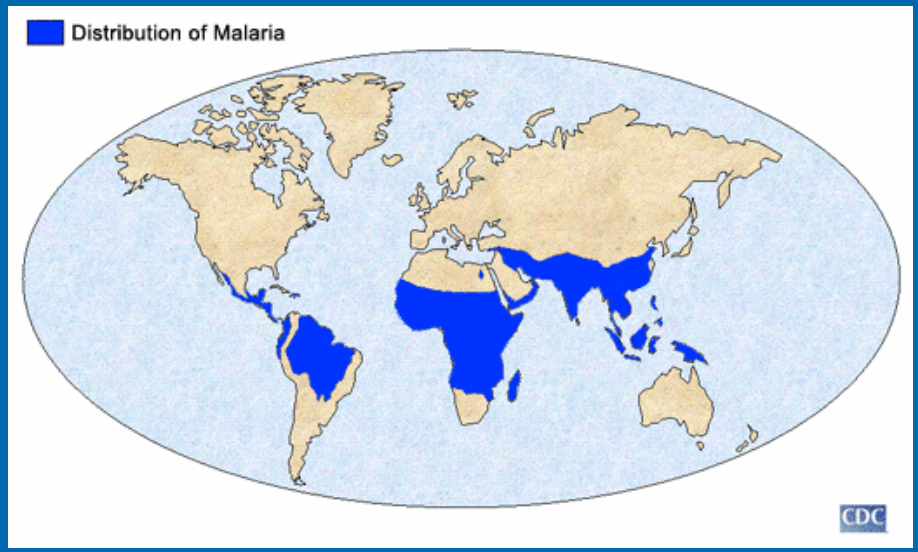
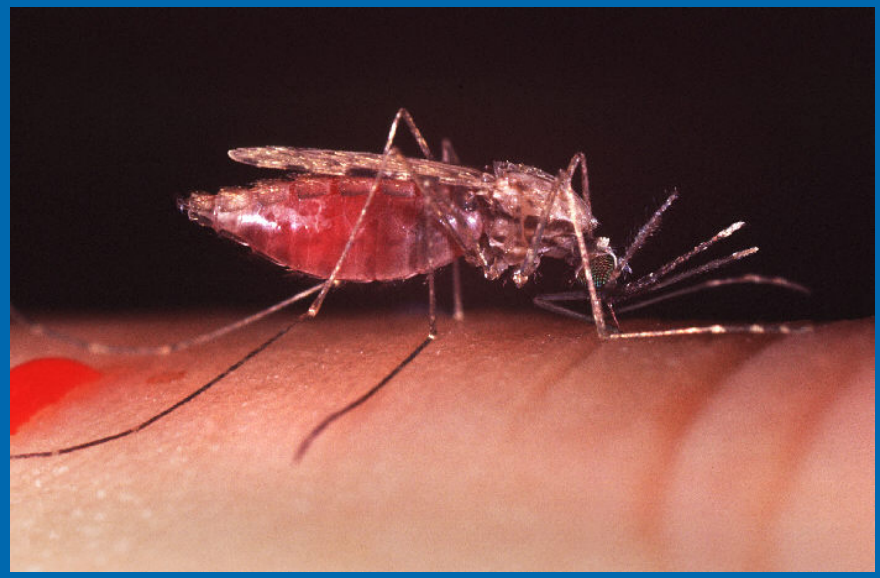
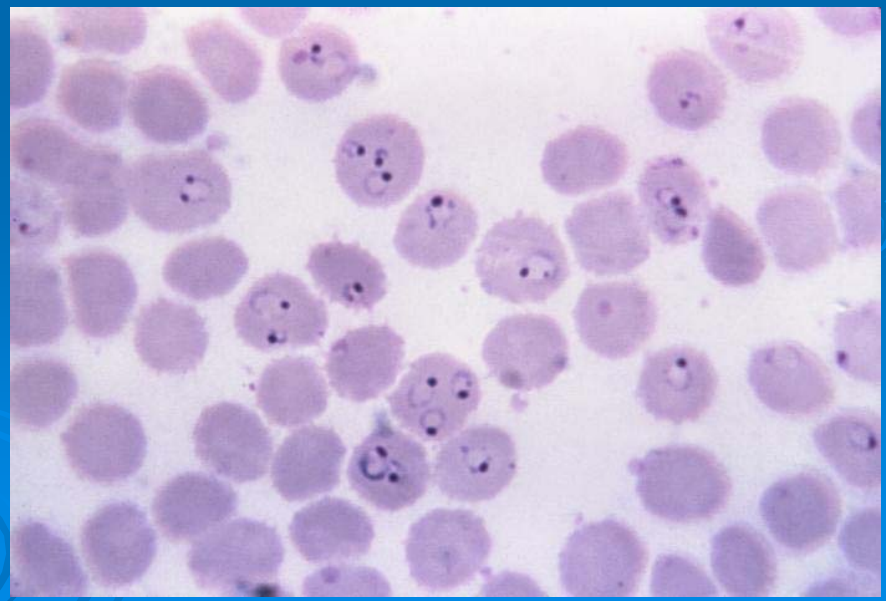
Emerging and newly recognized, transfusion-transmissible infectious agents

