Analysis of Pathways for Release of Rift Valley Fever Virus into Domestic Ruminant Livestock, Wild Ruminants, and People in the Continental United States

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Pathways Analysis

- Systematic assessment of the pathways along which a foreign animal disease might enter the US and establish an outbreak of disease in animals and/or man

- Also applicable for delineating the pathways along which a domestic disease agent might spread from a state or region to new state(s) or region(s)

Pathways Analysis

Its Uses

- Basis for release & exposure assessment within risk assessment portion of a risk analysis
- Targeted surveillance planning
- Emergency preparedness and response

Pathways Analysis Steps

Step 1:

Establish an understanding of host, agent, and environmental interactions for the disease in question based on **scientific** literature, expert opinion, personal experience or other sources of information.

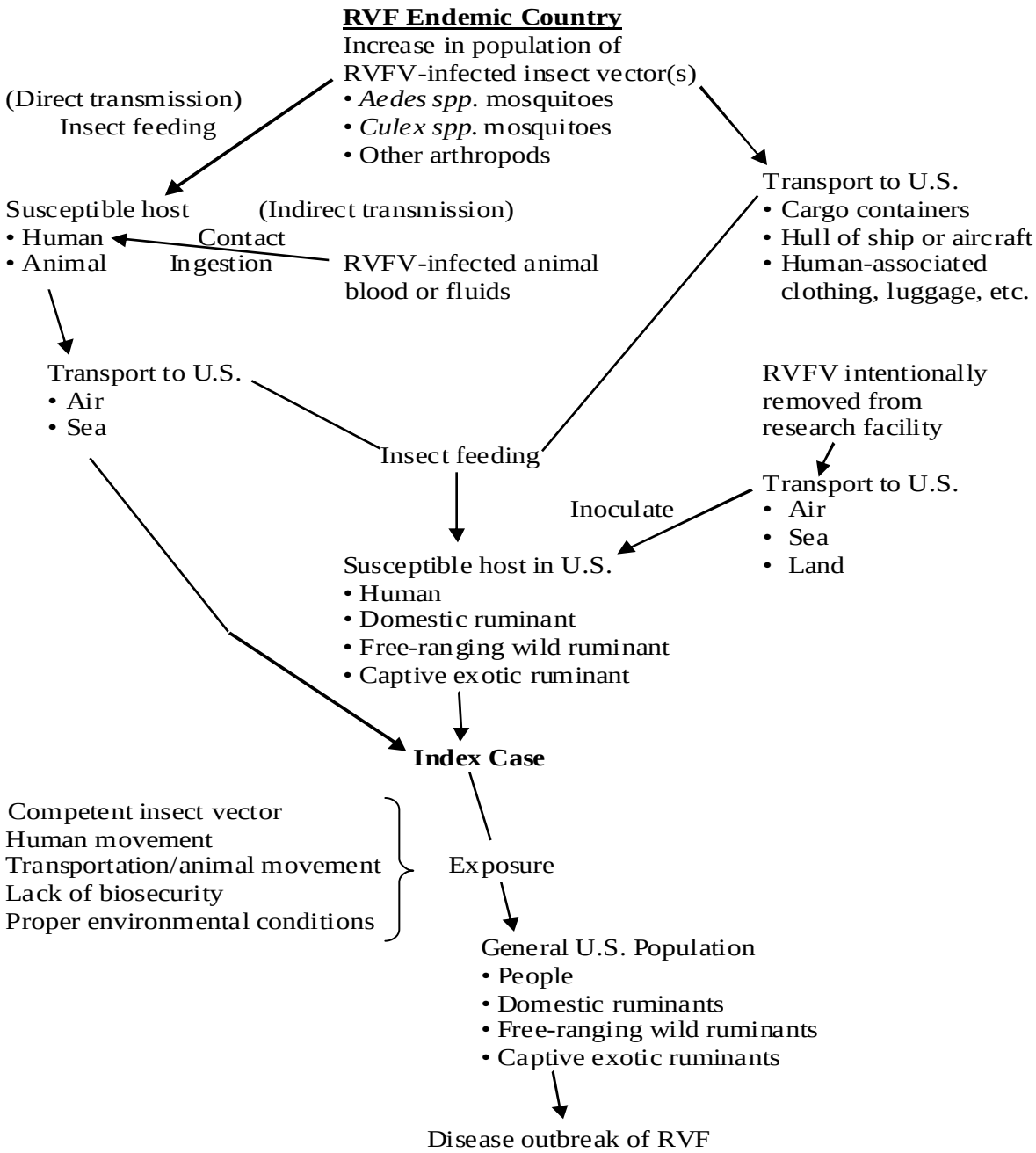
- Vector-borne (mosquito) viral (bunyavirus)disease
- Zoonotic (domestic & wild ruminants; people)
- Environment (Africa & Arabian peninsula; rain; select agent)

Pathways Analysis Steps

•Establish an understanding of host, agent, and environmental interactions for the disease in question based on scientific literature, expert opinion, personal experience or other sources of information.

