Transfusion-Transmitted Infections

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Biovigilance Component (Hemovigilance Module)
National Healthcare Safety Network

June 2025

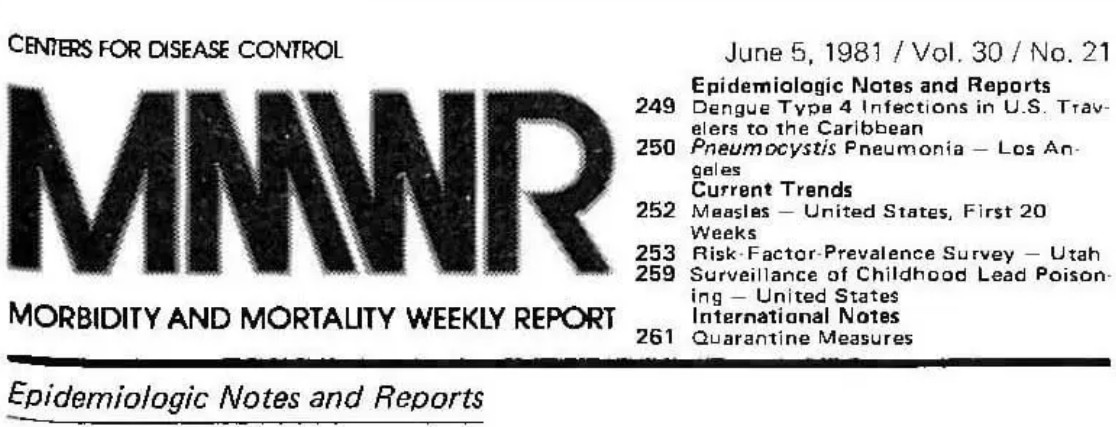
Transfusion-transmitted Infections

Transfusion-transmitted infections (TTIs) can be severe and result in death.

The problem…

- In the United States, TTI surveillance is inadequate:
  - No requirement for transfusing hospitals to report TTIs to CDC
  - Transfusion history is not a required field on most case report forms for nationally notifiable diseases
- Ongoing risk of emerging pathogens in the U.S. blood supply

HIV/AIDS



CENTERS FOR DISEASE CONTROL

June 5, 1981 / Vol. 30 / No. 21

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Epidemiologic Notes and Reports

Pneumocystis Pneumonia — Los Angeles

In the period October 1980-May 1981, 5 young men, all active homosexuals, were treated for biopsy-confirmed *Pneumocystis carinii* pneumonia at 3 different hospitals in Los Angeles, California. Two of the patients died. All 5 patients had laboratory-confirmed previous or current cytomegalovirus (CMV) infection and candidal mucosal infection. Case reports of these patients follow.

Patient 1: A previously healthy 33-year-old man developed *P. carinii* pneumonia and oral mucosal candidiasis in March 1981 after a 2-month history of fever associated with elevated liver enzymes, leukopenia, and CMV viruria. The serum complement-fixation

Image Credit: Centers for Disease Control and Prevention (U.S.) MMWR. Morbidity and Morality Weekly Report, Vol 30, No. 21, June 4, 1981

HIV/AIDS

Possible Transfusion-Associated Acquired Immune Deficiency Syndrome (AIDS) — California

CDC has received a report of a 20-month old infant from the San Francisco area who developed unexplained cellular immunodeficiency and opportunistic infection. This occurred after multiple transfusions, including a transfusion of platelets derived from the blood of a male subsequently found to have the acquired immune deficiency syndrome (AIDS).

The infant, a white male, was delivered by caesarian section on March 3, 1981. The estimated duration of pregnancy was 33 weeks; and the infant weighed 2850 g. The mother was known to have developed Rh sensitization during her first pregnancy, and amniocentesis done during this, her second, pregnancy showed the fetus had erythroblastosis fetalis. The infant had asphyxia at birth and required endotracheal intubation. Because of hyperbilirubinemia, six double-volume exchange transfusions were given over a 4-day period. During the 1-month hospitalization following birth, the infant received blood products, including whole blood, packed red blood cells, and platelets from 19 donors. All blood products were irradiated.

After discharge in April 1981, the infant appeared well, although hepatosplenomegaly was noted at age 4 months. At 7 months, he was hospitalized for treatment of severe otitis media. Oral candidiasis developed following antibiotic therapy and persisted. At 9 months of age, he developed anorexia, vomiting, and then jaundice. Transaminase levels were elevated, and serologic tests for hepatitis A and B viruses and cytomegalovirus were negative; non-A non-B hepatitis was diagnosed.

Image Credit: Centers for Disease Control and Prevention (U.S.) MMWR. Morbidity and Mortality Weekly Report, Vol. 31, No. 48, December 10, 1982

How many…

“How many people [with hemophilia] have to die? Is three enough? Is six? Is ten? Is a hundred enough? Just give us the number so we can set the threshold!”

- CDC official Don Francis

The meeting produced no recommendations or changes.

