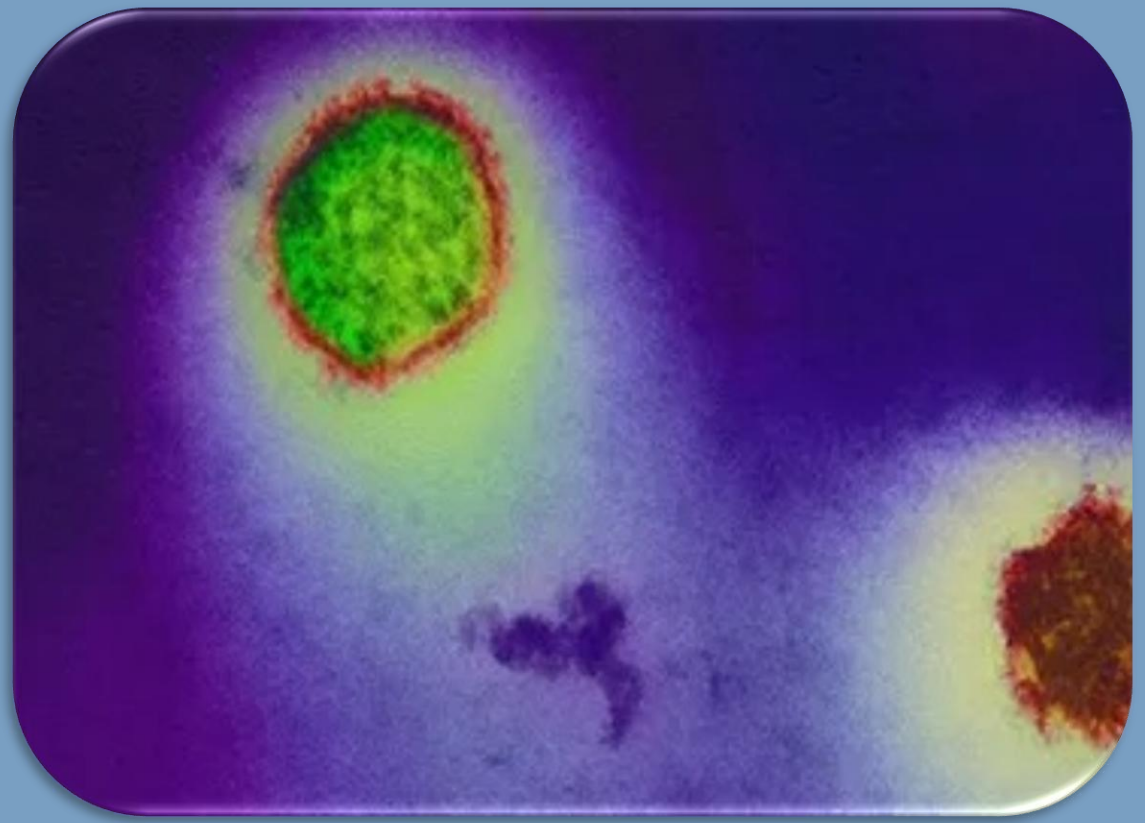


The Epidemiology of Hantavirus

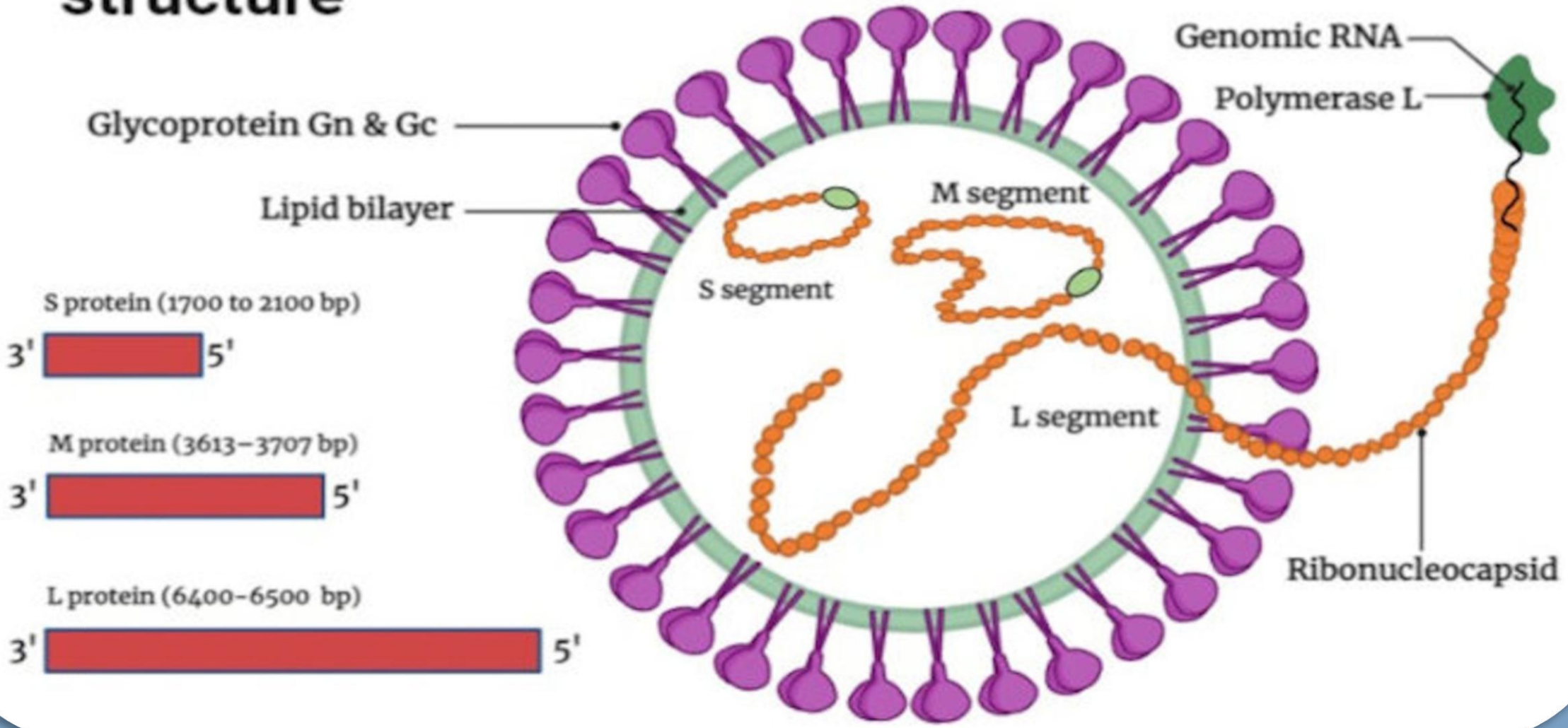
Hantavirus

Hantaviruses (HV) are viruses that belong to the Bunyaviridae family that are transmitted to humans through contact with the secretions of infected rodents.

They normally cause infection in rodents, but do not cause disease in them.

Humans may become infected with hantaviruses through contact with rodent urine, saliva, or feces.

Hantavirus structure



History

Hantaviruses have been suggested as a cause of "trench nephritis" in soldiers during the US Civil War and in British soldiers in Belgium during the First World War.