Roger Y. Dodd, PhD
American Red Cross
Holland Laboratory

Malaria







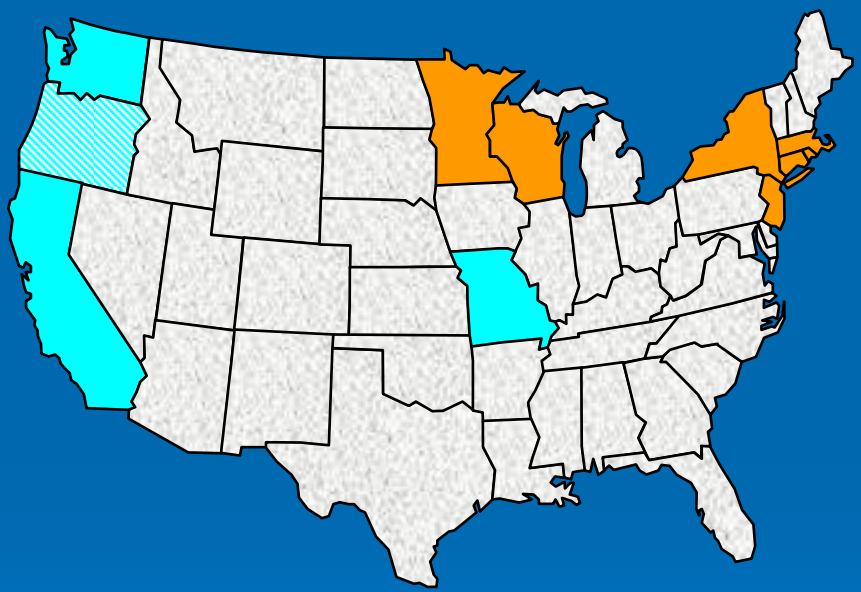
Malaria: background

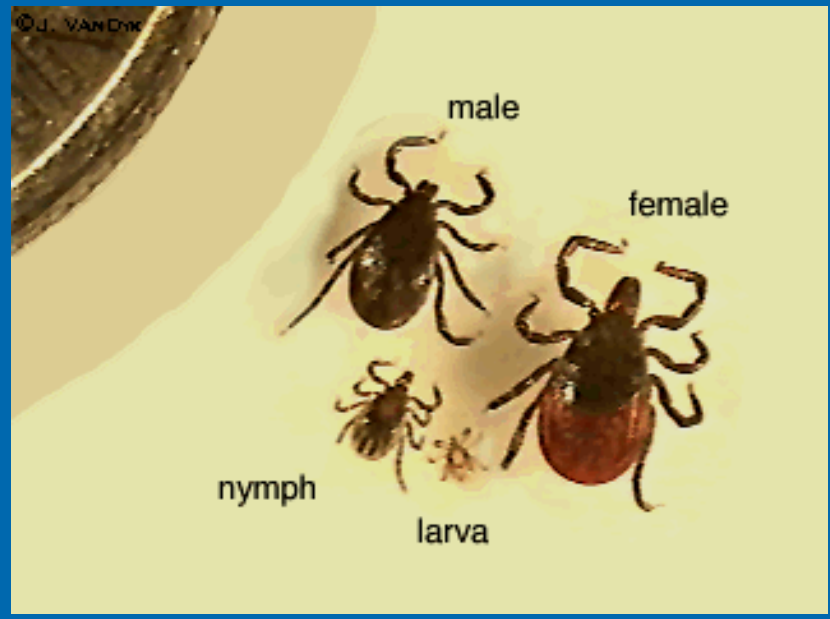
- Intraerythrocytic protozoan parasite, 4 species of *Plasmodium*
- Acute and chronic infection and disease, asymptomatic to fatal
- Transmitted by mosquitoes
- Global distribution in tropics and sub-tropics
- 300-500 million cases annually, 1.5-2.7 million deaths
- About 1000 imported cases annually in US, plus a handful of inexplicable cases

