This presentation is divided into two sections:
1. Global movement
2. Global disease distribution

Understanding disease risks requires understanding of both factors
58 Million Horses in the World (estimate)

- Transport is a major factor in the spread of equine disease
- High value horses are transported
- How many high value horses are there?
- How many are transported?

(From Herholz et al, 2012 EAAP Bratislava, Int’ comparisons EFTBA 2008)
Global Thoroughbred Breeding: BIG industry

<table>
<thead>
<tr>
<th></th>
<th>Americas</th>
<th>Asia</th>
<th>Europe</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mares</td>
<td>82,008</td>
<td>56,737</td>
<td>33,893</td>
<td>172,638</td>
</tr>
<tr>
<td>Foals</td>
<td>50,975</td>
<td>36,400</td>
<td>31,315</td>
<td>118,690</td>
</tr>
<tr>
<td>Stallions</td>
<td>5,045</td>
<td>1,669</td>
<td>2,331</td>
<td>9,045</td>
</tr>
</tbody>
</table>

Herholz et al, 2012 EAAP Bratislava
(Int’ comparisons EFTBA 2008)
Global Racing............BIG Business!

<table>
<thead>
<tr>
<th></th>
<th>Americas</th>
<th>Asia</th>
<th>Europe</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Races</td>
<td>72,647</td>
<td>54,801</td>
<td>31,670</td>
<td>159,118</td>
</tr>
<tr>
<td>Betting (€x1,000)</td>
<td>11,604,093</td>
<td>44,942,072</td>
<td>32,089,610</td>
<td>88,635,775</td>
</tr>
</tbody>
</table>

(int’ comparisons EFTA 2008)

And grow and grow....

- 2006 Asian Mile Challenge brings together races from Melbourne, Dubai, Hong Kong and Japan
- 2007 The Breeders’ Cup meeting is run over two days with three races on Friday
- Three more races added to Breeders’ Cup meeting and Singapore Turf Club add Kris Flyer Sprint to their international night.
- Wesley Ward sends over two American 2yo winners at Royal Ascot
And it continues to grow.

• 2010 Dubai opens state of the art racecourse at Meydan
• 2011 Kenilworth announce they will be allowed to run the first international race in South Africa in January 2012

Even in economic recession....

In the top 20 racing countries there were a total of (2006):

• 138,667 races,
• 200,141 individual starters,
• £1.7 Billion prize money
• £66 Billion betting turnover
• 6,977 stallions,
• 158,734 mares
• 102,224 foals
REASONS..............

• Prize money - four Hong Kong International Races are worth over 5 Million Pounds
• Dubai World Cup night is worth 16.6 Million pounds
• Capital Appreciation /breeder exposure
• Potential sale
• Change of training/medication regime
• Business & pleasure

Its all about money...

Top trainer in Britain 2010:
• Richard Hannon with £3,218,575

Top British based trainer overseas 2010:
• John Gosden £2,503,945

28 trainers (including three with jumpers) earned over £100,000 abroad and three won over £2 Million.
International Events organized by the 10 leading national host nations 1996 and 2006 (FEI 2007)

1996: 350 International Events
2006: 1530 International Events
Growth in Shipments 2001-2009
(major international shipper)

Growth in major international shippers 2001-2009

<table>
<thead>
<tr>
<th>First</th>
<th>Converted Cargo Vessel</th>
<th>Converted Tanker</th>
<th>Length</th>
<th>Draft (m)</th>
<th>TEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1956-1970)</td>
<td></td>
<td></td>
<td>135 m</td>
<td>&lt; 9 m</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200 m</td>
<td>&lt; 30 ft</td>
<td>800</td>
</tr>
<tr>
<td>Second</td>
<td>Cellular Containership</td>
<td></td>
<td>215 m</td>
<td>10 m</td>
<td>1,000-2,500</td>
</tr>
<tr>
<td>(1970-1980)</td>
<td></td>
<td></td>
<td></td>
<td>33 ft</td>
<td></td>
</tr>
<tr>
<td>Third</td>
<td>Panamax Class</td>
<td></td>
<td>250 m</td>
<td>11-12 m</td>
<td>3,000</td>
</tr>
<tr>
<td>(1980-1988)</td>
<td></td>
<td></td>
<td>290 m</td>
<td>36-40 ft</td>
<td>4,000</td>
</tr>
<tr>
<td>Fourth</td>
<td>Post Panamax</td>
<td></td>
<td>275 m</td>
<td>11-13 m</td>
<td>4,000-5,000</td>
</tr>
<tr>
<td>(1988-2000)</td>
<td></td>
<td></td>
<td>305 m</td>
<td>36-43 ft</td>
<td></td>
</tr>
<tr>
<td>Fifth</td>
<td>Post Panamax Plus</td>
<td></td>
<td>335 m</td>
<td>13-14 m</td>
<td>5,000-8,000</td>
</tr>
<tr>
<td>(2000-2005)</td>
<td></td>
<td></td>
<td></td>
<td>43-45 ft</td>
<td></td>
</tr>
<tr>
<td>Sixth</td>
<td>New Panamax</td>
<td></td>
<td>397 m</td>
<td>15.5 m</td>
<td>11,000-14,500</td>
</tr>
<tr>
<td>(2006-2009)</td>
<td></td>
<td></td>
<td></td>
<td>50 ft</td>
<td></td>
</tr>
</tbody>
</table>
Early Intercontinental Air Routes, 1930s...

