The role of dog population management in the prevention and control of rabies

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dog population management and the control of rabies

- the disease rabies
- rabies epidemiology
- dog populations
- rabies control in dog populations
Sequential events in rabies pathogenesis

Wandeler 1987
Different rabies virus variants “adapted” to different principal host species of the orders Chiroptera (bats) and Carnivora
What permits virus persistence in host populations?

- Triad:
  - high pathogenicity/high susceptibility
  - high susceptibility/high excretion
  - low immunogenicity/low survival triad

- CAVE AT:
  Triad does not cover all virus adaptations necessary for the survival of a virus in a species
  - with a habitat dependent population density,
  - turnover and structure,
  - specific patterns of behaviour and social interactions.
Prevention of human rabies

- disease elimination in the principal hosts (dogs, wildlife)
- immunization of domestic animals (dogs) in wildlife rabies areas
- prevention of exposure
- postexposure prophylaxis
Rabies immunizations

• To protect an individual animal or human

• To interrupt a chain of transmission from a reservoir to humans

• To control an epizootic
Rabies Control by Immunization

rabies vaccination program

\[ \downarrow \]

percentage of individuals resisting infection increased

(increased HERD IMMUNITY)

\[ \downarrow \]

effective reproductive rate of disease reduced below unity
Herd Immunity

• 70% immunized individuals sufficient to control dog rabies (in areas where dogs are under supervision)

• different simulation models suggest levels between 50% and 100%
• Herd immunity required to stop the epizootic is dependent on population density, structure, and dog-dog interactions

• required levels unknown
Dogs and Rabies

• 30 to 60,000 human rabies deaths annually
• >95% due to transmission from dogs
• Mostly in Asia and Africa
• Dog rabies eliminated in the 20\textsuperscript{th} century in Europe and North America and in parts of the Western Pacific Region
• Dog rabies control becoming successful in Latin America
# Population densities

<table>
<thead>
<tr>
<th>Species</th>
<th>Density (n/km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dogs (rural areas of Ct. Berne)</td>
<td>8</td>
</tr>
<tr>
<td>Dogs (suburban Berne)</td>
<td>40-100</td>
</tr>
<tr>
<td>Dogs (suburban Sri Lanka)</td>
<td>2000-4000</td>
</tr>
<tr>
<td>Dogs (urban Rajasthan)</td>
<td>300-1000</td>
</tr>
<tr>
<td>Red fox (rural areas of Ct. Berne)</td>
<td>6</td>
</tr>
<tr>
<td>Striped skunk (Toronto)</td>
<td>36 *</td>
</tr>
<tr>
<td>Raccoons (Toronto)</td>
<td>56 *</td>
</tr>
</tbody>
</table>

* from Rosatte 1992
Rabies control in dog populations

• Mass vaccination

• Reducing the number of unsupervised dogs through
  - promotion of responsible dog ownership
  - enforcing stray dog regulations
  - ABC programs
The Marwar Animal Protection Trust

Jodhpur, Rajasthan, India
Since 2004, the Trust has undertaken

a high-intensity spay and neuter program (ABC)

a rabies vaccination program

regular (weekly) lectures in schools on dog-bite prevention and rabies awareness

educational puppet shows for children that are not going to school
## Impact

<table>
<thead>
<tr>
<th>area</th>
<th>% spayed</th>
<th>% neutered</th>
<th>% + castrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>King’s Hospital</td>
<td>87</td>
<td>76</td>
<td>81</td>
</tr>
<tr>
<td>Cycle Market</td>
<td>77</td>
<td>86</td>
<td>83</td>
</tr>
<tr>
<td>Shivanji Gate</td>
<td>82</td>
<td>91</td>
<td>87</td>
</tr>
<tr>
<td>Kuri Bhagtasni</td>
<td>100</td>
<td>94</td>
<td>97</td>
</tr>
<tr>
<td>Shastri Nagar</td>
<td>62</td>
<td>75</td>
<td>69</td>
</tr>
<tr>
<td>sum</td>
<td>80</td>
<td>85</td>
<td>83</td>
</tr>
</tbody>
</table>

data: Diane Bélanger 2011
## Rabid dogs at the Marwar shelter

<table>
<thead>
<tr>
<th>examination date</th>
<th>number examined</th>
<th>number positive</th>
<th>percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>29</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>2007</td>
<td>31</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>2008</td>
<td>64</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>2010</td>
<td>110</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>2011</td>
<td>99</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
Success!

Congratulations
Federico Spinola,
Rajan Jaisinghani
Baldev Singh
Bishan Shukla
MAPT staff
Success?

- Data collection uneven, no information from Health authorities
- Rabies cases in dogs (and domestic animals), though decreasing, but still occurring
- Uncertain funding, uncertain sustainability
- Rapid city growth
  - increasing resources for dogs (no garbage collection)
  - increasing logistic difficulties for MAPT
thank you for your attention