



Urban Rats

Discussing the Problem

Gregory Glass, PhD


Departments of Molecular Microbiology & Immunology and Epidemiology
Johns Hopkins Bloomberg School of Public Health

E-mail questions at any time to maphtc@jhsp.edu






Rats: What they are

- 2277/5400 species of Mammals are Rodents (about 40% of all mammalian species)
- Rats are 'big' mice: Mammalian equivalent of 'germs'
- 56 species of genus *Rattus*
- 34 Other genera associated with *Rattus*
- Originated in Central/Eastern Asia
- N & S Americas have their indigenous species of 'rats'




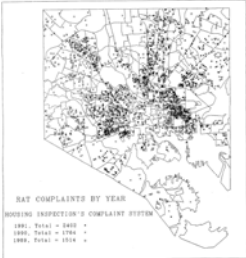
Some *Rattus* are Invasive Species Associated with Human Movement

Challenge of Synanthropic Animal Populations

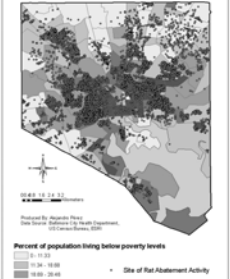
- **Animals that rely on human activities often affect quality of life for people**
 - Infectious diseases
 - Damage infrastructure
 - Food losses
 - Contaminate water
 - Physical damage
- **Attempts to reduce burden from animals**
- **Rat control efforts began in 1940's**
- **Leading to IPM**





RAT COMPLAINTS BY YEAR
INDICATING INSPECTION'S COMPLAINT SYSTEM

1980 - 1984 = 5452
1985 - 1989 = 1794
1990 - 1994 = 1034



Percent of population living below poverty levels

0 - 10.0
10.01 - 15.00
15.01 - 20.00
20.01 - 25.00
25.01 - 30.00

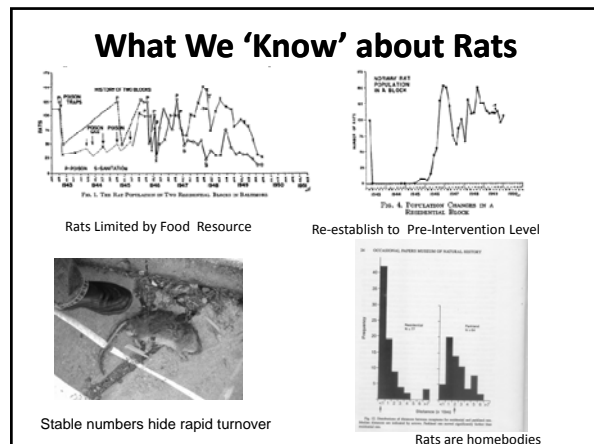
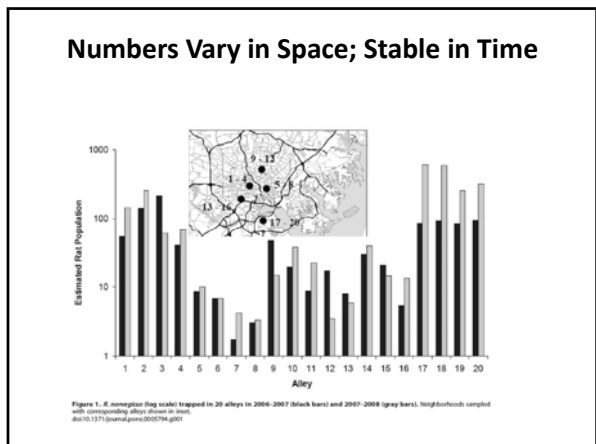
• Site of Rat Abatement Activity

Figure 2a Rat Abatement Activities by Poverty Levels Baltimore, MD 2007

Infestations are Persistent Problem

Why it remains problem

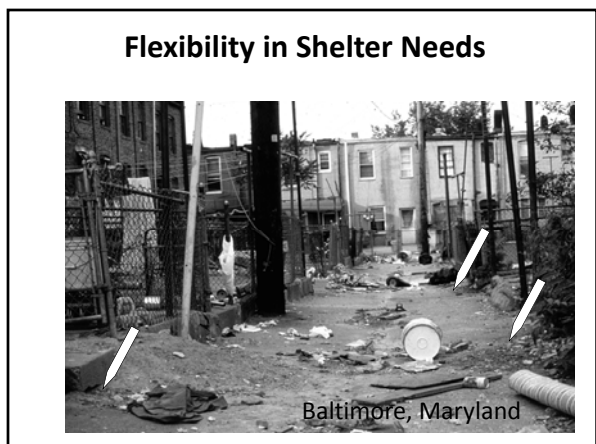
- View that it's insoluble - Self fulfilling outlook
- Other social challenges (crime, education, basic services, etc)
- Basic biology of rats



Homebodies Except for Breeding

- Females produce litters of 8-20 young
- Females breed with multiple males/litter
- Seek mates over 100's of meters
- Experience post-partum estrus

Resources for *Rattus*



Human Zoonotic Agents in Wild Norway Rats

Agent	Prevalence
Hep - E virus	74%
Hantavirus	58%
Leptospira interrogans	65%
Bartonella elizabethae	34%
Calodium hepatica	88%
Rickettsia typhi	7%
LCMV	0%

Easterbrook, et al. 2007a (Epi. Inf.)

Agents in Wild Norway Rats

Agent	Prevalence
Rat coronavirus (RCV/SDA)	92%
Rat parvovirus (RPV)	48%
Group B rotavirus	10%
Parvovirus H1	10%
Sendai virus	4%
Mycoplasma pulmonis	73%
Nippostrongylus braziliensis	72%
Cilia-assoc respir bacillus	52%

Easterbrook, et al. 2007b (Lab Animal)

Control/Eradication

- Elimination of populations
 - Directly reduce populations
 - Alter environment to make less suitable for rats
 - Combination of strategies – Integrated Pest Management

Targeting Populations Directly Unsuccessful; Variability in Results

Fig. 1. The Rat Population in Two Residential Blocks in Sacramento

TABLE 1 Lambropoulos et al 1999
Indicators of Rat Infestation at the Start and End of Each Study

Condition	Zone 1 (n = 849)		Zone 2 (n = 899)	
	Start	End	Start	End
Infested Properties	181 (21.3%)	75 (8.2%)	35 (3.9%)	3 (0.3%)
% Change	—	-61.3	—	-94
No Trash Containers	172 (20.3%)	148 (17.4%)	135 (15.0%)	123 (13.7%)
% Change	—	-13.4	—	-8.9
Bulk Trash Present	182 (21.4%)	115 (13.3%)	77 (8.6%)	75 (8.3%)
% Change	—	-36.8	—	-12.6
Units in Violation	248 (29.2%)	*	16 (1.8%)	*
Response from Units in Violation	45	*	7	*

*Data not available.

1) Within 6 months rats were at pre-intervention levels; 2) changing human behavior unsuccessful where infestations common

Population Treatment Successful in Limited Set of Circumstances



Challenge

- Commensal *Rattus* are unlikely to be globally eliminated → what is a socially acceptable level of infestation?
- Find a sustainable, acceptable, cost-effective strategy that the community incorporates into daily living that reduces rats to the 'acceptable' level