Heartwater surveillance in Guadeloupe: a model of partnership between research and surveillance for the Caribbean

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Heartwater: fatal tick-borne disease (TBD) for ruminants in Africa and the Caribbean. Major constraint for livestock development. Due to Ehrlichia ruminantium, transmitted by Tropical Bont Tick (TBT).

- From peracete forms with nervous symptoms & high hyperthermia to mild disease.
- Exotic cattle breeds & small ruminants more sensitive.
- If animals survive natural infection: life-long immunity but NO cross protection between strains...

TBT, Amblyomma variatetum: invasive species & threat for the USA.

1995-2006: Eradication programs (FOIECOM, CAP)*, tick control subsidized & implemented by farmers associations. TBD not eradicated from the region, mitigated results according to islands. Since 2006: Farmers responsible for acaricide treatment. Reluctancy to adopt efficient protocol (Bayticol every 2 weeks).

Objectives

- Strengthen field animal health Network & Improve Heartwater control in Guadeloupe

Materials & methods

- Awareness campaigns for TBD control (GDSG)*
  - Targets: ruminant owners & farmers.
  - Communication materials: leaflets, roll-up, power points displayed and distributed during ad-hoc communes meetings and during agricultural manifestations.
  - Objective: to make Animal owners realize that TBD can kill animals, that it is important to control ticks and to explain how.
  - Key messages: Developed by GDSG, based on the observations & recommendations of the sociological study. Tested with farmers.

Materials & methods

- Surveillance protocol
  - Formalise objectives, operation & roles of actors.
  - Co-funding: Vet Service Guadeloupe, CIRAD

Communication between partners

- Annual SC Meetings,
- Information bulletins, info-days for Vets

Multisaver online database

- Developed by CIRAD Guadeloupe
- Data centralization, real-time feedback of results (maps) accessible to all actors
- Specific rights according to role

Case definition

-Ruminant with marked modification of general condition, hyperthermia or constipation and nervous symptoms or sudden death*. Cattle identification: necessary for subsidies.

Excellent partner involvement and interaction

- 3 SC meetings, 6 bulletin issues, 1 info day for vets, 1 feedback meeting with all actors (planner end of 2012).
- 15 vets participate regularly and declared 375 samples since July 2010. Each month, 4 to 6 vets submit 11 to 19 blood samples.
- Improvement of data collection: \ Missing data, \ Geolocation, ...
- Topics developed in Bulletin: based on most FAQ (vets, GDSG, DAAF); lab results interpretation, differential diagnostic, literature review on other TBDs in Guadeloupe, case studies, ...

Awareness campaigns

- March-October 2011-2012: Weekly information at draught cattle competition (traditional)
- Pilot awareness campaign: organised in the 7 most affected communes (GDSG/CIRAD) – Last meeting very successful, to be implemented routinely. Impacts to evaluate.

Support research: Improve knowledge on Heartwater Epidemiology, Diagnostic and Vaccine strategies

- Diagnostic tests
  - Molecular diagnostic (PCR) on all samples
    - Heartwater (E. ruminantium)*
    - Babesiosis (B. bovis & B. bigemina)
    - Anaplasmosis (A. marginale, A. ovis)
  - CIRAD Guadeloupe: OE反思 Lab for heartwater annotated 210/92 cases. Highly sensitive & sensitive test: Detection limit: 0 DNA copy

- Genetic characterization of strains of E. ruminantium
  - Partnership with other research projects
  - 2 Genotyping methods used :
    - Variable Number Tandem Repeat (VNTR)
    - Multi Locus Sequence Typing (MLST)
  - Comparison with other genotypes from the Caribbean, West & South Africa & Indian Ocean.

Evaluation of diagnostic test for E. ruminantium

Observation: Negative results despite strongly suspicious cases...

- 173 "-" samples tested twice \( \rightarrow \) 13 (7,5%) & 8 (4,6%) first tested "-" were found "+" or weak + resp. after 2nd & 3rd testing.
- Limit of detection, but no need to test "-" samples twice
- Influence of Antibiotic treatment prior to blood sampling: ", bacteriaemia,
  - False - " Vets/farmers sensitized

- Genetic diversity of E. ruminantium in Guadeloupe
  - Preliminary results
  - 49 samples "strong +" genotyped by VNTR method, comparison with 7 reference strains
  - 26 genotypes identified
  - Next steps:
    - MLST for complete genotyping,
    - Genetic and epidemiological analysis: strains geographic diversity, evolutions and origin.

Discussion

- Regular communication & exchanges between partners; level of vets investment in the network satisfying; useful datasets & biological samples collection for further research, to be analyzed with epidemiological data.
- Communication campaigns: to implement routinely for optimal benefits of the Network & assess their impacts on TBD infestation & heartwater level of circulation.

Perspectives

- Design a Pilot study for applied research relying on RESPANG participants:
  - Isolate new E. ruminantium strains from the field and test cross-protection for vaccine preparation
  - Vaccination Field trial (potencial time frame: 1 year)
  - Diagnostic of other Rickettsia on negative samples (PCR on 165 gene).

- Community with regional stakeholders
  - Impart new knowledge and promotion of RESPANG and the integrated surveillance-research approach with the CaribVET T&TBD working group.
  - All Caribbean countries sensitized to Heartwater are invited to ship blood samples to CIRAD in case of clinical suspicions for early detection and subsequent control plan implementation.
  - Regular updates of Heartwater distribution maps in the Caribbean.

Conclusion & Discussion

The authors wish to acknowledge each participant in the RESPANG network, private veterinarians, GDSG, lab technicians, the Webmaster of CIRAD, and DAAF for funding RESPANG.

Challenges

- Tick control ineffective, incomplete knowledge on Heartwater epidemiology and evolution, risk of disease spread, no vaccine available yet, no disease monitoring.

T&TBD* working group of CaribVET recommended to highly infected islands with heartwater to implement:

- Sociological Study: to understand farmers reluctance (2010)
- Heartwater surveillance: to monitor case and assess evolution.

July 2010

- Setting-up of a passive syndromic surveillance network of neurological syndromes in ruminants in Guadeloupe \( \rightarrow \) RESPANG**
- to strengthen field health workers and to link in tight research with CaribVET.

Conclusion – RESPANG, a model for the Caribbean islands

Caribbean countries/territories encouraged to adopt similar approaches for their priorities: strengthen animal health networks, reinforce control based on research outputs (diversity, vaccine)