

Blood Ties:
A History of Blood Transfusion

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According to Martin Luther, “blood alone moves the wheels of history”. He, of course, meant this in a literal sense of blood spilled on a battlefield. However, his words also hold true when given a more metaphorical meaning. The history of blood transfusion is a story about sharing blood, by giving and receiving it. What may at first seem like a simple story is, on closer inspection, a complex and circling narrative - a microcosm of the larger narrative of how society and science interact.

In the ancient world, the proportion of blood a person possessed relative to other “humors” was thought to determine their temperament and health. When, in 1628, William Harvey proved that blood was part of a simple mechanical system—a fluid pumped in a circuit by the heart, and Rene Descartes argued for a mechanistic interpretation of this finding, they set the stage for blood transfusion by demonstrating that blood was an interchangeable part of a mechanical system. It took another three hundred years for blood transfusion to emerge as a viable medical technique. The advent of blood transfusion allowed people to give blood to each other; in the early twentieth century blood was still considered imbued with personal attributes, and thus the very conditions of early blood donation ensured that it was regarded as a personal gift. In the past one hundred years such views have been completely transformed, most notably by the fight against racially-guided blood donation policies, along with advancements in blood science, including the discovery of blood types and molecular markers, and changes in the practice of transfusion itself. These changes have revealed and reinforced our deep commonalities as a species, and transformed the nature of blood donation: blood donation is still a “gift”, but now it is an impersonal gift. However, more recently the HIV and Hepatitis C (HCV) epidemics have re-personalized blood by demonstrating that some people’s blood is dangerous, and this has eroded the gift-exchange model of blood transfusion.

Early blood transfusion: The personal gift

William Harvey revolutionized science and medicine when he published his great treatise *On the Motion of the Heart and Blood* in 1628, and established that the heart was a pump that moved blood in a circuit around the body. Harvey’s discovery occurred at a time of great upheaval, and marked a drastic shift in medicine and philosophy (1). Much to traditionalist Harvey’s consternation, his discovery was used to support philosopher Rene Descartes’ mechanistic approach to physiology (1, 2). Descartes accepted most of Harvey’s thesis about blood’s circuitous flow, and, epitomizing his role as philosopher, explained it a novel conceptual framework (3). Descartes’ proposed a philosophy of dualism where the body is mechanistic and distinct from a non-physical mind, which holds the soul (3). Together, Harvey and Descartes set the stage for blood transfusion by putting forward the idea that blood was an interchangeable part of a mechanical system.

Clinical transfusion did not lag far behind Harvey’s discovery. The first transfusion, in which a young “debauched” man was transfused with lamb’s blood, was attempted in 1667 in England at a meeting of the Royal Society at Gresham

College (4). In these early transfusions, people with mood disorders were transfused with lamb's blood, under the assumption that one could mollify a tempestuous temperament with the blood of a calm animal (5, 6). However, after a series of transfusions led to patients' death, this treatment for psychiatric disturbance lost favor in much of Western Europe (6).

When blood transfusion reappeared on the medical scene, it was in a different context: blood replacement following trauma or surgery. But that did not mean that blood, and the sharing of blood, had shed its symbolic charge. In 1817 British obstetrician James Blundell attempted, for the first time, human transfusions on women with post partum hemorrhage, or profuse blood loss following delivery (4). He used transfusions to replace blood rather than to cure psychiatric disease, and he used human blood rather than animal blood-both for convenience and for concerns over the safety of interspecies transfusion (6, 7). In 1875 German physiologist Leonard Landois definitively confirmed the inviability of interspecies transfusion when he demonstrated that cells in the recipient's blood will lyse the transfused blood cells originating from another species (4).

Although occasional transfusions were performed in the decades after Blundell, the field of blood transfusion was almost singlehandedly reinvigorated by American surgeon George W. Crile during the early twentieth century (6). He improved upon the current anastomosis technique, and while the field until then had advanced at slow pace, he performed over one hundred transfusions between 1905-1909 (6, 8). By now, blood transfusions were being performed for loss of blood, diseased blood, or shock (4). Crile was exhilarated by his early transfusions. He describes the successful transfusion of one patient, rather significantly, as a "miracle of resurrection" (9). Much more invasive and intimate than today's transfusions, blood vessels of both the patient and the donor were stripped down and directly connected – the donor's artery to the recipient's vein, for up to one hour – the direct connection mitigating the problem of clotting (4, 6, 8, 10). Blood transfusions became accessible to less experienced surgeons with the discoveries that citrate could be used as an anticoagulant, and that one could use a cannula to remove blood (4, 11).

The physical intimacy of early transfusion, and the sharing of such vital fluid, captured public imagination by challenging known boundaries between the self and others. Vignettes about the human stories of transfusion were common in early twentieth century newspapers, and intimated the connections that transfusion created (6). A 1921 vignette from the *New York Times* recounted a story that pushes the possibility of transfusion in creating connection to the brink- when one Julian Dick received an unsuccessful transfusion from the brother of the man who had shot him – the implication being that blood transfusion was a form of moral atonement or reparation. (12).

