Urban Rats – The Public Health Perspective

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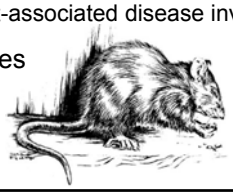
Today's Discussion

- Public health structure in Maryland
- Rat-related public health activities
  - Rat complaints and inspections
  - Rodent-associated disease investigations
- Resources



Who Are We?

- Maryland Department of Health & Mental Hygiene (DHMH)
  - Infectious Disease and Environmental Health Administration (IDEHA)
    - Office of Infectious Disease Epidemiology and Outbreak Response
      - Center for Zoonotic and Vector-borne Diseases (CZVBD)

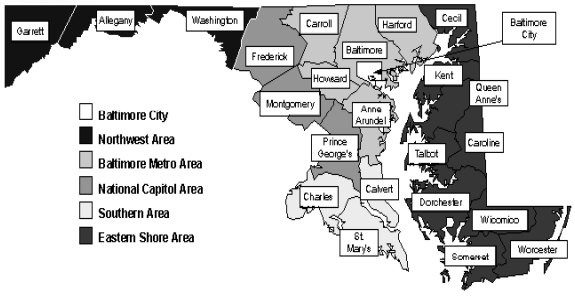
Infectious Disease & Environmental Health Administration

- To improve the health of Marylanders by reducing the transmission of infectious diseases, helping impacted persons live longer, healthier lives, and protecting individuals and communities from environmental health hazards
- We work in partnership with local health departments, providers, community based organizations, and public and private sector agencies to provide public health leadership in the prevention, control, monitoring, and treatment of infectious diseases and environmental health hazards

Center for Zoonotic & Vector-borne Diseases

Mission –
To reduce the incidence and associated impact of rabies and other zoonotic and vector-borne diseases in Maryland

Maryland Local Health Departments



Rat-related Public Health Activities

- Environmental Health / Sanitation
  - Rat complaints
  - Inspections
- Disease investigations
  - Rodent-associated infectious diseases

Rodent Complaints

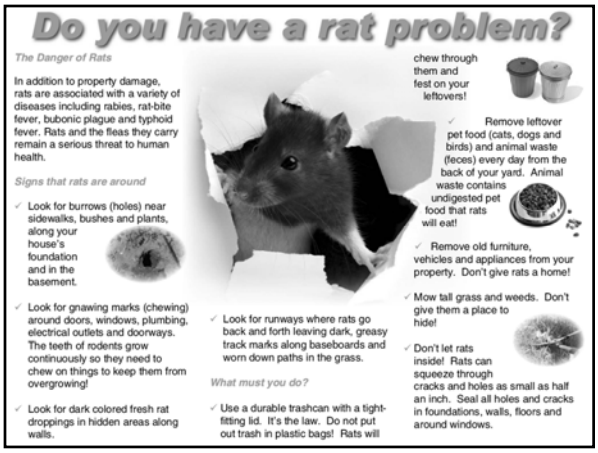
Photo courtesy of Kyle Shannon, Anne Arundel County Department of Health

Baltimore City

- Rat Rubout recently moved from Baltimore City Health Department to Department of Solid Waste
  - Greater synergy with other sanitation programs (e.g., vacant / abandoned / unoccupied house clean-up requests)
- 28,000 rat complaints in FY10
- 42,000 vacant / abandoned / unoccupied house clean-up requests each year

Baltimore City Activities

- Rodent complaints
  - Resident calls 311 with complaint
  - City inspects, baits, and leaves information
  - City follows-up 3 weeks later
- Vacant / abandoned / unoccupied properties
  - City baits after cleaning up property
- Rat Rubout Educator
  - Proactive
  - Inspects "hot" areas, leaves information
  - Attends community meetings



Do you have a rat problem?

The Danger of Rats

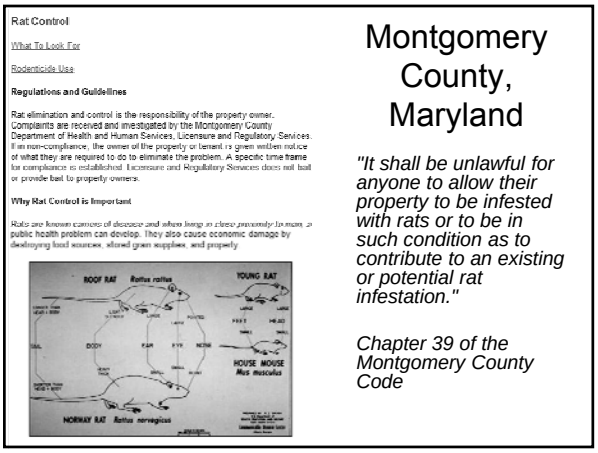
In addition to property damage, rats are associated with a variety of diseases including rabies, rat-bite fever, bubonic plague and typhoid fever. Rats and the fleas they carry remain a serious threat to human health.

