



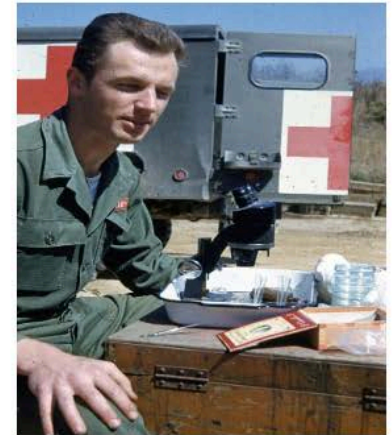
**Figure 1:** CPL Don Feeney of the Walter Reed Surgical Research Team at the 48th MASH in Korea examines a specimen in 1954. Photo: courtesy of the Donald J. Feeney Photo Collection.



**Figure 2:** Hemorrhagic manifestation of the conjunctiva. Epidemic Hemorrhagic Fever in Korea, 1952. National Museum of Health and Medicine (MIS 52-902-1).



**Figure 3:** Surgical Research Team at 48th MASH in Korea, 1954. Photo: courtesy of the Donald J. Feeney Photo Collection.



**Figure 4:** Entomologist, Stan Hoyt examines rodents for chiggers which were investigated as potential vectors of EHF in the early 1950s. Photo: courtesy of the Donald J. Feeney Photo Collection.

# Hantavirus infections among military forces

Mustonen J, *et al.*, 2024 Mil Med. 2024 Feb 27;189(3-4):551-555. (IF 1.2 H-Index 79, Q3)



Dr. Christian A. García-Sepúlveda  
Dr. Miguel Angel Jaramillo-López

Laboratorio de Genómica Viral y Humana  
Facultad de Medicina  
Universidad Autónoma de San Luis Potosí

# Historical Background

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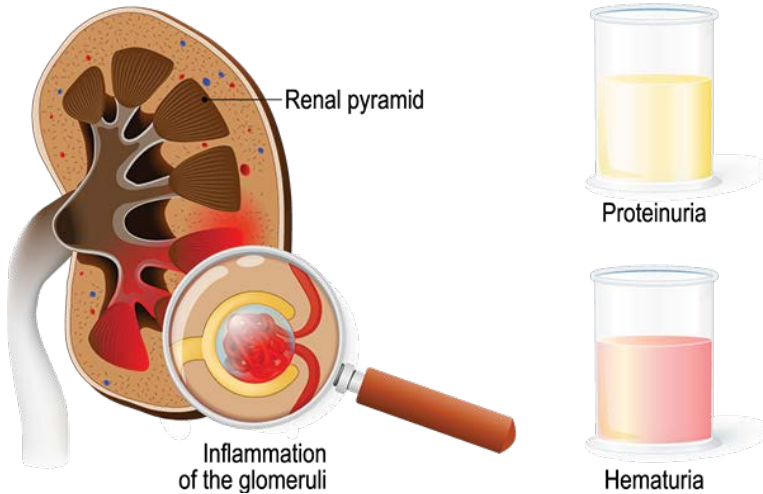
- “Trench nephritis”
- American Civil War 1862-1863
- World War I 1914-1918
- Clinically characterized:
  - ✓ Breathlessness
  - ✓ Swelling of the face or legs
  - ✓ Generalized dropsy
  - ✓ Hypertension



# Histopathology

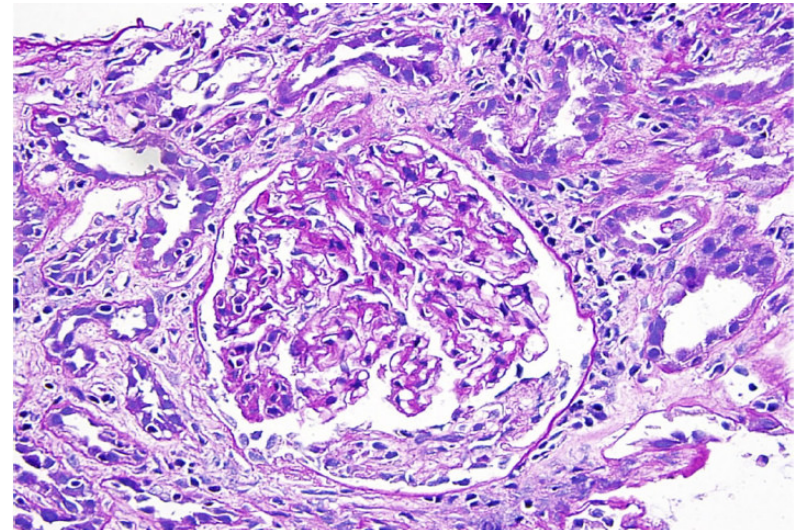
## Trench Nephritis

- Kidneys swollen
- Pale rather than haemorrhagic
- Acute glomerulonephritis



## Hantavirus infection

- Acute tubulointerstitial nephritis
- Mild glomerular changes



# Japanese and Russian armies

- Boundary between Manchuria and Soviet Union
- 1932
- Clinical and epidemiology studies- viral infection
- Disease in human volunteers by intravenous injection
- Couldn't establish the disease in animals
- Epidemic Hemorrhagic Nephrosonephritis (Russia)
- Manchuria Hemorrhagic Fever or Songo fever (Japan)
- HFRS
- Hantavirus???



