Quality Assurance of FMD Vaccines in India

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Outline ...

• FMD vaccine production in India
• Quality control
• Regulatory requirements
• Summary and recommendations
FMD vaccine production in India

1. FMD vaccine manufacturers
2. Vaccine production technology
3. Vaccine strain selection
Vaccine production technology

- All manufacturers use BHK suspension culture technique for manufacture of vaccine.
- Bioreactors/fermentors ranging from 50 L to 10000 L are being used for production of vaccine.
- Binaryethyleneimine (BEI) is used as an inactivant.
- Aluminium hydroxide and oil adjuvant vaccines are manufactured.

<table>
<thead>
<tr>
<th>Serotype</th>
<th>Vaccine strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type O</td>
<td>O TNN 24/84 or O IND R2/75 until October 2003</td>
</tr>
<tr>
<td></td>
<td>O IND R2/75 from October 2003 onwards</td>
</tr>
<tr>
<td>Type A</td>
<td>A IND 17/82 or A IND 7/77 Till 2003</td>
</tr>
<tr>
<td></td>
<td>A IND 17/82 till September, 2008</td>
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<tr>
<td></td>
<td>A IND 40/00 from September 2008 onwards</td>
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<tr>
<td>Type Asia1</td>
<td>Asia1 WBN 117/85 or Asia1 IND 63/72 until October 2003</td>
</tr>
<tr>
<td></td>
<td>Asia1 IND 63/72 from October 2003 onwards</td>
</tr>
<tr>
<td>Type C</td>
<td>C IND 51/79 or C BOM 64 until October 2003</td>
</tr>
<tr>
<td></td>
<td>Discontinued since October 2003</td>
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</tbody>
</table>
Vaccine production flow diagram
Quality Control

1. Raw material testing
2. In-process control
   2.1. Cell line characterization
   2.2. Virus characterization
   2.3. Cell culture cycle
   2.4. Seed virus testing
   2.5. Virus production
   2.6. Inactivation
   2.7. Purification and concentration
Quality control

- FMD vaccine monograph – IP 2010

<table>
<thead>
<tr>
<th>Identification</th>
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<tbody>
<tr>
<td>Tests</td>
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<tr>
<td>Safety</td>
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<tr>
<td>Sterility</td>
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<tr>
<td>Potency</td>
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<tr>
<td>Alternate Potency Test</td>
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<tr>
<td>Serological Assay</td>
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</table>

| Labeling |
FMD vaccine – Cold chain

The journey of a product

Drug company’s ownership

Distributors ownership

Mfg Site

FEW DAYS

1-5 MONTHS

1-3 MONTHS

Wholesaler

1-2 MONTHS

Pharmacy

0.5-1 MONTH

Patient
Post-marketing surveillance

<table>
<thead>
<tr>
<th>Phase</th>
<th>Type O Pre-Vaccination</th>
<th>Type O Post-Vaccination</th>
<th>Type A Pre-Vaccination</th>
<th>Type A Post-Vaccination</th>
<th>Type Asia 1 Pre-Vaccination</th>
<th>Type Asia 1 Post-Vaccination</th>
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</thead>
<tbody>
<tr>
<td>IX</td>
<td>63.7</td>
<td>85.6</td>
<td>52</td>
<td>73.3</td>
<td>52.6</td>
<td>73</td>
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<tr>
<td>X</td>
<td>63.4</td>
<td>87.4</td>
<td>50.6</td>
<td>74.1</td>
<td>48.9</td>
<td>76.7</td>
</tr>
</tbody>
</table>

Percentage of animals showing antibody titers of $\geq 1.8 \log_{10}$ against FMD virus – 30 DPV Source: PD FMD Annual report 2010-11
Regulatory requirements

1. Regulatory authorities
   1.1 Drug Control authorities
   1.2 Animal Ethics Committee
Conclusion

• Installed capacity of five Indian FMD manufacturers are 440 M trivalent doses.
• Several improvements in production have been made.
• cGMP and QA procedures adopted by Indian manufacturers help in production of quality FMD vaccine.
• Harmonization of vaccine strain and post marketing surveillance will add value to the satisfaction of customers.
Recommendations for consideration

1. An independent agency to carry out FMD vaccine batch testing and provide the manufacturers with the batch release certificate.

2. Post-marketing surveillance should be made mandatory.
Acknowledgements
Thanks for your attention