



## Health Emergencies

# Rodents in Disasters

Rodents are mammals of the order Rodentia, with rats and mice belonging to the suborder Myomorpha. Members of the Muridae family are the dominant species in every region of the world, due to their ability to adapt to and exploit new situations. Commensal rats and mice, that is those that live at the expense of humans, invade their dwellings, eat their food, upset their comfort, and frequently transmit diseases to them, belong to this family. Three species of commensal rodents are the most widely distributed: the Norwegian rat, *Rattus norvegicus*; the roof rat, *Rattus rattus*; and the common mouse, *Mus musculus*.

### Rodents and Public Health

Rats and mice (commensal and wild) have significance for public health chiefly due to their role as carriers or reservoirs for infections and diseases that can be transmitted to humans (zoonoses). The diseases present in the Americas include: the plague (*Yersinia pestis*), salmonellosis (*S. typhimurium*; *S. enteritidis*); leptospirosis (*L. icterohaemorrhagiae*); murine typhus (*Rickettsia typhi*); rickettsialpox (*R. akari*); lymphocytic choriomeningitis (arenavirus); rat-bite fever (*Spirillum minus*, *Streptobacillus moniliformis*); Hantavirus hemorrhagic pulmonary syndrome; hemorrhagic fevers (Arenavirus); Venezuelan equine encephalitis (alphavirus); Powassan encephalitis (Flavivirus); rabies; Rocky Mountain spotted fever (*R. rickettsii*); and tularemia (*Francisella tularensis*), as well as parasitisms, such as trichinosis (*Trichinella spiralis*); eosinophilic meningitis (*Angiostrongylus cantonensis*); and taeniasis (*Hymenolepis nana* or *H. diminuta*).

The transmission of these infections to humans occurs by indirect contact. Some are transmitted through contact with infected rodent urine or feces, others through fleas and lice, and still others through mosquito bites.

### Rodents and Mice in Natural Disasters

When natural disasters strike, rats and mice endure the same suffering as humans do. Many of them are crushed to death or drowned, die of starvation, or fall prey to infections. Their populations are frequently decimated. Moreover, there is often displacement among the survivors, who wander to new areas in search of protection, shelter, and food. Fearful and disorganized, it takes time for them to regroup and reorganize their social behavior, become familiar with their new environment, find safe havens, locate food and water, and memorize their movements. All this occurs before they reproduce again. Reproductive activity among wild rodents and commensal rats usually declines during the rainy season.

Colony building and reproduction only will begin when their new ecosystem has stabilized. Thus, the reestablishment of a rodent population after a disaster will take six to ten months under favorable conditions.



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The infections carried by the new populations can be transmitted to people when the conditions favor contact with contaminated rodent urine or feces or with their ectoparasites, vectors of the infections. This contact also occurs between various species of commensal and wild rodents, permitting transmission and cases of emerging or heretofore unknown infections in new geographical areas.

In conclusion, during the emergency the spread infection by rodents will not be an immediate concern. However, the activity and growth of rodent populations should be monitored as part of the surveillance of these diseases.

### MANAGEMENT AND CONTROL OF RODENT POPULATIONS

Decisions on rodent control after a natural disaster should be analyzed within an epidemiological and economic context, and steps to eliminate rodents should not be taken impulsively and haphazardly with the mass application of rodenticides. This measure takes time and money and exposes other animals (domestic animals) and people to an additional risk, which may be the chemical or biological components of the product. The indiscriminate elimination of rodents poses a greater risk, since the ectoparasites of these species, the vectors of the infections they carry, immediately seek out other hosts--among them humans--and transmit the infections to them. This is what happens with the plague and rickettsiosis.

Moreover, the disease vectors for people are not necessarily rodents. For example, the last leptospirosis outbreaks occurred in Peru and Ecuador during El Niño; in Nicaragua, after Hurricane Mitch, where the leptospire involved was *L. canicola*, whose principal reservoir is the dog; and in Belize, where the predominant leptospire was *L. harjo*, for which cattle are the principal reservoir. Consequently, the mass application of rodenticides would not be an appropriate measure.

#### What to Do:

- Keep an up-to-date epidemiological map of the geographical area, indicating the areas where infections have been detected where rodents are the reservoir.
- Identify the areas most vulnerable to access by rodents and contact with people--in particular, shelters, food storage sites, garbage dumps, and abandoned buildings.
- Determine the presence of fleas, lice, and other vectors for their immediate control.
- Search for indications of the growth of rodent populations: burrows, droppings, tracks and pawprints, gnawed food and materials.
- Monitor the health status of rat populations in specific areas. The capture and study of specimens should be the responsibility of specialized personnel.
- Control the rodent population. (Described below)



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## PREVENTION OF DISEASES TRANSMITTED BY RODENTS

- Community participation in both rural and urban areas is fundamental for the prevention of infections carried by rodents. A number of measures are recommended.
  - Protect food from rodents. Insofar as possible, use containers (metal boxes, clay or ceramic pots with lids, silos). Large volumes of food or sacks should be placed on wooden benches in an orderly fashion to facilitate inspection of the sacks.
  - Proper refuse and waste disposal. All materials that serve as a refuge for rodents--for example, cardboard boxes, idle machinery, wooden or brick troughs--should be removed from dwellings.
  - In areas where leptospirosis has been detected, shoes must be worn. Keep people from bathing in stagnant water.
  - General hygiene and sanitation. Dark, humid rooms and areas are undesirable; ensure that they receive adequate ventilation and light.
  - Application of pesticides for fleas and lice.

## Rodent Control

Rodent control activities should consider the epidemiological implications, ecology, and dynamic population of the rodents. When selecting the control methods, safety as well as public health and environment protection will be taken into account.

- **Environmental sanitation.** This is the best way to keep rodents out of housing and the neighborhood. It involves cleanliness, the proper storage and handling of food products, the proper disposal of organic products, and the elimination of everything that can serve as a refuge for rodents.
- **Traps.** These are used in situations where the use of rodenticides is undesirable or poses a risk. Traps are also used for scientific purposes or for the surveillance of disease and can be of the spring type or cages for the capture of live specimens. Traps are of little use in controlling major rodent infestations.
- **Rodenticides.** Rodenticides are rodent poisons. Toxic gases, as well as chemical and biological products, are available on the market. Rodenticides are not a solution in themselves. They should be accompanied by changes that permit an improvement in environmental sanitation.

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The application of rodenticides of any type should be carried out by specialized personnel and only when there is a recognized risk of a rodent population explosion and the risk of zoonosis transmission from rodents to people and domestic animals in rural or densely populated urban areas. In any case, the following is recommended:

  - Conduct an analysis of the risks mentioned above. Identify the predominant species of rodent (habits and behaviors differ; thus, the control measures can differ);



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- Conduct a situational diagnosis. Insofar as possible, use traps to determine the degree of infestation. Identify the localities where the infestation is greatest;
- Select the bait and determine where it is to be placed;
- Decide on the safety measures and inform the community;
- Conduct an evaluation two or three months later to determine the effectiveness of the measure.

### Health Emergencies Department

Tel: (202) 974-3434

Email: [emergencies@paho.org](mailto:emergencies@paho.org)