April 2011 marked the 70th anniversary of the establishment of the American Red Cross Blood Services (ARCBS). In this report, we present a biography of Dr. Charles Drew, the first medical director of the ARCBS. Although many may recognize Dr. Charles Drew for this position, the research and training that led him to be uniquely qualified to take this position may not be as well known. We present his professional training, his research on blood preservation and distribution, and his service to the larger medical community and country. Lastly, we address the many myths that have arisen over the years since his untimely death at the age of 45 on April 1, 1950, and present the legacy of Dr. Charles Drew that has largely been unknown to the greater medical and scientific community. *Immunohematology* 2011;27:94–100.

April 2011 marked the 70th anniversary of the establishment of the American Red Cross Blood Services (ARCBS). In this review, Dr. Charles Drew's role as the first medical director of the ARCBS is reviewed, as are his life and untimely death at the age of 45 on April 1, 1950.

**Early Life and Formal Education**

Charles R. Drew was born on June 3, 1904, in Washington, D.C., to Nora Rosella Drew and Richard Thomas. Drew grew up in a middle-class family in the interracial neighborhood of Foggy Bottom. He attended the segregated Paul Laurence Dunbar High School, where he excelled in a variety of sports, including competitive swimming, football, basketball, and track. He graduated in 1922, having earned an athletic scholarship to attend Amherst College in Massachusetts.1 Drew continued his exceptional athletic performance in college as the only freshman to win a major letter, and later as the recipient of the Thomas W. Ashley Memorial Trophy for his contributions to athletics. In 1925, he received an honorable mention as an All-American halfback in the eastern division. Drew graduated from Amherst College with a bachelor's degree (B.A.) in 1926. From 1926 to 1928, Drew served as the Director of Athletics and Instructor of Biology and Chemistry at Morgan College in Baltimore, Maryland.2 Then in 1928, Drew was accepted into medical school at McGill University in Montreal, Quebec, Canada. Drew was awarded the M.D., C.M. degrees (Doctor of Medicine and Master of Surgery [Chirurgie] degrees) from McGill University in 1933.

**Professional Training**

*Excellence of performance will transcend artificial barriers created by man.*

Attributed to Charles Drew by his trainees3

After graduating from McGill University School of Medicine, Drew completed an internship at the Royal Victoria Hospital (1933–1934), followed by an additional year of residency training in internal medicine at the Montreal General Hospital (1934–1935).4 Drew then served as an Instructor of Pathology at Howard University in Washington, D.C., from 1933 to 1936, and as a resident in surgery at Howard University's Freedmen's Hospital from 1936 to 1938.5 From 1938 to 1940 Drew was a resident in surgery at New York City's Presbyterian Hospital as well as a General Education Board Fellow in surgery at Columbia University under the mentorship of Dr. Allen Whipple and Dr. John Scudder. Dr. Scudder introduced Drew to the new concepts of fluid and electrolyte therapy in the treatment of shock, as well as blood preservation in the blood bank at the Columbia-Presbyterian Medical Center.5,6 Drew passed the American Board of Surgery examinations during his last months in New York with Dr. Whipple's sponsorship. His outstanding performance on the oral part of the examination, in which he lectured on fluid balance and shock management, was well recognized in surgical circles. He became the first African American to be appointed an examiner of the American Board of Surgery.7

**Drew's Studies on Blood Preservation and Distribution and His Service to the American Red Cross**

*As you know, there is no scientific basis for the separation of the bloods of different races except on the basis of the individual blood types or groups.*

Charles Drew1,8

In 1937, Bernard Fantus established the first hospital blood storage and distribution center at the Cook County Hospital in Chicago, where he coined the term *blood bank*.9,10 However,
the model for the first blood banks began during World War I when combat injuries provided insight into blood’s functions. Oswald H. Robertson, a physician volunteering with the U.S. Army during World War I, is credited with establishing the first blood-collection storage device along the front lines in France. At the Battle of Cambrai, Robertson constructed an ice chest from two ammunition cases that he used to store blood. He transported 22 units of blood to a casualty clearing station to treat wounded Canadian soldiers who were determined to be in advanced shock and not surgical candidates. Nine of the 20 soldiers receiving transfusions lived. Also during this time, Captain Gordon R. Ward, a surgeon with the British Royal Army Medical Corps, recommended the use of plasma in patients wounded in combat to treat shock caused by rapid blood loss. During the 1930s, early blood banks were formed using the knowledge gained from Russian researchers, who performed experiments using cadaver blood in transfusions, and research by British and American scientists.