Malaria and transfusion

- Globally, probably most frequent TTD
- Survives in stored cellular products
- Essentially all recipients susceptible
- 2-4 transfusion cases annually in US
- Risk stable, could increase with travel and potential reemergence
- Travel history is current intervention
  - >50,000 donors/year deferred

Babesia





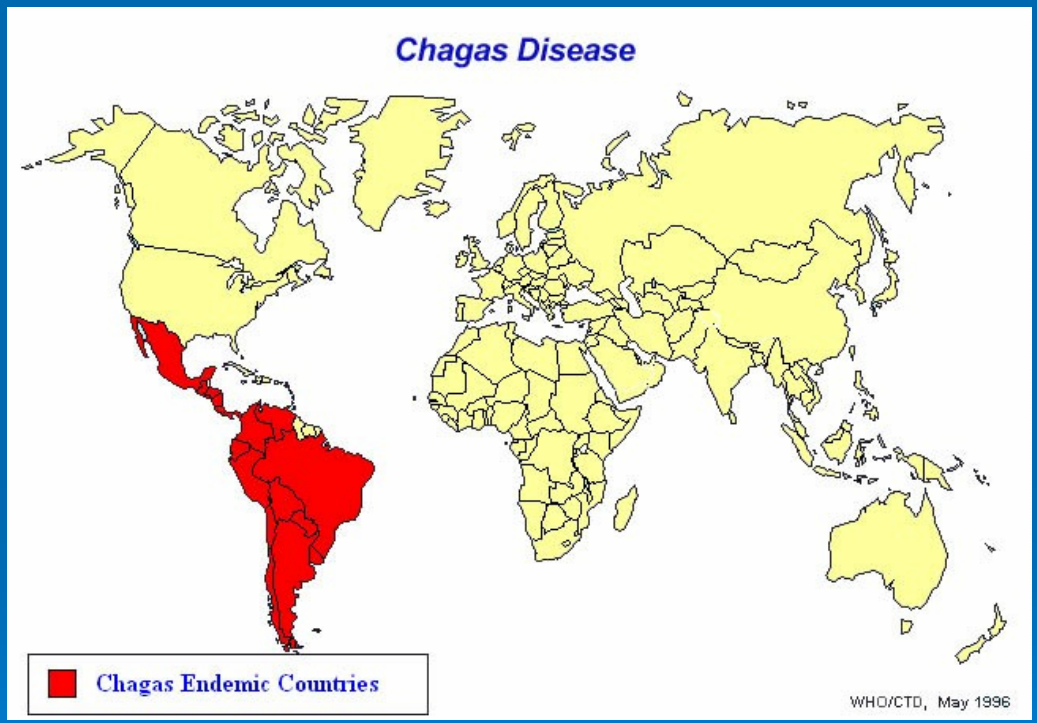
Babesia: background

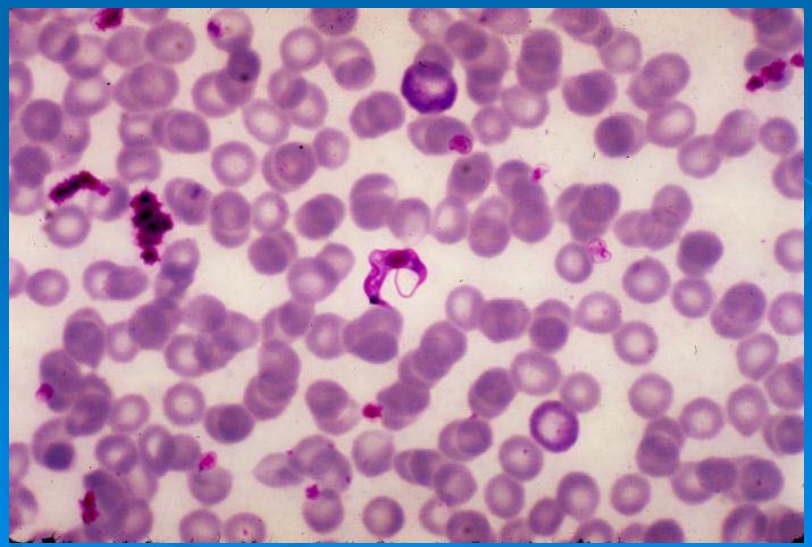
- Intraerythrocytic protozoan parasite, one major species
- Acute disease, up to 6 months subclinical infectivity, treatable, fatal for selected recipients
- Transmitted by ticks
- *B. microti* Northeast US, upper Midwest, others Midwest, Pacific coast
- Cases not reported, seroprevalence up to 1.5%

Babesia and transfusion

- Transfusion transmission recognized in US, Japan (I case)
- Survives in erythrocyte-containing components (including platelets)
- Outcomes worse in aged, splenectomized and immunocompromised
- More than 50 transfusion cases to date, demonstrable risk 1:1000 in highest incidence area of CT
- Risk increasing with geographic spread of agent, host/vector
- No available effective intervention
  - Donor population management, hospital vigilance and recipient treatment
  - Potential for testing?