Signs that rats are around

- Look for burrows (holes) near sidewalks, bushes and plants, along your house's foundation and in the basement.
- Look for gnawing marks (chewing) around doors, windows, plumbing, electrical outlets and doorways. The teeth of rodents grow continuously so they need to chew on things to keep them from overgrowing!
- Look for dark colored fresh rat droppings in hidden areas along walls.
- Look for runways where rats go back and forth leaving dark, greasy track marks along baseboards and worn down paths in the grass.

What must you do?

- Use a durable trashcan with a tight-fitting lid. It's the law. Do not put out trash in plastic bags! Rats will chew through them and fest on your leftovers!
- Remove leftover pet food (cats, dogs and birds) and animal waste (feces) every day from the back of your yard. Animal waste contains undigested pet food that rats will eat!
- Remove old furniture, vehicles and appliances from your property. Don't give rats a home!
- Mow tall grass and weeds. Don't give them a place to hide!
- Don't let rats inside! Rats can squeeze through cracks and holes as small as half an inch. Seal all holes and cracks in foundations, walls, floors and around windows.



Rat Control

What To Look For

Rodenticide Use

Regulations and Guidelines

Rat elimination and control is the responsibility of the property owner. Complaints are received and investigated by the Montgomery County Department of Health and Human Services, Licensure and Regulatory Services. If in non-compliance, the owner of the property or tenant is given written notice of what they are required to do to eliminate the problem. A specific time frame for compliance is established. Licensure and Regulatory Services does not bait or provide bait to property owners.

Why Rat Control is Important

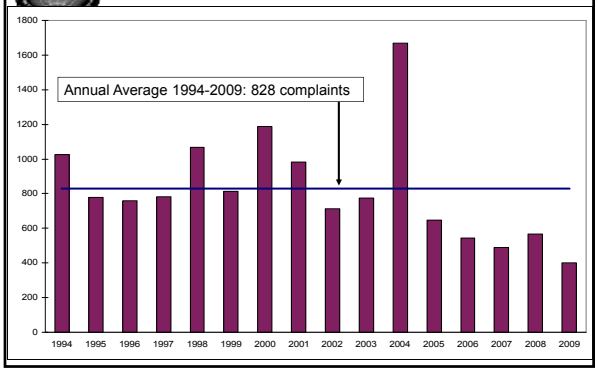
Rats are known carriers of diseases and when living in close proximity to man, a public health problem can develop. They also cause economic damage by destroying food sources, stored grain supplies, and property.

Montgomery County, Maryland

"It shall be unlawful for anyone to allow their property to be infested with rats or to be in such condition as to contribute to an existing or potential rat infestation."

Chapter 39 of the Montgomery County Code

Rat Complaints by Year, Montgomery County, Maryland, 1994-2009



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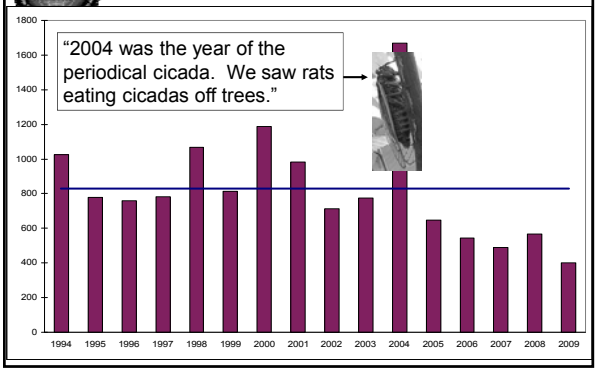
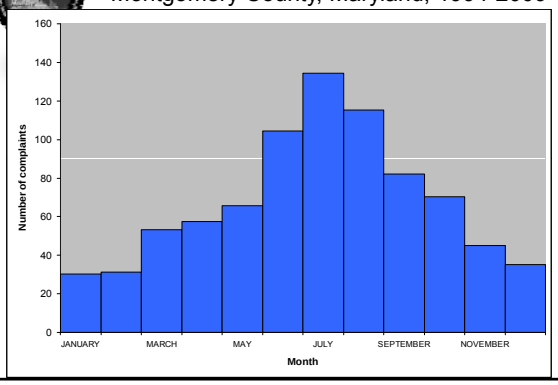


Average Number of Rat Complaints by Month, Montgomery County, Maryland, 1994-2009



Montgomery County Rat Complaint Investigations

- Try to find
  - Where rats are living
  - How extensive the infestation is
  - What is the food source
- To determine safest way to eliminate the rats
- Recommend
  - Rodenticides, or
  - If problem too large, hiring an exterminator

Inspections

- Inspections with rodent component
  - Restaurant
  - Multiple-dwelling
  - Campground
  - Pet stores
- Authority may vary by jurisdiction and type of inspection
  - Health vs. Housing vs. other
- Actions may range from ensuring appropriate rodent control to shutting down facility