Research News

Health Officials Seek Ways to Halt AIDS

A recent workshop considered the options for preventing the spread of the new immune disease; an easy solution is unlikely

On 4 January the Centers for Disease Control (CDC) convened a workshop at its Atlanta headquarters to assess the options for halting the spread of the new disease called acquired immunodeficiency syndrome or, more commonly, AIDS. The main topic of discussion was the possibility that the disease, which may kill up to 70 percent of the patients within 2 years of diagnosis, might be spread in blood and blood products.

The CDC recently reported that hemophiliacs are at high risk of contracting AIDS, which may be transmitted by an infectious agent in the blood clotting factor preparations that they take (*Science*, 7 January, p. 42). The Center's Bruce Evatt told the workshop that AIDS was the second leading cause of death for hemophiliacs in 1982, even though the disease was first discovered in hemophiliacs in the summer of that year. Eight hemophiliacs who had none of the other known risk factors died from AIDS, compared to some 40 who died of bleeding. James Curran, head of the CDC task force investigating AIDS, says, "The sense of urgency is greatest for hemophiliacs. The risk for others [who receive blood products] now appears small, but is unknown."

Suspicion has been cast on blood products in addition to clotting factor, however. An infant contracted AIDS after receiving red blood cells that had come from a man who developed the disease several months after he donated the blood. The CDC is also investigating the cases of two adults who developed AIDS after receiving blood transfusions during surgery. The two did not belong to any of the known high-risk groups, which include, in addition to hemophiliacs, homosexual and bisexual men who are extremely active sexually, users of intravenous drugs, and Haitians. In each case, investigators have identified a blood donor who has certain characteristics associated with AIDS, including a particular immune defect, although neither donor has actually developed the disease.

The CDC investigators have also identified several AIDS patients who donated blood. None of the recipients has contracted the condition, but there is still cause for worry. Thomas Spira of the CDC points out that there may be a long lag period, a year or more, between the time of exposure to the causative agent and the onset of AIDS. In other words, although there is currently no firm evidence linking ordinary blood transfusions to transmission of the disease, it is too early to rule out such a link.

The workshop participants easily reached agreement on some preventive measures that might check the spread of AIDS. About 75 percent of the AIDS victims are homosexual or bisexual men in whom the disease is thought to be sexually transmitted. There was general agreement that homosexual men should avoid sexual contact with known or suspected AIDS patients, minimize the number of their sexual partners, and refrain from anonymous sexual contacts. Heterosexuals might follow the same suggestions because, according to Curran, there are indications that AIDS may also be transmitted by heterosexual sex and other forms of intimate personal contact, such as that between mother and child.

> "The sense of urgency is greatest for hemophiliacs. . . ."

The seriousness of the threat of AIDS transmission by blood products and what, if anything, ought to be done in the current state of uncertainty remained thorny issues for the workshop participants. Not everyone agrees with the conclusion, accepted by CDC officials and many other investigators, that AIDS is caused by an infectious agent, presumably a virus, which could contaminate blood products. Louis Aledort, the medical director of the National Hemophilia Foundation, says, "I think it is too easily concluded that there is a transmissible agent. I can't rule it out but the data are not there yet." Aledort favors the idea that hemophiliacs, as well as homosexuals and intravenous drug users, because they are exposed to a great number of foreign antigens, experience a high degree of antigenic stimulation that effectively wears out their immune systems.

Nevertheless, because of the seriousness of AIDS, many participants were in favor of introducing measures to prevent persons who might be carrying an infectious agent from donating blood or plasma. The question is how to do this, especially in view of the long latent period of the disease and the possibility that many individuals who do not have full-blown AIDS may have a milder form or be asymptomatic carriers of an infectious agent.

Asking members of high-risk groups to voluntarily refrain from donating blood is one relatively uncontroversial approach, although it would probably not eliminate all potential carriers. Automatically excluding all members of high-risk groups is another, although this measure has the disadvantage of stigmatizing all homosexual males when only a fraction—those who are extremely sexually promiscuous—are likely to transmit an AIDS agent. Past and present users of intravenous drugs, who may be hepatitis carriers, and hemophiliacs are already excluded. Potential donors may also be screened for AIDS symptoms through a physical examination or a medical history.

Finally, the blood itself may be screened. Since the agent has not been identified, it would be necessary to use a "surrogate agent" as a marker for AIDS infectivity. The best candidate for this is an antibody to the core antigen of the hepatitis B virus. According to Spira, testing for this antibody in donated blood would detect about 90 percent of the donors who might transmit an AIDS agent, including persons with full-blown AIDS, those with the milder symptoms, and members of high-risk groups.

