DEVOTED TO REDUCING MALARIA DEATHS & SUFFERING IN HUMANITARIAN CRISSES
Lice Outbreaks: Transmission and Avenues for Treatment

Quyen Vu
Goals

• Understand the main differences between the three types of lice affecting humans
  – Morphology and vector biology
  – Disease risk
  – Most effective treatments
  – Prevention strategies
• Learn about the disease risks associated with body lice, especially in situations of humanitarian crisis
  – Burundi case study
  – Appropriate control strategies
Vector Biology

Three types of lice:

- Head lice: *Pediculus humanus capitis* (2-3 mm long)

- Body lice: *Pediculus humanus humanus* (2.3-3.6 mm long)

- Pubic lice (crabs): *Phthirus pubis* (1.1-1.8 mm long)
Vector Biology

All three types of lice:
- Are ectoparasites: lice live on the surface of the host
- Move by crawling, as opposed to flying
- Have humans as their only host
- Have similar life cycles

Head Lice  Body Lice  Pubic Lice
Lice Life Cycle

Lice stages:
1. Egg/nit
2. Nymph (3 molts)
3. Adult

Both nymphs and adults take blood meals from the human host.
DNA evidence suggests that human lice split off from gorilla lice approximately 3-4 million years ago.
History of Lice & Humans

- *Pediculus humanus capitis* (head lice) and *Pediculus humanus corporis* (body lice) diverged when humans started using clothing.

- Used DNA sequencing to estimate how long ago common ancestors lived.

- Body lice usually found in clothing.

- Diverged ~72,000 years ago.
Lice in the News

- Outbreaks do show up in national news!
- Not severe: most of the stories related to school and campus outbreaks
  - “Head Lice Epidemic Closes Anderson Schools” 1973
  - “Lice Outbreak Cancels Classes” 1980
Symptoms

Head Lice
- Itching
- Difficulty sleeping
- Sores and secondary bacterial infections from scratching
Symptoms (Continued)

- Body lice: Intense itching
  - Skin discoloration/thickening
  - Secondary bacterial infection also possible from prolonged scratching
  - Red rash

- Pubic lice “crabs”: Itching
Disease

- Head lice: does **not** spread disease
- Body lice **spreads bacterial disease**!
- Pubic lice: does **not** spread disease
Body Lice Diseases

- Louse-Borne Relapsing Fever (*Borrelia recurrentis*)
  - 1 Million cases observed in North Africa (WWII)
  - Case fatality rate 10%
  - Related to tick-borne relapsing fever (*B. duttonii*)

- Trench Fever (*Bartonella quintana*)
  - Less serious, rarely fatal
  - Characteristic five-day fever

- Epidemic typhus (*Rickettsia prowazekii*)
Diagnosis by Direct Visualization

- Observation of live nymphs or adult lice.
- Finding nits is suggestive of infection but not definitive.
- Use fine-tooth comb and magnifying glass.
Epidemiology & Risk Factors

Head lice: “head-to-head” transmission
- 6-12 million cases/yr in the United States in children age 3-11
- Found worldwide
- Girls at higher risk than boys
- African Americans lower risk than other racial groups
Pubic Lice (“Crabs”):

- Current worldwide prevalence estimated 2%
- Spread through sexual contact and is considered an STD
- Can be spread through fomites: contact with clothing, linens, and towels belonging to an infected person.
- Pubic lice found on children can be an indicator of sexual abuse.
Body lice: humanitarian crises & disenfranchised groups

- Associated with poor hygiene and crowded living conditions
- In the United States: prisons, homeless transient populations
Epidemic Typhus (*Rickettsia prowazekii*)

- Pathogen type: gram negative bacteria
- In North America, animal reservoir is the flying squirrel
- Was first observed and described in Italy in year 1083
- Typhus epidemics associated with extremely high mortality throughout history
  - Civil War
  - WWI: 3 million deaths in Russia
  - WWII
- Featured in literature
  - Jane Eyre, Lolita, Doctor Zhivago, among others!
Epidemic Typhus (*Rickettsia prowazekii*)