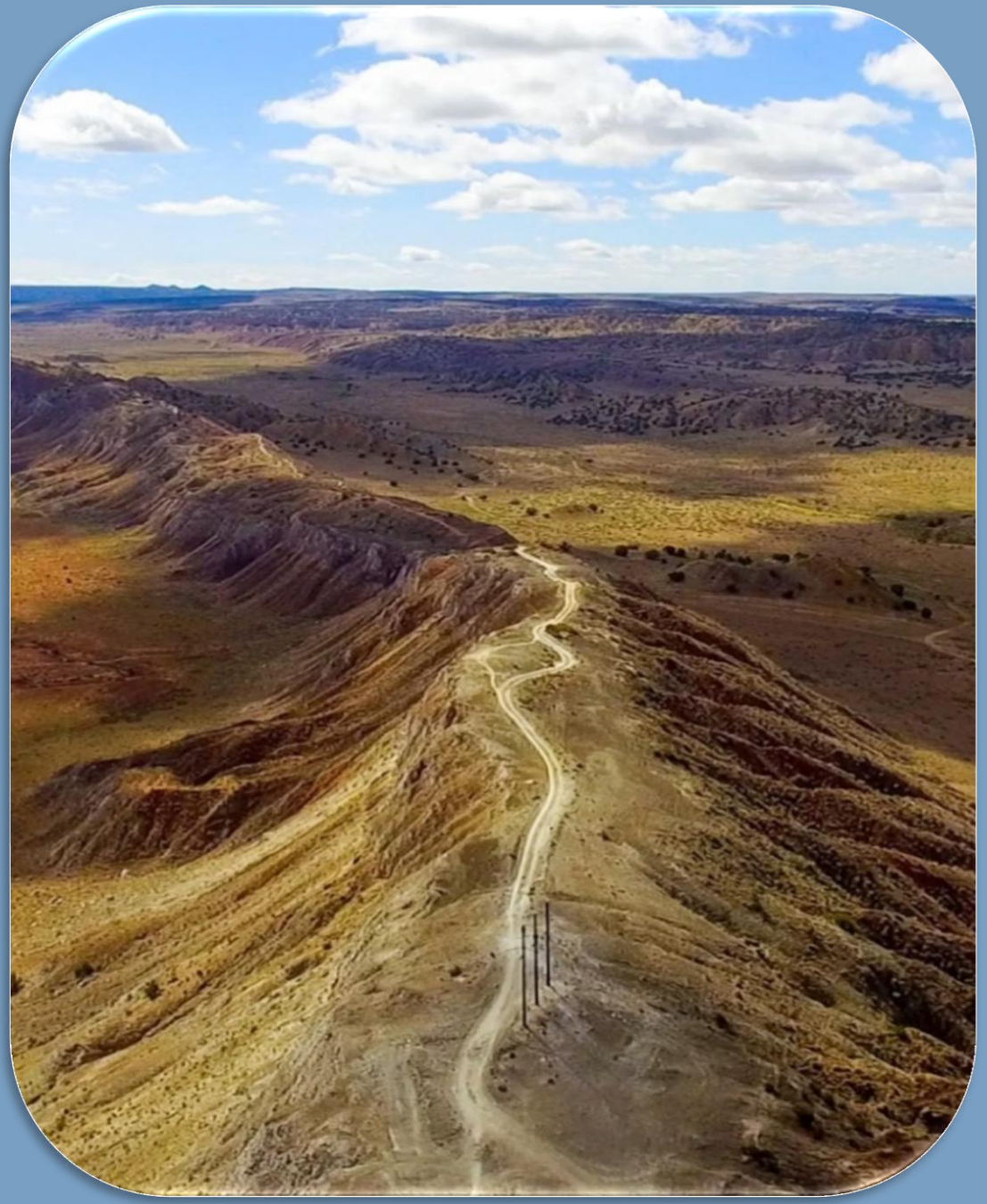
The disease was also mentioned in East Asia, where it was probably endemic, and was first described scientifically in Vladivostok in 1913–1914.

Around 3,200 cases of hemorrhagic fever occurred among United Nations soldiers stationed near the Hantan River during the Korean War, where it was first identified in 1951 and named "Korean hemorrhagic fever" and "epidemic hemorrhagic fever".

, in 1976 in South Korea, Ho Wang Lee tested striped field mice and showed that antigens from their lungs were reactive to antibodies in sera from war survivors. In 1978, the virus was isolated for the first time, and in 1980, it was named Hantaan virus after the river.

The 1993 Four Corners

Unexplained respiratory deaths cluster in Arizona, Colorado, New Mexico, and Utah — alarming public health officials. Researchers isolate a previously unknown pathogen: the **Sin Nombre virus**, named for the canyon where it was found.



