VECTOR BORNE DISEASES: DENGUE, ZIKA, YELLOW FEVER AND RICCKETSIOSIS

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TALK OVERVIEW



EPIDEMIOLOGY

DISEASE & DIAGNOSIS PREVENTION & TREATMENT



THE ARBOVIRUSES THE VIRUSES



THE ARBOVIRUSES THE VIRUSES



1. Aedes mosquitoes Ae. aegypti and Ae. albopictus

THE VECTORS

THE ARBOVIRUSES

2. Across the tropical world Spread via trade and travel

- 3. Peridomestic Lay eggs in small containers
- 4. Heterogeneous Hard to trace
- 5. Bite during the day Human movement important
- 6. Diseases of megacities







RICKETTSIAL THE BACTERIA

CVPA





R. conorii Mediterranean spotted fever African tick bite fever

> *R. rickettsii* Rocky Mountain spotted fever



VECTOR-BORNE DISEASES CHANGING RISK



Spatial variation

Seasonal variation





THE ARBOVIRUSES GLOBAL DISTRIBUTION



RICKETSIAL GLOBAL DISTRIBUTION

Typhus



Americas, Mediterranean and Africa

Colder regions, especially with overcrowding

Rickettsia typh



Asia-pacific

THE ARBOVIRUSES THE DISEASE

Specific

complications



SUBJECT OF CONTROLLES OF CONTR

Zika



Yellow fever Scrub Typhus Typhus RMSF

THE ARBOVIRUSES THE DISEASE

Common but typically mild



CRITERIA FOR DENGUE ± WARNING SIGNS

Probable dengue

live in /travel to dengue endemic area. Fever and 2 of the following criteria:

- Nausea, vomiting
- Rash
- Aches and pains
- Tourniquet test positive
- Leukopenia
- Any warning sign

Laboratory-confirmed dengue

(important when no sign of plasma leakage)

Warning signs*

• Abdominal pain or tenderness

- Persistent vomiting
- Clinical fluid accumulation
- Mucosal bleed • Lethargy, restlessness
- Liver enlargment >2 cm
- Laboratory: increase in HCT
- concurrent with rapid decrease in platelet count

*(requiring strict observation and medical intervention)

SEVERE DENGUE

1. Severe plasma leakage 2. Severe haemorrhage 3.Severe organ impairment

CRITERIA FOR SEVERE DENGUE

Severe plasma leakage

leading to:

- Shock (DSS)
- Fluid accumulation with respiratory distress

Severe bleeding

as evaluated by clinician

Severe organ involvement

- Liver: AST or ALT >=1000
- CNS: Impaired consciousness
- Heart and other organs



Symptoms of Zika







DENGUE: PAEDIATRIC BURDEN

Country:	Mexico	Brazil	Indonesia
Map:	Proportion of burden in 9+	Proportion of burden in 9+	Proportion of burden in 9+
Proportion of infections in children (%)	69	78	87

ZIKA SPECIFIC COMPLICATIONS



RICKETSIAL THE DISEASE

Non-specific at early stage

- Fever
- Headache
- Malaise
- Rash
- Nausea
- Vomiting

• Rash sometime at the site of the bite eschar



DIAGNOSIS

Primarily clinical Serological test support

Most common: Paired sample serology

Gold standard: PCR gold standard

Rapid point of care: NS1 / combined NS1/IgM



PREVENTION



DENGUE VACCINATION: WHAT ROLE COULD IT PLAY?

Characteristics

- Yellow Fever backbone | proven
- Tetravalent antibody titers | good correlate of protection
- Well tolerated | minimal side effects
- Three dose schedule | align with routine immunization schedules



DENGUE VACCINE: PHASE III TRIALS

LATIN AMERICA

Sites 22

Age of participants 9-16

Total participants 18,835

Effectiveness



ASIA

Sites 12

Age of participants 2-14

Total participants 10,275

Effectiveness



DENGUE VACCINE: COMPLICATED EFFICACY

Reduced efficacy against DENV2

	Dengue vaccine		Control		Efficacy		
	Person-years at risk	Cases or episodes*	Person-years at risk	Cases or episodes*	% (95% CI)		
>28 days after three injections (per-protocol analysis)							
Cases	2522	45	1251	32	30·2% (-13·4 to 56·6)		
Serotype 1 episodes	2536	9	1251	10	55·6% (-21·6 to 84·0)		
Serotype 2 episodes	2510	31	1250	17	9·2% (-75·0 to 51·3)		
Serotype 3 episodes	2541	1	1257	2	75·3% (-375·0 to 99·6)		
Serotype 4 episodes	2542	0	1263	4	100·0% (24·8 to 100·0)		



Higher risk of disease in under 5s



Serostatus or age?

THE FUTURE FOR DENGVAXIA®?

Licensed and commercially available in 11 countries:



But International health bodies conflicted:





YELLOW FEVER: A DISEASE ON THE MOVE





As of 2nd May 2017:

Classification	Number
Notified	3131
Confirmed	715
Under investigation	827
Discarded	1589
CFR	34%

YELLOW FEVER: GAPS IN VACCINE COVERAGE



300-500 million doses short

TREATMENT



SURVEILLANCE: KEEPING UP-TO-DATE



LARIS KARKLIS/THE WASHINGTON POST

THE DECLINE IN REPORTED ZIKA CASES



A. Jan-Dec 2015 ~141,000 cases

B. Jan-Dec 2016 ~478,000 cases

C. Jan-Jun 2017 ~31,000 cases

ZIKA OUTBREAK: VARIABLE RATES OF REPORTED MICROCEPHALY



ZIKA OUTBREAK: MICROCEPHALY HYPOTHESES

- 1. Other arboviruses | coinfection or recent exposure to
- 2. Maternal characteristics | age, race, etc
- 3. Socioeconomic status | general vulnerabilities to normal development
- 4. Maternal care | specific vulnerabilities around early detection of development abnormalities
- 5. Water contamination | pesticides or other environmental causes
- 6. **BVDV** | known to cause birth defects in cattle
- 7. Variations in reporting | of Zika and microcephaly

ZIKA OUTBREAK: CHALLENGES OF STUDYING AN OUTBREAK



Diagnosis

- Limited window of detection of viremia
- Serological diagnostics cross-react
 with dengue antibodies



Outbreak dynamics

- Very short lived epidemics
- Challenges with getting ethical approval and site setup

ZIKA OUTBREAK: UNANSWERED QUESTIONS

Clinical

- 1. Characterization of the full spectrum of disease
 - Zika Congenital syndrome (ZCS)
 - Long term impacts of adult infection
- 2. Risk of sexual transmission
- 3. Cross reaction of diagnostic tests

Epidemiological

- 1. Interaction with other arboviruses?
- 2. Why did the Zika epidemic in L. America happen now?
- 3. What will the risk of Zika be in the future?
- 4. Animal reservoirs?

SURVEILLANCE: HEALTHMAP LIVE ALERTS



SURVEILLANCE: www.vbd-air.com

BKK Bangkok

SIN Singapore

VECTOR-BORNE DISEASE AIRPORT IMPORTATION RISK TOOL



Status: There are 3 airports found with direct connection to airport CPH for Dengue

SURVEILLANCE: GEOSENTINEL





GeoSentinel Surveillance Sites

GeoSentinel Affiliate Members

GeoSentinel Sites participate in surveillance and GeoSenti monitoring of all travel related illnesses seen in their that info

GeoSentinel Affiliate Members are ISTM provider clinics that informally provide leads and contacts when they

SUMMARY



ACKNOWLEDGEMENTS

