Hui Wen Fan
Coordination of Anthropozoonosis
Secretariat of Health Surveillance
Brazilian Ministry of Health
fan.wen@saude.gov.br

ISSUES RELATED TO ANTIVENOM DISTRIBUTION AND APPROPRIATE USE

Geneva, 10th January 2007
BRAZIL: GENERAL INFORMATION

8,547,403.5 km²
169,799,170 population
27 states
5,567 municipalities
80% living in urban areas
• 1901: Production of snake antivenoms in Brazil

• 1970’s decade: National Program for Self-Sufficiency in Biological Products

• 1986: National Program for Snakebites Control

• 2006: Four public manufacturers, nine types of antivenoms
SURVEILLANCE PROGRAM FOR RABIES AND ENVENOMINGS CONTROL
SURVEILLANCE PROGRAM FOR RABIES AND ENVENOMINGS CONTROL
<table>
<thead>
<tr>
<th>N°</th>
<th>1. Tipo de Notificação</th>
<th>2. Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Município da Notificação</td>
<td>Código (IBGE)</td>
<td></td>
</tr>
<tr>
<td>4. Unidade de Saúde (ou outra fonte notificadora)</td>
<td>Código</td>
<td></td>
</tr>
<tr>
<td>5. Agravo</td>
<td>Código (CID10)</td>
<td></td>
</tr>
<tr>
<td>6. Nome do Paciente</td>
<td>Data de Nascimento</td>
<td></td>
</tr>
</tbody>
</table>

**Animais Peçonhentos**

<table>
<thead>
<tr>
<th>Agravo</th>
<th>Código (CID10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X 20</td>
<td></td>
</tr>
</tbody>
</table>
ENVENOMINGS BY POISONOUS ANIMALS IN BRAZIL, 1987-2005

- Snake bites
- Scorpion stings
- Spider bites


Cases: 0, 20000, 40000, 60000, 80000, 100000
FIGURES OF ENVENOMINGS CAUSED BY POISONOUS ANIMALS
BRAZIL, 2005

- 28,711 snake bites
  15 cases/100,000 pop
  114 deaths (0.40%)

- 36,558 scorpion stings
  16 cases/100,000 pop
  50 deaths (0.14%)

- 19,634 spider bites
  10 cases/100,000 pop
  9 deaths (0.05%)
HUMAN RABIES IN BRAZIL, 1980-2005
SURVEILLANCE PROGRAM FOR RABIES AND ENVENOMINGS CONTROL

ANTIVENOM PRODUCTION

INFORMATION SYSTEM
ANTIVENOMS MANUFACTURERS IN BRAZIL

- **INSTITUTO BUTANTAN**: 270,000 ampoules
- **FUNED**: 190,000 ampoules
- **INSTITUTO VITAL BRAZIL S.A.**: 58,000 ampoules
- **CPPI**: 6,000 ampoules
Bothrops AV
Crotalus AV
Bothrops-Crotalus AV
Bothrops-Lachesis AV
Coral (Micrurus) AV
Tityus scorpion AV
Arachnidae AV
(Tityus, Phoneutria, Loxosceles)
Loxosceles AV
Lonomia caterpillar AV
Rabies AV
SURVEILLANCE PROGRAM FOR RABIES AND ENVENOMINGS CONTROL

- INFORMATION SYSTEM
- ANTIVENOM PRODUCTION
- ANTIVENOM DISTRIBUTION
Principles for a rational distribution

• Based on epidemiological data
  – Season variation
  – Geographical distribution

• Decentralized
  – Nº health centres as much as possible
  – Access to treatment as soon as possible (< 6 hrs)

• According to manufactory conditions
  – Transport / Storage
ANTIVENOM MENSAL DISTRIBUTION AND UTILISATION.
Brazil, 2004
ANTIVENOM MENSAL DISTRIBUTION AND UTILISATION.
Brazil, 2005
Distribution of *Lachesis muta* (bushmaster) snake bites and specific antivenom to be distributed in Brazil, 2005.
HIERARCHY AND RESPONSABILITIES CONCERNING AV DISTRIBUTION

AV manufacturers

1 central level

27 regional levels (States)

