Geography of an emerging disease in North America: *Trypanosoma cruzi* infection in New Mexico

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• Introduction
  – Chagas Disease & *T. cruzi*

• Methods
  – New Mexico surveys
  – Geography

• Challenges
  – Weather
  – Fire

• Results
  – Trap nights & Specimens

• What’s next
  – More questions!

• Acknowledgements
Introduction

• Chagas Disease: Incurable, chronic illness

• Can go undetected for decades

• Can cause late stage complications
  – heart failure,
  – sudden cardiac death,
  – digestive problems
• Chagas may spread to & through the United States by:
  – Human migration (~300K cases)
  – Potential movement of the triatomine bugs

Coura 2010
• Caused by flagellated parasite
  – *Trypanosoma cruzi*

• Vector
  – Triatomine bugs

• Transmission
  – Bug to human host:
    • Vector bite
    • Subsequent bug defecation
    • Scratching of bite wound

http://www.med.uni-marburg.de/stpg/ukm/lthygieneschwarz/projects.html

www.cdc.gov/parasites/chagas 9/10/11
New Mexico Triatoma Species

1959
Triatoma protracta protracta (a)
Triatoma protracta woodi (a)
Triatoma rubida (b)
Triatoma sanguisuga (c)*
Triatoma gerstaeckeri (d)

All located in Sylvan locations
T.p. protracta and T.p. gerstaeckeri also in human habitation areas

2011
Triatoma lecticularia: Placitas, NM

*CDC shows range may not be in NM

All photos: www.cdc.gov/parasites/chagas 9/10/11
Triatomine bugs are known to cohabitate with:

– Neotoma

– That live in middens

Photo by: Beth Ann Lopez
• Texas and Arizona regularly monitor
  – Human populations
  – Wildlife

• New Mexico: Last surveyed for sylvatic triatomine bugs in 1959 (Wood & Wood 1961)

• Work on presence and behavioral ecology of triatomine bugs and *T. cruzi* urgently needed to understand potential human health threat
Methods

• Primary collection points
  – Valles Caldera National Preserve
  – Sevilleta LTER
  – Jornada LTER
  – Tyrone

• Also:
  – Springtime Canyon
  – Placitas, NM
  – Ruidoso, NM
  – On-going collection efforts
Survey Locations

Survey Locations

http://sev.lternet.edu
Survey Locations

Jornada Experimental Range

QuickTime™ and a decompressor are needed to see this picture.

http://jornada-www.nmsu.edu
Survey Locations

Tyrone/Burro Mountain


Google maps: Sept 9, 2011
Challenges

• Weather: Dry or Wet or Dry?
  – La Niña: drought in New Mexico
  – Monsoon: late arrival, small
  – La Niña: repeat 2011-2012?

• Fire
  – VCNP: Las Conchas Fire

Photo: Brian Kliesen, USFS/ June 26, 2011
Neotoma: Springtime Canyon

QuickTime™ and a Motion JPEG OpenDML decompressor are needed to see this picture.

Video courtesy of Jerry Dragoo
## Results

<table>
<thead>
<tr>
<th>General Location</th>
<th># Sites</th>
<th>Trap Nights</th>
<th>Dates</th>
<th>Collected</th>
<th>Insects</th>
<th>% Trapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevilleta</td>
<td>3</td>
<td>270</td>
<td>July 7-9, Aug 19-20, 2011</td>
<td>*9</td>
<td>0</td>
<td>3.33%</td>
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<tr>
<td>Jornada</td>
<td>1</td>
<td>84</td>
<td>Aug 6-7, 2011</td>
<td>0</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>Valles Caldera</td>
<td>4</td>
<td>134</td>
<td>Aug 12-14, 2011</td>
<td>*19</td>
<td>0</td>
<td>14.18%</td>
</tr>
<tr>
<td>Springtime Canyon</td>
<td>3</td>
<td>128</td>
<td>Aug 24-25, 2011</td>
<td>6</td>
<td>0</td>
<td>4.69%</td>
</tr>
<tr>
<td>Gila National Forest: Tyrone</td>
<td>2</td>
<td>112</td>
<td>Aug 26-28, 2011</td>
<td>23</td>
<td>14</td>
<td>20.5% (m) 12.5% (b)</td>
</tr>
<tr>
<td><strong>6 LOCATIONS</strong></td>
<td><strong>13 SITES</strong></td>
<td><strong>728</strong></td>
<td><strong>15 DAYS</strong></td>
<td><strong>57</strong></td>
<td><strong>14</strong></td>
<td></td>
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</tbody>
</table>

*Does not includes released animals*
## Specimens

<table>
<thead>
<tr>
<th></th>
<th>VCNP</th>
<th>SEV</th>
<th>JRN</th>
<th>Tyrone</th>
<th>Springtime Canyon</th>
<th>Placitas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><em>N. albigula</em></td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>12</td>
<td>6</td>
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<td><em>T. minimus</em></td>
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<td>0</td>
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<tr>
<td><em>T. quadrivittatus</em></td>
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<td>0</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td><em>P. maniculatus</em></td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td><em>P. boylir</em></td>
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<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>0</td>
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<tr>
<td><em>P. truei</em></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td><strong>Triatoma</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>T. protracta</em></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
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<td>0</td>
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<tr>
<td><em>T. lecticularia</em></td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
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What’s next

• PCR analysis forthcoming
• Further distribution analysis
• Niche modeling
  – ClimbDB
  – GIS
  – Other environmental factors
  – Niche modeling
• Human health outreach
  – Burro Mountain RV park
  – Knowledge & Behavior surveys
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