Chagas' disease





Chagas': background

- Protozoan parasite, free in blood, tropism for smooth and cardiac muscle
- Acute disease and chronic (lifelong) infection, asymptomatic to fatal
- Zoonosis, transmitted by triatomine bugs
- Agent, vectors found in continental Americas, 40°S - 40°N, human cases only in Mexico, S. and Central America
- 19-20 million infected individuals, incidence declining
- At least 100,000 infected individuals in US as a result of population movements

Chagas' and transfusion

- 12 – 50% from infected blood in S. America
- Survives in stored components, most infections from whole blood or platelets
- Severe disease in immunocompromised patients
- At least 7 cases in North America, estimated seroprevalence 1:40,000 to 1:25,000 (60% parasitemia)
- Risk increasing in US (population movement and focus on Hispanic donors)
- No effective intervention available: questioning neither specific nor sensitive
  - Antibody testing would be effective

Leishmania

- Current and past concern relate to troop and civilian deployment in Iraq and Afghanistan
- Protozoan parasite transmitted by sandflies: widespread in tropics
- A few historical examples of bloodborne transmission: no current cases
- Intervention: deferral for returnees from middle East conflict areas

Bacterial contamination: general

- Outgrowth of bacteria in components
- Acute to fatal disease
- Skin or environmental contaminants or donor bacteremia
- Generalized occurrence
- Frequency depends on measure
  - 1:1500 platelets with reactive cultures
  - 1:19,000 platelets result in detectable reaction
  - 1:100,000 reported septic cases (BaCon)

Bacteria and transfusion

- Most frequent ID outcome in US
- Platelets>rbc>plasma
- All recipients susceptible, worse in immunocompromised and fragile patients
- Risk falling(?) as a result of intervention
- Intervention – AABB and CAP Standard
  - “Limit and detect”
  - Bacterial culture, surrogate measures, sample first, skin-prep