and today...

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Worldwide movements of horses from and to the European Union and the EFTA States in 2009 and 2010

11.5 horses/day
4 horses/day!
6 horses/day!
1.6 horses/day
0.6 horses/day

24 horses to EU per day!
Day x: 1 case of AHS near Maastricht!!

Import of horses to the European Union, Switzerland and Norway 2009 and 2010
Horse movements
Increased international & intercontinental movements
carry inherent risks of transfer of infectious disease

<table>
<thead>
<tr>
<th>Port of Entry</th>
<th>Total</th>
<th>Febrile on arrival</th>
<th>% febrile</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York (mainly from Holland)</td>
<td>2062</td>
<td>236</td>
<td>11.4%</td>
</tr>
<tr>
<td>Miami (mainly from Argentina and Holland)</td>
<td>1600</td>
<td>106</td>
<td>6.6%</td>
</tr>
<tr>
<td>Los Angeles (from all over Europe and Australia and New Zealand)</td>
<td>1058</td>
<td>127</td>
<td>12%</td>
</tr>
</tbody>
</table>
## SECTION 2: DISEASES

Prof. Heinz Gerber, Vetsuisse Bern

Herholz et al., 2012 EAAP Bratislava

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<table>
<thead>
<tr>
<th>Spread of equine diseases - Main risks to biosecurity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Importation of live animals, meat &amp; meat products, biological products (semen, embryo’s, plasma)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Animal movement</strong></td>
</tr>
<tr>
<td><strong>Animal to animal spread</strong></td>
</tr>
<tr>
<td><strong>Change in epidemiology (lack of knowledge?)</strong></td>
</tr>
<tr>
<td><strong>Extension of the range of disease vectors and/or change in vector competence</strong></td>
</tr>
<tr>
<td><strong>Migrating birds or other wild animals</strong></td>
</tr>
</tbody>
</table>
Each category has disease spread potential

Insect-Vectors with disease spread potential

- Flies
- Ticks
- Gnats
- Mosquito’s
Pan-American Games, Guadalajara, Mexico
October 2011

**VENEZUELAN EQUINE ENCEPHALOMYELITIS IN MEXICO**

1. To advise you of an outbreak of Venezuelan Equine Encephalomyelitis (VEE) in Mexico

**Purpose and background**

2. On 19 August Mexico notified the World Organisation for Animal Health (OIE) that it has confirmed two cases of VEE in horses in the region of Veracruz.

3. This means that in accordance with Commission Decision 2004/211/EC, the Mexican authorities cannot currently certify exports of horses to the EU.

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Spread in Equine Infectious Anemia from Rumania
Equine infectious Anemia (EIA)

- Viral infection of equids
- Incubation: 1-3 weeks up to 3 month
- Infected Equids carry the virus for lifetime & are a potential risk for the spread of the disease
- Compulsory notifiable disease (OIE, ADNS)

Local transmission: blood suckling horse flies & in utero infection

Long distance spread: Movements of infected horses and their genetics, use of contaminated needles or blood products
EIA situation Rumania (2010)

- Number of EIA outbreaks at 10th April 2010: 5936
- Number of EIA cases at 10th April 2010: 11622
- All positive cases came from private holdings, no registered horses
- no cases in competition horses, breeding or riding centres

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Introduction of EIA from Rumania

- **Ireland 2006**: 38 EIA cases after import of infectious plasma
- **Great Britain 2010**: 2 EIA cases after import of horses (via Belgium)
- **Belgium 2010**: 3 EIA cases after import of horses
- **France 2010**: 1 EIA case after import of horse (via Belgium)
- **Germany 2010**: 33 EIA cases after import of horses
Glanders can be introduced at any time into free countries or zones by latent infected equines

Global equine disease distribution
Criteria for listing diseases:

World Organisation of Animal Health (OIE):

• International spread
• Zoonotic Potential
• Significant Spread within Naïve Populations
• Emerging Diseases

THEY HAVE NOT GONE AWAY!

