Status of the Global Rinderpest Eradication Programme (GREP) and Risks of Rinderpest re-emergence in Asia, Middle East and Africa

Felix Njeumi, Giancarlo Ferrari, Manzoor Hussain, Juan Lubroth
OUTLINE

1- Global situation in 2002
2- Current situation in 2008
3- Achievements between 2002 and 2008
4- Difficulties that may hamper the global eradication process
‘From its homeland around the Caspian Basin, century after century, rinderpest swept west over and around Europe and east over and around Asia with every marauding army causing the disaster, death and devastation that preceded the fall of the Roman Empire, the conquest of Christian Europe by Charlemagne, the French Revolution, the impoverishment of Russia and the colonisation of Africa.’

Scott and Provost (1992)
RINDERPEST

Early 1980s

Early 1990s

Signs:
- Fever
- Discharges: nose, eyes
- Diarrhoea/dysentery
- Ulcers in mouth
- Death (can exceed 90 %)

GREP PROGRESS

2006 ?
last suspicions
FAO launched the Intensified GREP marking the transition to the final eradication thrust

- based on epidemiological understanding
  - suspected reservoirs of infection

- reservoirs in marginalised extensive pastoral systems in Africa and in buffalo dairying and village cattle production systems in South Asia

- focus: CONTAINMENT – ELIMINATION – PROVING FREEDOM
Rinderpest areas of concern in 2002

Lineage 1 (Africa)  Lineage 2 (Africa)  Lineage 3 (Asia)
The OIE/GREP Pathway to Global Rinderpest Freedom from 2002-2010

2002
2003
2004
2005
2006
2007
2008
2009
2010

International surveillance exercise

NO MORE RINDERPEST

GREP Timetable

Provisional Freedom From Rinderpest

Freedom From Infection

Global Declaration of Rinderpest Freedom
Tools developed and applied

- Epidemiology (Participatory Epidemiology, Risk-based surveillance, random map coordinated, modelling, ...)
- Community involvement
- Technical guidelines and strategies
- Technical communication
- Diagnosis and surveillance
Africa

- **Sudan** - No vaccination since June 2002. Has applied for freedom and their dossier was evaluated in October 2007 and approved.
- The “*cordon sanitaire*” between Chad and Central Africa Republic was removed in 2003.
- Many countries in Central and West Africa are moving along the OIE Pathway.
- A *tripartite meeting* between FAO-OIE-AU/IBAR was organized by GREP in November 2006 gathering countries whose have not yet applied even for provisional freedom and assist them for accreditation. Participating countries were: Cape Verde, Sierra Leone, Liberia, Equatorial Guinea, Sao Tome and Principe, and Mozambique with Ethiopia, Kenya and Somalia from the Somali Ecosystem.
Achievements in the Somali Ecosystem (SES)

- The virus last confirmed in October 2001 - buffaloes in Meru N/Park in Kenya; but no link with cattle established.
- In 2002, AU-IBAR/PACE and FAO/GREP convened strategy workshop for mild RP in SES - ‘Seek, Confirm & Eliminate’ strategy.
- Strategy seemed to work, but implementation slowed down by the need for training process and development of systems in addition to:
  - Inability to isolate the RP virus
  - Slow and inadequate lab support
  - Poor accessibility and insecurity
• The most recent mild RP compatible disease event in cattle (Sept 2003) in Kenya/bordering Somalia - where viral RNA seemed to have been detected, genetic characterisation did not confirm as lineage 2 RP virus

• Results of sero-surveys in cattle in 2002/3 in 3 regions in S Somalia were of concern - Gedo (17%), Middle Juba (15.99%), and Lower Juba (16.98%)

• However, all 123 wildlife sera collected on the Kenyan side of the SES (Garissa, Tana River, Ijara and Lamu districts) were negative on H-CELISA (Kabete & CIRAD-EMVT) and N-cELISA (CIRAD-EMVT) -
  - (3 sera were positive with low titres on VNT at Muguga)
Somali ecosystem rinderpest status buffalo 1994-6

Pie charts rinderpest antibody from herds
- Red: Proportion positive antibody
- Green: Proportion negative antibody
- Yellow: National Wildlife Parks

