VBD diseases (re)emerging
- Scattered and non uniform information



Need for central and easily accessible database for medical entomologists, PH workers, vector control,!

WP3 – Vector surveillance and distribution data

- *“To maintain and update existing databases for vector surveillance and distribution, and create new databases for arthropod vector surveillance based on available data”*
- Scheme
 - 4.3.1 Support to the development of the VBORNET network
 - 4.3.2 Data access and sharing
 - 4.3.3 Arthropod vector surveillance
 - 4.3.4 Arthropod vector distribution maps
 - Mosquitoes
 - Ticks
 - Phlebotominae
 - Other Arthropods



V
b
o
r
n
Net

Objectives



4.3.1 Support to the development of the VBORNET network

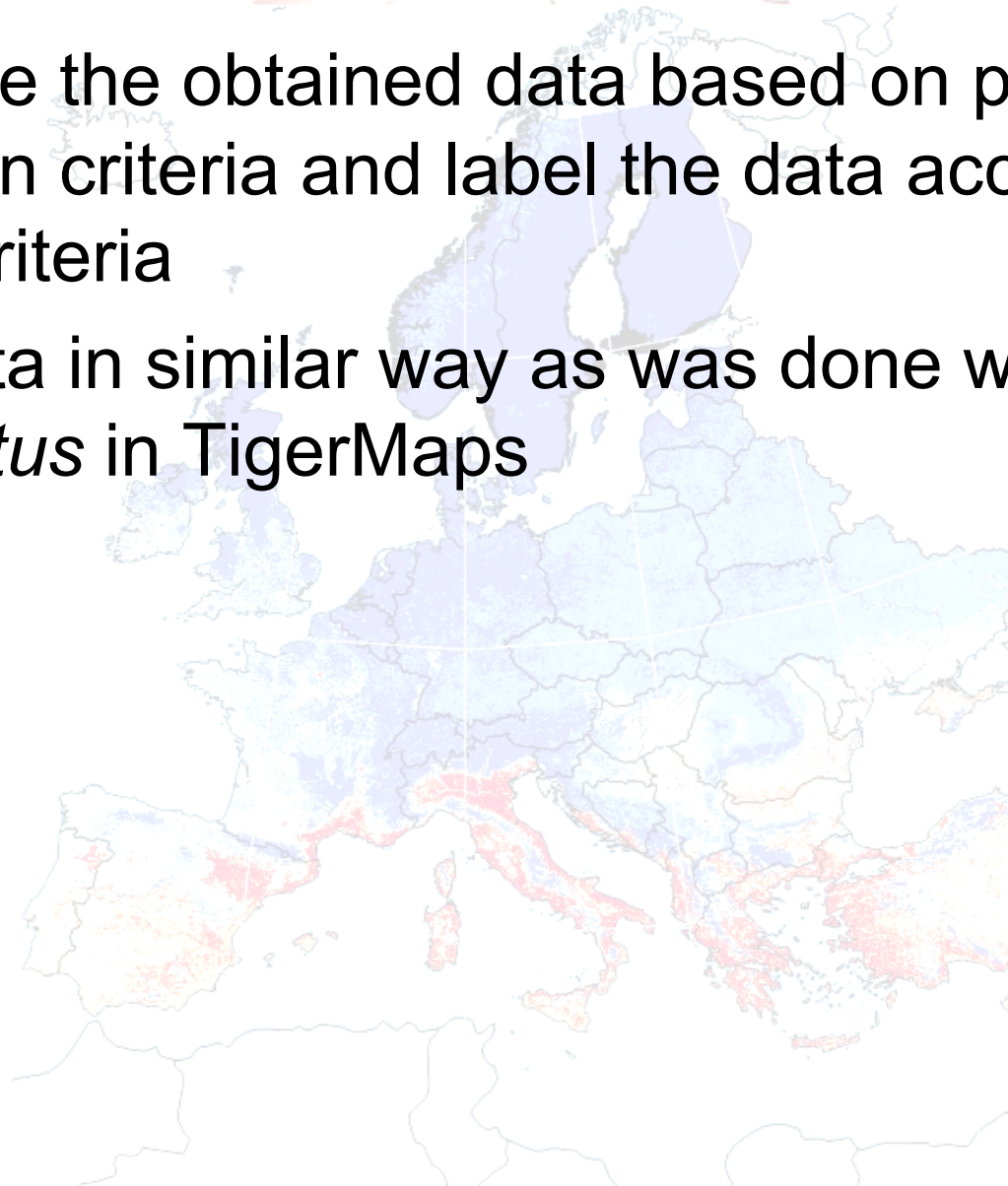
- Implement of the two-stage approach
 - Rapid consolidation network to access all vector information systems
 - ID localised vector related surveillance & PH resources and activities (country based)
- Extensive links with existing networks: EDEN, TigerMaps, ICTTD, CIRAD and MODIRISK
- Links with scientific societies
- Other vector data and surveillance information sources will be identified both:
 - Actively: i.e. active search and identification by WP3 VBORNET collaborators,
 - Passively: i.e. open partnership form as part of the VBORNET web-site

