EPIDEMIOLOGY OF RIFT VALLEY FEVER IN SAUDI ARABIA

By

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Environmental Factors in South-West Saudi Arabia:

- Almost identical viruses were isolated from Africa (1990/91, 1997/98) and Saudi Arabia (2000/2001) outbreaks (Shoemaker et al., 2002).
    - * Rainfall (100-470 mm/year)
    - * Lakes, ponds, and dams
    - * Vegetation (agricultural activities)
    - * Mosquitoes (large densities, 5000/site/night during the outbreak, 160/site/night after control campaign)
    - * Others: soil, temperature, humidity, and wind speed etc.

An ideal mosquito breeding site in Saudi Arabia:

RVF outbreak site in Saudi Arabia (dry season):

2000/2001 RVF outbreak in KSA:

- The epizootic: August 2000-April 2001
- Infection rate in Jazan was 23% & 9% in Asir
- 66% of the cases were in Jazan & 27% in Asir
- 65% of the cases were in September & October
- Human cases were 886 (in all regions)
- Of these, 683 (82%) were laboratory confirmed
- Case fatality rate was 14%

Control of RVF epizootic in KSA:

Vaccination:

- Mass vaccination at the time of the outbreak
- Continuous partial (young animals at 6 months of age) & ring vaccination (localised new cases) thereafter
- The live-attenuated RVF vaccine was the choice
- 500,000 animals are vaccinated annually in Jazan
- 100,000 - - - - - - Asir
- 50,000 - - - - - - Makkah

Animal factors:

- Genotype of animal (During the 2000/2001 outbreak: the infection rate was 9.7% in sheep, 7.9% in goats, 1.3% in camels and 1.2% in cattle (Elfadil et al., 2004).
- Breed (local breeds were more resistant)
- Age (young animals were more affected)
- Sex (storms of abortion were observed)

Factors associated with RVF in KSA (diagnosed by ELISA): (Elfadil et al. 2006)

Factor	Odds Ratio
Dense mosquito population	4.2
High rainfall	5
Lakes & ponds	4.2
Good vegetation	2

Factors associated with RVF active virus in KSA (diagnosed by PCR) (Elfadil et al. 2006):

Factor	Odds Ratio
High IgM level	3
Abortion	4.3
Genotype (sheep vs goats)	4

Risk Factors to RVF in KSA:

Human cases = 886 (Madani et al., 2003)

- Exposed to:
- Both mosquito bites & animals = 76%
- Mosquito bites only = 22%
- Animals only = 1%
- None of the above = 1%

- 62% reported abortion storms in animals
- 51% reported extraordinary animal deaths

Risk imposed by trade animals:

- Incubation period of RVF: 18 hours-7 days.
- Course of the disease: 1-7 days.
- Duration of viremia: 1-7 days.
- Exporting countries in East Africa: Sudan, Ethiopia, Somalia and Kenya.
- Importing countries: Gulf countries, mainly Saudi Arabia (for Hajj).
- Transportation: mainly by ground and sea.
- Transmission: vector-borne & direct contact.

Economic impact of RVF:

- 20 million pastoralists in East Africa are highly reliant on sales of livestock to Saudi Arabia.
- About 10-15 million head of livestock are exported to Saudi Arabia annually.
- Small ruminants trade to Makkah estimated to be worth US$ 0.6-0.9 billion/year.
- Saudi Arabia banned importing livestock from East Africa after the 1997/1998 and 2006/2007 RVF outbreaks.

Economic Impact of RVF in S-W KSA

* Ban of animal movement from affected regions to markets in Saudi Arabia for 4 years
* Ban of importation of livestock from Africa for 4 years.
* Closure of livestock markets in the affected regions for about one year.
* Stamping out of 23829 smuggled small ruminants to Makkah (US$ 4000000)

Seroepidemiological active surveillance:

- Conducted annually in the rainy season
- Main purposes are: to detect new infection (IgM) or clinical disease and to monitor herd immunity (IgG)
- In 2003 infection rate = zero
- In 2004 infection rate = 0.36% (36/10,000)

  - Clinically affected herds were diagnosed
- In 2005 infection rate = zero
- In 2006 infection rate = 0.28% (28/10,000)

  - No clinically affected herds were diagnosed

Sentinel herds:

- 11 herds were placed in high risk areas (7 in Jazan, 2 in Asir, 1 in Makkah and 1 in Albaha)
- Monitored every 2-3 months for IgM & IgG
- RVF infection was detected in 2004 in Jazan & Asir, and in 2006 in Jazan

* Results from seroepidemiological surveillance and monitoring sentinels proved persistence of RVF in Jazan & Asir, though in a very low rate

Incidence of RVF in Jazan Measured by IgG in Sentinel Animals, 2011-2014

* 2011: 7/244/year
* 2012: 12/237/year
* 2013: 12/225/year
* 2014: 10/213/year
* No IgM cases were diagnosed
* No clinical cases were diagnosed

Thank You

For Listening