Step 2:

Develop a list of potential pathways for entry of the disease agent into a susceptible livestock and/or human population



Pathways

1. Importation of RVFV-infected domestic or wild animal species
2. Entry of RVFV-infected people
3. Mechanical transport of RVFV-infected insect vectors
4. Airborne transport of insect vector or virus
5. Smuggling of live virus

Pathways Analysis Steps

•Establish an understanding of host, agent, and environmental interactions for the disease in question based on scientific literature, expert opinion, personal experience or other sources of information.

•Develop a list of potential pathways for entry of the disease agent into a susceptible livestock and/or human population

Step 3:

Evaluate the feasibility of each pathway

Pathways

1. Importation of RVFV-infected domestic or wild animal species
   - Legal importation of domestic ruminants is currently not a feasible pathway
   - Legal importations of wild ruminants for zoological purposes may be a feasible pathway
   - Legal importation of ruminants indigenous to Africa have crossed the U.S.-Mexican and U.S.-Canadian border
   - Legal and illegal importation of nonhuman primates
   - Illegal trade in domestic & wild ruminants does not appear to be occurring

Pathways

2. Entry of RVFV-infected people

- U.S. Airports in NY, GA, MD, NJ, TX, and DC receive nearly all of the passengers
  - ≅300,000/yr
  - 16 African countries & Saudia Arabia
- Cruise ships are not important

Pathways

2. Entry of RVFV-infected people

- No diseased passengers were quarantined
- 13,875 people had their luggage and personal items inspected
  - Insects were found on two occasions but genus and species were not reported
  - ≅52% of passengers traveled to visit family and/or friends
    - ≅880,000 African immigrants living in US
      - » NY, CA, TX, MD, NJ, MA, VA, GA, FL, and MN

Pathways

3. Mechanical transport of RVFV-infected insect vectors
   - 46 RVFV-endemic countries exported 99 commodities
     - 36 U.S. ports of entry in 26 states
       - Philadelphia (PA) and New York City (NY), and Charleston (SC) ports received most of these commodities

Pathways

3. Mechanical transport of RVFV-infected insect vectors
   - No customs data or data from other sources were found that reported the number and species of insects recovered from containers or hulls of transport vehicles

Pathways

4. Airborne transport of insect vector or virus

- This pathway does not seem viable for facilitating entry of adult mosquitoes, virus, or RVFV-infected mosquito eggs into the US
  - ≅4830 Km (3000 mi.) between Africa and the US
  - Average surface wind speeds are approximately 8.60 m/s (19.3 mi/hr)
  - Mosquitoes may remain airborne for up to 29 hours
  - RVFV usually not excreted as an aerosol by ill animal
  - RVFV susceptible to dessication
  - Eggs are prone to a number of hazards but unlikely to be affected by wind events

Pathways

5. Smuggling of live virus
   - Commonly studied virus in research labs around the world
   - No publicly accessible databases or other intelligence sources found that document country-by-country movement of RVFV in and out of research laboratories

Pathways Analysis Steps

- Establish an understanding of host, agent, and environmental interactions for the disease in question based on scientific literature, expert opinion, personal experience or other sources of information.
- Develop a list of potential pathways for entry of the disease agent into a susceptible livestock and/or human population
- Evaluate the feasibility of each pathway
- **Step 4:**

Identify the populations at-risk for each feasible pathway that the disease agent follows to enter the US (or state or region)

Exposure of Susceptible Animal and Human Populations to RVFV in the US

- Domestic & wild ruminants & people in 14 states (AL, CA, FL, GA, MA, MD, ME, MN, NJ, NY, PA, SC, TX, and VA) appear to be most vulnerable for exposure to RVFV
- White-tailed deer may well be the first wildlife species to become infected with RVFV and exhibit signs of RVF

Questions?

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