Geospatial considerations of VBD transmission

RC

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Surveillance of VBD

Surveillance of VBD

- Why are clinicians often the first step to detection? Why not arthropod surveillance?

- We only find what we're looking for:
  - Knowledge (what's next? In what mosquito? Maybe a tick?)
  - $$$$$

Dengue
Chikungunya
Zika
Yellow Fever
Eastern equine encephalomyelitis
St. Louis Encephalitis
West Nile

Mayaro
Usutu
Spondweni
Oropouche
Bunyamwera
Ngari
Rift Valley Fever
African Swine Fever
Tick-borne Encephalitis

Zika virus

- Detection in the Americas – difficult because *everything looks the same*

Fever
Aches & Pains
Tiredness
Headache
Rash

Flu

Fever
Aches & Pains
Tiredness
Headache
Rash

Dengue

Fever
Aches & Pains
Tiredness
Headache
Rash

chikungunya

Fever
Aches & Pains
Tiredness
Headache
Rash

Zika

Zika virus

- Detection in the Americas

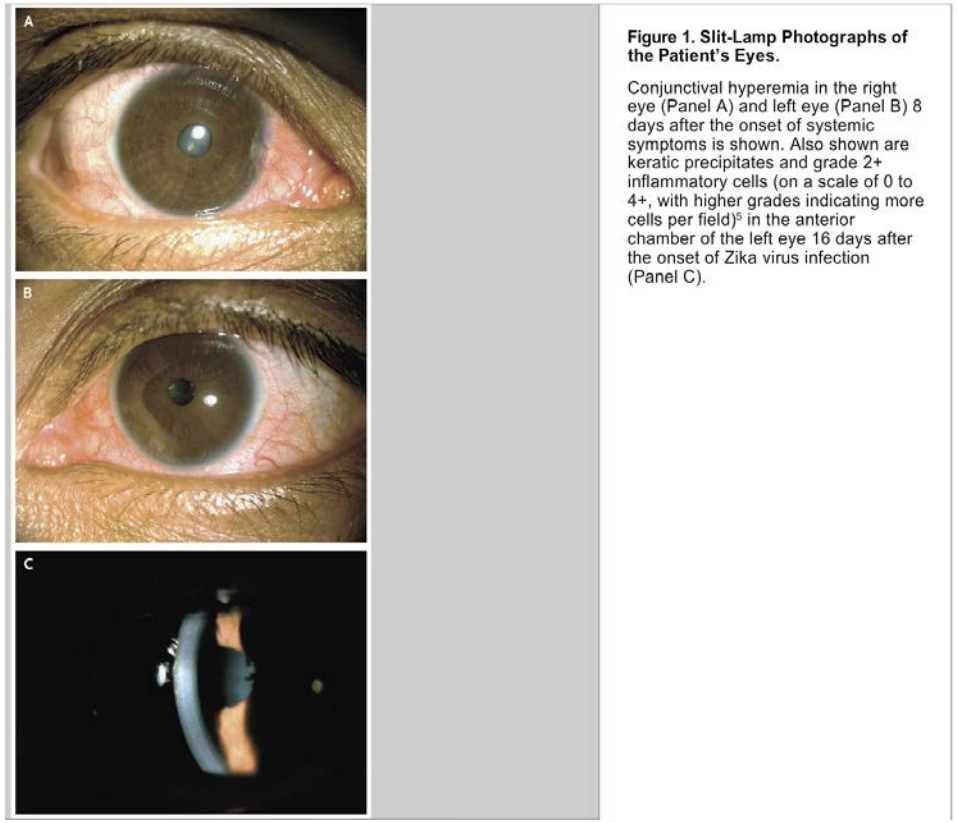


Figure 1. Slit-Lamp Photographs of the Patient's Eyes.

Conjunctival hyperemia in the right eye (Panel A) and left eye (Panel B) 8 days after the onset of systemic symptoms is shown. Also shown are keratic precipitates and grade 2+ inflammatory cells (on a scale of 0 to 4+, with higher grades indicating more cells per field)[5] in the anterior chamber of the left eye 16 days after the onset of Zika virus infection (Panel C).