It is well understood that gift giving creates social connection between people, including the goodwill and obligation that result from the possibility of

reciprocity (13). People currently live in large societies comprised of dissimilar and geographically distant peoples, and voluntary communal gifts, like donating blood for transfusion, have become an important means of forging community. It is anonymous giving, but its very anonymity helps to smooth over the anxieties and intergroup tensions of mass society. (14). Indeed, in his seminal book *The Gift Relationship* researcher Richard Titmuss argued that voluntary blood donation has singular altruistic attributes, namely blood donation can be painful, givers do not require reciprocation of blood donation, and the recipient is not obliged to donate their own blood (14). In a similar vein, sociologist Catherine Waldby suggested that giving and receiving blood can create the conditions for imagined community among fellow citizens (15). However, in the early decades of modern blood transfusion, 'imagining' such communities was far from easy for the public or for physicians. In the backdrop of scientific advancements around blood transfusion, social prejudice and science mixed when scholars started to theorize on "scientific" conceptions of race.

Channeling beliefs from earlier times, people who underwent early transfusions commonly believed that receiving another's blood would dilute, as they say, their own identity. When, in 1921, Italian singer Enrico Caruso received two transfusions from non-Italians he questioned the endurance of his Italian identity. His widow recorded his fear, "I have no more my pure Italian blood, who am I now?" (6). Historian Susan Lederer recounts the opposite case of a Jewish merchant who was delighted after he received blood from a young man claiming to be descending from Irish royalty (6). Transfusion "upgraded" his identity.

Feminist literature uses the term *intercorporeality* to describe the complex ways in which people share their lived experiences (16). The advent of blood transfusion created new possibilities for intercorporeality. Before transfusion, sharing of bodily fluid occurred when a mother breast fed her child, or during intimate encounters. In this context, the direct life-preserving transfer of blood from one's body to another similarly created a uniquely profound connection, and when these transfusions occurred outside of family lines they connected people in a way that was not possible before transfusion (16). Thus, blood donation in this age was considered a unique and highly personal voluntary gift, one that questioned self-other boundaries and forged community.

Blood Donation as an Impersonal gift: the Depersonalizing of Blood Donations

An example of the struggle between the belief in the medical benefits of blood transfusion and the fears that interracial transfusion would lead to the dissolution of racial boundaries can be found in the sensationalist 1900 science-fiction story *Dr. Immortelle* (17). Here, a depraved physician transfuses himself with the blood of unwilling children in order to remain young, and a noble and brave nurse discovers his secret. Victor de Lyle, the evil doctor's reluctant servant, embodies fears of racial intermixing, as a black slave who turned Caucasian after years of forced transfusions (17). Such symbolic anxieties, however deep-seated,

had less to feed on by the mid to late twentieth century when blood donation changed from being a personal gift imbued with individual characteristics to an impersonal, identity-neutral, offering.

The first step in this process involved physically separating the donor and the recipient; the second was to render both anonymous. In the decades preceding World War II (WWII), advances in blood technology led to the possibility of banking blood, separating blood components, and storing plasma (18, 19), as well as in mobilizing donors (18). Wartime transfusions on the frontlines of the Spanish civil war were successfully attempted, and necessitated large-scale operations under emergency conditions-advancements that began to depersonalize blood donation (20, 21). These large scale anonymous blood donations, originating from civilian blood banks, were unprecedented and have been described as a new level of altruism, where the donor and recipient are anonymous and there is no expectation of reciprocity-they served to forge a sense of community among donors and recipients (14).

By 1940 WWII was well underway, and recognizing the need for blood for British casualties, the Blood for Britain program was created in New York (21). Led by McGill educated African-American physician Charles Drew, liquid plasma was collected en masse from volunteer donors (21). This represents yet another stage in the distancing of blood from the imagination, as plasma does not visually resemble blood. Both Caucasian and African Americans responded to the patriotic call to give blood, and following the precedent set by the first American blood bank which had opened in 1937, Drew accepted donations from both groups but recorded the blood's racial origins (6). In 1941, when the Blood for Britain program closed, a program of dried plasma collection was initiated by the American Red Cross (19). In this program, blood donation from African Americans was refused (22). The gift of blood donation might have been an altruistic gift, but it was one with exception. African Americans were not permitted to join the army, an important symbol of American identity, and now they were not allowed to donate blood to allied troops. They were excluded, in very important ways, from contributing, and consequently belonging, to the larger society. They were not fully "citizens".

Throughout the first half of the twentieth century, scientists unsuccessfully searched for serologic differences between the blood of Caucasians and that of African Americans (6). Despite scientific consensus that Caucasian and African-American blood was identical, wartime refusal of black blood was justified on population grounds-as African Americans were not allowed to enlist, authorities stated that their blood was not needed (23). However, authorities privately recognized that these policies mainly reflected long-standing racial tensions (6). Blood was considered imbued with racial characteristics of the donor.