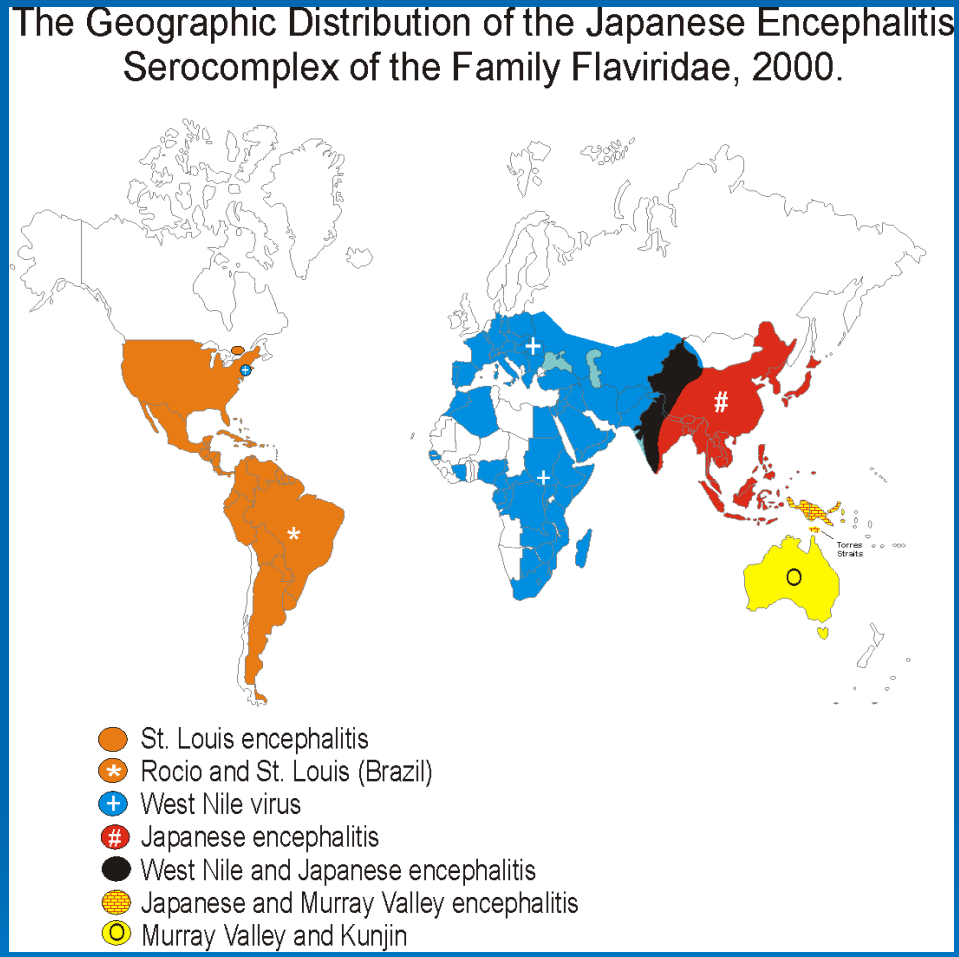
Anaplasma phagocytophilum

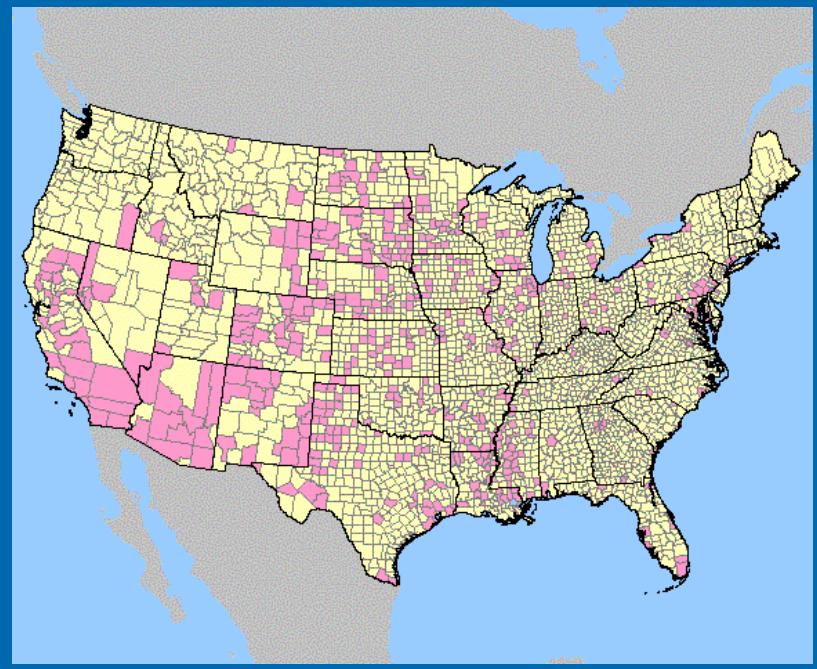
- Agent of human granulocytic ehrlichiosis
- Northeast, upper Midwest, occurs with *Babesia* etc
- Transmitted by ticks
- One suspect transfusion case reported
- No definitive intervention (leukoreduction may help)
- Prevalence studies ongoing – up to 3.5%