4.3.2 Data access and sharing

- Identify data providers (experts) as ‘certified collaborative’ partners VBORNET
 - Searchable web-tool
 - Quality control: data base will include detailed records of data source publications, data providers and their contact details
- VBORNET will
 - promote exchanges and collaborations between European experts
 - facilitate expert-to-expert access to primary data on vector distribution and surveillance in Europe.
 - create reference database on medical entomology and public health experts in the field of VBD
 - used by the contributors to strengthen their network and facilitate the cross fertilization between medical entomologists and PH-experts.

4.3.2 Data access and sharing

- Evaluate the obtained data based on predefined inclusion criteria and label the data according to these criteria
- Use data in similar way as was done with *Ae. albopictus* in TigerMaps



4.3.3 Arthropod vector surveillance

- Inventory of vector surveillance activities in EU for mosquito, tick and phlebotomine vectors (PH importance):
 - Surveillance of the distribution and/or abundance of invasive (where applicable) and main native vector species,
 - Global routine surveillance of pest species, generally developed associated to a control strategy,
 - Occasional haematophagous fauna inventories, generally developed within research programmes.
- Close collaboration with WP4
- First step: vector surveillance activities/country
 - Vector surveillance maps (if feasible)

4.3.4 Arthropod vector distribution maps

- First phase focus on vector species carrying priority diseases listed by the V-borne project
- Network design, questionnaire and database = flexible and compliant to new situations and threats.
 - = important feature of VBORNET: in case of any new VBD emergency all necessary VBORNET resources will rapidly be allocated to fit specific ECDC needs and requests!
- Creation of state of the art maps based on the expert validated presence/absence data gathered at admin level 1(country)-2(region)-3(province/district)
 - Will be available on VBORNET website

Mosquitoes

- Focus on known active and potential vectors
 - *Ae. albopictus* and *Ae. aegypti* for chikungunya and dengue.
 - *Anopheles* spp. (*An. atroparvus*, *An. claviger* s.s., *An. labranchiae*, *An. sacharovi*, *An. superpictus*, *An. gambiae* s.l., *An. arabiensis*, *An. albimanus*) for malaria.
 - *Ae. polynesiensis* for Bancroft filariasis (in overseas territories).
- First phase:
 - *Ae. albopictus* mapping, extended to *Ae. aegypti* & other imported exotic species Europe
- Second phase:
 - potential vectors for malaria & filariasis
 - EDEN collaboration
 - Additional potential vector species will be included (consultation ECDC and VBORNET members)
- Mosquito network focal point: **F. Schaffner**