John Elliott, a laboratory chief at Rowan Hospital in Salisbury, North Carolina, researched early methods to separate plasma during the 1930s. Plasma was the first blood product tested for blood banking in the United States because plasma did not have to be typed (at that time). Moreover, it had increased resistance to degradation during handling, and it could be stored for long periods. Elliott contacted the ARC to promote the use of plasma on a large scale after reading that the organization was conducting pilot blood collections. Elliott also gave a plasma sample to Dr. Scudder at Columbia University, who was on the board of the Blood Betterment Association and who was Charles Drew’s mentor.

In 1938, Drew began working with Dr. Scudder, whose research initially focused on the dynamics of fluid loss and blood volume related to shock and later focused on the preservation of blood. Drew’s Doctorate of Science dissertation, entitled “Banked Blood: A Study in Blood Preservation,” was completed in the spring of 1940. On reading Drew’s dissertation today, it is impressive for its detailed history of blood transfusions and the evolution of blood banks. Several experimental studies are described that address the physiologic changes that occur in the electrolytes of plasma in stored blood as well as the cellular changes in heparinized blood. In particular, the toxicity caused by increasing levels of potassium in stored blood is discussed in relation to various blood preservatives. Drew also studied the chemical and biologic changes that occur during blood storage in different containers. Additionally, Drew designed experiments that evaluated the effects of trauma, specifically in the form of shaking blood, for varying times. These results had direct implications for the transport and storage of blood during World War II, which the United States joined shortly after the completion of Drew’s work. For example, Drew’s dissertation included an outline for establishing the experimental blood bank at the Presbyterian Hospital by incorporating several aspects from his research into the logistics of running a blood bank. Drew meticulously described the processes of blood typing donors and drawing blood. He listed both donor and recipient statistics regarding the indications for transfusion as well as the types of reactions, including urticaria, fever, chills, and jaundice. In the first 400 transfusions, there were 60 reactions, which was a 15 percent reaction rate.

Drew also investigated the cellular and protein changes in the recipients after the blood transfusions. More specifically, he examined the increases in protein content, and the changes in hemoglobin, red blood cell count, and cell volume. Overall, Drew concluded that blood could be stored for a week under his conditions; however, he observed that blood
could become toxic as a result of increasing potassium levels in the plasma.\textsuperscript{12-15} He identified that the addition of glucose helped maintain a near-neutral pH, which lengthened the life of the red blood cells.\textsuperscript{12,15} Moreover, Drew determined that blood storage could be improved by minimizing the interface between the cells and the plasma.\textsuperscript{12,16} Drew believed that the blood bank’s functions could best be achieved when all of its activities were centered in one facility, and he included a floor plan of a center in his dissertation. Drew’s research on blood, as elucidated in his dissertation, served as a foundation for his later work with the ARC.

During the latter part of 1940, the threat of joining World War II served as the impetus for the U.S. military to determine the utility of using plasma in combat. At this time, the ARC and the Blood Transfusion Betterment Association, a privately run blood service based in New York City, were researching the ability to process plasma on a national scale.\textsuperscript{4} In August 1940, the ARC and the Blood Transfusion Betterment Association collectively formed the Blood for Britain project.\textsuperscript{11} The Blood for Britain project was a humanitarian project sponsored by the ARC, which was organized to prepare and ship large quantities of liquid plasma to England. The project included eight hospitals in the New York area. After blood was collected from donors, it was sent to a central laboratory to remove the plasma. Because plasma is inherently susceptible to bacterial contamination, the plasma was then shipped to refrigerated warehouses, and then overseas. In September 1940, Drew was offered the position of Medical Director of the Blood for Britain project. He took a leave of absence from Howard University to contribute to this project. Drew’s attention to detail extended to each step of the plasma processing as Medical Director of the Blood for Britain project. This included testing plasma at regular intervals for 3 weeks to screen for bacteria at all intervals of growth, as well as mandating that testing be performed at one central laboratory, which eliminated the contamination that had been found in one of the earlier shipments to England.\textsuperscript{9} Drew, along with Tracy Voorhees, submitted a proposal for a 3-month pilot program in December 1940 for the mass production of dried plasma. In his final report for the Blood for Britain project, Drew emphasized the importance of continuing plasma research in New York.\textsuperscript{9} Based on his prior work and expertise, Drew was asked to extend his leave from Howard University to serve as director for the New York pilot program.\textsuperscript{17} In January 1941, the ARC established a program at Columbia University’s Presbyterian Hospital for the U.S. Army and Navy for the mass production of plasma. Drew began to research a system to procure and prepare dried plasma based on his own studies and the findings of others.