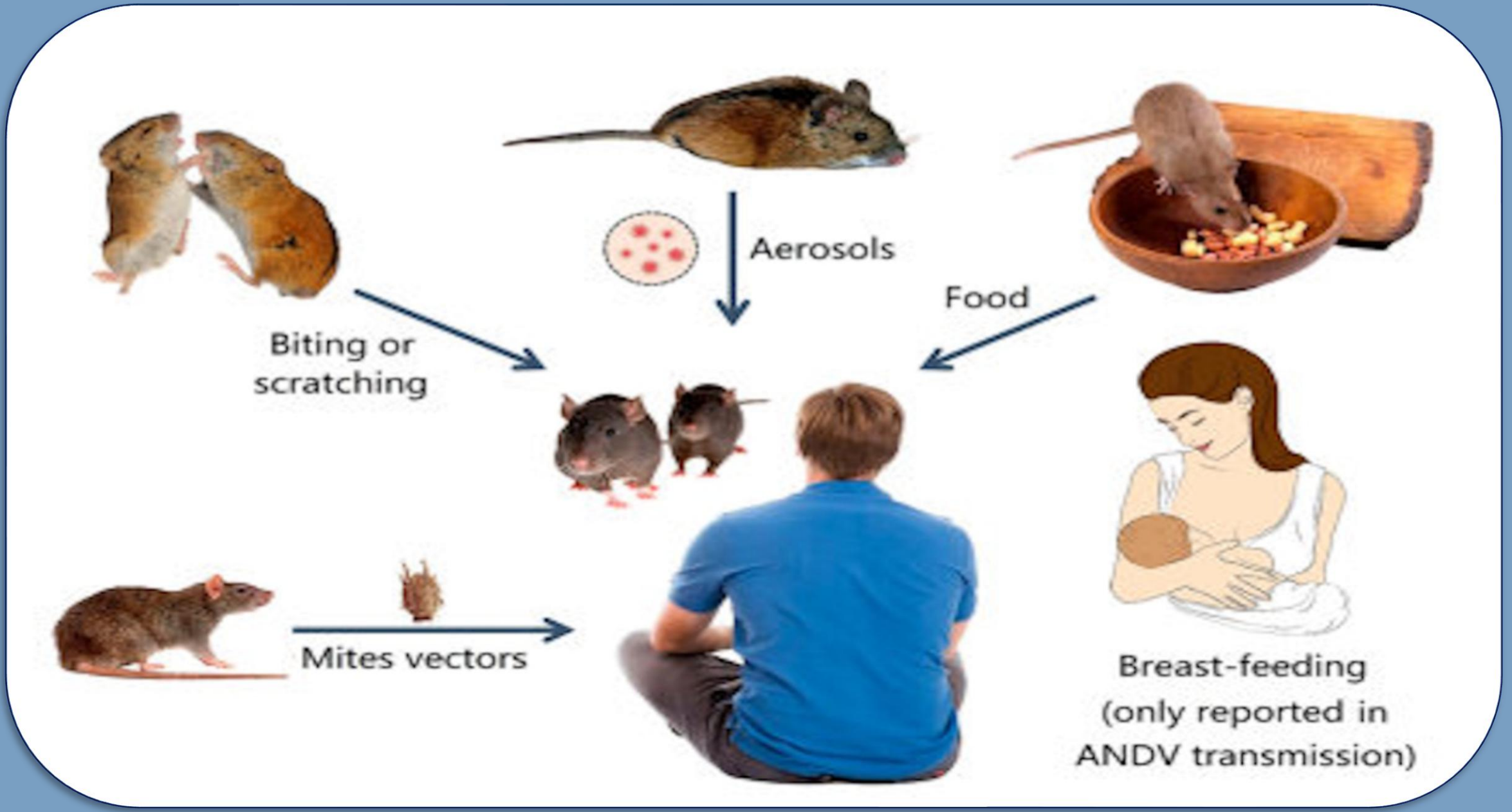
NEW MEXICO

Zoonotic Origin

Hantaviruses are carried by specific murid rodents, with each virus strain tightly linked to a single host species.

Transmission Route

Aerosolization of virus-contaminated rodent urine or feces represents the principal vehicle for the transmission of hantaviruses. Disease has also followed the bite of infected rodents because saliva contains virus, although this appears to be a much less frequent mode of transmission.


Aerosols
Food
Biting or scratching
Mites vectors
Breast-feeding (only reported in ANDV transmission)