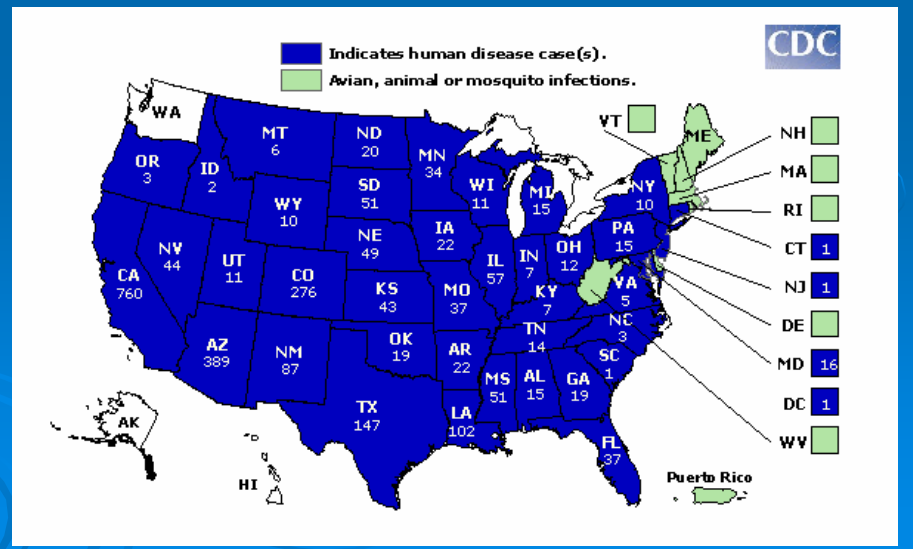
Other bacteria

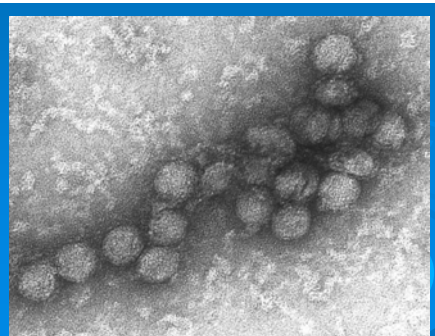
- *Borrelia burgdorferi*
  - Agent of Lyme disease, no transfusion cases
- *Bartonella* spp
  - Bloodborne, of concern, no cases
- Rickettsiae
  - RMSF, no cases, *Orientia* has in-vitro capability
- *Chlamydia* spp
  - Intracellular, no cases

WNV


The Geographic Distribution of the Japanese Encephalitis Serocomplex of the Family Flaviridae, 2000.
St. Louis encephalitis
Rocio and St. Louis (Brazil)
West Nile virus
Japanese encephalitis
West Nile and Japanese encephalitis
Japanese and Murray Valley encephalitis
Murray Valley and Kunjin




CDC
Indicates human disease case(s).
Avian, animal or mosquito infections.
WA 3
OR 3
CA 760
ID 2
NV 44
MT 6
WY 10
UT 11
AZ 389
CO 276
NM 87
ND 20
SD 51
NE 49
KS 43
OK 19
TX 147
MN 34
IA 22
MO 37
AR 22
LA 102
WI 11
IL 57
MS 51
MI 15
IN 7
KY 7
TN 14
AL 15
OH 12
GA 19
FL 37
SC 1
NC 3
VA 5
PA 15
NY 10
VT
ME
NH
MA
RI
CT 1
NJ 1
DE
MD 16
DC 1
WV
AK
HI
Puerto Rico



WNV: background

- Flavivirus (enveloped, RNA)
- Acute infection, asymptomatic to fatal disease
- Transmitted by mosquitoes, usually from infected birds
- S Europe, Africa, Middle East to India, arrived US 1999, endemic in essentially all of the continental US by 2004
- Up to 400,000 individuals infected in 2002, 2003 in US

WNV and transfusion

- Transfusion transmission rare to absent outside US
- Virus survives in all stored components
- Most recipients susceptible
- 23 documented transmissions 2002
- Risk profile unknown – stable, declining?
  - 1.5/10,000 RNA positive donors in 2003
- Primary intervention is NAT for WNV RNA in small pools, and singly where indicated

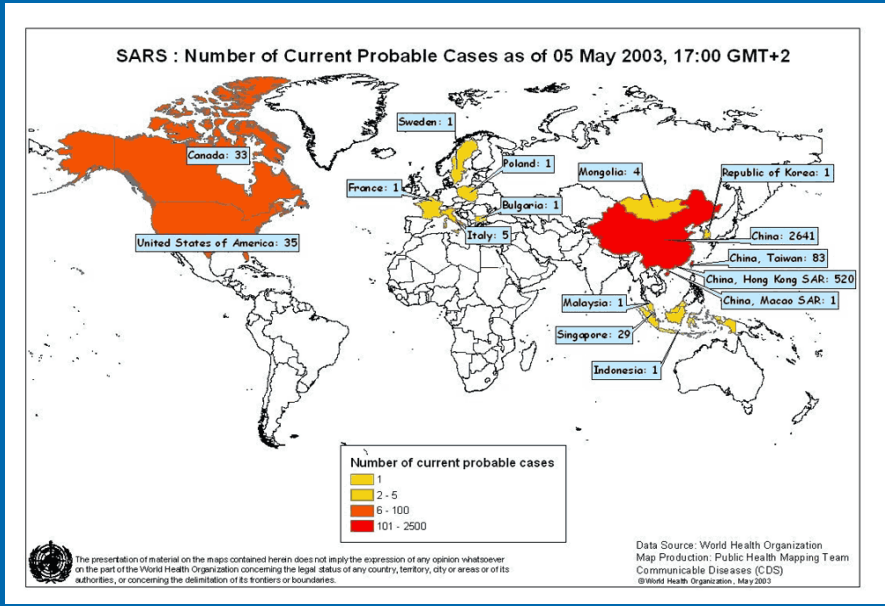
HHV-8: background

- Herpesvirus (enveloped, DNA)
- Chronic, persistent infection, agent of Kaposi's sarcoma (classic and HIV-associated)
- Transmitted person-to-person (sexual, saliva, organ transplant)
- Global distribution? Africa, s Europe? MSM
- Seroprevalence is test-dependent, up to 2.4% in blood donors in US