Ticks

- Importance of 5 tick genera in VBD
 - *Ixodes ricinus*: Lyme Disease, tick borne encephalitis (TBE), tularaemia, rickettsiosis.
 - *Dermacentor reticulatus*: tularaemia, rickettsiosis.
 - *Hyalomma marginatum*: Crimean-Congo hemorrhagic fever (CCHF).
 - *Ornithodoros* sp.: tick born recurrent fever (TBRF).
 - *Rhipicephalus sanguineus*: rickettsiosis.
- Presence/absence data & abundance only available for *Ixodes ricinus* → special focus limit geographic distribution
- Other species: sporadic info, generally obsolete spatially and temporally heterogeneous and biased → mapped + ID missing information gaps
- Input from different existing networks (EDEN, ICTTD, CIRAD, ...)
- Tick network focal point: **L. Vial**

Phlebotominae

- Mediterranean Phlebotomine vectors important for transmission leishmaniasis & sandfly fevers
 - *Phlebotomus (Larroussius) ariasi*,
 - *Phlebotomus (Larroussius) perniciosus*,
 - *Phlebotomus (Larroussius) perfiliewi*,
 - *Phlebotomus (Larroussius) neglectus*,
 - *Phlebotomus (Larroussius) tobbi*,
 - *Phlebotomus (Phlebotomus) papatasi*,
 - *Phlebotomus (Paraphlebotomus) sergenti*.
- Native species: presence/absence around boundaries of geographical ranges
- Invasive species: no human aided importation/distribution
- Phlebotomine network focal point: **B. Alten**

Other Arthropods

- Fleas:
 - Main flea species involved in infectious disease transmission to humans:
 - ubiquitous cat flea *Ctenocephalides felis*
 - ubiquitous rat flea *Xenopsylla cheopis*
 - However of many others role not clear or underestimated
- Blackflies & biting midges:
 - Nuisance problems
 - Control programmes
 - No transmission to humans
- Emerging zoonosis or anthroponosis
 - e.g. *Phortica* spp. (Drosophilidae)
- Other bugs network focal point: **P.-E. Fournier**

Workflow 1

- Establish rules for data sharing.
- Develop questionnaires designed to locate, identify and describe relevant data sources and obtain agreements from target individuals to complete them.
- Start including individual contributors of VBORNET partner networks (is currently established collaborations).
- Identify and invite other institutions and experts to join the common database.
- Identify potential network nodes for each country or European region as practically applicable as an extension of the VBORNET network.

Workflow 2

- Collect existing available baseline data on:
 - Confirmed vector presence and absence, summarised by administrative unit this will help to avoid many difficulties inherent in obtaining detailed survey data, and will also provide standardised information.
 - Historical data information
 - Vector surveillance activities
- Produce state of the art vector distribution and surveillance maps.
- Identify existing knowledge and data gaps.



