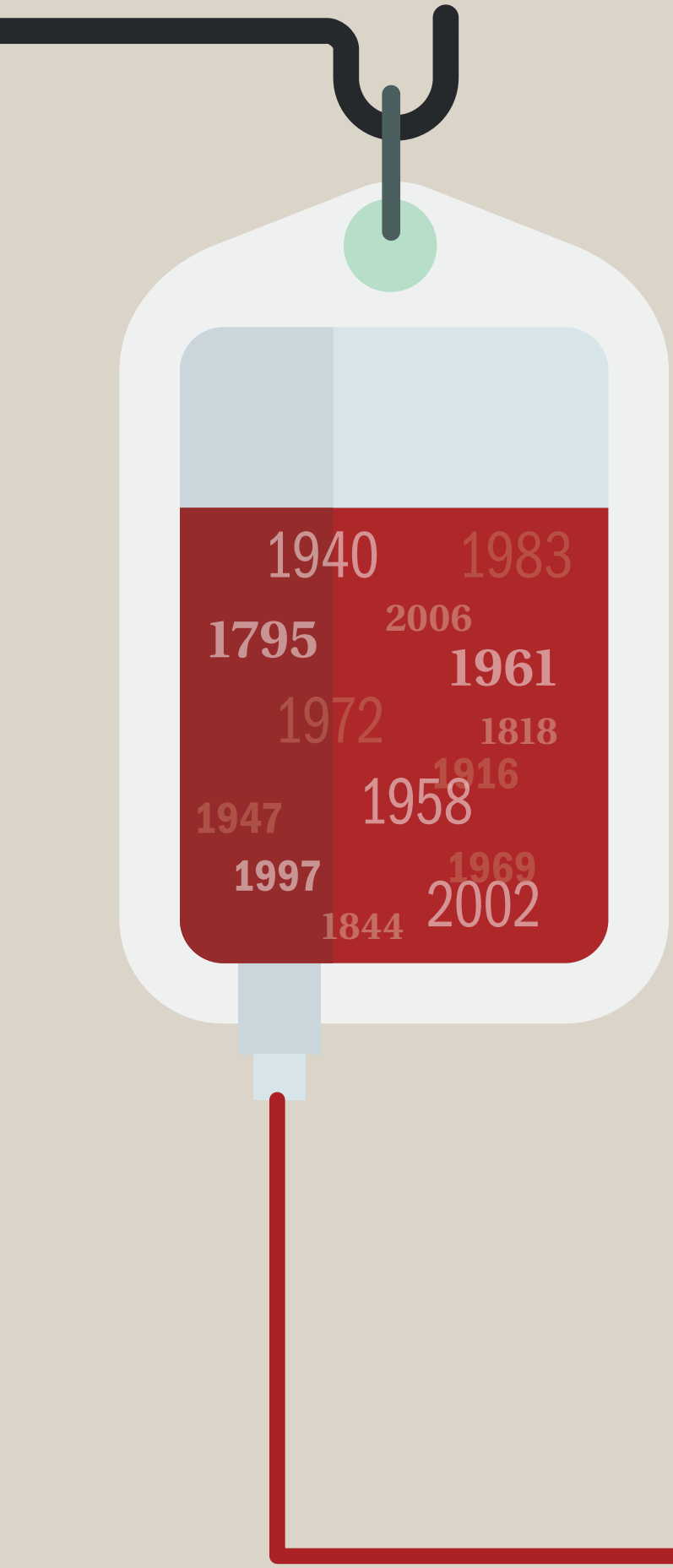

Abbreviated Timeline of Great Moments in Transfusion Medicine History

1628
> English physician William Harvey discovers blood circulation, followed shortly by the earliest known attempt to transfuse blood.

1665
> First successful blood transfusion (dog to dog) performed by Richard Lower in England

1667
> Jean-Baptiste Denis in France and Richard Lower separately report successful transfusions from lambs to humans; transfusing blood from animals to humans banned within 10 years because of reactions.

1795
> In Philadelphia, American physician Philip Syng Physick performs the first human blood transfusion, although he does not publish this information.

1818
> British obstetrician James Blundell performs first successful transfusion of human blood to treat postpartum hemorrhage.

1840
> Samuel Armstrong Lane, aided by Blundell, performs first successful whole blood transfusion to treat hemophilia in London.