HHV-8 and transfusion

- No direct evidence of transfusion transmission
  - Transmission by organs, epidemiologic linkage of transfusion and elevated prevalence, IDUs
- DNA identified in seropositive donation
- Recipient susceptibility unknown
- Risk profile unclear
- No clear intervention, although 2 higher risk groups already excluded
  - Potential for Ab test, but no gold standard

SARS


SARS : Number of Current Probable Cases as of 05 May 2003, 17:00 GMT+2
Sweden: 1
Canada: 33
Poland: 1
Mongolia: 4
Republic of Korea: 1
France: 1
Bulgaria: 1
China: 2641
Italy: 5
China, Taiwan: 83
United States of America: 35
China, Hong Kong SAR: 520
Malaysia: 1
China, Macao SAR: 1
Singapore: 29
Indonesia: 1
Number of current probable cases
1
2 - 5
6 - 100
101 - 2500
The presentation of material on the maps contained herein does not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or areas or of its authorities, or concerning the delimitation of its frontiers or boundaries.
Data Source: World Health Organization
Map Production: Public Health Mapping Team
Communicable Diseases (CDS)
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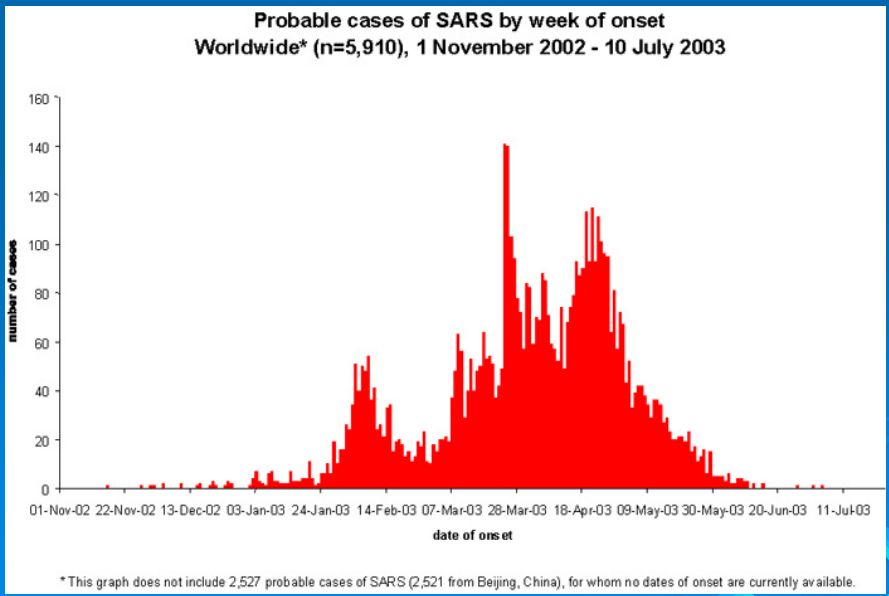
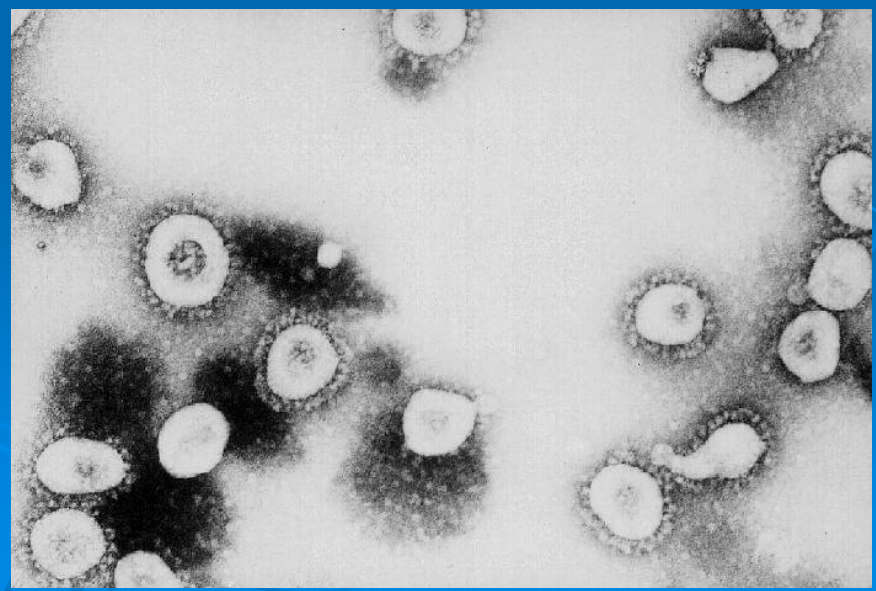