V
b
o
r
n
Net

Achievements

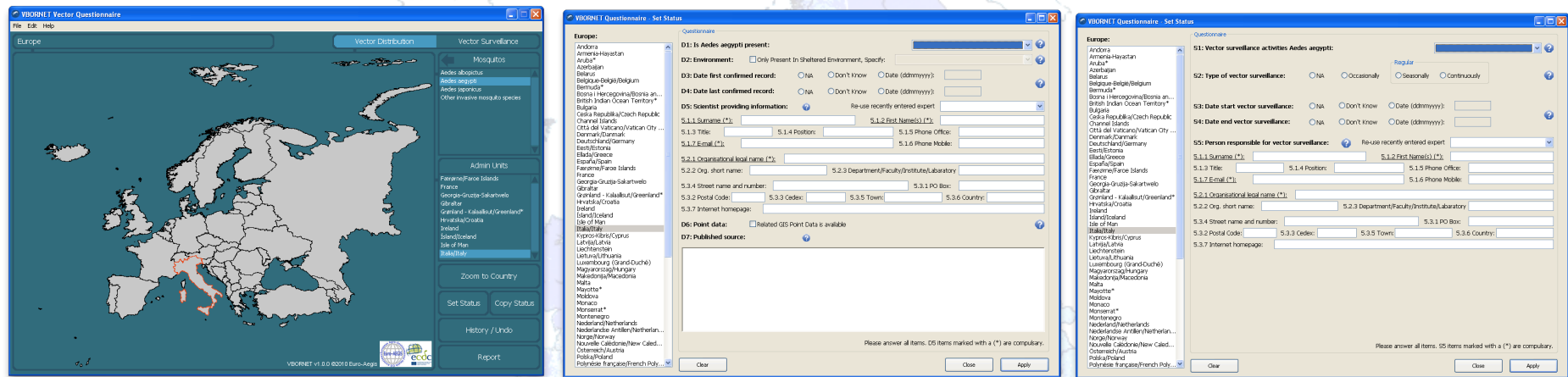


4.3.1 Support to the development of the VBORNET network

- Networks & scientific organisations collaborating
 - MODIRISK
 - EMCA
 - EDEN
 - Tigermaps
 - CIRAD
 - ICTTD
 - ...
- Other vector initiatives identified
 - FleaTickRisk
 -
- Network
 - 391 identified experts
 - Positive response

4.3.2 Data access and sharing

- Rules established for data sharing
- Questionnaire



- Main window where the expert can select the vector and administrative unit of interest.
- The expert can enter data with respect to presence of species at the selected administrative unit
- The expert can enter data with respect to the current surveillance systems for the given selected administrative unit

4.3.3 & 4.3.4

Arthropod vector surveillance & distribution

- **Searched for**
 - **Ongoing activities**
 - **Other networks (e.g. Eucalb)**
 - **National/localized actions**
 - **PH/research driven networks**
 - **Experts in surveillance & control**
 - **Literature**
- **Activities per target group**

Mosquitoes

- Update *Aedes albopictus* maps
 - Including new records (e.g. Malta)
- New imported species
 - *Aedes j. japonicus* (Belgium, Switzerland)
 - Import route
 - Tyre trade in Belgium, unknown in Switzerland
 - **Testing control measurements (BE) & entomological surveillance (BE, CH)**
 - *Aedes atropalpus* (Netherlands)
 - Import route
 - Tyre trade
 - **Control measurements will be undertaken**
 - *Aedes spp.* (Belgium)
 - Import route not known
 - **No control measurements undertaken**
- Other (vector) species identified
 - *Aedes vexans*
 - *Culex pipiens s.l.*
 - *Culex modestus*

Countries, microstates and territories* (EU and geographical Europe) <small>* with ISO/NUTS code</small>	Existing general mosquito study or surveillance during the last 5 years				Existing mosquito control programme during the last 5 years			
	national	regional	regular	occasional	national	regional	regular	occasional
Andorra	●	-	●	-	-	-	-	-
Albania	-	-	-	-	-	-	-	-
Belgium	●	-	●	-	-	-	-	-
Bosnia and Herzegovina	-	●	●	-	-	●	●	-
Bulgaria	-	●	-	●	-	-	-	-
Switzerland	-	●	●	-	-	●	●	-
Cyprus	●	-	●	-	-	●	●	-
Czech Republic	-	●	●	-	-	●	●	-
Germany	-	●	●	-	-	●	●	-
Denmark	-	●	●	-	-	-	-	-
Spain	-	●	●	-	-	●	●	-
Finland	-	●	-	●	-	-	-	-
France	-	●	●	-	-	●	●	-
Guernsey	●	-	●	-	-	-	-	-
Greece	-	●	●	-	-	●	●	-
Croatia	-	●	●	-	-	●	●	-
Ireland	-	●	-	●	-	-	-	-
Isle of Man	●	-	●	-	-	-	-	-
Italy	-	●	●	-	-	●	●	-
Jersey	●	-	●	-	-	-	-	-
Monaco	●	-	●	-	●	-	●	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	-	●	-	●	-	-	-	-
Poland	-	●	●	-	-	●	-	●
Portugal	-	●	-	●	-	●	-	●
Romania	-	●	-	●	-	-	-	-
Serbia	-	●	●	-	-	●	●	-
Russia	-	●	-	●	-	●	-	●
Sweden	-	●	●	-	-	●	●	-
Slovakia	-	●	-	●	-	-	-	-
Slovenia	-	-	-	-	-	-	-	-
San Marino	-	-	-	-	-	-	-	-
Turkey	-	●	●	-	-	●	●	-
United Kingdom	●	-	●	-	-	-	-	-
Vatican City	-	-	-	-	-	-	-	-