Some workshop participants favored requiring the test for all blood collection centers, but Aaron Kellner of the New York Blood Center dissented. "It is one thing to do these tests in the laboratory and another in the real world," he said. Kellner suggests that a few blood collection centers in the cities where AIDS is most prevalent—New York, San Francisco, and Los Angeles—undertake pilot

21 JANUARY 1983

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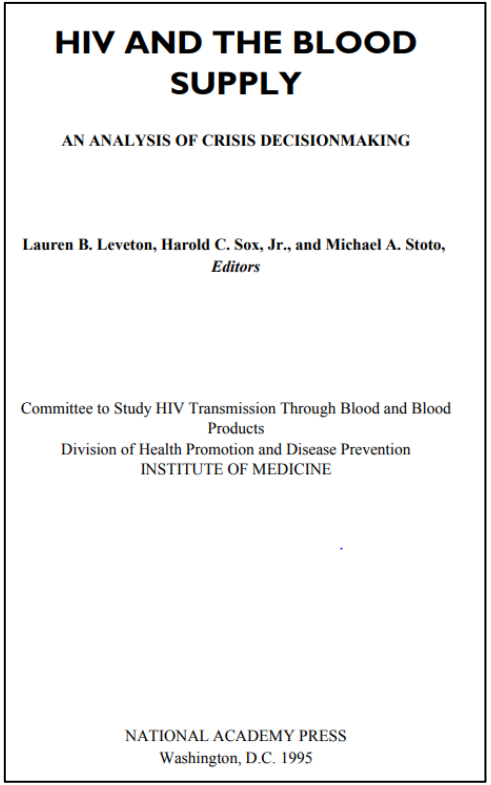
Image credit: Hemophilia Federation of America. Retrieved from History of Bleeding Disorders - Hemophilia Federation of America accessed on 5/15/25.

Institute of Medicine

- The Secretary of the Department of Health and Human Services (DHHS) asked a Committee of the Institute of Medicine (IOM) to review the scientific evidence that was available to decisionmakers during the early 1980s when the AIDS epidemic emerged, to examine the decision-making processes, and to evaluate the actions taken to contain the epidemic

- In 1995, the committee published 14 recommendations:
  - 3 for Public Health Service
  - 2 for CDC
  - 6 for FDA
  - 3 for physicians and patients



References: Institute of Medicine (US) Committee to Study HIV Transmission Through Blood and Blood Products. *HIV And The Blood Supply: An Analysis Of Crisis Decisionmaking*. Edited by Lauren B. Leveton et. al., National Academies Press (US), 1995. doi:10.17226/4989; Institute of Medicine. Emerging Infections. Washington, D.C.: National Academy Press, 1992.

IOM recommendations for CDC

Recommendation 4: Other federal agencies must understand, support, and respond to the CDC's responsibility to serve as the nation's early warning system for threats to the health of the public

Recommendation 5: The PHS should establish a surveillance system, within CDC, that will detect, monitor, and warn of adverse effects in the recipients of blood and blood products.

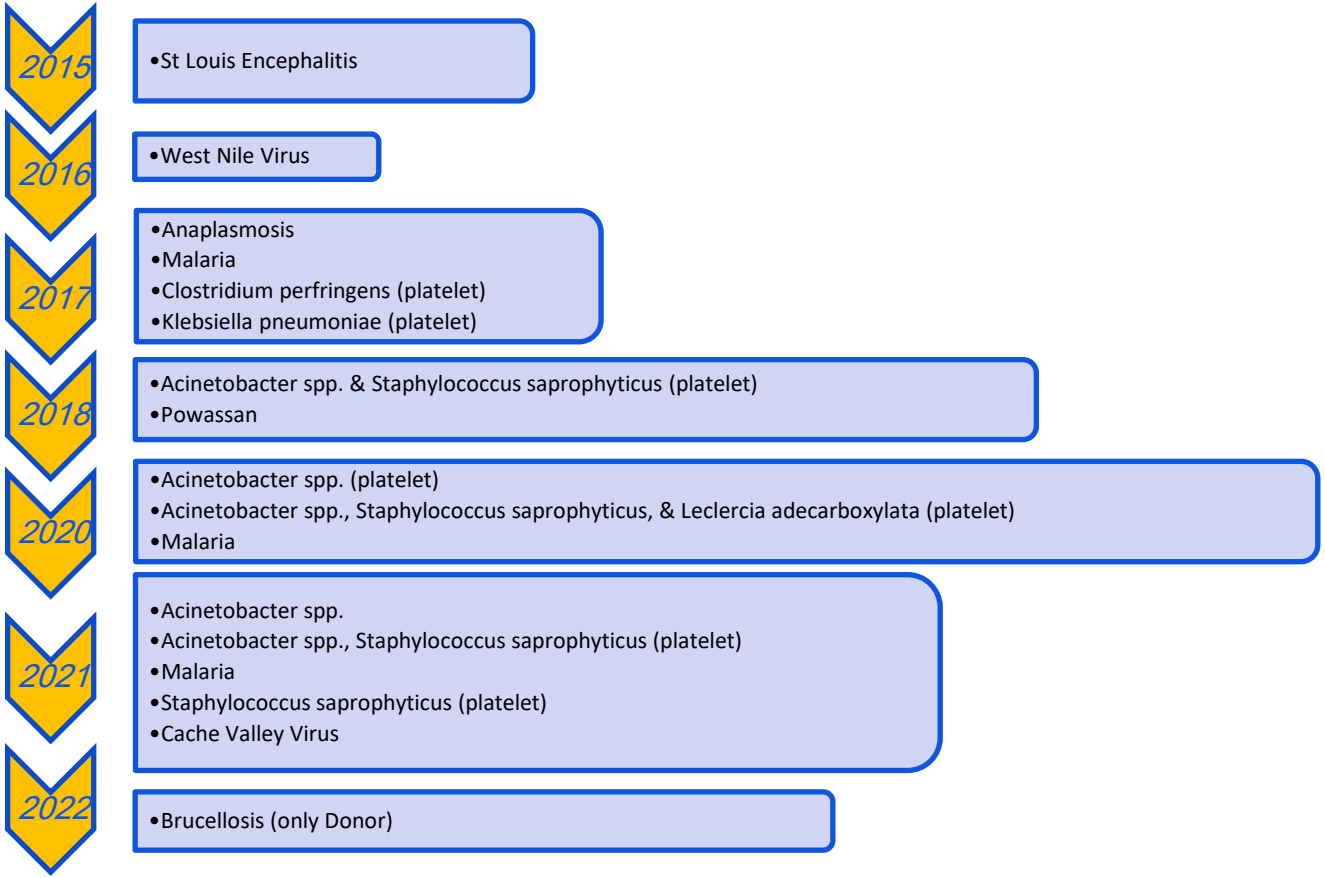
References: Institute of Medicine (US) Committee to Study HIV Transmission Through Blood and Blood Products. *HIV And The Blood Supply: An Analysis Of Crisis Decisionmaking*. Edited by Lauren B. Leveton et. al., National Academies Press (US), 1995. doi:10.17226/4989; Institute of Medicine. Emerging Infections. Washington, D.C.: National Academy Press, 1992.