Probable cases of SARS by week of onset
Worldwide* (n=5,910), 1 November 2002 - 10 July 2003
number of cases
0
20
40
60
80
100
120
140
160
01-Nov-02 22-Nov-02 13-Dec-02 03-Jan-03 24-Jan-03 14-Feb-03 07-Mar-03 28-Mar-03 18-Apr-03 09-May-03 30-May-03 20-Jun-03 11-Jul-03
date of onset
*This graph does not include 2,527 probable cases of SARS (2,521 from Beijing, China), for whom no dates of onset are currently available.



SARS: general

- Novel coronavirus
- Acute infection, asymptomatic to fatal disease
- Transmitted person-to-person by aerosol and fecal/oral routes, likely zoonosis
- Originated in PRC, rapidly globalized by air transport, about 8,500 cases reported
  - Single epidemic in 2003
- US caseload unclear, ~60, depending on case-definition

SARS and transfusion

- No transfusion cases reported
- Virus found in kidney of deceased patient, subsequently in blood of symptomatic patients by NAT
- Risk currently (apparently) absent
- Intervention by excluding patients, travelers and case-contacts

Other viruses

- Dengue (emerging/reemerging?)
  - One case (HK), one marrow transplant (PR)
- Simian Foamy virus
  - Animal transmissibility, retrovirus, FDA concern (not echoed by BPAC), non-pathogenic?
- TTV/SEN-V, HGV
  - Transmissible, non-pathogenic? No action

vCJD: general

- Transmissible spongiform encephalopathy (prion disease)
- Degenerative, fatal disease with lengthy incubation period
- Results from consumption of tissue from BSE-infected cattle
- Most cases in, or associated with UK (152), 6-10 others in Europe
- No endogenous case in US

vCJD and transfusion

- Concern high, occurrence infrequent
- Likely present in all components (very low titer in plasma products)
- Recipient susceptibility unknown
- 2 cases transfusion transmission to date, one leading to disease (both in UK)
- Risk appears to be declining, but
  - Unknown number of exposed individuals
  - “second wave” possible
- Intervention in US based upon travel history

Agents of bioterrorism (Class A)

- Anthrax
- Botulism
  - Toxin: not transmissible
- Plague
- Smallpox
- Tularemia
- Viral hemorrhagic fevers

Anthrax

- *B. anthracis* (spores)
- Inhalation route most likely
- 7-42 day incubation, potentially longer
- No person-to-person transmission
- Potential for bacteremia
- Blood safety potentially compromised
  - External contamination
  - (Fear of) donor infectivity

Plague

- *Y. pestis*
- Inhalation route most likely
- Incubation 1-6 days
- Pneumonic plague may be transmitted person-to-person (droplets)
- High, rapid mortality after onset if not treated (within 24 hours)
- Bacteremia occurs
- Blood safety compromised

Smallpox

- Variola major (enveloped DNA virus)
- Inhalation route
- 12-14 day incubation period
- Person-to-person transmission from symptomatic cases (droplet) & fomites
- Population highly susceptible
- Symptomatic viremia
- Blood safety compromised

Tularemia

- *F. tularensis*
- Inhalation route most likely
- Incubation period 1-14 days (usually 3-5), pleuropneumonitis
- No person-to-person transmission
- Bacteremia, particularly in early infection
- Blood safety compromised

Viral hemorrhagic fevers

- RNA viruses, enveloped: Ebola, Lassa, Marburg etc
- Inhalation route most likely
- Incubation 3-15 days
- Person-to-person transmission, aerosol, blood contact etc
- Extensive viremia
- Blood safety compromised
- May need extensive transfusion

Overview

- Numerous emerging and newly recognized infections with potential for transfusion transmission
- All classes of agents
- No common pathogenesis, transmission route, infectious period or risk factor
- Absence of effective interventions