The pilot program that he proposed aimed to mass produce dried plasma. For the first time, mobile blood units were used to collect blood, and Drew supervised the first mobile run into Farmingdale, Long Island.\textsuperscript{9} The concept of donating blood to unknown recipients without financial consideration was new, and unexpectedly successful, at this time.\textsuperscript{5}

Drew continued to serve as the medical director for the ARC pilot program (Blood for Britain) until April 1, 1941.\textsuperscript{9,18} In February 1941, Drew was officially appointed medical director of the first ARBCS. During the 8 months that Drew served as both the acting and appointed medical director of the ARCBS and pilot program (Blood for Britain), he was able to establish and supervise a blood-collection program in addition to directing the preparation of dried plasma. The pilot blood plasma program that Drew had envisioned served as a model for the organization and operation of the ARC in the national blood plasma program.\textsuperscript{12} Drew returned from his leave of absence from teaching at Howard University in April 1941. In October 1941, he was named the Chair of the Department of Surgery and Chief Surgeon at Howard University’s Freedmen’s Hospital, a position he held until his death.\textsuperscript{18}

Myths regarding Dr. Drew’s reasons for leaving the ARC have been written for years, as recently as 1996.\textsuperscript{19,20} In fact, the rumors are so prevalent on the Internet, it takes a fair amount of reading of the established literature to distinguish fact from fiction. One account published in 1979 states that Drew “was no longer medical supervisor of the blood program—for an ironic reason. By order of the armed forces, the Red Cross had adopted a policy under which only Caucasian blood would be acceptable for later administration to members of the military forces...Dr. Drew could not sit still for this affront both to his race and to science. He subsequently resigned from the Red Cross....”\textsuperscript{17} In reality, Drew served the ARC (i.e., beyond its identity as the Blood for Britain project) for only 3 months, from January to April 1941. He left before any ARC centers beyond New York City were opened. As late as August 18, 1941, ARC rules were in place to accept blood from both men and women and from people of all races.\textsuperscript{21} However, later that year, after Drew returned to Howard University, the ARC gave in to the demands of the strictly segregated U.S. Army, which first refused blood donations from and later segregated blood from African American donors.\textsuperscript{21} Therefore, the segregation policy was not implemented for some time after Dr. Drew left the ARC; an official statement of his rationale for leaving was never made.\textsuperscript{9,21}
Service after the American Red Cross

The boys whom we are now helping to train, I believe, in time will constitute my greatest contribution to medicine.

Charles Drew, 1947. From a letter written to President of Amherst College Charles W. Cole.

The surgical resident training program at Freedmen's Hospital was established in 1936 under the leadership of Dr. Edward Lee Howes. Howard created its residency program as a means to increase the viability of its medical education, because African American medical graduates had limited opportunities to obtain clinical appointments in the United States. When Drew returned to Freedmen's Hospital in April 1941, his commitment was to teaching. His infallible drive, compassion, and concern for his residents extended to every aspect of their scholastic education and personal well-being. He relentlessly worked to secure internships, and he encouraged specialty training for his best students at white medical institutions once they had completed their education. Unfortunately, it was not until after Drew's death that more opportunities for African American doctors to gain admittance to residency programs became available.