Kenya
Somalia
Lower Juba
Middle Juba
GALISSA
ISILO
WAJR
TANA RIVER
MERU
ISLIO
200 0 200 Miles

Food and Agriculture Organization of the United Nations
Agriculture Department
Animal Production and Health Division
Rinderpest buffalo serology
Somali ecosystem Kenya 1997-2001

Pie charts rinderpest serology from herds
- Red: Proportion positive antibody
- Green: Proportion negative antibody
- Yellow: National Wildlife Parks

Kenya
- Meru
- Tsavo
- Garissa
- Tana River

Somalia
- Middle Juba
- Lower Juba

200 0 200
400 Miles

Food and Agriculture Organization of the United Nations
Agriculture Department
Animal Production and Health Division
Somali ecosystem rinderpest status buffalo 2002 - 2004

Map of Kenya showing herd % seroprevalence charts with symbols for different regions and national parks.

Legend:
- Green: Negative antibody %
- Yellow: National Park
- Black: Country Border
- White: District border

Key:
- S: Buffalo herds

Other notable points:
- Wajir
- Kilifi
- Isiolo
- Lower Juba
- Lamu
- Tsavo East
- Garissa
- Kitui
Somali Ecosystem

- The results consistently showed persistence of *rinderpest* sero-positive animals in Gedo, Lower Juba and Middle Juba since 2002-03. Though...

- The prevalence reduced significantly in the 3 regions (average: 17% in 2002-03, 2.5% in 2006 to 0.0 in 2007).

- The remaining regions persistently showed very low or no *rinderpest* sero-prevalence.

- No laboratory confirmation of virus in suspected clinical cases and no wildlife positive samples.

- **Ethiopia**: surveillance do not detect any antibodies and has applied for infection freedom

- **Kenya**: seroprevalence was very low
## Rinderpest Sero-prevalence in the SES: June 2006

<table>
<thead>
<tr>
<th></th>
<th>Apparent sero-prevalence (%) with 95% CI</th>
<th>True sero-prevalence with 95% CI</th>
<th>Within herd sero-prevalence range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>0.06 (0.00;0.13)</td>
<td>0.00 (0.00;0.03)</td>
<td>0 - 10</td>
</tr>
<tr>
<td>Kenya</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somalia</td>
<td>1.04 (0.82;1.26)</td>
<td>1.11 (0.99;1.23)</td>
<td>0 - 23.52</td>
</tr>
<tr>
<td>SES</td>
<td>0.48 (0.38:0.58)</td>
<td>0.45 (0.39:0.50)</td>
<td>0 - 23.52</td>
</tr>
</tbody>
</table>
Observed RP prevalences in three target regions (Somalia) following RP surveys in March 2007

<table>
<thead>
<tr>
<th>Region</th>
<th>RP Prevalence%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gedo</td>
<td>4.25 (42/988)</td>
</tr>
<tr>
<td>Middle Juba</td>
<td>1.67 (19/1135)</td>
</tr>
<tr>
<td>Lower Juba</td>
<td>1.89 (79/3075)</td>
</tr>
<tr>
<td>Overall RP sero-prevalence</td>
<td>2.57 (79/3075)</td>
</tr>
</tbody>
</table>

December 2007 a field investigation was carried out based on GREP (Sep 2007) recommendations. Field and laboratory findings did not show any evidence of rinderpest virus circulation and by extension; do not support endemic status for the virus in the SES.
Free from Rinderpest infection
Free from Rinderpest disease
Provisionally free from Rinderpest
Yet to join the OIE Pathway for Rinderpest
Asia

• Process of RP eradication following OIE Pathway has been successfully implemented in many countries
  • Dossiers for Serbia and Belarus were formulated and were evaluated in 02/2008
  • Freedom for infection granted to: China, India, Iran, Myanmar, Mongolia, Thailand
  • Dossiers evaluated in 02/2008: Afghanistan, Tajikistan and Uzbekistan.
Asia - Pakistan

ABSENCE OF RINDERPEST FROM FORMER RESERVOIRS
Participatory Disease Surveillance

Disease Search Teams – a highly professional activity
### Absence of Rinderpest from Former Reservoirs