Surveillance programs mosquitoes

- Control programs for nuisance species

- Vector species control for *Aedes albopictus*

Countries, microstates and territories* (EU and geographical Europe) <small>* with ISO/NUTS code</small>	Existing surveillance for <i>Ae. albopictus</i> during the last 5 years				If regular surveillance: active since
	national	regional	active	passive	
Andorra	●	-	●	-	Oc
Albania	●	-	●	-	Oc
Belgium	●	-	●	-	2007
Bosnia and Herzegovina	-	-	-	-	Oc
Bulgaria	-	-	-	-	-
Switzerland	-	●	●	-	2003
Cyprus	-	-	-	-	-
Czech Republic	-	●	●	-	Oc
Germany	-	●	●	-	2005
Denmark	-	-	-	-	-
Spain	-	●	●	-	2003
Finland	-	-	-	-	-
France	●	-	●	-	1999
Guernsey	●	-	-	●	2006
Greece	-	●	●	-	2006
Croatia	-	●	●	-	2000
Ireland	-	-	-	-	-
Isle of Man	●	-	-	●	2006
Italy	●	-	●	-	2000
Jersey	●	-	-	●	2006
Monaco	-	-	-	-	-
Montenegro	●	-	●	-	2001
Netherlands	●	-	●	-	2005
Poland	-	-	-	-	-
Portugal	-	-	-	-	-
Romania	-	-	-	-	-
Serbia	●	-	-	●	2005
Russia	-	-	-	-	-
Sweden	-	-	-	-	-
Slovakia	-	-	-	-	-
Slovenia	-	-	-	-	2005
San Marino	-	-	-	-	-
Turkey	-	-	-	-	-
United Kingdom	●	-	-	●	2006
Vatican City	-	-	-	-	-

Mosquitoes

- Surveillance Europe

- Active or passive surveillance of invasive mosquitoes

- At national level: 12 states
 - At regional level: 6 states

- Vector control

- At national level: 2 states
 - At regional level: 5 states
 - Nowadays only 2 existing plans for vector borne disease control (CHIK et DEN)

- Ongoing inventories

- Belgium, Netherlands, Switzerland, France (??),
 - Scattered and non uniform

- Literature in Europe?

Ticks

- Tick surveillance
 - Sporadic
- Tick control
 - *Ixodes ricinus* :
 - application of persistent acaricides to animals (dips, pour-on synthetic pyrethroids and insect growth regulators)
 - destruction of tick microhabitat
- Tick borne diseases surveillance
 - TBE in 2007
 - Notifiable disease in 16 European countries, including 13 European Union (EU) Member States (Austria, the Czech Republic, Estonia, Finland, Germany, Greece, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Sweden) and three non-EU Member States (Norway, Russia and Switzerland) .

Phlebotominae



- Inventory of literature
 - 67 published papers from 1972 to 2010 in Europe
- Ongoing surveillance
 - Turkey, France(??)



Other arthropods

- No surveillance of fleas or human lice in Europe
- No surveillance of louse- or flea-borne diseases in Europe
- Some louse- or flea-transmitted diseases are reportable: plague, epidemic typhus
- Surveillance Culicoides due to bluetongue outbreak
 - Culicoides of MODIRISK are also ID (inventory)