- Also known as: “jail fever”, “camp fever”, “famine fever”
- Body lice
- Transmission:
  1. Louse feeds on human infected with *R. prowazekii*
  2. *R. prowazekii* grows in louse’s gut
  3. *R. prowazekii* excreted in louse feces
  4. Human scratches louse bite, rubs feces into wound
- Symptoms:
  - Severe headache, sustained high fever, rash, muscle pain
- Can be treated with antibiotics
Humanitarian Crisis in Burundi

• Civil war ongoing 1993-2005
  – Ethnic divisions: Hutus, Tutsis
  – Hutu president was assassinated by Tutsi extremists
  – Further aggravated by regional violence between Hutus and Tutsis (Rwandan Genocide)
  – Many refugees and internally-displaced persons
  – Total estimated death toll: 300,000
Jail Fever Outbreak in Burundi

- Nurse observed clinical symptoms in prisoners (1997)
  - Abrupt fever of up to 40 degrees C.
  - Serologic testing: R. prowazekii confirmed.
  - Body lice in jail
  - Conditions noted: “cold weather, poor hygiene, poverty”
  - “Confirmation of a typhus outbreak in Burundi is of concern, given the relative political instability…”
Large Epidemic Typhus Outbreak (Burundi)


- World Health Organization identified 24,000 cases in Bujumbura Province (Burundi).
  - Cases were later identified in six provinces
  - Largest outbreak in 50 years
  - Risk identified: Burundi, Zaire, Rwanda
Lice Treatment

OTC Medications

- Pyrethins: kill live lice but not the nits
- Permethrin lotion 1%: similar to Pyrethin, kills the adult lice but not the nits.
Lice Treatment (Continued)

Prescription Medications

- **Malathion lotion 0.5%**: kills live lice and partially ovicidal (kills some eggs.) Can be irritating to skin/scalp.

- **Benzyl alcohol lotion 5%**: does not kill live eggs

- **Lindane shampoo 1%**: not recommended as first-line therapy because can cause neurological damage
Which treatments should be used?

- Most parents use the “Nix” shampoo: Permethrin 1%.
  - Usually cited as the standard treatment.
- If Permethrin is unsuccessful, move to prescription treatments
  - Lindane is currently not recommended by the American Academy of Pediatrics (AAP): should only be used if all the other treatments are ineffective.
Additional Lice Treatments

• Several studies have looked at oral ivermectin administration as an alternative to topical medications
  – Oral ivermectin was found to be more effective than topical malathion lotion
  – Important given issues of resistance to existing topical treatments

• **Recent news!** The FDA has approved a topical ivermectin-based lotion (brand-name Sklice)
Fumigation and dusting with chemical insecticides: DDT, 1% malathion, or 1% permethrin.

- First used in WWII: U.S. military dusted DDT powder on troops and refugees.
- 10% DDT louse powder on patient, clothing, bedding and members of household
- Highly effective (lice mortality of 99% from 1% DDT; lice mortality 96% in 0.1% DDT)
Prevention

• Avoid methods of transmission (head-to-head contact, sexual contact)

• Improved hygiene/sanitation for body lice
  – Regular change of clothes
  – Regular bathing

• Laundry and soaking in hot water

• Pets do not play a role in lice outbreaks
Prevention in Schools: No-Nit Policy Controversy

• No-Nit Policy: Education, screening, and treatment of children with lice in order to prevent transmission and maintain “nit-free” environments
  – Emphasize accurate diagnosis
  – Education about prevention techniques
  – Temporary dismissal of children with lice
• American Academy of Pediatricians oppose the strict no-nit policy
  – Causes lost classroom time for children
  – (Head) lice aren’t a severe medical problem
  – Recommend: common sense
Summary

- **Body lice** are more serious than pubic or head lice because they can transmit disease.

- Diseases associated with body lice are **severe**!
  - Epidemic typhus (*R. prowazekii*)

- Refugees and those affected by humanitarian crises are particularly at risk.

- **Insecticide spraying** is an important control measure
References