Rodent – virus shedding & infectivity

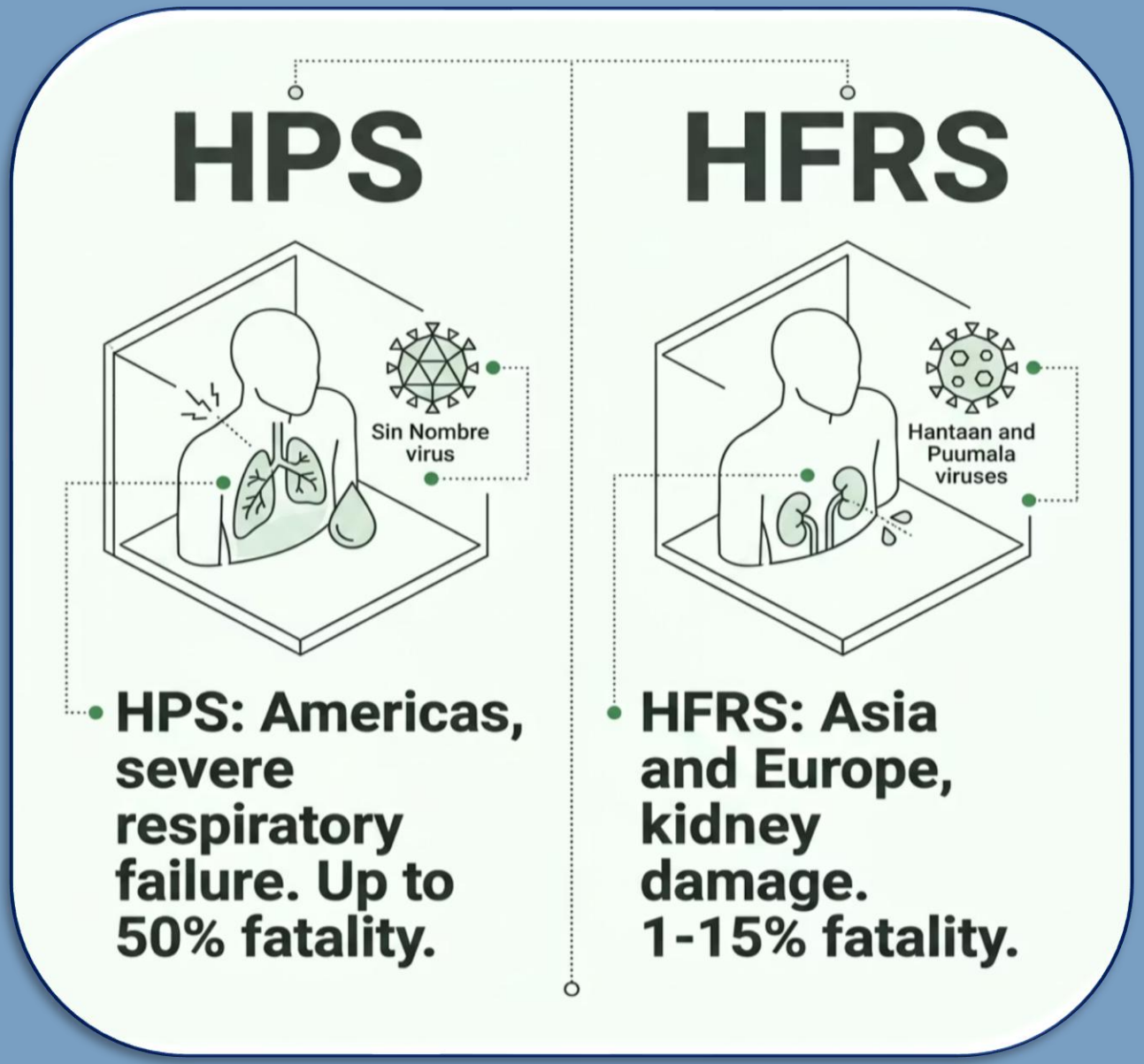
Rodent viral loads and shedding in saliva and excreta peak approximately 2–4 weeks following initial infection, and then decrease over subsequent months despite the persistence of viral RNA in host tissues.

Indirect inhalation is favored as the dominant mode of intraspecies transmission for many hantaviruses due to the ease with which the virus can pass between rodents (for example between cages up to 1.5 m apart for PUUV) and to people.

Live vole exposure experiments have demonstrated that PUUV remains infectious at room temperature for 12–15 days once outside the host.

Hantaviruses are carried by specific murid rodents, with each virus strain tightly linked to a single host species.

Humans are infected through aerosolized urine, droppings, or saliva from infected rodents — rarely through bites.



There are an estimated 100 000 to 200 000 cases of hantavirus infection each year worldwide.

HPS dominates the Americas, attacking the lungs

HFRS prevails across Asia and Europe, targeting the kidneys

Hantaan and Dobrava–Belgrade hantaviruses cause a severe form of HFRS in Asia and Balkans, respectively, whereas Puumala virus cause a milder form of HFRS in Northern and Central Europe. Seoul virus, carried by urban rats, causes a moderate HFRS worldwide.

Sin nombre and Andes viruses are the main causative agents of HCPS in Northern and Southern America, respectively.

- Hantaan virus (HTNV)
- Puumala virus (PUUV)
- Seoul virus (SEOV)
- Dobrava–Belgrade virus (DOBVs)

- Sin nombre (SNV)
- Andes (ANDV)