1867
> English surgeon Joseph Lister uses antiseptics to control infection during transfusion.

1873-1880
> Physicians in U.S. transfuse milk to humans (from cows, goats and humans).

1884
> Practitioners replace milk with saline to decrease adverse reactions.

1901
> Karl Landsteiner, an Austrian physician, discovers first three human blood groups, which he labels A, B and C; C is later renamed O.

1902
> Landsteiner's colleagues Alfred Decastello and Adriano Sturli add a fourth blood type: AB.

1907
> Ludvig Hektoen proposes crossmatching blood between donors and patients to check for compatibility.
> Reuben Ottenberg performs first typed and crossmatched blood transfusion in New York and recognizes Mendelian inheritance of blood groups.

1908
> Alexis Carrel, a French surgeon, devises method to prevent clotting: direct transfusion, or sewing recipient's vein directly to donor's artery.

1908
> Carlo Moreschi describes antiglobulin technique to reveal antigen-antibody reaction not visible to the naked eye.

1912
> Roger Lee and Paul Dudley White develop Lee-White clotting time; Lee demonstrates existence of "universal donor" and "universal recipient."

1914
> Long-term anticoagulants, including sodium citrate, permit storage of blood.

1915
> Richard Lewisohn develops indirect transfusion procedure using sodium citrate as anticoagulant.
> Richard Weil demonstrates feasibility of refrigerated storage of anticoagulated blood.

1916
> Francis Rous and J. R. Turner introduce citrate-glucose solution, enabling blood to be stored for several days post collection, facilitating indirect transfusion and allowing for establishment of first "blood depot" by Oswald Robertson.

1927-1947
> Landsteiner and his assistant, Philip Levine, discover new blood group antigen systems M, N and P, based on antibodies formed by rabbits injected with human red blood cells.

1932
> First blood bank established in a Leningrad hospital.

1937
> Bernard Fantus establishes first hospital laboratory capable of preserving and storing donated blood in U.S. and coins the term "blood bank."

1939/40
> Landsteiner, Levine, R.E. Stetson and Alex Weiner discover Rh blood group system, which is quickly recognized as cause of most transfusion reactions.

1940
> Edwin Cohn develops cold ethanol fractionation, which breaks down plasma into components and products, including albumin, gamma globulin and fibrinogen.
> John Elliott turns vacuum bottle into first blood container.
> U.S. government establishes national blood collection program.
> Charles R. Drew directs "Plasma for Britain" project, organizes first large-scale blood bank in U.S. and originates first mobile blood donation stations, or bloodmobiles.

1943
> J.F. Loutit and Patrick L. Mollison introduce acid citrate dextrose (ACD) solution, an anticoagulant that can be used in lower volumes and enables transfusion of greater amounts of blood and longer-term blood storage.

1943
> P. Beeson publishes classic description of transfusion-transmitted hepatitis.

1945
> Robin Coombs, Arthur Mourant and Rob Race describe use of anti-human globulin to identify "incomplete" antibodies.

1947

> Baylor Hospital pathologist Joe Hill arranges "Blood Bank Institute" to give blood bankers opportunity to collaborate and attend discussions on topics of general interest.
> Hill's administrative assistant, Marjorie Saunders, sends questionnaire to blood banks asking if respondents want to join national association of blood banks; 78% of surveyed indicate they do.
> At start of Blood Bank Institute, Saunders reads note from 67 attendees requesting formation of association of blood banks.
> Saunders appoints committee, led by W. Quinn Jordan, to address request.
> Final day of meeting, at general session, attendees vote to establish American Association of Blood Banks.

1948

> Julius Davenport creates first AABB emblem, with motto "Vitae Custodes," meaning guardians of life.

1950

> Audrey Smith reports use of glycerol cryoprotectant to freeze RBCs.
> Carl Walter and W.P. Murphy, Jr., introduce plastic bag for blood collection; replacing breakable glass bottles with durable plastic bags facilitates creation of blood collection system that allows safe and easy preparation of multiple blood components from single unit of whole blood.

1951

> Bernice Hemphill establishes California clearinghouse for blood exchange.
> Publication of first standards for blood banks, Standard Procedures and Methods of the Florida Association of Blood Banks.

1953

> Development of refrigerated centrifuge.
> AABB establishes national Blood Clearinghouse Program, a centralized system for exchanging blood and precursor to the National Blood Exchange.
> Technical Methods and Procedures of the American Association of Blood Banks published.