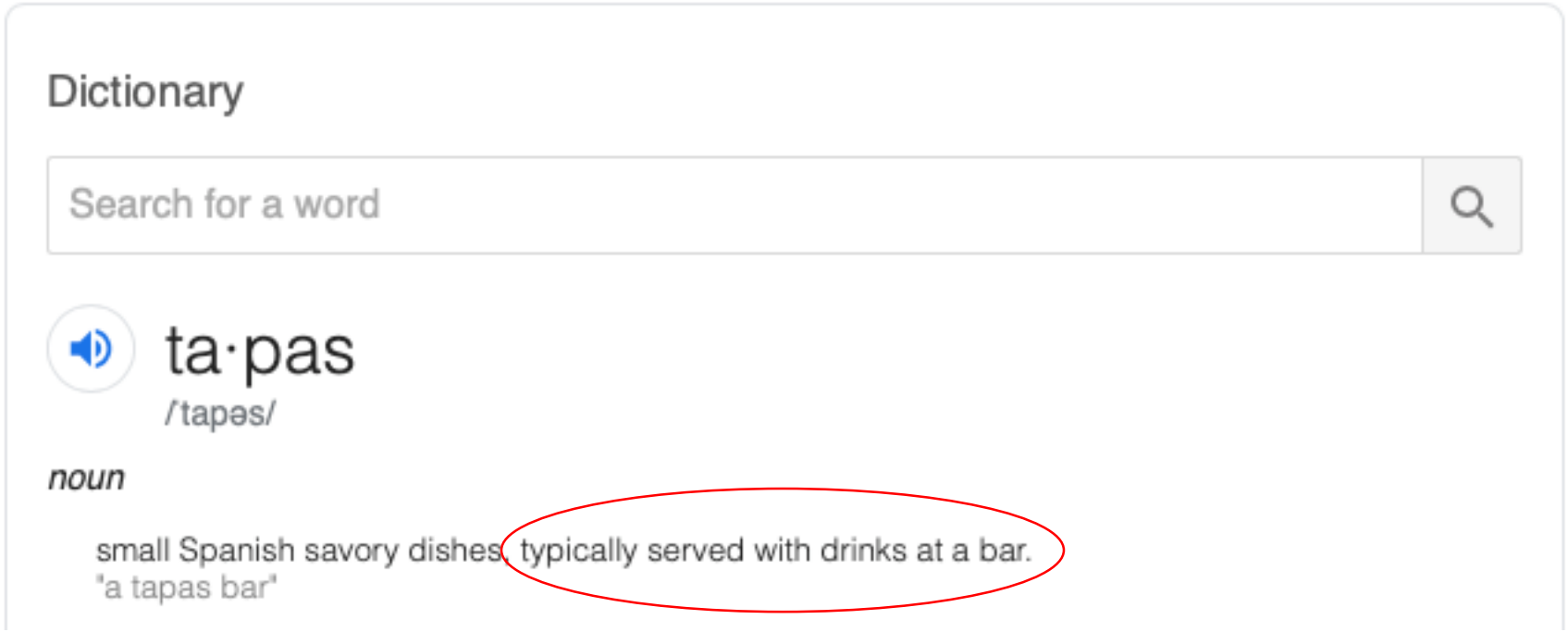
Dengue-like illness with conjunctivitis

Not characteristic of either dengue or chikungunya

Also, as the outbreak progresses, we get better at distinguishing the rash

Surveillance of VBD

- Targeted proactive arthropod surveillance (TaPAS) model



Surveillance of VBD

- Targeted proactive arthropod surveillance (TaPAS) model

1. Prioritize biothreats from global histories

2. Develop pan-group molecular detection tests

3. ID geographical areas most at risk for introduction and/or emergence

4. Implement targeted detection efforts

Output: Early Detection

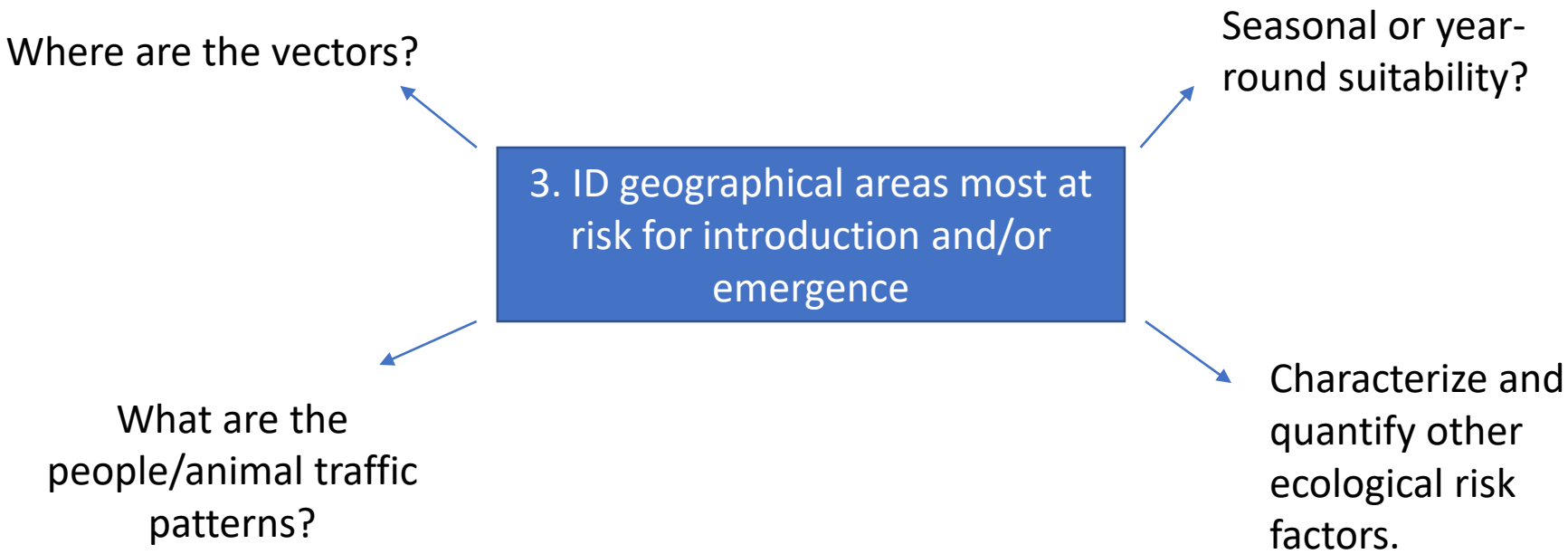
Surveillance of VBD

- Targeted proactive arthropod surveillance (TaPAS) model

1. Prioritize biothreats from global histories	What has or is currently circulating globally in efficient systems?
2. Develop pan-group molecular detection tests	PCR-based in all likelihood

