2016 APHIS-SAGARPA Cattle Fever Tick Summit
Weslaco, Texas
November 29-30, 2016

Cattle Fever Tick Vaccine
Vacuna contra la fiebre de garrapata del ganado:
Guidelines for Assessment
Lineamientos para la evaluación

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The Building for Animal Infectomics

- It is located in the state of Queretaro, in the central part of Mexico.

The Building for Animal Infectomics

- The Building for Animal Infectomics (NINFA in Spanish) was built in 2013.
- It is located in the state of Queretaro, in Mexico.

It has a capacity to contain individually up to 20 bovines in separated pens indoors.

The unit also contains 10 large outdoors pens for up to 6 bovines each.

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The Building for Animal Infectomics

To date, we have conducted:

- Three large tick vaccine trials (18-20 bovines)
  - University of Castilla-La Mancha (Spain)
  - The Biology Center of the Academy of Sciences (Check Republic)
  - MERCK – MSD (USA)
- One small pilot tick vaccine trial (4 bovines)
  - UAQ (Mexico)
- Two *in vitro* tick feeding trials for tick and tick-borne pathogen vaccine evaluation.

The Building for Animal Infectomics

We keep in laboratory conditions two species of ticks:

- a Mexican strain of *Rhipicephalus microplus* (Media Joya)
- a Mexican strain of *Rhipicephalus annulatus*

The Building for Animal Infectomics

Regularly, we also maintain other species of ticks:

- *Rhipicephalus sanguineus*
- *Amblyomma immitator*
- *Amblyomma cajenense* and
- *Dermacentor nittens*

all from field isolates.

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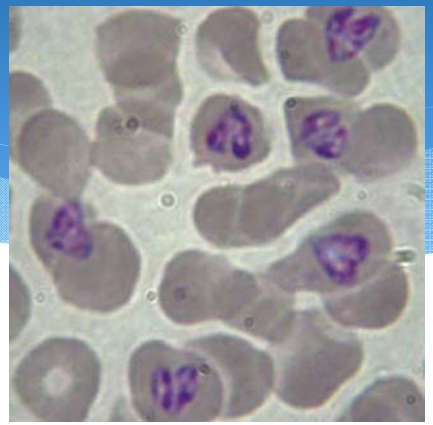
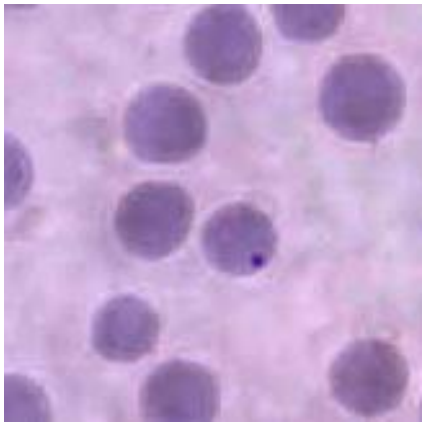
The Building for Animal Infectomics

We also keep laboratory strains of *B. bovis*, *B. bigemina* and *Anaplasma marginale* in liquid nitrogen and perform infection experiments in bovines on a regular basis.