Hantavirus- specific antibodies

Paraguay (40%),

Salta province in Argentina (17%),

Los Santos province in Panama (13%),

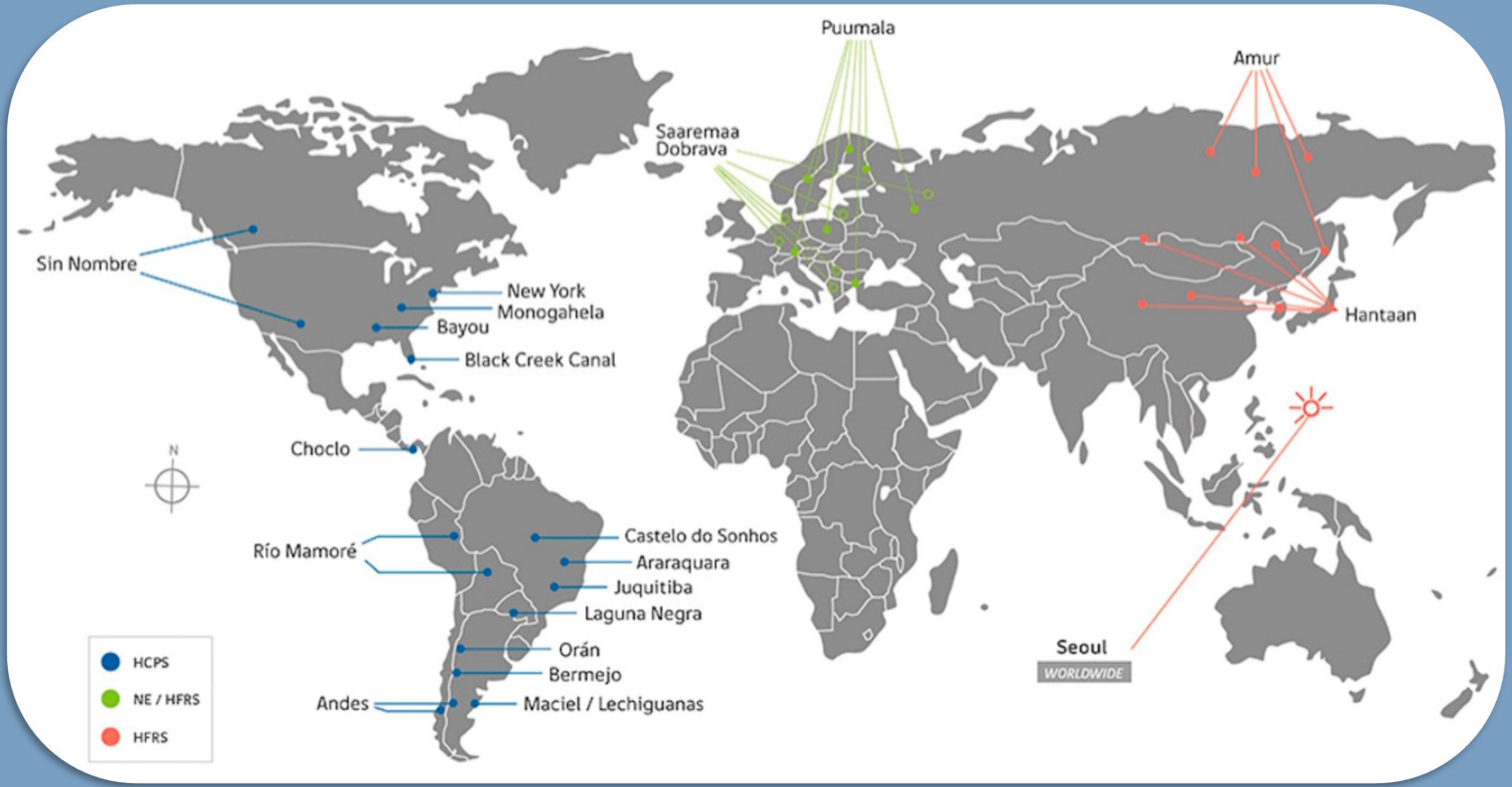
northern Sweden (20%)

