



Risk Mitigation Consulting Inc.

Intelligence and Analysis Division

WHITE PAPER SERIES

Rodent-Carried Illnesses and the Factors Increasing Risk of Exposure

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INTENT

This white paper is designed to provide an in-depth analysis of relevant, publicly available information on threat and hazard events/trends and their potential impacts to the interests of the United States, both at home and abroad. This product is not intended to be an all-encompassing assessment of the subject, rather, it provides a brief overview to provide the reader with situational awareness regarding topics with which they may not be familiar.



Rodent-Carried Illnesses and the Factors Increasing Risk of Exposure

Introduction

During 2018, California experienced a much larger outbreak of typhus than previous years.¹ Typhus is a bacteria that causes a variety of symptoms, including aches, fever, nausea, vomiting, and if left untreated serious organ damage. Additionally, other illnesses have begun to appear in the same or similar areas, such as typhoid.^{1,2,3} These outbreaks happen in areas with one similar characteristic; a large chance of humans coming into contact with rodent populations. While not usually life threatening, the rarity of the illnesses transmitted by rodents can make them hard to identify until multiple people are infected.⁴ Due to this, understanding the factors that influence rodent populations and their contact with humans is important for mitigating the chance of a group of humans becoming infected by these diseases.

Threats Posed by Exposure to Rodents

Direct

Rodents, primarily rats, are capable of transmitting several illnesses through different means. The primary vector for rodent to human illnesses are fleas. Fleas can carry typhus, various parasites, and other illnesses such as plague.^{5,6,7,8} While usually curable, these illnesses can still pose a threat, especially in the case of typhus where there is no vaccine.⁸ Additionally, illnesses can also be transmitted through contact with the rodent itself regardless of fleas as is the case with tularemia.⁶ These illnesses can be serious if left untreated but do require a near proximity to an infected rodent to be transmitted.

Indirect

In this case, indirect exposure refers to infection of a rodent-carried illness through a means other than rodents. While not nearly as common, a large rodent population in an area increases the risk of food becoming contaminated, animals such as pets coming into contact with the rodents and potentially spreading the illness, and infected individuals spreading the illness.^{1,3} While a primary focus will be given to case studies involving typhus, it is important to note the other risks associated with having a large rodent population including indirect transmission.

Rodent-Carried Illnesses

Typhus

Transmitted by the fleas of rodents, typhus has the capability to be spread by most animals with fleas but typically spreads by rats and opossums. The transmission to humans happens when coming into contact with infected fleas or infected flea feces.⁸ The harm in this illness comes from the non-unique symptoms. Fever, aches, vomiting, and the other symptoms of typhus are commonly seen in other illnesses.⁹ This increases the likelihood that the illness infects more people



before medical personnel discover that it is typhus and has a connection to rats, leading to the potential of a large-scale outbreaks in areas where typhus is not common.

Plague

While not nearly as large of a threat as it was in the middle ages, the bubonic plague shows the potential for damage that rodent-carried illnesses can have. Transmitted by flea bites, contact with infected tissue, and an infected human's coughs, plague can be extremely infectious in unsanitary conditions.⁵ While treatable with antibiotics, plague can be hard to diagnose in some cases and is extremely serious if left untreated.⁵

Angiostrongylus

Also known as the rat lungworm, *angiostrongylus* is a parasite spread by rats that has a unique transmission cycle. Rat feces contain the worm which is then spread to snails and slugs that can either transmit the parasite to humans by being consumed or indirectly through produce.¹⁰ While mostly prevalent in Southeast Asia and the Pacific islands, the parasite is being seen in other areas as well and has no specific treatment other than letting the worms die off and hoping for no serious damage.¹⁰

Case Studies

Overview

These case studies are intended to present both the effects that rodent-carried illnesses have and introduce the factors that affect rodent populations. A large rodent population can be an indicator of other threatening situations, along with posing the threat of transmitting illnesses. Due to their presence, areas with high rodent populations should take measures to reduce their populations, but also recognize the underlying issues that caused the population growth and attempt to solve them.

Los Angeles

In 2018 there was a massive resurgence of typhus in the Los Angeles County area. In that year there were 167 cases compared to the 13 in 2008 over the entirety of California.¹ Los Angeles in particular saw many of these cases. There are many competing theories to the cause of the rise in cases, but in general there is a trend among the theories. Most have some effect or involve contact with rodent populations.^{1,3,11} A popular suggestion is the rising homeless population in Los Angeles. The increase in people living on the streets increases their exposure to rats, along with both stray and pet dogs and cats. In addition, the trash from the increase in homeless provides food and cover for rodents to use.¹¹

Efforts have been made to reduce the risk of transmitting typhus in the Los Angeles area. Large scale cleaning efforts were implemented, including working with private businesses to clean unutilized buildings that can harbor rodents. In addition to this, trapping feral animals has also helped during previous outbreaks.¹¹ These efforts to reduce the level of contact between infected rodents and animals highlight the factors affecting the risk of transmission, primarily unsanitary conditions in areas with a large presence of humans.



Texas

Galveston, Texas previously had a reemergence of typhus in 2013. In this case, opossums seemed to play a much larger role in transmission than rats. Due to this, the factors opposite to those discussed in an urban environment played a role. The risk was most likely increased due to human activities encroaching further into rural areas and increasing the chance of coming into contact with opossums. While somewhat old, the reemergence of typhus in Texas shows that all rodents can pose a risk of spreading illnesses.^{4,9} Therefore, factors that increase the risk of humans, or pets of humans, coming into contact with any rodents should be considered.

Madagascar

While the plague is not near as potent as it was in the medieval era, it is still around today. Madagascar was hit severely by the plague in 2017. In total there were 2,348 confirmed, probable, and suspected cases of plague.¹² While the quick response of the government of Madagascar supported by WHO was able to distribute antibiotics and quell the outbreak, plague is seasonal in Madagascar and will continue to return.¹² The risk of illnesses such as plague should not be underestimated, as they are deadly and can thrive in areas with rodents, humans, and unsanitary conditions.

Hawaii

Hawaii's rat lungworm problem displays the potential for indirect infection rats can provide. Cases in 2019 have numbered up to 5, with ten in 2018.¹³ Because rats infect slugs, the parasite can remain on the leafy greens the slugs were on and transmission can happen through consumption of the infected slug or produce.¹⁴ The illness itself is not serious in most cases and the parasite dies over time, with most of the Hawaii cases following that trend.¹⁰ Hawaii does show the potential rats can have for indirect transmission as is the case with rat lungworm, and extra caution should be used to reduce the risk of these illnesses if they are present in your area.

Outlook

The risk that rodents pose should not be overlooked with the variety of different illnesses they can spread. In addition, these illnesses tend to be hard to diagnose as one carried by rats until multiple people have been infected. Rodent-carried illnesses are not always serious but can become so especially if left untreated. Because of this, rodent-carried illnesses pose enough of a threat to warrant consideration of the health risks involved with a large local rodent population.

In general, the threat of a large rodent population is most present when there is a high chance of human contact. While not the only way that rodent carried illnesses can be transmitted, human contact is the most common and factors that increase the chance of contact increase risk. Some of these factors can be urban environments, unsanitary conditions, and large amounts of humans in the case of rodents such as rats. Any condition that provides an easy source of food and shelter for rodents should also be considered, regardless of if that rodent is a rat. Efforts to reduce risk can include extermination, however, typically the most effective measures are the ones that help eliminate favorable conditions for rodents such as removing waste from streets. Due to the risk of rodent-carried illnesses, efforts should be made to reduce the chance of contact, direct or indirect, with local rodent populations.



Source List

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