Blood quickly became a rallying point of the flourishing WWII civil rights movement (24, 25). In 1942, following the battle at Pearl Harbour, strong nationalist sentiment encouraged large numbers to contribute their blood to the nation's war

efforts, but again African Americans were refused (24). Opposition grew throughout society (24). The liberal newspaper *PM* echoed the prevailing sentiment with the cutting argument, "Whoever is responsible for the present policy whether he be in the Red Cross or the armed services, is alienating almost 15,000,000 African-Americans from America's war effort, by telling them that Hitler's ideas of race and blood are democracy's ideas too. What fifth columnist could Hitler possibly hire to do a job equal to that?" (26). In this same year, the Red Cross decided to accept African-American plasma, albeit segregated from Caucasian's, and in 1950 racial classification was definitively eliminated (6, 27). The weakening of ideas of racial differences that resulted from the success of this movement was encapsulated by the *New York Times* declaring a position that would have been unheard of just 10 years prior, that "human blood is human blood regardless of the degree of pigmentation of the skin" (28).

At the same time that blood transfusion was eroding boundaries of racial identity, advances in science were further leading to a more impersonal and inclusive conception of blood. Following the reductionist trajectory of modern science, blood has been studied on an even smaller scale, and components of blood and molecular markers have been identified and analyzed. In 1901, pathologist Karl Landsteiner revealed the existence of four blood groupings (29). His discoveries gained clinical relevance when Doctors Ottenberg and Epstein demonstrated that ABO screening before transfusions eliminated negative sequelae (30). Rh groups were discovered in 1939-1940, solving the mystery of hemolytic disease of the newborn (31). Thirty-three major blood group systems are currently recognized (32).

The abundance and importance of biological advances in science lead to the rise of *biologism*, or the understanding of life from a biological standpoint (33). Biologic understanding of blood reveals our similitude as a species. ABO and Rh grouping places people in categories, but these do not follow the lines that people have traditionally been have drawn to classify themselves. Spread across race, gender, national lines, and adhering to only the closest family connections, they spur any attempts to find identity in them.

Repersonalizing of blood and rejection of the gift-exchange model

The HIV and HCV epidemics circle back to the start of our narrative by leading to an impersonal re-personalization of blood (15). Although people long understood the risks of disease transmission through blood transfusion (34), transmission of blood borne disease had not before occurred so rapidly and on such a large scale. Thousands of people in North America were infected with HIV from transfusions between 1978-1984, before the development of the ELISA test (6). It is estimated that the majority of the hemophiliac population reliant on transfusion of clotting factors became infected with HCV and HIV (35).

There is an interesting corollary between the African Americans whose blood gift was rejected during WWII, and the HCV+ group whose blood gift is now withheld from circulation. Although sound fears of disease transmission underlies rejection of HCV+ blood, these two groups are similar in that the exclusion of their blood from common circulation affects their identification with it, and implicitly reflects badly on their status as full members of society. In a recent study healthy blood donors and HCV+ subjects were interviewed, and unlike their healthy counterparts, and HCV+ subjects were self-identified with their blood, and were quite aware of the risks that the distribution of their blood posed to society (15). Interestingly, the majority of subjects in both groups held an impersonal view of blood—they either reported that its connection with the donor's identity was strictly biological, or that it was a communal substance with no connection to identity (15). Thus, the re-personalization of blood does not involve personal attributes, but rather an acquired diseased status that puts one at risk to others. By not regarding their blood as "themselves", these patients could refuse to accept that *they* were a "public risk".

Scholars have argued that contamination of the blood bank during the initial decades of the HIV/AIDS crisis strained the social fabric of the gift-exchange model on which blood banks are based, and that strain continues to be felt (15). There is an interesting disconnect between the desire to give blood and the willingness to accept it. Despite the currently minute risk of infection with blood born disease from the blood bank, when regularly contributing healthy blood donors were asked whether they would prefer receiving an autologous blood donation or one from the blood bank, they unanimously preferred the former; the social fabric is damaged even among contributors (15).

Our relationship with blood currently faces a new age with the advent of artificial blood. Blood born epidemics led to serious concerns about the safety of the human blood bank, and spurned interest in creating synthetic blood substitutes (36). The use of artificially produced blood blurs the line between flesh and technology. Catherine Waldby calls this "technogenesis" which she defines as "the loss of an origin securely in nature" (37), and it is likely to change our relationship with blood in new and complex ways.

Conclusion

When twentieth century physicians, who inherited an understanding from the ancient Greeks of blood as imbued with personal identity, and perfected techniques of blood transfusion, they created the possibility of forging community by giving a personal gift. The personal gift became depersonalized during the mid to late twentieth century, when wide scale warfare necessitated mass and anonymous blood transfusion, African Americans fought for trans-racial blood donation, and an increasingly fast rate of scientific advancements revealed the deep commonalities of our blood. However, unconscientious use of this new technology led to the epidemic spread of blood born disease, and the fabric of the gift-exchange model of blood

donation was severely damaged. Blood again became personal, but in an impersonal disease-status way. Partly as a response to this development, synthetic blood was created, and poses to supplant the gift-exchange model of blood transfusion. With these interactions between society and science - blood ties have loosened; our connection to each other is more fluid and hard to hold onto.

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