3,156 local levels (municipalities)

3,208 Health centres for AV use
100% of municipalites with AV
89 km between health units

32% of municipalites with AV
33 km between health units
CASE-FATALITY RATE OF SNAKE BITES
ACCORDING TO TIME BETWEEN ACCIDENT AND AV TREATMENT
Brazil, 2005

Source: Brazilian Information System of Diseases
Conditions of transport and storage
PLANNING ANTIVENOM DISTRIBUTION

Antivenom supply = [(cases x mean ampoules) + (stock – remaining)]

**Cases**: number of accidents previewed for a given period, e.g., one month

**Mean ampoules**: weighted number of ampoules used, considering severity of envenoming

**Stock**: strategic quantity of antivenom that should be available in case of unexpected increase or sub register of accidents, losses of AV (misuse, expiring date, storage and handle conditions) and deviations.

**Remaining**: number of ampoules not used in the previous period
COST OF AV ACQUIRED BY BRAZILIAN MINISTRY OF HEALTH - 2005

466,760 ampoules

US$ 8,548,595.27

or

€ 6,580,904.54
SURVEILLANCE PROGRAM FOR RABIES AND ENVENOMINGS CONTROL

INFORMATION SYSTEM

ANTIVENOM PRODUCTION

ANTIVENOM DISTRIBUTION

ANTIVENOM USE
PRINCIPLES OF ANTIVENOM THERAPY

• Precociousness in antivenom therapy

• Specificity of antivenoms

• Diagnosis of envenoming based on clinical and epidemiological features
  – Geographical distribution of animals
  – Venoms actions / Local and systemic aspects of envenomings

• Amount of AV based on severity of envenoming
### Antivenom Misuse for Snake Bites in Brazil, 2001-5

<table>
<thead>
<tr>
<th>Type of envenoming</th>
<th>Total</th>
<th>Misused</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bothrops</td>
<td>568,529</td>
<td>8,915</td>
<td>1.57</td>
</tr>
<tr>
<td>Crotalus</td>
<td>91,270</td>
<td>9,275</td>
<td>10.16</td>
</tr>
<tr>
<td>Elapidae</td>
<td>3,881</td>
<td>1,152</td>
<td>29.68</td>
</tr>
<tr>
<td>Lachesis</td>
<td>16,028</td>
<td>8,280</td>
<td>51.66</td>
</tr>
<tr>
<td>Non poisonous</td>
<td>1,129</td>
<td>1,129</td>
<td>100.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>680,837</td>
<td>28,751</td>
<td>4.22</td>
</tr>
</tbody>
</table>

**US$ 533,812.46**

**€ 410,941.07**
**Bothrops** (lanced-head pit viper) snake bites:
amount of antivenom recommended and administered.
Brazil, 2005

<table>
<thead>
<tr>
<th>Severity</th>
<th>Rule</th>
<th>Given</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Mild</td>
<td>2-4</td>
<td>5.1</td>
</tr>
<tr>
<td>Moderate</td>
<td>4-8</td>
<td>7.1</td>
</tr>
<tr>
<td>Severe</td>
<td>8-12</td>
<td>10.5</td>
</tr>
</tbody>
</table>
**Crotalus durissus** (South American rattlesnake) snake bites:
amount of antivenom recommended and administered.
Brazil, 2005

<table>
<thead>
<tr>
<th>Severity</th>
<th>Rule</th>
<th>Given</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min-Max</td>
</tr>
<tr>
<td>Mild</td>
<td>5</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-20</td>
</tr>
<tr>
<td>Moderate</td>
<td>10</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-30</td>
</tr>
<tr>
<td>Severe</td>
<td>20</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-50</td>
</tr>
</tbody>
</table>
SURVEILLANCE PROGRAM FOR RABIES AND ENVENOMINGS CONTROL
For the success of rabies and envenomings surveillance program there are necessary:

- An information system that gives reliable figures;
- Antivenoms of good quality and sufficient amount;
- Rational logistics of antivenom distribution;
- Continuous monitoring antivenom use and medical assistance;
- Efficient education activities to reduce the impact of diseases as public health problems and thus antivenoms requirements.
Bothrops alternatus