Drew was a member of the American-Soviet Medical Society for several years. The story covered a presentation made at the 12th annual meeting of the American Association of Blood Banks in Chicago, Illinois, on November 6, 1959, at which the lead author, Dr. John Scudder, suggested a scientific rationale for segregating blood based largely on racial differences found in newly discovered antigens, such as Kidd and Duffy. And Dr. Scudder, Drew's previous scientific mentor at Columbia, was very open about his opinions. Another 1959 article in the New York Times read, “Blood Expert Says Transfusion between Races May Be Perilous,” based on Dr. Scudder's opinions. A more detailed account of Dr. Scudder's controversial ideas on blood segregation can be found in several well-documented analyses. Drew's opposing views on the segregation of blood were made clear in a communication with Dr. Scudder in 1944, in which he suggested the concept of segregation came from “Army attitude” toward segregation. Although the ARC started segregating blood in 1941, it was not until 1950 that the ARC leadership voted to discontinue racial designations on donor medical records. Even 10 years after Drew's death and after the practice of blood segregation had been given up in 1960, Dr. Scudder was still a proponent of the practice. For example, Dr. Scudder was invited to give the 1960 Charles R. Drew Memorial Lecture at Tuskegee Institute, as well as at Columbia University, during which he took the opportunity to give the valedictory lecture entitled “Practical Genetic Concepts in Modern Medicine,” recalling many of the themes of his 1959 talk in Chicago regarding the medical benefits of segregating the blood supply.

The Segregation of Blood

As blood bank practice developed throughout the 1950s, studies were published that were interpreted by some to support the practice of segregating blood, a practice the ARC adopted in its early days because of its relationship with the U.S. Army. A highly publicized Associated Press release on November 7, 1959, reported that “[a] noted medical research and blood specialist says transfusions are safer for patients when blood of their own race is used.” The story covered a presentation made at the 12th annual meeting of the American Association of Blood Banks in Chicago, Illinois, on November 6, 1959, at which the lead author, Dr. John Scudder, suggested a scientific rationale for segregating blood based largely on racial differences found in newly discovered antigens, such as Kidd and Duffy. And Dr. Scudder, Drew's previous scientific mentor at Columbia, was very open about his opinions. Another 1959 article in the New York Times read, “Blood Expert Says Transfusion between Races May Be Perilous,” based on Dr. Scudder's opinions. A more detailed account of Dr. Scudder's controversial ideas on blood segregation can be found in several well-documented analyses. Drew's opposing views on the segregation of blood were made clear in a communication with Dr. Scudder in 1944, in which he suggested the concept of segregation came from “Army attitude” toward segregation. Although the ARC started segregating blood in 1941, it was not until 1950 that the ARC leadership voted to discontinue racial designations on donor medical records. Even 10 years after Drew's death and after the practice of blood segregation had been given up in 1960, Dr. Scudder was still a proponent of the practice. For example, Dr. Scudder was invited to give the 1960 Charles R. Drew Memorial Lecture at Tuskegee Institute, as well as at Columbia University, during which he took the opportunity to give the valedictory lecture entitled “Practical Genetic Concepts in Modern Medicine,” recalling many of the themes of his 1959 talk in Chicago regarding the medical benefits of segregating the blood supply.

Death

The success of the group as a whole is the basis for any tradition which we may create. In such traditions lies the sense of discipleship, the inspiration which serves as a guide for those who come after, so that each man's job is not just his job alone but a part of a greater job whose horizons we at present can only dimly imagine for they are beyond our view.

Letter to his resident Jack White, 1946.

At a time when segregation permeated all aspects of society, including the medical profession, Drew traveled to a medical conference held annually at the John A. Andrew Hospital in Tuskegee, Alabama, for rural African American residents who lived in regions of the Deep South. The free
medical clinics that were offered at the conference were attended by predominately African American physicians from across the country. Drew attended this conference annually and enjoyed the opportunity to provide education for young surgeons. After working a long day that began at 6:30 AM and concluded with hospital rounds at 11 PM, Drew and three other physicians—Samuel Bullock, a Howard medical professor, and Walter R. Johnson and John R. Ford, both surgery interns from Howard University—began driving to Tuskegee, Alabama, for this medical conference in the early morning hours of April 1, 1950.