**Participatory Disease Surveillance**

**Pakistan:** > 10% of villages searched in 2003 - 2005

**Sindh Province**

<table>
<thead>
<tr>
<th>Town</th>
<th>'92</th>
<th>'93</th>
<th>'94</th>
<th>'95</th>
<th>'96</th>
<th>'97</th>
<th>'98</th>
<th>'99</th>
<th>'00</th>
<th>'01</th>
<th>'02</th>
<th>'03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhi and Bin Qassim</td>
<td>12</td>
<td>12</td>
<td>14</td>
<td>10</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bilal/Korangi/Landhi</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shah Faisal/Malir</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gadap</td>
<td>10</td>
<td>5</td>
<td>14</td>
<td>13</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gulshan-E-Iqbal</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Liaqatabad</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gulberg</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>New Karachi</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>North Nizamabad</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jamsheed Sadder</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lyari</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Orangi</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Baldia</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Site</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kiamari</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bin Qasim</td>
<td>14</td>
<td>4</td>
<td>17</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>44</td>
<td>33</td>
<td>51</td>
<td>41</td>
<td>29</td>
<td>12</td>
<td>11</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
### Absence of Rinderpest from Former Reservoirs

#### Serosurveillance

<table>
<thead>
<tr>
<th>Province</th>
<th>2003</th>
<th>2004/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Islamabad Capital Territory</td>
<td>2/507 (0.40%)</td>
<td>2/452 (0.44%)</td>
</tr>
<tr>
<td>Northern Areas</td>
<td>2/760 (0.26%)</td>
<td>55/2462 (2.23%)</td>
</tr>
<tr>
<td>Azad Jammu and Kashmir</td>
<td>0/760 (0%)</td>
<td>1/2394 (0.04%)</td>
</tr>
<tr>
<td>North West Frontier Province</td>
<td>4/1000 (0.4%)</td>
<td>7/6000 (1.17%)</td>
</tr>
<tr>
<td>Balochistan</td>
<td>4/2107 (0.2%)</td>
<td>6/5968 (0.10%)</td>
</tr>
<tr>
<td>Punjab</td>
<td>7/1000 (0.7%)</td>
<td>13/5901 (0.22%)</td>
</tr>
<tr>
<td>Sindh</td>
<td>13/2455 (0.53%)</td>
<td>16/5939 (0.27%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32/9589 (0.33%)</strong></td>
<td><strong>100/29116 (0.34%)</strong></td>
</tr>
</tbody>
</table>

The results of focussed (2003) and randomised (2004/5) serosurveys conducted in Pakistan give 0.33 and 0.34% respectively.

**Pakistan is recognised as an infection-free country**
Base on the epidemiological situation and the MoU, countries could be split in 3 groups:

1) Rule 1: Historically infection-free by geographic isolation
2) Rule 2: Accreditation by submission of a dossier
3) Rule 3: Accreditation through serology and dossier
## Countries where action is needed

<table>
<thead>
<tr>
<th>Rule</th>
<th>Regional group</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 2</td>
<td>Africa</td>
<td>Cape Verde, Equatorial Guinea, Gambia, Liberia, Libya and Sierra Leone</td>
</tr>
<tr>
<td></td>
<td>Middle East</td>
<td>Bahrain, Jordan, Lebanon,</td>
</tr>
<tr>
<td></td>
<td>Asia and Caucasus</td>
<td>Bangladesh, Belarus, Brunei, Cambodia, DR Korea, Georgia, Kyrgyzstan, Serbia.</td>
</tr>
<tr>
<td>Rule 3</td>
<td>Africa</td>
<td>Cameroon, Central Africa Republic, Chad, Djibouti, Ethiopia, Kenya, Niger, Nigeria &amp; Somalia</td>
</tr>
<tr>
<td></td>
<td>Middle East</td>
<td>Kuwait, Israel, Iraq, Oman, Qatar, Saudi Arabia, Syria, Palestine, UAE &amp; Yemen</td>
</tr>
<tr>
<td></td>
<td>Asia and Caucasus</td>
<td>Afghanistan, Armenia, Azerbaijan, Russia, Sri Lanka, Turkmenistan, Tajikistan and Uzbekistan</td>
</tr>
</tbody>
</table>
Rule 1

