Epidemiology

- Study of occurrence, distribution, control of disease in populations
  - Mortality and morbidity
  - Prevalence and incidence in population
  - Endemic vs. epidemic vs. pandemic

Epidemiological triangle: determinants of disease

Transmission probability

- The probability that, given contact between a pathogen and a susceptible host, transfer will occur
- Depends on:
  - The characteristics of vector
  - The parasite
  - Susceptibility
  - The type of contact
  - Vectorial capacity – what is it?

Trypanosomiasis (sleeping sickness)

- caused by two subspecies of protists in the genus *Trypanosoma*
- carried from host to host by blood-sucking tsetse flies
- trypanosome infection is characterized by a series of progressive symptoms:
  - swelling at bite
  - immune rxn (swelling of lymph nodes, etc)
  - infection and swelling of CNS
  - possible heart failure

*Trypanosoma and the Tsetse Fly*

- These flies are found throughout middle Africa, where the disease affects 66 million people in 36 countries
Global epidemiology

- Follow pattern of disease incidence
- Know modes of transmission, interseasonal maintenance, 1st and 2nd hosts, vectors, reservoirs
- Endemic vs. epidemic diseases
- Emerging diseases

Emerging infectious diseases

- Chagas disease
- Cryptococcosis
- Dengue fever
- Lyme disease
- Malaria
- Plague
- Rift Valley fever
- Sleeping sickness (trypanosomiasis)
- Tularemia
- West Nile virus
- Yellow fever

Global emerging / re-emerging infectious diseases

- Emerging: incidence has increased in the past 20 years or threatens to increase in near future
- Re-emerging: thought to be under control, but producing new epidemics

Changing patterns of disease

- Decline in infectious diseases in West
- Change in age distribution
  - Aging of baby boomers
- Refrigeration, A/C & nutrition
  - A/C helped eliminate malaria in US
- Global climate change and vector-borne pathogens
  - Did GCC allow WNV to become established?
  - Will malaria return to US?
- Land use changes
- Evolution of pathogens
- Human susceptibility/vulnerability
- Increased dispersal of hitchhikers

Vector surveillance and control

- Monitor vector populations closely
- Reasons to initiate vector control
  - Nuisance
  - Public health
- When to initiate control
  - Night trap counts >50/night
  - Landing rate counts >10/min
- One million mosquitoes
42 counties requested mosquito control operations began Aug. 20 and ended Oct. 20 3,672,239.8 acres (Avg. 111,280 per spray night) 18,935 gallons of dibrom (OP) 16 Planes $0.80/acre =

integrated pest management programs based on scientific knowledge of ecology and behavior multi-faceted approach:  
- education  
- physical  
- biological  
- chemical  
successful program includes what elements?

larval mosquito surveillance all possible breeding sites catalogued and inspected larval numbers recorded

larval mosquito control operations emphasis on source reduction and water management tire removal products applied when required

larviciding products Bacillus thuringiensis var. israelensis (Bti)  
mosquito dunks  
Bacillus sphaericus  
methoprene  
JH mimic  
oils  
advantages?

adult mosquito surveillance CO₂, gravid, light traps landing rate counts on humans sentinel chickens, dead birds, horses, humans identification  
- separated by species  
- determine what species has disease  
- focus control efforts  
- determine need for /effectiveness of pesticide
adult mosquito control operations
- considered after all other efforts have failed to manage population
- ultra-low volume (ULV) applications
- hand-held, truck-mounted, aerial

education and public awareness
- surveys
- information
- breeding site reduction
- personal protective measures

social action
- mobilization of society
- health education and systems
- leadership: policies, strategies, tactics
- surveillance of infection and disease
- monitor and evaluate program

GIS application
- map complaints
- report incidence
- find and monitor habitats
- develop spray routes
- mosquito traps
- breeding sites
- service requests
- truck spray route
- truck spray routes
- GIS application
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