After driving through the night and alternating drivers, Drew began driving Dr. Bullock’s Buick Roadmaster around 7:30 AM. As they drove along a stretch of NC 49 north of the town of Haw River in Alamance County, North Carolina, Drew apparently fell asleep at the wheel. Years later Dr. Ford reconstructed the events at the time of the accident around 7:50 AM. He recalled the wheels on the right side of the car hitting the shoulder and Dr. Bullock yelling out, "Hey Charlie!" Drew pulled the wheel sharply to the left causing the car to roll over while traveling more than 70 miles per hour. As the car flipped over toward the passenger side, both the driver and passenger doors opened.

The car turned over a second time, and Drew was halfway thrown from the car with his head, thorax, and left leg sustaining serious trauma from the impact. Johnson and Bullock were relatively uninjured; however, Ford was ejected from the car and sustained a concussion, fractures of the left humerus and scapula, and severe injuries to his right knee. Drew and Ford were transported to the emergency room at Alamance General Hospital, the only hospital in Alamance County, 40 minutes after the accident. Drew had endured a closed head injury, severe soft-tissue injuries, and a crushed chest injury, which resulted in obstruction of the superior vena cava and avulsion of the hepatic veins. Drew’s death certificate, which was signed by Harold Kernodle, lists the following injuries from the automobile accident that led to his death: (1) brain injury, (2) internal hemorrhage lungs, and (3) multiple extremities injuries. John Ford was admitted to the hospital and remained there for 2 days. During his treatment he was assigned to a room in the basement, which was reserved for African American patients. At Alamance General Hospital the treatment of admitted patients was segregated by race as in other hospitals throughout the country at the time; however, both African American and white patients were treated in the emergency room.

Drew’s body was taken to the Sharpe Memorial Chapel in Burlington, North Carolina, and from there, the McGuire Funeral Home transported him back to Washington. His body lay in state for public viewing at Howard University’s Andrew Rankin Memorial Chapel from April 4 until the day of his funeral service on April 5, 1950. The service was held at the Nineteenth Street Baptist Church, the church Drew and his family had attended his entire life. Drew was 45 years old at the time of his death, and he was survived by his wife, Lenore, and four children: Bebe Roberta, Charlene Rosella, Rhea Sylvia, and Charles Richard, Jr., ages 9, 8, 6, and 4, respectively, at the time of his death.

Drew was awarded a posthumous fellowship in the American College of Surgeons, an organization to which he had not previously been allowed admission. At least twelve K–12 schools and six medical facilities and higher education institutions have been named in honor of Dr. Drew (Table 1). In 1981, the U.S. Postal Service issued a 35-cent stamp in honor of Drew as part of the “Great American Series.” The Charles Drew University of Medicine and Science was established in 1966 in Los Angeles, California, as a private medical and health sciences institution with the goal of providing education to medical professionals serving the underprivileged. There is a Charles R. Drew Memorial Bridge in Washington, D.C., and one of the boroughs of Montreal, where he attended McGill University, has been named after him (Parc Charles-Drew, in Le Sud-Ouest). A marker was erected in 1986 by the Alamance County Historic Properties Commission, the Omega Psi Phi Fraternity, and Drew’s friends at the site of Drew’s accident in Haw River, North Carolina (Fig. 1).

Unfortunately, in the decades since Drew’s death, myths related to the circumstances of his death and work with the
blood bank have been propagated in both oral and written form. One of the earliest myths related the irony that Drew, who played an important role in the creation of blood banks, bled to death after being refused treatment at an all-white hospital. As Drew biographer Spencie Love related, although these myths and legends were not true, they were altered and extrapolated on, often obscuring and obliterating the truth over time, as a reflection of how a culture views its past. She noted that the historian Paul Gaston finds that “[m]yths are not polite euphemisms for falsehoods, but are combinations of images and symbols that reflect a people’s way of perceiving truth.” Organically related to fundamental reality of life, they fuse the real and the imaginary into a blend that becomes a reality itself, a force in history. Spencie Love presented an analogy that compared history with mirrors, stating, “as shapers of our past we each have the opportunity at any given point in time to fashion new mirrors that are a little better made and a little more serviceable than the ones we have been using.... History is indeed a hall of mirrors, some dazzling, some distorting the past beyond recognition.” Although the circumstances regarding Charles Drew’s life may have been distorted in fundamental ways over the years, his contributions and his role as a leader in American medicine stand apart and are undisputed. His leadership in blood banking, the ARC, and