Oversight and Monitoring of Blood Safety

FDA U.S. FOOD & DRUG ADMINISTRATION	• Direct regulatory responsibility for blood and blood products
NIH National Heart, Lung, and Blood Institute	• Funding basic and translational research
CDC	• Surveillance and detection of public health risks

Reference: Busch M, Chamberland M, Epstein J, Kleinman S, Khabbaz R, Nemo G. Oversight and monitoring of blood safety in the United States. Vox Sang. 1999;77(2):67-76. doi: 10.1159/000031079. PMID: 10516550.

TTI investigations by BOOTS over the years, 2014-2022



Need Header

Federal agencies have worked together to identify donor deferral criteria to exclude donors with infectious disease risk factors

Full-Length Blood Donor History Questionnaire (DHQ) v4.0

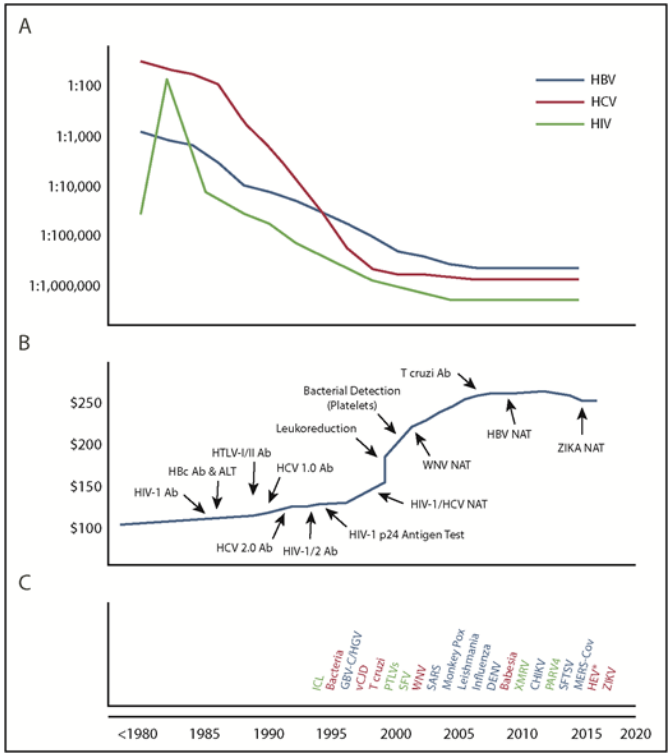
Are you	Yes	No
1. Feeling healthy and well today?	❑	❑
2. Currently taking an antibiotic?	❑	❑
3. Currently taking any other medication for an infection?	❑	❑
4. Pregnant now?	❑	❑
Have you		
5. Taken any medications on the Medication Deferral List in the time frames indicated? (Review the Medication Deferral List.)	❑	❑
6. Read the blood donor educational materials today?	❑	❑
In the past **48 hours**, have you		
7. Taken aspirin or anything that has aspirin in it?	❑	❑
In the past **8 weeks**, have you		
8. Donated blood, platelets, or plasma?	❑	❑
9. Had any vaccinations or other shots?	❑	❑
10. Had contact with someone who was vaccinated for smallpox in the past 8 weeks?	❑	❑
In the past **3 months**, have you		
11. Taken any medication by mouth (oral) to prevent HIV infection? (i.e., PrEP or PEP)	❑	❑
12. Had sexual contact with a new partner? (refer to the examples of "new partner" in the Blood Donor Educational Material)	❑	❑
13. Had sexual contact with more than one partner?	❑	❑
14. Had sexual contact with anyone who has ever had a positive test for HIV infection?	❑	❑
15. Received money, drugs, or other payment for sex?	❑	❑
16. Had sexual contact with anyone who has, in the past 3 months, received money, drugs, or other payment for sex?	❑	❑
17. Used needles to inject drugs, steroids, or anything not prescribed by your doctor?	❑	❑
18. Had sexual contact with anyone who has used needles in the past 3 months to inject drugs, steroids, or anything not prescribed by their doctor?	❑	❑
19. Had syphilis or gonorrhea or been treated for syphilis or gonorrhea?	❑	❑
20. Had sexual contact with a person who has hepatitis?	❑	❑
21. Lived with a person who has hepatitis?	❑	❑
22. Had an accidental needle-stick?	❑	❑
23. Come into contact with someone else's blood?	❑	❑
24. Had a tattoo?	❑	❑
25. Had ear or body piercing?	❑	❑
26. Had a blood transfusion?	❑	❑
27. Had a transplant such as organ, tissue, or bone marrow?	❑	❑
28. Had a graft such as bone or skin?	❑	❑
In the past **16 weeks**, have you		
29. Donated a double unit of red blood cells using an apheresis machine?	❑	❑