Surveillance of VBD

- Targeted proactive arthropod surveillance (TaPAS) model



Surveillance of VBD

- Targeted proactive arthropod surveillance (TaPAS) model

a) Cost-benefit analysis
b) Public support

4. Implement targeted detection efforts

c) Integrate into existing workflows

Output: Early Detection

Everybody wins!

Surveillance of VBD

- Caveats

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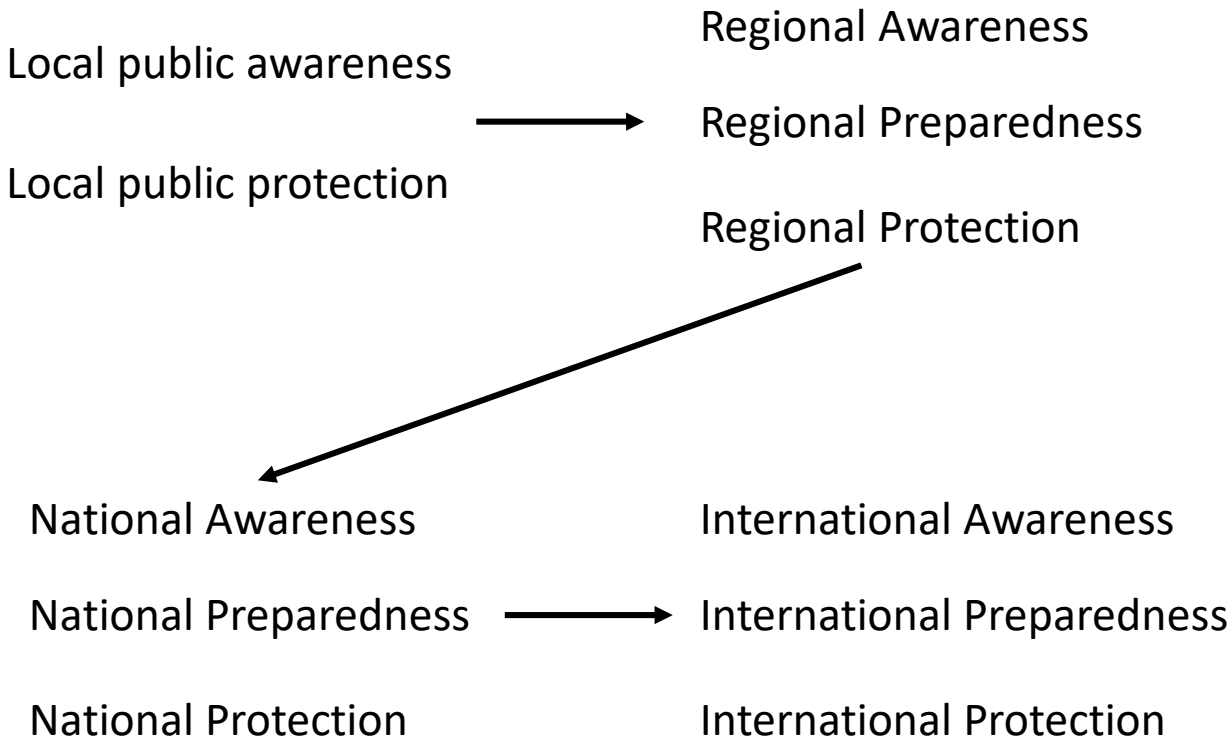

Realizing TaPAS

The most important factor for success:

3. ID geographical areas most at risk for introduction and/or emergence

Characterization of local and international arboviral threats:

1. Potential for being zoonoses / human pathogens
2. Arbovirus ecology
    1. Vectors
    2. Viral:vector interactions
    3. Environmental constraints
3. Potential expanded ecologies in disparate geographical areas
    1. Potential reservoirs
    2. Secondary vectors present in “new” area