# Puumala epidemic during WW II (Northern Finland)

- Front of Salla, Eastern Lapland, Finland
- 1942- 1000 German and 60 Finish
- Kondrad Stuhlfauth (1943)
- Herman Hortling(1944)





# Nephropatia epidemica (NE)

1945



Suggested by  
Myhrum



1980, Brummer-  
Korvenkontio,  
Vaehri- bank vole  
(*Myodes glareolus*)

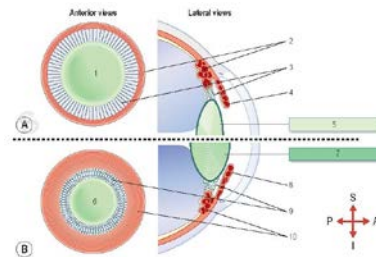


Virus was named  
Puumala



# PUUV clinical features

- High fever, headache, abdominal and back pain, nausea and vomiting
- Hypotension
- Transiently reduced vision- 25%
- “Accommodation cramp”
- 12-26% of patients



No fatal cases

Fatality rate: <0.1% (Finland), 0.4% (Sweden)

## Laboratory findings

- Proteinuria
- Hematuria
- Reduced renal function



Bank vole



Lemming

# Hantaan virus epidemic in Korean war

- 3200 cases
- 1951 – 1954
- United Nations soldiers
- Isolated events, small outbreaks
- Fatality rate 5-10%
- American Army medical services established a Hemorrhagic Fever Center close to the region in which the largest number of cases occurred in South Korea.



24-Hour Urine Collection





# Clinical picture

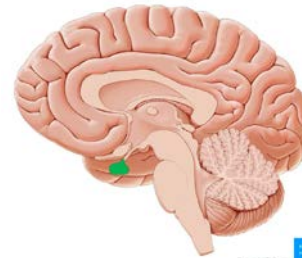
- Sudden intense headache
- Chills
- Anorexia
- Vomiting
- Petechial rash



## Laboratory findings

- Leukocytosis
- Thrombocytopenia
- Albuminuria
- Elevated serum creatinine

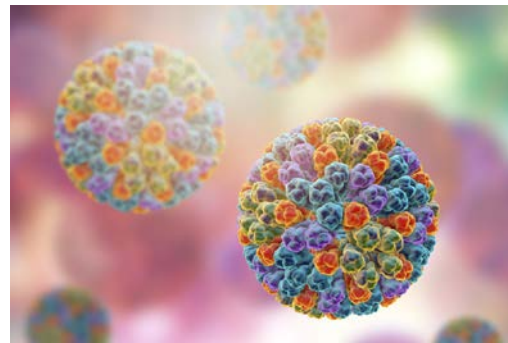
## Hemorrhages



# Korean hemorrhagic fever (KHF)

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- Remained unknown until 1978
- New virus discovered- *Hantaan virus* (HTNV)
- Striped field mouse (*Apodemus agrarius*)
- Incubation period 2-6 weeks
- Several deaths in the United States among military personnel who returned from Korea



# Puumala and Dobrava infections in Balkan war

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## 1987-2001

235 cases of HFRS

Croatia

147 (63%) were among  
Croatian army soldiers

## Epidemic in 1995

129 HFRS cases

120 were soldiers

Soldiers were typically accommodated in wooden huts in beech forests  
Bank Vole (PUUV) and yellow-necked mouse (DOBV)



# Other cases

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14 of 3754 U.S. mariners who participated in a joint United States– Republic of Korea training exercise in 1986 developed HFRS. 10 were hospitalized and 2 died.

In 2005, four U.S. soldiers acquired HFRS caused by HTNV while training near the demilitarized zone in South Korea

In Sweden, 705 soldiers involved in field training in three PUUV- endemic counties were bled twice within a 6-month interval



The conditions in war frontiers are an important risk factor

Conclu



Use of traps and poisons, elimination of rodent food sources, measures to prevent rodent entering houses, ventilation of rooms, and use of rubber gloves, disinfectants, and masks. No effective among soldiers.



# RVPVE

## Red de Vigilancia de Patógenos Virales Emergentes



CEFPPPE - SLP



CIAAS - CIACYT



Christian A. García-Sepúlveda — Laboratorio de Genómica Viral & Humana, Facultad de Medicina UASLP

Sandra E. Guerra-Palomares — Laboratorio de Genómica Viral & Humana, Facultad de Medicina UASLP

Juan Carlos Cuevas Tello — Grupo de Bioinformática, Facultad de Ingeniería UASLP

Ignacio Amezcua Osorio — Comité Estatal para el Fomento y Protección Pecuaria de San Luis Potosí (CEFPP)

Guillermo Espinosa Reyes — Centro de Investigación Aplicada en Ambiente y Salud (CIAAS), Facultad de Medicina UASLP

Fernando Díaz-Barriga Martínez — Centro Colaborador OMS/OPS CIAAS, Facultad de Medicina UASLP

Andreu Comas García — Epidemiología y virología molecular, Depto. Microbiología, Fac. de Medicina UASLP

Dulce Ma. Hernández Piña — Lab manager, LGVH UASLP

J. Manuel Mendoza Méndez — Hantavirus americanos en roedores silvestres, LGVH UASLP

Nidya Jurado-Sánchez — Vigilancia de vectores y arbovirus, LGVH UASLP

Mariel Pacheco-Cortez — Hantavirus SEOV en personal biomédico, LGVH UASLP

Samuel Mora-Andrade — Bat collection research, LGVH UASLP

Carolina Escalante Vargas — Bat collection research, CEFPP

