Dengue Fever Outbreak in Hawaii
Dengue Virus

- Is an arbovirus
- Has 4 serotypes (DEN-1, 2, 3, 4)
- Transmitted by infected *Aedes* mosquitoes - daytime feeder
- Causes dengue fever, dengue hemorrhagic fever, and dengue shock syndrome
World Distribution of Dengue
2000

- Areas infested with *Aedes aegypti*
- Areas with *Aedes aegypti* and recent epidemic dengue
Past Dengue in Hawaii

• Epidemics in 1852, 1856, 1903

• Last endemic dengue transmission during 1943 DEN-1 epidemic

• A total of 18 confirmed cases of imported dengue between 1992 and 2000 (mean=2, range 0-8)
Timeline of Events in 2001

**July**
- Increased imported cases (12)

**Aug 3**
- Statewide Doctor Alert

**Sep 12**
- Maui DOH called about illness
Timeline of Events in 2001

July
Increased imported cases (12)

Aug 3
Statewide Doctor Alert

Sep 12
Maui DOH called about illness

Sep 21
CDC confirms dengue

Sep 24
Enhanced surveillance operational
Surveillance for Dengue

Physicians requested to test persons with *clinically compatible illness*:

Fever (or chills) *and* 2 or more of the following symptoms:

- Headache
- Eye or retro-orbital pain
- Myalgia
- Arthralgia
- Rash
- Any hemorrhagic manifestation
Surveillance for Dengue II

Case Definition:

- Culture positive for dengue virus (13%)
- IgM antibody positive (83%)
- IgG antibody positive in a person tested >2 months post onset of clinically compatible illness and linked to another IgM/culture positive case (4%)
Results

Between Sep 12, 2001 and Mar 15, 2002:

• >1700 reported “suspected” cases investigated

• 76% of these individuals met clinically compatible illness criteria
Dengue Testing in Hawaii 3/15/02

Confirmed 118 (7%)

Negative 1005 (59%)

N=1714

Source: HDOH/Epidemiology Branch
Confirmed Dengue Cases 3/15/02

Gender

- Male: 60%
- Female: 40%

Age group

- <10: 11
- 10-19: 20
- 20-29: 8
- 30-39: 15
- 40-49: 24
- 50-59: 29
- 60-69: 5
- 70+: 5
- unk: 1

Source: HDOH/Epidemiology Branch
Symptoms – Confirmed Infections

- Fever 95 %  (range: 100-104 F, m: 102 F)
- Myalgia 92 %
- Headache 89 %
- Chills 85 %
- Arthralgia 73 %
- Rash 66 %
- Eye pain 58 %

- N / V 48 %
- Diarrhea 36 %
- Sore throat 25 %
- Nasal congestion 23 %
- Cough 21 %
Symptoms – Confirmed Infections

40 (34%) reported at least one hemorrhagic manifestation:

- Petechiae 24 %
- Heavy menses 19 % (females)
- Bleeding gums 8 %
- Epistaxis 8 %
- Melena 4 %
- Purpura 1 %
- Hematuria 1 %
- Hematemesis 1 %
Dengue Testing in Hawaii by Week of Illness Onset

First reported case

CDC CONF NEGATIVE Not Determined

Legend:

- CDC CONF
- NEGATIVE
- Not Determined
confirmed dengue cases (n = 25)

Hauula

9 (8%)

Laie

11 (9%)

Kailua

Kaneohe

Aiea

Honolulu

Haleiwa

updated 3/15/02

Source: HDOH/Epidemiology Branch
KAУAI

confirmed dengue cases (n = 4)

Hanalei
Anahola
Kapaa
Kalaheo

updated 3/15/02

Source: HDOH/Epidemiology Branch
Mosquito Observations

• *Aedes albopictus* high densities in Nahiku and elsewhere

• *Aedes aegypti* not present in outbreak foci on Maui, Kauai, and Oahu
Household Serological Survey - Preliminary data
Late October 28, 2001

28/72 (39%) of participants infected

1/131 (1%) of participants infected
Origin of the Outbreak?

One outbreak with local spread vs.
Simultaneous but separate outbreaks of dengue on three islands
Epidemiologic Findings -

- 73 (62%) of all confirmed infections from Hana area
- 4 of 10 Maui infections outside Hana area were linked to Hana area
- 1 of 4 Kauai infections linked to exposure in Hana area
- 0 of Oahu infections linked to Kauai or Maui
Imported and Local Dengue Cases by Month  2001

Source:  HDOH/Epidemiology Branch
Dengue 1 Phylogeny

15 isolates from Hawaii residents - Den-1

American Genotype

Pacific Genotype

CDC/02
Public Health Education

Intensive public health outreach on primary dengue prevention and mosquito control

- **Town meetings** by DOH and DOE educators
- Distribution of >600,000 dengue **brochures**
- Dengue **website** (www.hawaii.gov/doh/dengue)
- **Medical alerts** to physicians
- **Press releases**, public service announcements – TV, radio
- **Fliers** to Maui rental car agencies and hotels
- **Checkpoints** along Hana highway – distribution of fliers, repellant
- **Lectures** on dengue at medical centers
- **CDC video tapes** for physicians
Public Health Action

• Mosquito inspection and treatment of over 2,500 residences
• Aggressive mosquito control statewide (spraying, source reduction)
• On-site education on mosquito control and disease prevention
• County solid waste clean-up with on-site trash pickup
• Closure of camping grounds and off-roads in Hana
Conclusions

- DEN-1 virus responsible for current outbreak in Hawaii
- Virus transmitted locally by Aedes albopictus
- Local transmission likely the result of recent importation of dengue virus from endemic countries
- No DHF/DSS or fatal dengue infections identified to date
Future Plans

- Continue surveillance for dengue fever, DHS, DSS
- Enhance laboratory capacity to confirm dengue with serological and culture - consider NAATs
- Continue public education and awareness of dengue
- Continue promotion and implementation of mosquito control measures
Future Plans

- Conclude survey of visitors to better assess risk
- Conduct formal mosquito surveys on all islands to assess for presence of *Aedes aegypti*
- Closely monitor future dengue activity in the Pacific and Asia
Acknowledgements

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- Kauai District Health Office
- Hawaii District Health Office
Mahalo!