Equine diseases
• African horse sickness
• Contagious equine metritis
• Dourine
• Equine encephalomyelitis (Eastern)
• Equine encephalomyelitis (Western)
• Equine infectious anaemia
• Equine influenza
• Equine piroplasmosis
• Equine rhinopneumonitis
• Equine viral arteritis
• Glanders
• Surra (Trypanosoma evansi)
• Venezuelan equine encephalomyelitis
Top 17 most dangerous disease threats by USDA

1. High Pathogenic Al (F)
2. Foot-and-Mouth Disease
3. Rift Valley fever (F)
4. Exotic Newcastle Disease
5. Nipah and Hendra virus (F)
6. Classical swine fever
7. African swine fever
8. Bovine spongiform encephalopathy (?)
9. Rinderpest
10. Japanese encephalitis (F)
11. African horse sickness
12. Venezuelan equine (F) encephalitis
13. Contagious bovine pleuropneumonia
14. Ehrlichia ruminantium (Heartwater)
15. Eastern equine encephalitis (F)
16. Coxiella burnetii (F)
17. Akabane virus

Zoonotic diseases: (F) fatal (?) possible
Worldwide equine vector-borne disease outbreaks based on WAHID and ADNS data.
January 2010 - May 2011

Herholz et al, 2012 EAAP Bratislava

Worldwide other equine OIE-notifiable disease outbreaks based on WAHID and ADNS data.
January 2010 - May 2011

Herholz et al, 2012 EAAP Bratislava
Responsibility starts with prevention

Especially, if no treatment is available
Objective:
• Minimise likelihood of the occurrence of an event
• Minimise negative consequences of an event
**Equine diseases: vaccine availability**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Commercially available vaccines</th>
<th>Licensed in (not exhaustive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Horse Sickness</td>
<td>Modified Live Vaccine (MLV)</td>
<td>South Africa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vaccination prohibited in most countries</td>
</tr>
<tr>
<td>Venezuelan equine encephalomyelitis</td>
<td>Killed &amp; MLV</td>
<td>USA</td>
</tr>
<tr>
<td>Equine encephalomyelitis (Eastern)</td>
<td>Killed &amp; MLV</td>
<td>USA</td>
</tr>
<tr>
<td>Equine encephalomyelitis (Western)</td>
<td>Killed</td>
<td>USA</td>
</tr>
<tr>
<td>West Nile Virus</td>
<td>Live canary pox vaccine, Live chimera, killed, DNA-vaccine,</td>
<td>Europe, USA, India</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equine rhinopneumonitis</td>
<td>Killed, MLV</td>
<td>Europe, USA,</td>
</tr>
<tr>
<td>Equine influenza</td>
<td>Killed, MLV intranasal</td>
<td>Europe, USA, Australia</td>
</tr>
<tr>
<td>Equine viral arteritis</td>
<td>Killed MLV</td>
<td>Some European countries, North America In many countries vaccination is not allowed</td>
</tr>
</tbody>
</table>
Equine diseases: prevention & control

- **No vaccine available:**
  - Equine piroplasmosis, Equine infectious anaemia, Glanders, Surra, Dourine, Contagious equine metritis
- **Existing vaccines for routine use:**
  - Equine encephalitides (VEE, EEE, WEE & WNF)
  - Equine Influenza
  - (Equine rhinopneumonitis, Equine viral arteritis)

**How about African Horse Sickness?**

Impact of an AHS outbreak
1989 Spain and Portugal
- 137 outbreaks;
- 104 farms; 206 equine deaths;
- 170,000 equines vaccinated, 82 died after vaccination
- Cost $1.9 million

- Inventory: 5.25 million horses; Sales: $1.75 billion;
- direct impact of $39 billion on the U.S. economy (AHC report) & an overall impact of $102 billion.
The horse industry supports 1.4 million equivalent full-time jobs.

UK: AHS could cost the UK over £3.5 billion ($5.7 billion)
Why is there no safe & efficacious vaccine against AHS commercially available?

From development to commercialization: 5-8 years

Market Authorization: Registration requires 5-8 years of development

Substantial Investments are required