1957

> AABB forms Inspection and Accreditation committee to monitor implementation of blood banking standards.

1958

> AABB opens first national office in Chicago; publishes first edition of Standards for a Blood Transfusion Service (now titled Standards for Blood Banks and Transfusion Services).

1959

> Max Perutz of Cambridge deciphers molecular structure of hemoglobin.
> AABB establishes first rare blood donor file.

1961

> AABB publishes peer reviewed research journal, *Transfusion*, first American journal devoted entirely to blood banking and transfusion technology.
> Recognition that platelet concentrates can reduce mortality from hemorrhage in cancer patients.

1962

> First antihemophilic factor (AHF) concentrate — to treat coagulation disorders in patients with hemophilia — produced through fractionation.

1964

> Plasmapheresis introduced as method to collect plasma for fractionation.

1965

> Judith Pool and Angela Shannon report method to produce cryoprecipitated AHF to treat hemophilia.

1967

> Rh immune globulin introduced commercially to treat hemolytic disease of the newborn.

1969

> S. Murphy and F. Gardner demonstrate feasibility of storing platelets at room temperature, revolutionizing platelet transfusion therapy.

1970

> Blood banks move toward all-volunteer blood donor system.

1971

> Hepatitis B surface antigen (HBsAg) testing of donated blood begins.

1972

> Apheresis used to extract singular cellular component while returning remaining blood to donor.
> Food and Drug Administration begins regulating blood and plasma.

1979
> Anticoagulant CPDA-1 extends shelf life of whole blood and packed RBCs to 35 days.

1981
> First case of Acquired Immune Deficiency Syndrome (AIDS) reported.

1983
> Additive solutions extend shelf life of RBCs to 42 days.

1984
> Human Immunodeficiency Virus (HIV) identified as cause of AIDS.

1985
> FDA approves enzyme-linked immunosorbent assay (ELISA), first blood-screening test to detect HIV antibodies.

1987
> Development and implementation of two tests that screen for indirect evidence of hepatitis: hepatitis B core antibody (anti-HBc) and alanine aminotransferase test (ALT).

1989
> Testing of donated blood for human-T-lymphotropic-virus-I-antibody (anti-HTLV-I) begins.

1990
> Introduction of first specific test for hepatitis C — major cause of "non-A, non-B" hepatitis.

1992
> Implementation of testing donor blood for HIV-1 and HIV-2 antibodies (anti-HIV-1 and anti-HIV-2).

1996
> HIV p24 antigen testing of donated blood begins; although test does not completely close HIV window, it shortens window period.

1997
> U.S. government issues two reports suggesting ways to improve blood safety, including regulatory reform.
> AABB founds National Blood Data Resource Center to collect, analyze and distribute data on all aspects of blood banking and transfusion medicine.

1999
> Blood establishments begin using nucleic acid amplification testing (NAT) under FDA's Investigational New Drug (IND) program; NAT employs testing technology that directly detects genetic materials from viruses, including HCV and HIV.

2002
> West Nile virus (WNV) identified as transfusion-transmissible.
> FDA approves NAT for HIV and HCV.

2003
> FDA issues final guidance, "Revised Recommendations for the Assessment of Donor Suitability and Blood and Blood Product Safety in Cases of Known or Suspected West Nile Virus Infection."
> First West Nile virus-positive unit of blood intercepted.
> FDA releases "Guidance on Implementation of New Bacteria Reduction and Detection Standard."

2005
> FDA allows certain apheresis platelets collected for transfusion to be stored up to 7 days when tested with microbial detection system release test.
> FDA's Center for Biologics Evaluation and Research publishes compliance program guidance for inspection of human cells, tissues, and cellular and tissue-based products (HCT/Ps).
> FDA approves first WNV blood test to screen donors of blood, organs, cells and tissues.

2006
> AABB starts collaborating with Centers for Disease Control and Prevention to create CDC National Healthcare Safety Network Hemovigilance Module.

2014
> FDA approves first U.S. pathogen inactivation systems for platelets and plasma.

2017
> FDA approves first two chimeric antigen receptor (CAR) T cell therapies to treat cancer.

2018
> FDA grants emergency use authorization (EUA) enabling U.S. military to use freeze-dried plasma to treat hemorrhage in combat settings. ■