Full-Length Blood Donor History Questionnaire (DHQ) v4.0

	Yes	No
In the past **12 months**, have you		
30. Been in juvenile detention, lockup, jail, or prison for 72 hours or more consecutively?	❑	❑
In the past **2 years**, have you		
31. Received any medication by injection to prevent HIV infection? (i.e. long-acting antiviral PrEP or PEP)	❑	❑
In the past **3 years**, have you		
32. Been outside the United States or Canada?	❑	❑
Have you **EVER**		
33. Had a positive test for HIV infection?	❑	❑
34. Taken any medication to treat HIV infection?	❑	❑
35. Been pregnant?	❑	❑
36. Had malaria?	❑	❑
37. Received a dura mater (or brain covering) graft or xenotransplantation product?	❑	❑
38. Had any type of cancer, including leukemia?	❑	❑
39. Had any problems with your heart or lungs?	❑	❑
40. Had a bleeding condition or blood disease?	❑	❑
41. Had a positive test result for *Babesia*?	❑	❑

Since the 1970s, serological assays targeting virus-specific antibodies and antigens and nucleic acid-amplification technology (NAT) have been effective in identifying transfusion-transmitted infectious agents.

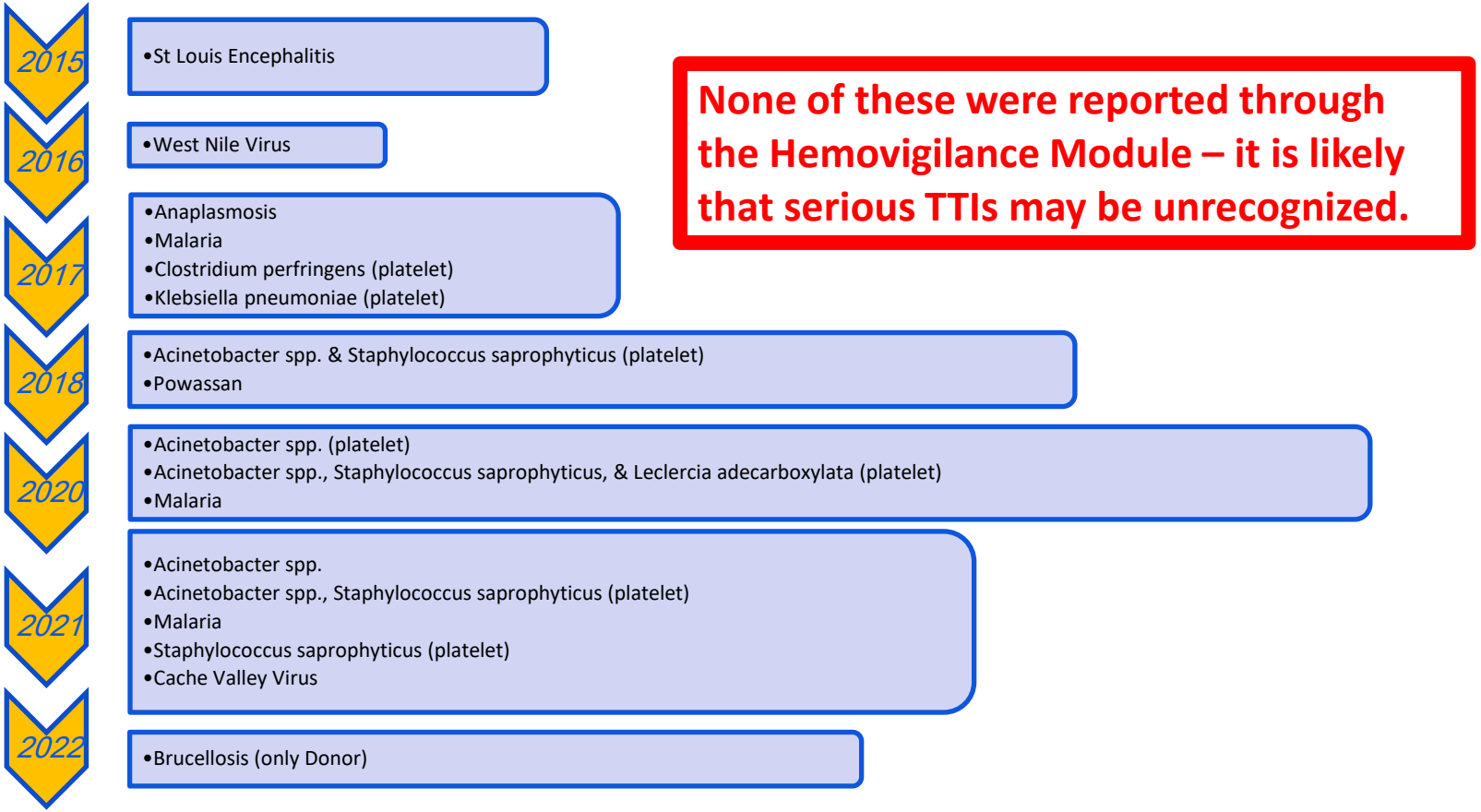
Figure. Risks of major transfusion transmitted viruses, progressive blood safety interventions and costs, and emerging infectious diseases that have been investigated for impact on blood safety over the past 4 decades