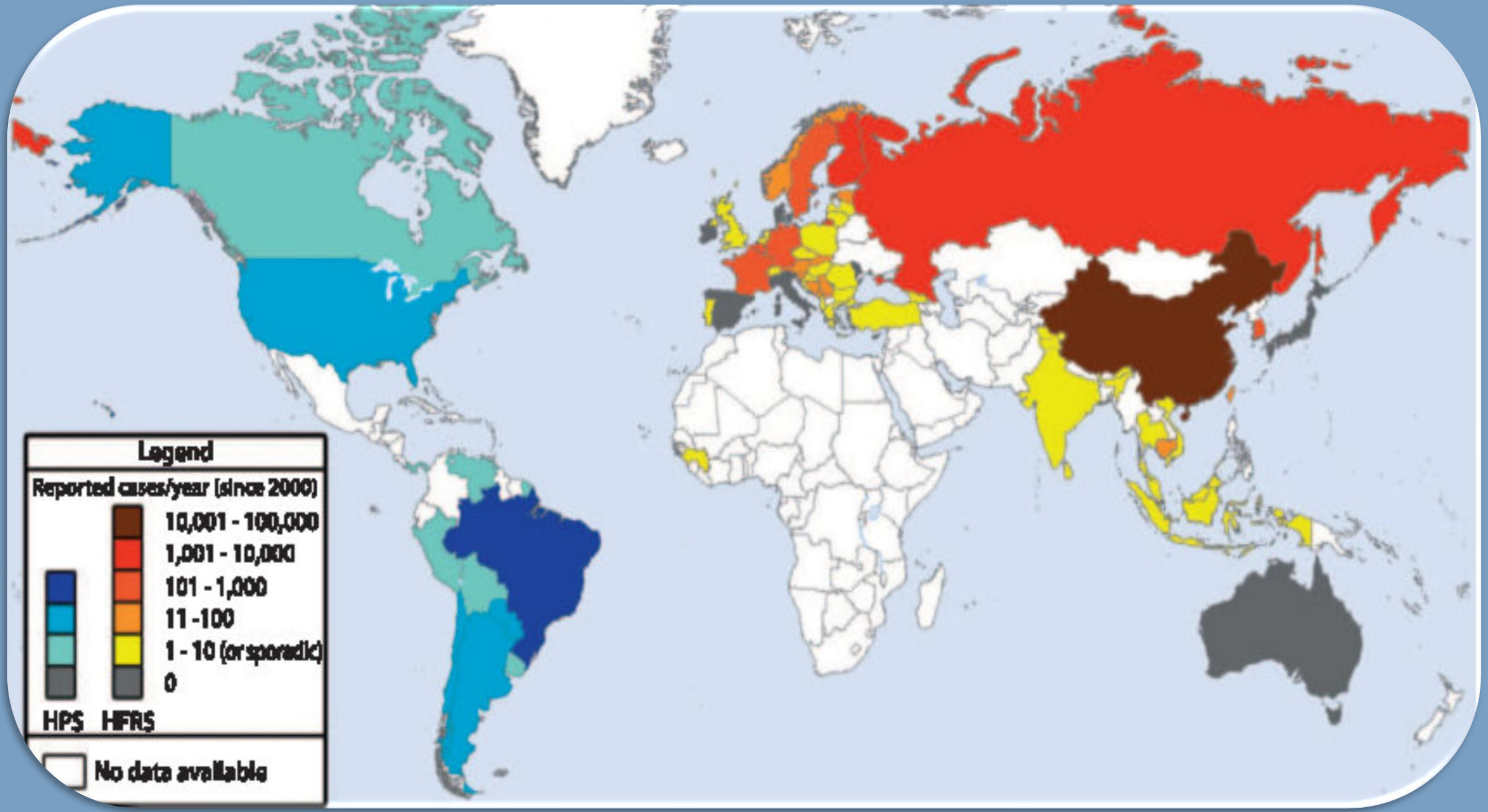
Iran (4.5%)

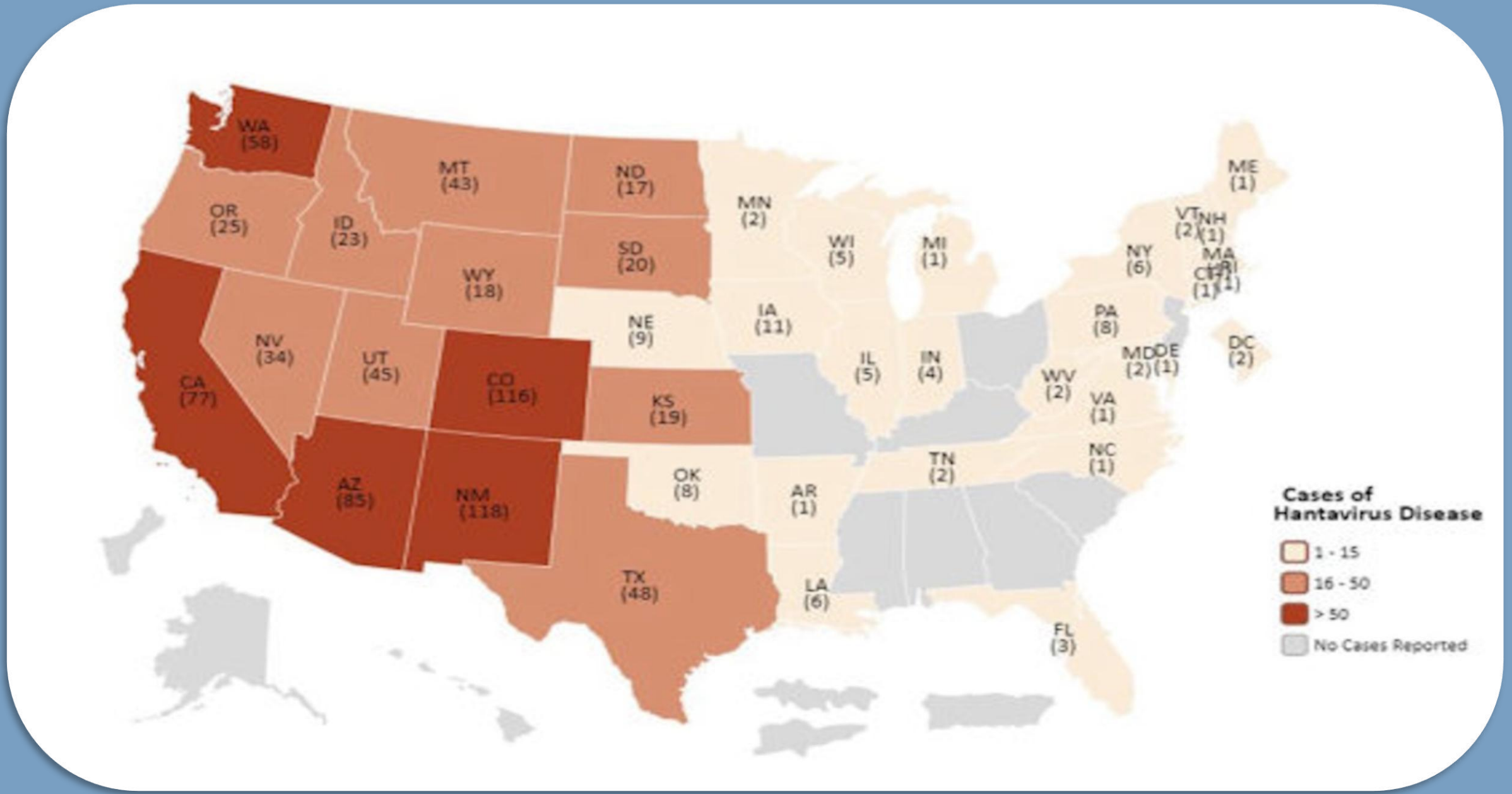
Sin nombre hantavirus-specific antibodies in only approximately 0.5% of those sampled suggesting infection of humans with SNV is rare.