Table 1. The legacy of Charles Drew*

<table>
<thead>
<tr>
<th>Medical Facilities and Higher Education Institutions</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charles R. Drew University of Medicine and Science</td>
<td>Los Angeles, CA</td>
</tr>
<tr>
<td>Charles Drew Health Center</td>
<td>Omaha, NE</td>
</tr>
<tr>
<td>Charles Drew Science Enrichment Laboratory</td>
<td>East Lansing, MI</td>
</tr>
<tr>
<td>Charles Drew Health Foundation</td>
<td>East Palo Alto, CA</td>
</tr>
<tr>
<td>Charles Drew Community Health Center</td>
<td>Burlington, NC (near the old Alamance County hospital site)</td>
</tr>
<tr>
<td>Charles R. Drew Wellness Center</td>
<td>Columbia, SC</td>
</tr>
<tr>
<td>Charles Drew Memorial Cultural House</td>
<td>Amherst College</td>
</tr>
<tr>
<td>Charles Drew Hall (Dorm), Howard University</td>
<td>Washington, D.C.</td>
</tr>
</tbody>
</table>

**K-12 Schools**

| Charles R. Drew Junior High School                   | Detroit, MI |
| Charles Drew Science Magnet School                   | Buffalo, NY |
| Charles R. Drew Elementary School                    | Miami Beach, FL |
| Charles R. Drew Elementary School                    | Pompano Beach, FL |
| Bluford Drew Jenison S.T.E.M Academy                 | Baltimore, MD |
| Dr. Charles R. Drew Elementary School                | Baltimore, MD |
| Charles R. Drew Elementary School                    | Arlington, VA |
| Dr. Charles Drew Elementary School                   | New Orleans, LA |
| Charles R. Drew Charter School                       | Atlanta, GA |
| Charles R. Drew High School                          | Riverdale, GA |
| Compton-Drew Middle School ILC                        | St. Louis, MO |
| Charles R. Drew Elementary School                    | Washington, DC |
| Charles Drew Academy at Anacostia High School        | Washington, DC |

**Other**

| Charles R. Drew Memorial Park                        | Queens County, New York |
| Charles R. Drew Memorial Bridge                      | Washington, DC |
| Parc Charles-Drew                                    | Le Sud-Ouest, Montreal, Quebec, Canada |
| USNS Charles Drew (dry cargo ship)                   | U.S. Navy |

*Adapted from Wikipedia and Google search for “Charles Drew memorials,” January 2011.

Figure 1. Charles Richard Drew memorial marker. This marker was erected in 1986 by the Alamance County government, Omega Psi Phi Fraternity, and friends. Additional details can be found at http://www.hmdb.org/marker.asp?marker=31142. The inscription is detailed below.

Charles Richard Drew
1904–1950

Black scientist and surgeon
Pioneer in the preservation of blood plasma
Medical director of the Blood-for-Britain Project, 1940
Director of the first American Red Cross Blood Bank, 1941
Teacher to a generation of American doctors, Freedmen’s Hospital, Howard University, Washington, D.C.
Outstanding athlete, Amherst College and McGill University
Member of Omega Psi Phi Fraternity
Steadfast foe of racial injustice
Died in Alamance General Hospital 1 April, 1950, after an automobile accident at this site

“There must always be the continuing struggle to make the increasing knowledge of the world bear some fruit in increased understanding and in the production of human happiness.”

Charles R. Drew
the larger medical community and country are undeniable. This is the legacy that needs to be shared.

Acknowledgments

The authors wish to thank Connor S. Willis for his inspiring curiosity about Dr. Drew, which became the impetus for writing this manuscript. We also thank him for his assistance with the memorial photographs taken in Burlington, North Carolina.

References


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*Immunohematology is printed on acid-free paper.