Reference: Busch MP, Bloch EM, Kleinman S. Prevention of transfusion-transmitted infections. Blood. 2019 Apr 25;133(17):1854-1864. doi: 10.1182/blood-2018-11-833996. Epub 2019 Feb 26. PMID: 30808637.

National Healthcare Safety Network (NHSN)

TTI investigations by BOOTS over the years, 2014-2022



None of these were reported through the Hemovigilance Module – it is likely that serious TTIs may be unrecognized.

We need your help

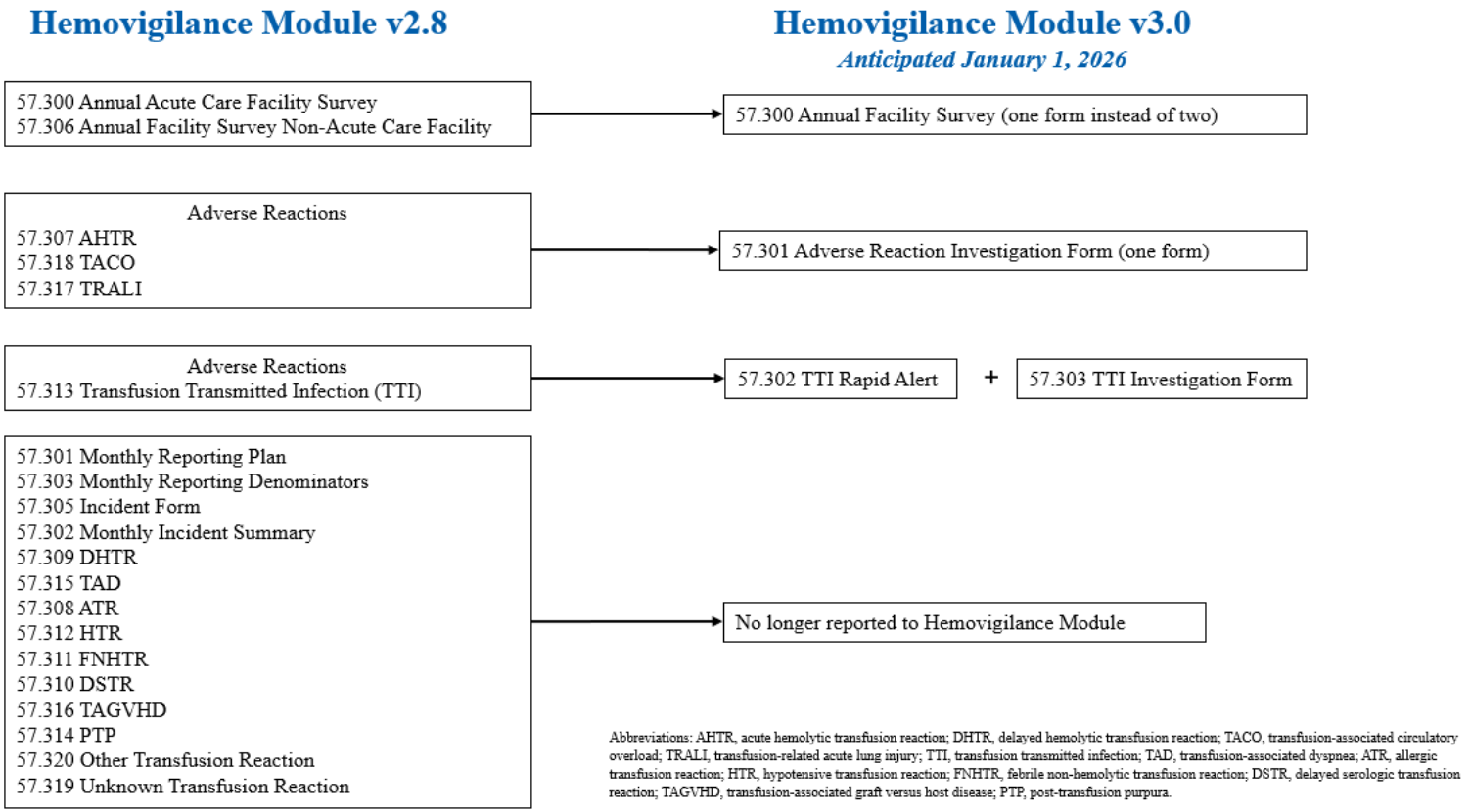
- CDC is modernizing hemovigilance efforts to rapidly and systematically identify emerging pathogens transmitted through blood transfusion