Workflow

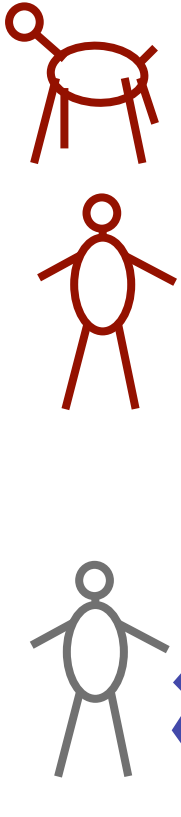
- **Establish rules for data sharing.**
- **Develop questionnaires designed to locate, identify and describe relevant data sources and obtain agreements from target individuals to complete them.**
- **Start including individual contributors of VBORNET partner networks (is currently established collaborations).**
- **Identify and invite other institutions and experts to join the common database.**
- Identify potential network nodes for each country or European region as practically applicable as an extension of the VBORNET network.
- **Collect existing available baseline data on:**
 - Confirmed vector presence and absence, summarised by administrative unit this will help to avoid many difficulties inherent in obtaining detailed survey data, and will also provide standardised information.
 - Historical data information
 - Vector surveillance activities
- Produce state of the art vector distribution and surveillance maps.
- Identify existing knowledge and data gaps.



V
b
o
r
n
Net

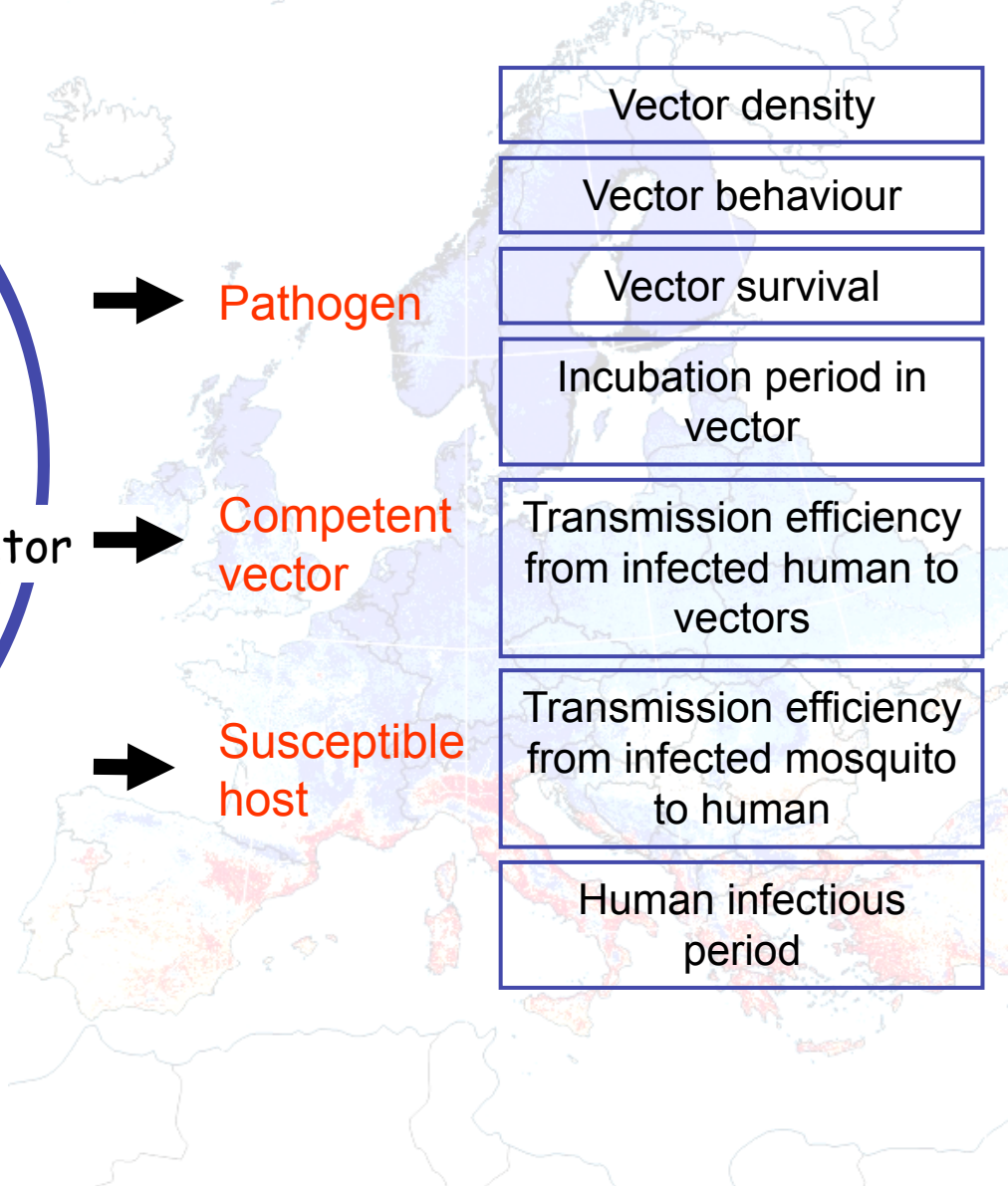
Remarks and Future perspectives





Remark

Vector borne diseases in a changing world



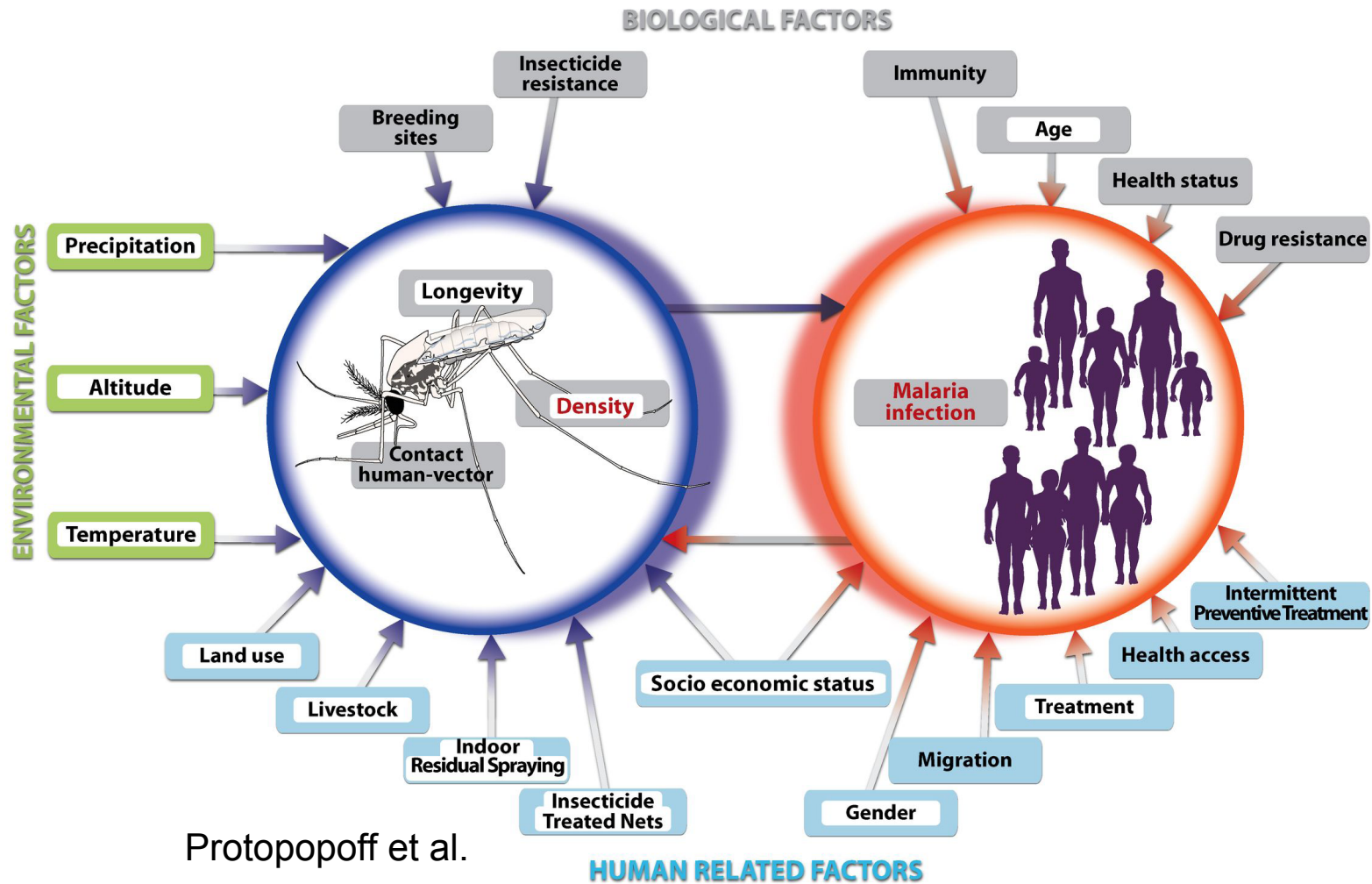
- Vector density
- Vector behaviour
- Vector survival
- Incubation period in vector
- Transmission efficiency from infected human to vectors
- Transmission efficiency from infected mosquito to human
- Human infectious period