Babesia bigemina

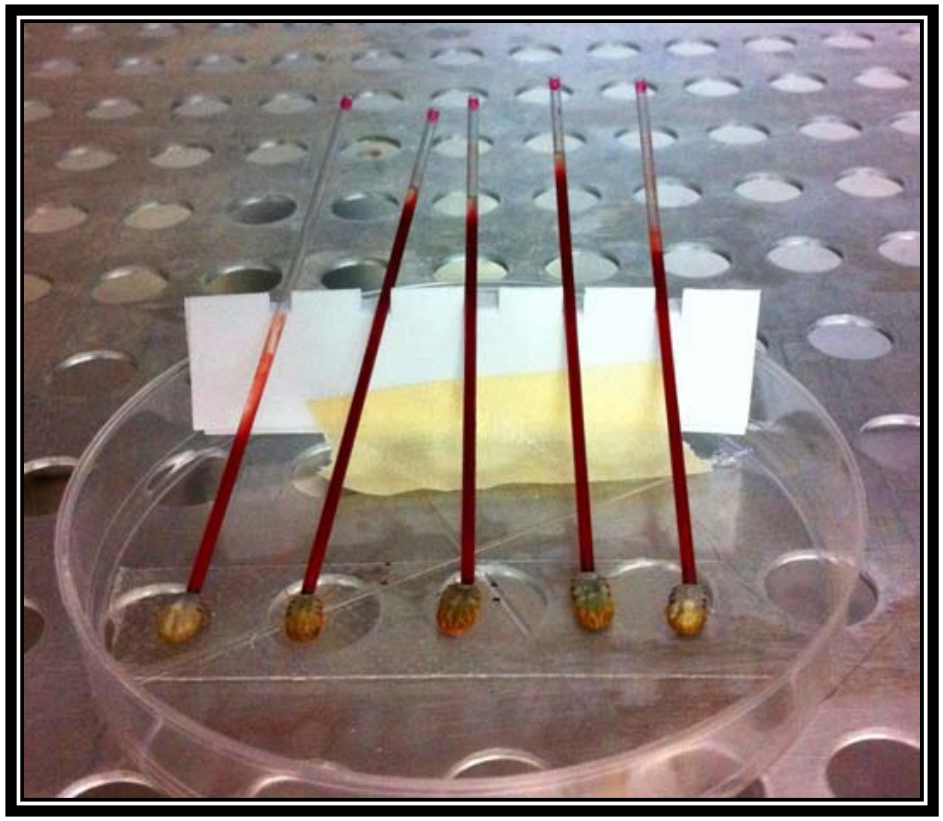


Anaplasma marginale

Babesia bovis

Images: Juan Mosqueda

In vitro tick feeding



Images: Juan Mosqueda

Cattle Tick Vaccine Consortium CATVAC

Schetters *et al. Parasites & Vectors* (2016) 9:105
DOI 10.1186/s13071-016-1386-8

Parasites & Vectors

MEETING REPORT Open Access

Cattle tick vaccine researchers join forces in CATVAC

Theo Schetters[1,2*], Richard Bishop[3], Michael Crampton[4], Petr Kopáček[5], Alicja Lew-Tabor[6,7], Christine Maritz-Olivier[8], Robert Miller[9], Juan Mosqueda[10], Joaquín Patarroyo[11], Manuel Rodriguez-Valle[6], Glen A. Scoles[12] and José de la Fuente[13,14]

Abstract

A meeting sponsored by the Bill & Melinda Gates Foundation was held at the Avanti Hotel, Mohammedia, Morocco, July 14–15, 2015. The meeting resulted in the formation of the Cattle Tick Vaccine Consortium (CATVAC).

Keywords: CATVAC, Vaccine, Cattle, Tick, *Rhipicephalus microplus*

Ideal Vaccine

1. 100 % safe
2. One dosis
3. Easily administered
4. Ambient storage
5. Easy and cheap to produce
6. Long-lasting protection

www.dogaware.com/health/vaccinations.html

www.mansfield.ohio-state.edu/~sabedon/biol2080.htm
www.malariavaccine.org/mal-vac1-ideal-vaccine.htm

Vaccine development guidelines

The Vaccine:

- Antigens. RM86, RM95, Subolesin, Ferritin 2, Silk.

- Adjuvants: Only those accepted for use in cattle, including water-in-oil adjuvants (such as Montanide ISA50V2), saponins (Quil A, VetSap, Q-vac), aluminum salts (Alum)

- Formulations: single, combined, multi-epitope, chimera. Physical separation of each antigen vs combined formulation.

Vaccine development guidelines

Eficacy claim:

The minimal efficacy will be defined as **>70%** reduction in the number of engorged *R. microplus* ticks in vaccinated bovines as compared to non-vaccinated controls.

In addition, protection must better than that obtained with a Bm86-based vaccine group (positive control, i.e. Gavac).

Vaccine development guidelines

Target Animal: dairy and beef cattle. 4 months of age if the mother was vaccinated.

Vaccination: 2 doses subcutaneously at a 4-week interval. Boosters are given every six months.

Vaccine development guidelines

Standarization of tick vaccine research
A number of specific standars has to be defined:

Positive antigen control

- There is an urgency to establish a positive antigen control for vaccine efficacy studies based on Bm86.
- This control preparation will be used in future efficacy trials.
- In addition, a standardized antibody test to determine the antibody titer against Bm86 needs to be developed and used by vaccine developers.

Vaccine development guidelines

Standarization of tick vaccine research
A number of specific standars has to be defined

Challenge model

Parameters that can be standardized are:

- The age of the experimental animals,
- Their sex,
- Their breed,
- The tick strain,
- The number of larvae used for infestation, and
- The challenge model (whole body or patch infestation)

Vaccine development guidelines

Standarization of tick vaccine research
A number of specific standars has to be defined:

Calculation of efficacy

- It is proposed to **always present the percentage reduction in the number of engorged females upon infestation with *R. microplus* larvae.**
- In the case that the effect of vaccination on oviposition and/or larval viability has been determined, this will be expressed as total efficacy (stating which parameters were used to calculate this value).

Vaccine development guidelines

Standarization of tick vaccine research
A number of specific standars has to be defined:

Correlate of protection

- Research should aim at defining a correlate of protection, which is a requirement for registration of the vaccine.
- Preferably, the correlate of protection is the antibody titer against the vaccine antigen(s).
- This correlate of protection will be used to establish a potency test for the release of vaccine batches (quality control).

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