- Strong collaborations are needed to systematically
  - Identify pathogens of interest in a patient receiving a transfusion*
  - Notify CDC

- CDC will work with the health department and healthcare facility to complete a TTI investigation form

*Pathogens of Interest:
Viruses: Cache Valley virus, Colorado tick fever virus, Dengue virus, Eastern Equine Encephalitis virus, Hepatitis A virus, Hepatitis E virus, Japanese Encephalitis Virus, Oropouche virus, Powassan virus, St. Louis encephalitis virus, Tick-borne encephalitis virus, Chikungunya, Yellow Fever virus, Zika virus.
Bacteria: Acinetobacter baumannii, Anaplasma phagocytophilum, Brucella spp., Coxiella burnetii (Q Fever), Ehrlichia spp., Leclercia adecarboxylata, Rickettsia rickettsii.
Parasites: Babesia spp., Leishmania spp., Plasmodium spp. (Malaria).

The NEW Hemovigilance Module



Abbreviations: AHTR, acute hemolytic transfusion reaction; DHTR, delayed hemolytic transfusion reaction; TACO, transfusion-associated circulatory overload; TRALI, transfusion-related acute lung injury; TTI, transfusion transmitted infection; TAD, transfusion-associated dyspnea; ATR, allergic transfusion reaction; HTR, hypotensive transfusion reaction; FNHTR, febrile non-hemolytic transfusion reaction; DSTR, delayed serologic transfusion reaction; TAGVHD, transfusion-associated graft versus host disease; PTP, post-transfusion purpura.

TTI Pathogens of Interest

Pathogens of Interest	Nationally Notifiable?	Data currently reported to CDC*
Viruses		
Cache Valley virus	Yes	ArboNet – Transfusion and transplant 30 days prior to symptom onset
Colorado tick fever virus		
Dengue virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
Eastern Equine Encephalitis virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
Hepatitis A virus	Yes	CRF & NNDSS – Does not ask about transfusions
Hepatitis E virus		CRF – Does not ask about transfusions
Japanese Encephalitis virus		
Oropouche virus		ArboNet – Transfusion and transplant 30 days prior to symptom onset
Powassan virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
St. Louis encephalitis virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
Tick-borne encephalitis virus		
Chikungunya virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
Yellow Fever virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
Zika virus	Yes	ArboNet & NNDSS – Transfusion and transplant 30 days prior to symptom onset
Bacteria		
Acinetobacter baumannii		
Anaplasma phagocytophilum	Yes	NNDSS & CRF – Transfusion history
Brucella spp.	Yes	NNDSS & CRF – Does not ask about transfusions
Coxiella burnetii (Q Fever)	Yes	NNDSS & CRF – Does not ask about transfusions
Ehrlichia spp.	Yes	NNDSS & CRF – Transfusion and transplant history
Leclercia adecarboxylata		
Rickettsia rickettsii	Yes	NNDSS – Transfusion and transplant history
Parasites		
Babesia spp.	Yes	NNDSS & CRF – Transfusion history
Leishmania spp.		
Plasmodium spp. (Malaria)	Yes	NNDSS & CRF – Transfusion history

*As far as we know, transfusion history is only reported to CDC through a case report form (CRF). We do not know what fields are reported electronically via NNDSS for these pathogens – we are looking into this.

Proposed reporting structure for TTIs – HV 3.0

*Pathogens of Interest:
Viruses: Cache Valley virus, Colorado tick fever virus, Dengue virus, Eastern Equine Encephalitis virus, Hepatitis A virus, Hepatitis E virus, Japanese Encephalitis Virus, Oropouche virus, Powassan virus, St. Louis encephalitis virus, Tick-borne encephalitis virus, Chikungunya, Yellow Fever virus, Zika virus.
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Parasites: Babesia spp., Leishmania spp., Plasmodium spp. (Malaria).

CDC's NEW TTI Rapid Alert Form

Hemovigilance Module
Transfusion Transmitted Infection (TTI)
Rapid Alert Form

*Required fields

***Facility ID#:** _____ ***Reporter Name:** [Dropdown based on current Facility users]

***Medical Record #:** _____ ***State of Residence:** ____

* ☐ **Pathogen of interest[1] has been detected: [Multiselect Dropdown – Pathogens of Interest]**

* ☐ **Patient received a transfusion in the 30 days prior to symptom onset or infection identification**

[1]Pathogens of Interest:

Viruses: Cache Valley virus, Colorado tick fever virus, Dengue virus, Eastern Equine Encephalitis virus, Hepatitis A virus, Hepatitis E virus, Japanese Encephalitis virus, Oropouche virus, Powassan virus, St. Louis encephalitis virus, Tick-borne encephalitis virus, Chikungunya, Yellow Fever virus, Zika virus.