These infections are considered dead-end events for the virus, due to an absence of human-to-human transmission. One exception is known; Andes virus (ANDV), which can be occasionally transmitted among people.

Seoul is the only hantavirus known to cause disease in urban areas, as the other hantaviruses are associated with rodents that are predominantly rural in their distribution.


Puumala
Amur
Saaremaa
Dobrava
Sin Nombre
New York
Monogahela
Bayou
Black Creek Canal
Hantaan
Choclo
N
Río Mamoré
Castelo do Sonhos
Araraquara
Juquitiba
Laguna Negra
Orán
Bermejo
Andes
Maciel / Lechiguanas
Seoul
WORLDWIDE
HCPS
NE / HFRS
HFRS


Legend
Reported cases/year (since 2000)
10,001 - 100,000
1,001 - 10,000
101 - 1,000
11 - 100
1 - 10 (or sporadic)
0
HPS
HFRS
No data available


WA (58)
OR (25)
CA (77)
ID (23)
NV (34)
MT (43)
WY (18)
UT (45)
AZ (85)
CO (116)
NM (118)
ND (17)
SD (20)
NE (9)
KS (19)
OK (8)
TX (48)
MN (2)
IA (11)
MO (5)
AR (1)
LA (6)
WI (5)
IL (5)
MI (1)
IN (4)
OH (4)
KY (2)
TN (2)
MS (1)
AL (1)
GA (1)
FL (3)
SC (1)
NC (1)
VA (1)
WV (2)
PA (8)
NY (6)
MD (2)
DE (1)
NJ (1)
CT (1)
RI (1)
MA (1)
VT (2)
NH (1)
ME (1)
DC (2)
Cases of Hantavirus Disease
1 - 15
16 - 50
> 50
No Cases Reported

Ecological Drivers of Emergence

Climate Change

Milder winters boost rodent survival and expand their geographic range.

Habitat Fragmentation

Loss of predator biodiversity removes natural checks on rodent populations.

The Dilution Effect Human-driven disturbance favors a single dominant, virus-carrying rodent species — amplifying transmission risk.

Climate Variables

Temperature, precipitation and rainfall, have similarly been highlighted as drivers of hantavirus cardiopulmonary syndrome outbreaks and nephropathia epidemica infections in other areas.

cool and damp conditions are able to substantially prolong infectiousness.

The Human Element

Who Is at Risk?

Average patient age is **38**, with **63% male** prevalence — reflecting occupational exposure patterns.

High-Risk Activities

Forestry, farming, and **cleaning enclosed rodent-infested spaces** are the most common exposure scenarios.

Loss of predators

Loss of predator biodiversity removes natural checks on rodent populations.