Historically infection-free by geographic isolation

OIE members

Countries requested to enter in the global list through OIE

FAO-OIE International Committee

FAO/UN members

Countries requested to enter in the global list through FAO
Accreditation by submission of a dossier

GREP to contact countries and fill a mission to assist in dossiers formulation

OIE members

Dossier evaluated by OIE-FAO Ad Hoc Group

Dossier accepted by the Scientific commission

Countries requested to enter in the global list through OIE

FAO/UN members

Dossier evaluated by FAO-OIE Ad Hoc Group

Countries requested to enter in the global list through FAO

FAO-OIE International Committee
Accreditation through serology and dossier

GREP to contact countries and fill a mission to assist in serology and dossiers formulation

OIE members

FAO/UN members

Dossier evaluated by Ad Hoc Group

Dossier evaluated by FAO-OIE Ad Hoc Group

Dossier accepted by the Scientific commission

Countries requested to enter in the global list through OIE

Countries requested to enter in the global list through FAO

FAO-OIE International Committee
GREP achievements during the last 5 years

- **Accreditation**
  - 2002 - 87 Members States declared free from rinderpest infection.
  - 2007 - 117 countries are free from rinderpest infection, 11 are rinderpest disease free and 17 are self-declared countries or zones provisionally free from rinderpest disease. 16 Countries will be accredited in 05/2008 as infection free.

- **OIE**: Contributions to modifications of the OIE pathway, *Ad hoc* group meetings.

- **In Africa**: close relationship with OAU/AU-IBAR for rinderpest activities through PACE, and follow-up SERECU (Somali Ecosystem Rinderpest Eradication Coordination Unit) and trust funds for others countries.

- **In Central Asia**: Trust Fund project covering: Afghanistan, Pakistan, Tajikistan, Turkmenistan and Uzbekistan. Pakistan successfully obtained infection freedom status, and others are provisional free.

- **In Middle East**: through Trust Funds and TCPs, countries have moved along the OIE pathway.
GREP achievements during the last 5 years

- **Organization of regional meetings**

- **Engagement**
  - Country missions
  - Awareness and identification of donors

- **Surveillance:**
  - Strategy and training manuals developed
  - Assistance in field surveillance, monitoring disease and progress
  - Dispatch and testing of samples
  - Data analysis
  - Development of animal ageing techniques
  - Emergency support and Co-ordination
  - Technical support and guidance
  - Development of methodologies useful for others diseases

- **Dossiers**
  - Assistance countries for dossiers formulation

- **Projects:**
  - Identification and formulation
Constraints affecting the Global Eradication

- Loss of interest as rinderpest is not any more an important disease
- From the ~200 countries around the world, 169 are OIE member countries, 192 of FAO. The gap needs to be closed.
- Country infrastructure to carry out the required surveillance
- Accountability and destruction of rinderpest viruses in frozen states
- Unsanctioned production and use of vaccine
- Possibility of reversion to virulence of the vaccine strain
- Trade: countries who do not trade it animal do not see any need for accreditation.
- Situation of Western Sahara, West Bank/Gaza and dependencies or protectorates needs to be resolved through engagement
- Armed conflicts and civil disturbances in non-free or questionable areas
- Diversion of funds and attention ... HPAI
Since the last GREP meeting in 2002, there has not been a single confirmed outbreak of rinderpest reported to OIE.

- **Re-emergence from a wildlife reservoir**
  - Kenya: no seroconversion in wildlife since 2001
  - 3 years seems to be limit of independent maintenance in wildlife

- **Reversion to virulence of a live vaccine**

- **Agroterrorism – malignant introduction**

- **Reconstruction of rinderpest infection of cattle with another morbillivirus and adaptation to the new host**
The absence of rinderpest from recent emergencies and disasters is quite remarkable and very different from the situation which would have existed less than a decade ago.

If action and achievement is delayed for any reason or if free areas are re-infected by any outbreak, the whole timetable of 2010 will need to be rethought.
Progressive Control of Transboundary Animal Diseases at the source is an International Public Good and within the Millennium Development Goals.