Diseases Associated with Rats

- Leptospirosis *(Leptospira interrogans)*
- Hantavirus
- Plague *(Yersinia pestis)*
- Rat bite fever *(Streptobaccilus moniliformis)*
- Tularemia (*Francisella tularensis*)
- Salmonellosis (*Salmonella* spp.)
- Murine typhus (*Rickettsia typhi*)
- More…

Rodent Disease Transmission

- Inhalation
  - Aerosolized feces
  - Aerosolized urine
- Ingestion
  - Urine
  - Stool
- Direct contact
  - Saliva
  - Infected tissue
  - Bites

Hantaviruses

- RNA viruses
  - United States, mostly Sin Nombre virus
  - Many hantaviruses worldwide
- Rodent reservoir specific to hantavirus
  - Deer mouse (*Peromyscus maniculatus*) for Sin Nombre virus
  - Norway rat (*Rattus norvegicus*) for Seoul virus
- Transmission via aerosolized rodent excreta

Hantavirus Clinical Features

- Hantavirus pulmonary syndrome (HPS)
  - Abrupt onset respiratory distress
  - Fever, cardiac insufficiency, and pulmonary capillary leakage, often resulting in shock and death
- Hemorrhagic fever with renal syndrome (HFRS)
  - Fever, shock and renal insufficiency

Hantavirus Epidemiology

- Reportable nationally and in Maryland
- 25 – 40 U.S. cases annually
  - Most cases in southwest
    - HPS due to Sin Nombre virus
  - No Maryland HPS cases to date
  - "Local" HPS cases: WV, VA, PA
- Persons in areas contaminated with excreta at risk

Hantavirus Case Report, Maryland, 2008

- 22 year old male presented to emergency department (ED) with 3 days cough and fever
  - Pulmonary exam notable for expiratory wheezing
  - Received nebulized bronchodilators and discharged
- Returned 3 days later complaining of nausea, vomiting, crampy abdominal pain, diarrhea, headache, sore throat, persistent fever, myalgias, nonproductive cough, dark urine

Hospital Course

- Hypotensive in ED → admitted
- Day 3 of symptoms
  - Leukocytosis with bandemia and thrombocytopenia
  - Elevated transaminase, creatinine, and creatinine phosphokinase levels
- Day 6 of symptoms, decreased urinary output → acute renal failure attributed to rhabdomyolysis
  - Hemodialysis

Laboratory Findings

- Laboratory testing
  - Blood and urine cultures negative
  - Influenza, RSV, adenovirus, parainfluenza negative
  - Legionella pneumophila serogroup 1 negative
  - Hepatitis A, B, C negative
  - Leptospirosis negative
  - Hantavirus antibodies positive
    - IgG: 9.62 (<1.10)
    - IgM: 8.34 (<1.10)

DHMH Investigation

- Coordination with CDC
  - Clinical picture consistent with HFRS, not HPS
  - Sin Nombre virus
    - IgM, IgG negative
  - Seoul virus
    - IgM (1:1600), IgG (≥1:6400), and PCR positive
- Coordination with two local health departments and academic partners
  - Patient interview
  - Residence and workplace visits
  - Rodent trapping

Patient Interview

- No history of foreign or domestic travel
- Possible rodent exposure at work
  - Denied direct contact with rodents
  - Denied seeing rodents
  - Reported many others had seen rodents
- No other rodent exposure

Environmental Investigation and Recommendations

- Worksite
  - Rodent droppings visualized
  - Poor sanitation
  - Dry sweeping and power washing
  - Recommendations
    - Control rodent problem
    - No dry sweeping or power washing
- Residence
  - Rat burrows on same block as residence
  - Reviewed appropriate rodent hygiene with patient
- No rats trapped at either location

Seoul Virus Disease in U.S.

- Seoul virus
  - 50% seroprevalence in Baltimore Norway rats
  - Hemorrhagic fever with renal syndrome
    - Most cases in Korea, China, Japan, Russia
- Domestically acquired HFRS due to Seoul virus not previously diagnosed in acute stage in U.S.
- Retrospectively diagnosed in Baltimore patients with renal disease

Outcome and Lessons Learned

- Patient completely recovered
- Consider uncommon pathogens
- Collaboration essential
  - Two local health departments
    - Communicable Disease
    - Environmental Health
  - DHMH
  - CDC
  - Academic partners

References and Resources

- www.cdc.gov/rodents
- Woods C, Palekar R, Kim P, et al. Domestically Acquired Seoul Virus Causing Hemorrhagic Fever with Renal Syndrome — Maryland, 2008. *Clinical Infectious Diseases.* 2009;49(10):e109-12.

Acknowledgments

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- Kyle Shannon, RS, Zoonotic Disease Specialist, Anne Arundel County Department of Health

Questions ?

Maryland Infectious Disease and Environmental Health Administration

http://eh.dhmh.md.gov/ideah