- Biology of vector
- Environment
- Climate
- Socio-economic factors
- Access to care
- Control

Van Bortel 2008

Remark:

Simplistic predictions based only on temperature/climate change lead to resignation!



Protopopoff et al.

Future Activities

- Extend network
 - Other fields? (eg virology, travel medicine, ...)
 - Link with ENIVD?
- Creation database layers (implement risk factors)
- Quality test database use by external members VBORNET
- Possibility to modify input data
- Arthropod vector distribution
 - Distribution maps of identified (new) vectors
 - Include risk factors on maps?

Future activities

- Arthropod vector surveillance
 - Information on ongoing control activities
 - Legislation use of biocides in Europe / uniform legislation!
 - Rapid detection and correct ID of imported and/ or invasive species
 - Adapt control adequate to imported/invasive species
 - Surveillance of import routes?
- Attention to local transmissions
 - e.g. local *Plasmodium falciparum* transmission *An. plumbeus*
- Attention to emerging viruses
- Attention to changing human behaviour & land use (closer relationship vector-human; e.g. mosquitoes, ticks,...)
- Stimulation of vector ecology/taxonomy studies
- Implement national programs
 - e.g. VIRORISK Belgium (identify knowledge gaps in distribution vectors and transmission possibility viruses)
 - e.g. Alien Alert (Belgium)
 - ...

“Footnote”

- In Europe there is a vast expertise in medical entomology **HOWEVER** focused on Tropical regions!
- These & other projects underline the knowledge gaps in medical entomology focused on Europe
- Therefore there is a need for inventory of training programs in Europe



Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Comparative Immunology, Microbiology
& Infectious Diseases 27 (2004) 377–392

C O M P A R A T I V E
I M M U N O L O G Y
M I C R O B I O L O G Y &
I N F E C T I O U S
D I S E A S E S

www.elsevier.com/locate/cimid

Current status of medical and veterinary
entomology in France: endangered discipline
or promising science?

Dominique Cuisance^{a,*}, Jean-Antoine Rioux^{b,1}

WP3 presentation AGM

June 2nd

• **AM**

8h30 – 10h00 – **Mosquitoes:**

Francis Schaffner: Invasive mosquitoes in Europe.

Eva Declercq: MODIRISK from spatial data to mosquito models

Discussion: missing data priorities and way forward

10h00 – 10h30: *Coffee break*

10h30 – 12h30 – **Ticks:**

Laurence Vial: Ornithodoros ticks around the Mediterranean

Aurélie Merlin: historical tick data for Europe

Jordi Tarres-Call: EFSA work on tick distributions

Discussion: Missing data priorities and way forward

12h30 – 13h30: *Lunch*

• **PM**

13h30 – 15h00 – **Phlebotomines**

Bülent Alten: Current data on phlebotomine distributions in Turkey.

Bülent Alten: historical phlebotomine data for Europe

Discussion: Missing data priorities and way forward

15h00 – 16h00 – **Other vectors**

Pierre Edouard Fournier: the importance of other disease vectors

Discussion: Missing data priorities and way forward

16h00 – 16h30: *Coffee break*

16h30 – 18h00: Public health

Marieta Braks: Introduction

Cecilia Campion: Presentation PH database for the Mediterranean

Discussion: how to expand to other VBORNET regions