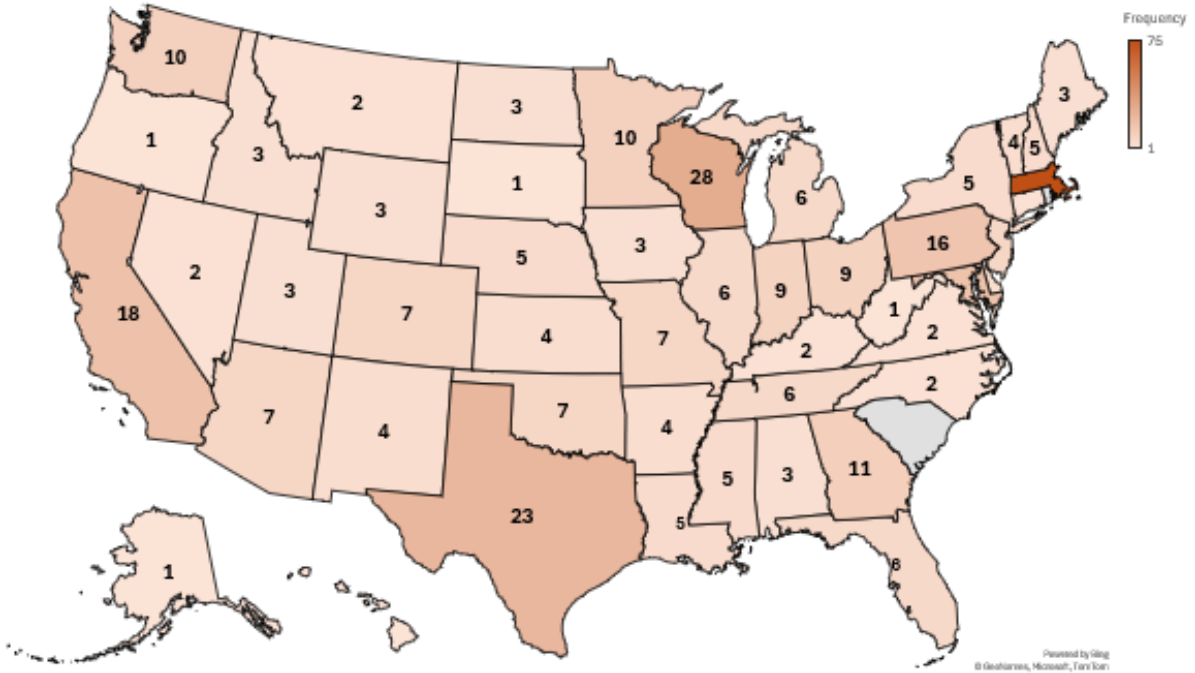
Bacteria: Acinetobacter baumannii, Anaplasma phagocytophilum, Brucella spp., Coxiella burnetii (Q Fever), Ehrlichia, Leclercia adecarboxylata, Rickettsia rickettsii.

Parasites: Babesia spp., Leishmania spp., Plasmodium spp. (Malaria).

CDC's Updated TTI Investigation Form

- Patient Information
- Patient Medical History (reason for transfusion)
- Adverse Reaction Details
- Laboratory Test Results
- Signs and Symptoms
- Patient Treatment
- Recipient Epidemiologic Risk Assessment (to rule out transfusion)
- Component Details (ISBT128 product codes, pathogen detected)
- Donor Investigation (mosquito or tick exposures, travel history)
- Investigations Findings (Case Definition, Severity, Imputability)
- Facility Investigation Notes
- CDC Investigation Notes

Number of facilities enrolled in NHSN Hemovigilance Module, March 2025



- 380 facilities in the United States are actively enrolled in the Hemovigilance Module
- Only 61/380 facilities have submitted their Annual Facility Survey
- Only 3 TTIs have been reported in 2025
- ~4,000 facilities perform inpatient transfusions

What you can do now:

- Ask about transfusion history.
- Please ask your NHSN Facility Administrator to add the Biovigilance Component (Hemovigilance Module).

Components Followed

Follow/ Followed	Component	Activated	Deactivated	Agreement Accepted	View Agreement
☑	Biovigilance	06/12/2023		Y	View Agreement
☐	Dialysis				
☑	Healthcare Personnel Safety	04/17/2019		Y	View Agreement
☐	Long Term Care Facility				
☐	Medication Safety (pilot facilities only)				
☐	Neonatal				
☐	Outpatient Procedure				
☑	Patient Safety	06/12/2019		Y	View Agreement

Contact the NHSN Helpdesk

- **NHSN-ServiceNow** to submit questions to the NHSN Help Desk.
- Access new portal at **https://servicedesk.cdc.gov/nhsncsp**.
- If you do not have a SAMS login, or are unable to access ServiceNow, you can still email the NHSN Help Desk at nhsn@cdc.gov.

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov