醫療財團法人
台灣血液基金會
捐血救人 Taiwan Blood Services Foundation

2021 ANNUAL REPORT

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Message from the President

Affected by the COVID-19 pandemic in the past two years, the whole world has had its hard time, with people from all walks of life facing many challenges, especially in medical issues. In 2021, Taiwan once raised the COVID-19 alert to Level 3 nationwide, impacting not only its economy and people's livelihood but also our blood-raising activities. As a result, the amounts of donated blood dropped sharply for a while. Fortunately, we managed to meet the clinical uses for patients in need of blood transfusion therapy.

The COVID-19 virus has no intermediate host. Thus, it is essential to maintain social distance so as to reduce the chance of infection. Nevertheless, keeping a distance means that all social activities must be minimized; some countries have even implemented lockdowns to confine people at home to minimize face-to-face contact, hoping to "suffocate" the virus. However, one of the downsides was that once social activities were reduced to a minimum, it would be very difficult for us to host blood donation activities, which are highly dependent on crowd gathering after all. Therefore, the epidemic prevention policies enforced by Level 3 alert had a great impact on our blood donation operations, because blood donation (either for disinfection or for blood collection) must be carried out in close contact. To make the situation even worse, blood cannot be stored for a long time, as blood cells have a limited lifespan. If no blood is donated within three to five days, there will be blood shortage, because blood is still irreplaceable so far.

Staying at home for epidemic prevention led to a sharp drop in blood donors, as schools, associations, and enterprises that used to conduct blood donation activities retreated to avoid crowd gatherings. We even had difficulties in finding a good place to park our bloodmobiles. After Level 3 alert was announced, those popular places for blood donation, which had been originally crowded with people, became empty instantly, making it difficult for us to raise blood. As a result, the blood safety stock in each blood center declined rapidly, even falling below the limit of four days into an emergency state of blood shortage and imposing a grave challenge to the

lives and medical rights of those patients in urgent need of blood transfusion at the time.

Although the reduction in social activities, because of the COVID-19 pandemic, might have reduced the incidence of accidents such as car accidents and lessened the need for non-acute surgeries and medical care, the incidence of cancer would not decrease and many of its courses of treatment required blood transfusion without delay. Fortunately, we always have a group of regular blood donors to rely on. They are people who are not afraid of the COVID-19 pandemic, manage their own health well, and donate blood continuously. This group of "Bodhisattva-like blood donors" is really admirable. As they aim to donate blood regularly, they become so highly self-disciplined to maintain good health, in order that they can provide good quality blood for patients to use and they can donate blood successfully every time. As blood donors, they not only set up such goals for themselves but also encourage each other to fulfill them. They are really lovely and respectable. This group of regular blood donors did not receive any money in return. What they got was spiritual satisfaction and happiness. They donate blood for a simple reason: to save life. It was also because of them that our medical care service did not stagnate. “Give blood save lives”, but sometimes saves a family. We should pay the highest respect to this group of "Bodhisattva-like blood donors" and give them the biggest applause.

Although Taiwan has the highest non-remunerated blood donation rate in the world, we have suffered from an occasional shortage of the sources of blood supply in recent years. In response to the potential worry of blood shortage in the future, we have taken various measures to stabilize the sources of blood supply. For example, we introduced the concept of "Patient Blood Management (PBM)" in 2020 and invited various specialists to compile the "Practical Blood

Transfusion Manual", which was published in June 2020 and whose second edition has been currently revised and is expected to be published in June 2022. It is hoped that this manual can not only provide physicians with more comprehensive blood transfusion modes but also assist hospitals in promoting blood saving in clinical use, so that various blood components can be transfused more accurately and effectively to patients undergoing blood transfusion so as to achieve the goal of preventing adverse blood transfusion reactions and effectively reducing medical costs.

In 2021, we at the Taiwan Blood Services Foundation (TBSF) presented the theme: "Comprehensive Blood Quality Control : The Unique Blood Management Information System with Ubiquitous Intelligence in Taiwan", which not only gained for us the "SNQ (Symbol of National Quality) Certification—Medical Periphery Category/Public Service Group" but was also honored with the bronze medal award in the "National Biotechnology and Medical Care Quality Award" contest. This is the fifth time that our TBSF has won the award, meaning that we have been highly affirmed by the country. This blood management information system, which is fully digitized to shorten the time difference and provide more timely services, has built in an intelligent expert mode to assist in reviewing the qualifications of blood donors and fully connecting the donation and blood supply processes to improve the efficiency of blood management and improve blood safety. We hope that this technology-based and digital services can also improve the experience of blood donors in blood donation.

TBSF has not only used an all-round information system to track the whole process of blood history so that safe blood becomes the support and backing of the medical system for people's health but has fully mobilized its resources to maintain a safe blood supply of medical use under the impact of the COVID-19 pandemic, thanks to the selfless dedication of regular blood donors from all walks of life. In the future, we will continue to manage ourselves with a positive and rigorous attitude. Upholding the concept of "Happy Blood Donation and Safe Blood Use", we will keep on improving to create a better blood donation environment and provide high-quality blood for clinical needs.

Sheng-Mou Hou

President

About us

Our Aim

Upholding the concept of "happy blood donation and safe blood use," the TBSF practices a voluntary non-remunerated blood donation system, insists on strict blood quality control and provides the most complete services for blood donors and blood recipients so as to ensure a sufficient blood supply for clinical uses.

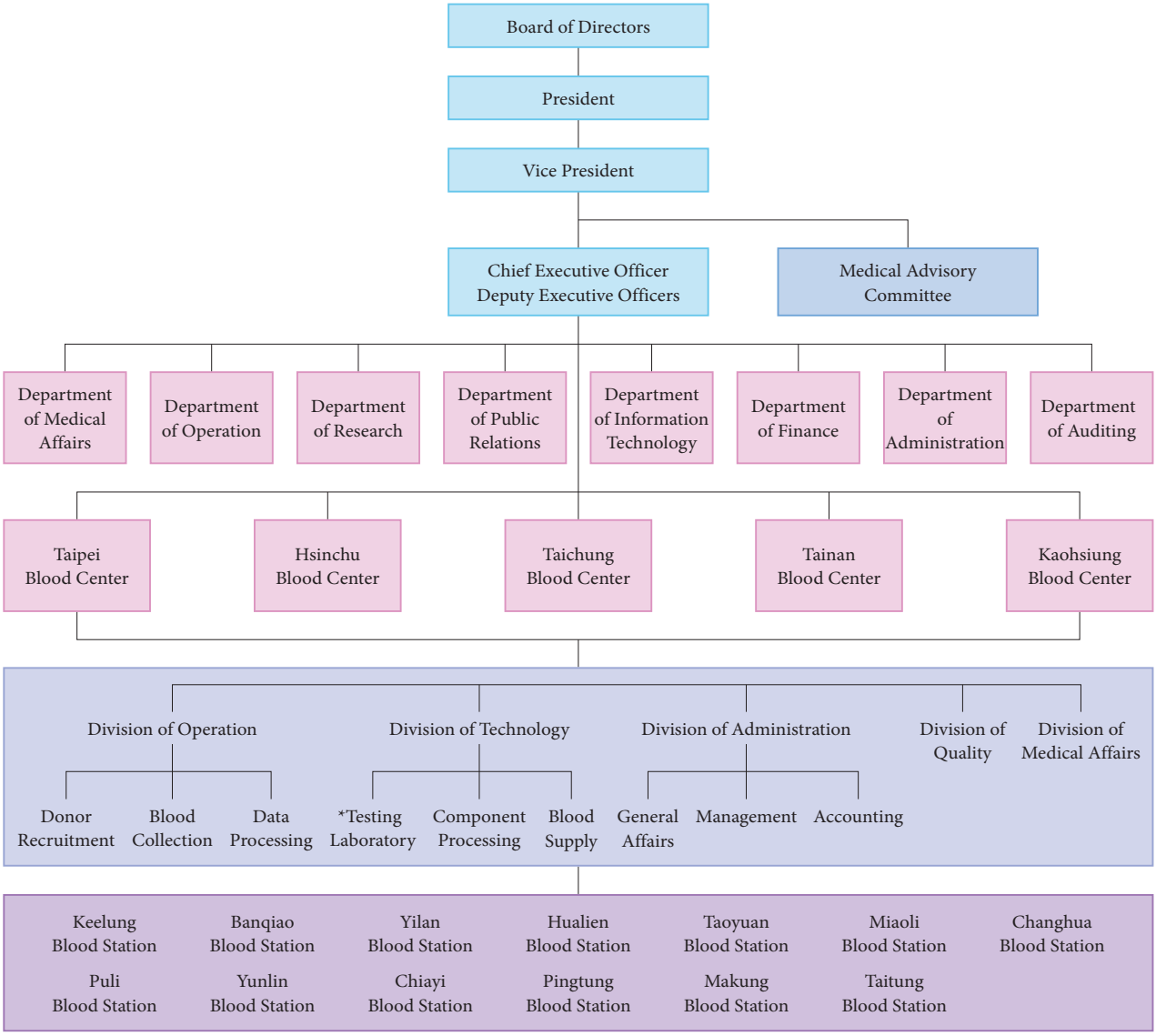
Our Vision

Adhering to sustainable development under the principles of integrity, harmony, efficiency, and innovation, the TBSF vows to become the leader in blood supply for safe clinical uses in Taiwan.

Our Missions

1. To plan and implement blood donation services.
2. To establish blood donation systems, and to conduct research and development on safe blood use.
3. To conduct research on blood science and technology.
4. To collect , laboratory-test, and supply blood for patients of public and private hospital.
5. To conduct research on the health maintenance of blood donors.
6. To conduct matters concerning the use and safety management of blood suitable for transfusion.
7. To plan and supply blood in large quantity at times of major disasters or wars.
8. To commission toll fractionation , to storage and supply domestic plasma derived products.
9. Other matters concerning blood donation and supply.

Organization



Note: * There are 2 centralized testing laboratories in Taipei and Kaohsiung Blood Center.

History of Taiwan Blood Services Foundation (1974~2021)

1974

April • Chinese Blood Donation Association was established.

August • Taipei Blood Center was established.

1975

October • Taichung Blood Center was established.

1976

December • The Kaohsiung Blood Center was established.

1978

July • Taipei Blood Center started the production and supply of blood components, including packed RBC, washed RBC, WBC concentrates, platelets, fresh frozen plasma and frozen plasma.

1981

July • Tainan Blood Center was established.

1983

January • Taipei Blood Center introduced leukocyte and platelet apheresis.

1985

July • Human leukocyte antigen (HLA) laboratory was established.

1987

June • Hospital-based and Red Cross paid donor blood banks closed.

1988

January • Implementation of anti-HIV-I test.

1989

December • To prevent blood donations from high-risk AIDS groups and other unsuitable donors, the Blood Centers started "a confidential phone call", whereby donors could call to notify the Blood Centers if the blood donated is unsuitable.

1990

January • Chinese Blood Services Foundation which is the predecessor of Taiwan Blood Services Foundation was established.

1991

April • Hualien Blood Center was established.

December • The annual blood donations exceeded one million units, and the blood donation rate

reached 5.18%.

1992

May
- Hsinchu Blood Center was established.
- Implementation of anti-HCV test.
- Establishment of electronic database of red cell phenotypes.

1993

February
- Introduction of HLA-matched apheresis platelets.

September
- Implementation of a computer system to replace manual work of blood donation and processing.

1995

April
- It is the first time, the President met the 28 outstanding blood donors in the presidential palace for annual blood donor recognition event.

1996

January
- Implementation of anti-HTLV test.

1997

January
- The Minister of Department of Health, Chang Po-ya and the President of TBSF Lin Kou-Sin announced to start the productions of plasma derivative products.

1998

February
- Implementation of RBC irregular antibody screening test.

April • The first public umbilical cord blood bank was established. The plan was ended in January 2013.

1999

March • The Blood Centers got approval of the MCA (Medicines Control Agency) and sent source plasma to plasma fractionation plant of SNBTS (Scottish National Blood Transfusion Service).

2001

August • Consolidation of 6 blood centers' testing labs into 2 centralized labs located in Taipei and Kaohsiung blood centers.

December • The "TBSF" plasma derivative products started to supply.

2007

January • Implementation of bacteria testing for all apheresis platelets.

2009

September • The archive sample bank built in Hsinchu Blood Center was launched.

2013

January • Implementation of Nucleic Acid Amplification Testing (NAT).

2015

July • The TRALI (transfusion-related acute lung injury) prevention policy was initiated with the following two initiatives: 1) male plasma was prioritized for transfusions. 2) HLA & HNA antibody screening for female apheresis donors.

November • Implementation of cholesterol, LDL-C, and HbA1c tests every 3 years for those who have

donated blood in the past 2 years and are above 40 years old.

2016

October • Implementation of the mobile social communication app LINE official account named " i-Blood " with intelligent query, personalized notification and instant push broadcast functions.

2017

February • Haemovigilance reporting system was launched.

April • Hualien blood center was reorganized and merged into Taipei and Kaohsiung blood centers.

2018

August • The new Blood Management System based on Internet Data Center was launched.

December • The universal screening of RBC Mia antigen have been introduced.

• The TBSF hosted at the 5th APEC Blood Safety Policy Forum in Taipei.

2019

June • The singer, Miss Fang Wu, our blood donation spokesperson, composed the song to encourage the public to give blood.

November • Testing and labeling of RBC antigens C, c, E, e, Jka, and Jkb for leukocyte-reduced RBCs.

2020

March • Hsinchu Blood Center has added the supply of " irradiation of blood products " since March 1.

March • In response to the COVID-19 pandemic, we have set up the TBSF Epidemic Prevention Command Center.

June • To introduce the concept of patient blood management, we have published the " Practical

Blood Transfusion Manual ” and distributed it to hospitals.

August • The Hsinchu Blood Center has completed the construction of its “Emerging Infectious Pathogen Testing Laboratory,” which has been since September 25 approved as a “Designated Testing Agency for Reported Cases of Severe Special Infectious Pneumonia” by the Central Epidemic Command Center.

2021

August • Leukocyte-Reduced RBCs are comprehensively supplied to various medical institutions, opening an important milestone for blood transfusion safety.

October • Fubon Financial Holding donated "Taiwan's first electric blood donation mobile - Fubon" to Taipei Blood Center, not only providing a blood donation environment without exhaust gas but also making a contribution to the reduction of carbon dioxide for the earth.

Taiwan's first electric blood donation mobile - Fubon.

OUR PERFORMANCE

OUR PERFORMANCE

Recruitment and retention of blood donors

Blood Donation Month— "Blood Donation, Love Never Ends!"

A severe blood supply shortage is most likely to take place around the Lunar New Year holiday every year, because it is a long holiday and people catch cold easily due to cold weather. As a result, the number of people who are willing to roll up their sleeves to donate blood is greatly reduced. Affected by the COVID-19 pandemic, the recruitment of blood donors has not been as expected since 2020, as many people have been discouraged. The launch of the COVID-19 prevention project during autumn and winter, TBSF still strictly complies with national policies, with all blood donation sites keeping on taking various prevention strategies, so that people can "donate blood safely and patients can use blood safely".

The Blood Donation Month in 2021 started from January 10, 2021 and ended on February 10, 2021. As usual, it was one month before the Lunar New Year holiday. To reserve blood for clinical use during the Lunar New Year holiday, it is necessary to adjust the blood inventory in advance, so that patients in need of blood during the Lunar New Year holiday can receive adequate clinical uses. The theme of 2021 Blood Donation Month is "Blood Donation, Love Never Ends". The press conference for Blood Donation Awareness Month was held on January 8, to which Dr. Kun-Jun Jiang and Ms. Meilan Yu were

Dr. Kun-Jun Jiang, Ms. Meilan Yu and TBSF urged the public to donate blood at the 2021 Blood Donation Month press conference.

Dr. Kun-Jun Jiang, as a doctor, shoots a promotional video for TBSF to encourage people to donate blood.

invited to share their stories and experiences. Serving as the spokesman for Taiwan Blood Services Foundation (TBSF) this time, Dr. Jiang had also filmed a promotional video, which was publicly premiered at the press conference.

Unleash the power of social communication with continuous advocacy

Taiwan is the only country in the world that comprehensively tests blood donors for Mia antigen. President Sheng-Mao Hou is well aware of the importance of the quality and safety of blood supply. Since he served as President of TBSF in 2017, he has been committed to improving the safety and quality of blood for clinical use in Taiwan, and actively promoting the use of "Leukocyte-Reduced blood products" in hospitals; at the same time, he has also been actively sharing Taiwan's experience in blood transfusion safety with the international community. In particular, we at the TBSF hope to play the spirit of "Taiwan Can Help" to its fullest by using our world-unique Mia monoclonal antibody with a high titer value to help Southeast Asian countries and southern China, where people also suffer from the Mia antibody problems.

To thank those regular blood donors for their continuous support and to reassure the public of blood donation safety, Sheng-Mou Hou, President of TBSF, has been keeping on telling people that every blood donation site adopts high-standard COVID-19 prevention measures. He has even contributed articles to newspapers and magazines. For example, not only did he publish an article named "Pay tribute to blood donors who support medical operations during


廣告企劃製作

台灣血液基金會四度獲SNQ肯定及「國家生技醫療品質獎」之殊榮

台灣是全球唯一大規模對捐血者全面檢測 Mia 抗原的國家

Issue 719 of "Common Wealth Magazine" reports that TBSF has received the SNQ recognition and the bronze medal awards of "National Biotechnology and Medical Care Quality Award" for four times.

健康

健康名人堂

支持醫療運轉 向疫情期間的捐血人致敬

侯勝茂

Dr. Sheng-Mou Hou, President of TBSF, published articles on the "United Daily News" on August 2, 2021, expressing his gratitude toward blood donors.

the COVID-19 pandemic period" on the "United Daily News " on August 2, 2021, but he also wrote an article named "Pay tribute to Bodhisattva-like regular blood donors for their rolling up sleeves despite the COVID-19 pandemic" on the 446th issue of "Hot Blood Magazine".

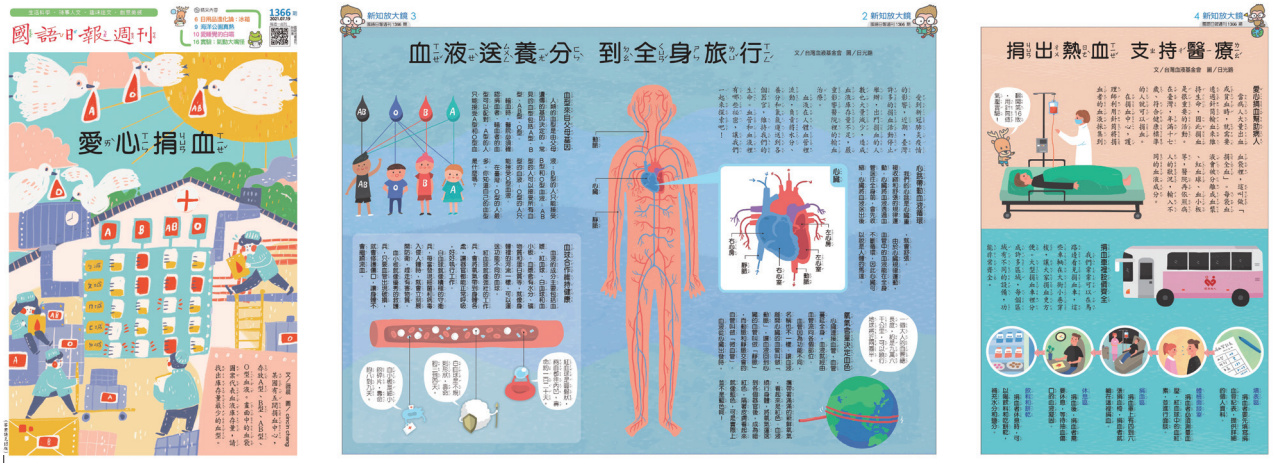
Besides, "Mandarin Daily News Weekly" has also produced a special issue of "Blood Donation with Love", which was published in the 1366th issue of the Weekly (July 19, 2021). The content includes blood knowledge and the importance of blood donation. It is hoped that the special topic can let the concept of blood donation germinate in the hearts of school children and achieve the effect of putting roots down.

Recognition of blood donors with outstanding donation merit

There were 38 representative blood donors with outstanding donation merit in 2020 received by President Tsai Ing-wen at the Presidential Office Building at 10 a.m. on November 29, 2021.

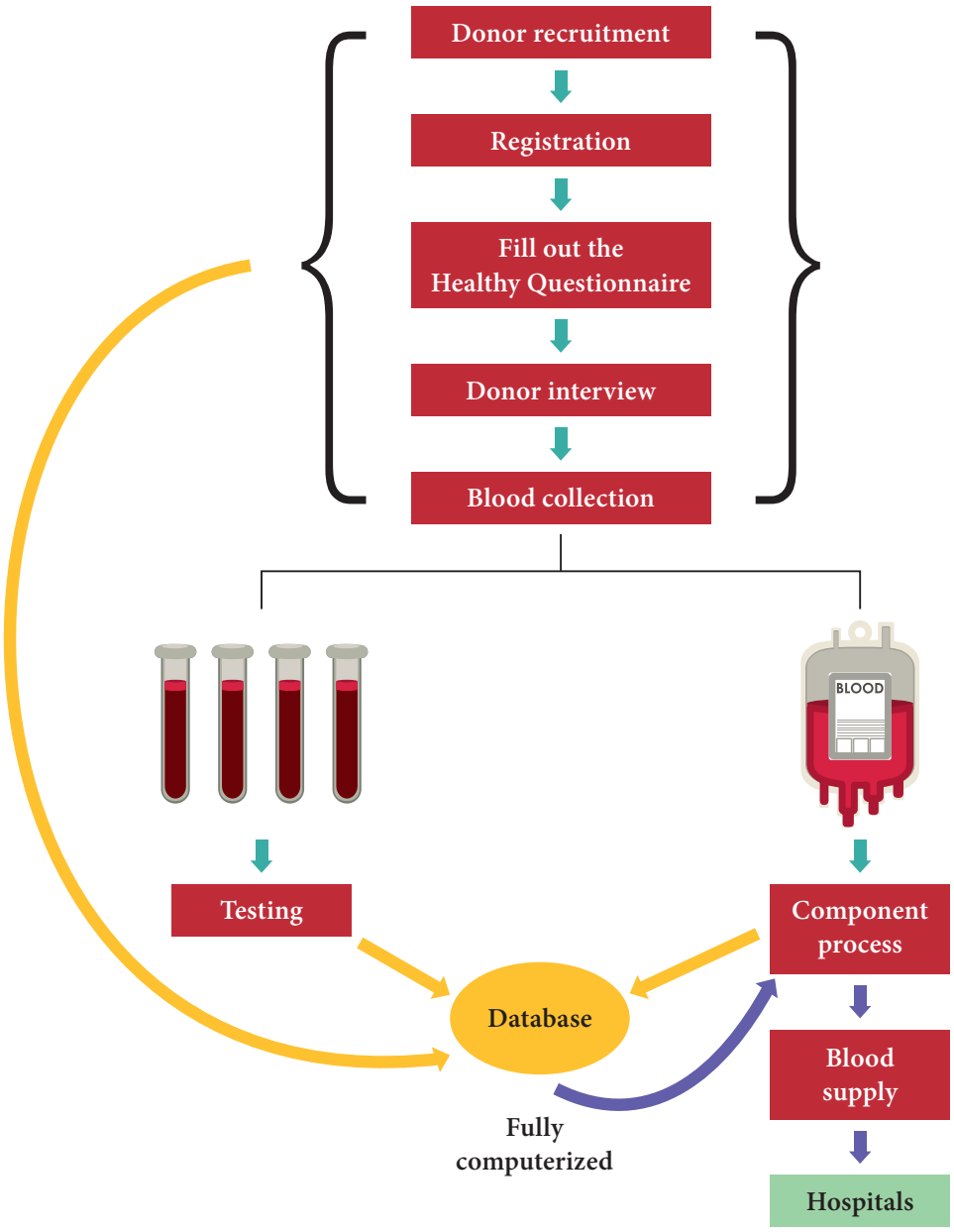
Participate in international conferences and academic exchanges, share experiences and gain new knowledge

TBSF actively participates in various international conferences and exchanges to absorb relevant new knowledge and to obtain important references for various improvements. In fact, such events are also an important channel to learn of the current international situations. In 2021, most of the international conferences and exchange activities, such as APBN Board Video Conference and the 31th Regional Congress of the ISBT were held in the form of webinars due to the COVID-19 pandemic.



The 1366th issue of "Mandarin Daily News Weekly" issued on July 19, 2021 produced a special issue with the theme of "Blood Donation with Love". (Picture: Courtesy of Mandarin Daily News Weekly)

Blood operation process

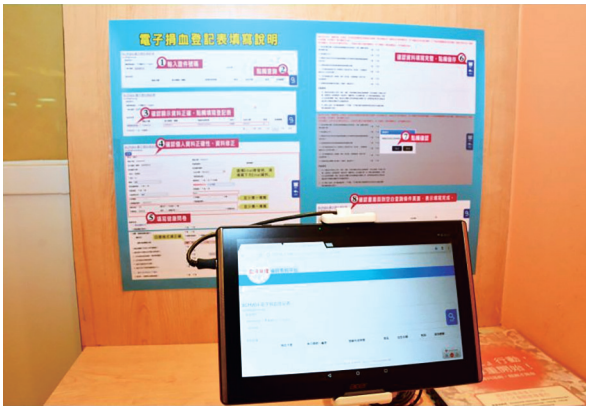


The production of each bag of blood results from regional blood donation activities held after the evaluation and planning by the Donor Recruitment Section of the Blood Center. The personal information of each blood donor is filed and stored after the blood donor completes the blood donation registration form, the physical examination interview, and the blood collecting process. Then, each tube of collected blood is sent to the Laboratory for viral, biochemical, & blood-type testing. The examination results are automatically delivered to the computer for storage. Each blood bag is sent to the Blood Component Processing Section to be further processed as each kind of final plasma product, such as packed RBCs, platelets, and so on. Finally, each qualified blood bag will be sent to the Distribution Section based on the needs of the hospital.

Blood donation operation process

A “Private Interview Space” is arranged in each blood center, blood donation room, and blood donation van so that each blood donor can honestly complete the survey and relevant questions in private surroundings. The following is an introduction to the blood donation process:

A photo ID, such as an Identification Card of Taiwan is needed to verify the identity of a blood donor during the blood donation process. In 2021, more than one million people donated their blood so the blood supply reached approximately 6 billion milliliters.



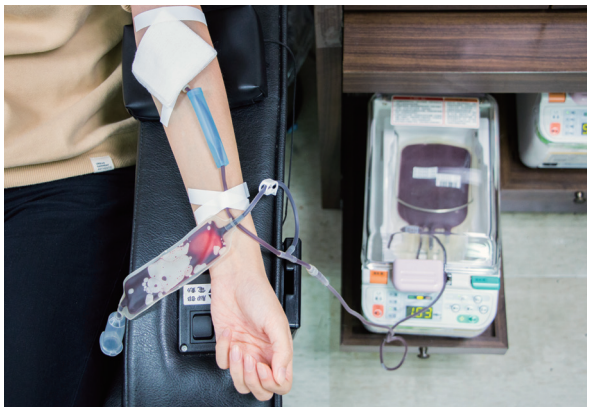
Each person needs to fill in the blood donation registration form, which in addition to basic information, also asks questions concerning recent individual health status and whether there is a high risk of sexual behavior and other issues that need to be answered honestly. Lastly, each person needs to sign the form.

Inside the blood donation van, each seat is equipped with a monitor that plays a health lesson video about blood donation to remind blood donors of the importance of blood safety.

The “Private Interview Space” is arranged to enable blood donors to honestly answer the questionnaire and related questions in private surroundings.

In addition to measuring weight, body temperature, blood pressure and hemoglobin, a staff will provide health education about blood safety and ensure that the blood donor is qualified. This is the first step for blood safety check.

The "Conscience Call Back" sheet can remind blood donors to call the blood center back via the phone number on the sheet to ensure appropriate follow-up treatment of the blood can be carried out if they have not told health professionals of high-risk behaviors or any issues that they think may affect the safety of the blood.



During the blood collection process, each blood bag is put in the automatic oscillator for weight measurement, and the quantity of collected blood is monitored to protect the safety of blood donors.

Each blood unit will have four tubes reserved for each test. Three of them are for viral, biochemical, blood-type testing and the other one is for archive sample.

The collected blood will be temporarily stored in a temperature-controlled container to maintain quality.

In the bright and open blood donation rest area, snacks like cookies and milk are served. Magazines and TVs are also provided in the area so that blood donors can relax after the process.

The collected blood and tubes will be delivered to the blood center by professionals in dedicated incubators and trolleys.

The following table lists relevant criteria and conditions for blood donation:

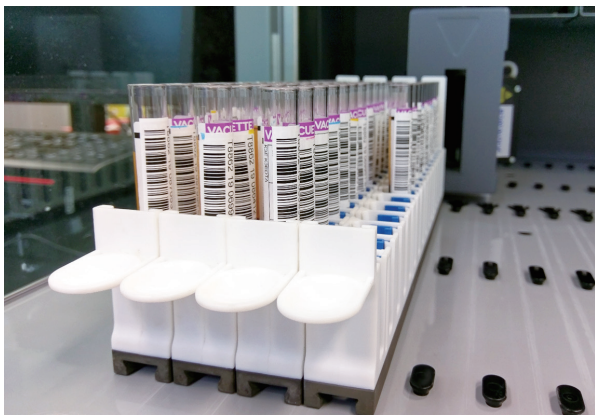
	Whole blood		Platelet apheresis	
Volume	250 ml	500 ml	1 unit	2 units
Age	17-65	17-65	17-65	17-65
Body weight	male: 50 kg female: 45 kg	60 kg	60 kg	60 kg
Oral Temperature	35.5~37.5°C			
Hemoglobin	male: 13g% female: 12g%			
Platelet count			180,000/uL	Trima: 250,000/uL MCS: 300,000/uL Amicus: 250,000/uL
Interval	2 months	3 months	2 weeks	
Max donations per year	male: 1500 cc female: 1000 cc		24 donations	

Blood testing

To ensure that the quality and sustainability of laboratory testing, donor screening is mainly performed in two sites. Testing Sections in Taipei Blood Center and Kaohsiung Blood Center are in charge of nationwide blood examination operations. Currently, routine donor screening include: ABO blood type, Rh blood type, Mia antigen, irregular antibody screen, ALT, HBsAg, anti-HCV, anti-HTLV, anti-HIV, syphilis, and viral nucleic acid testing (HBV, HCV, and HIV-1). The operating procedure is as follows:

Average testing volume is around 5,000 per day using fully automated testing equipment. Test results are delivered via an exclusive network to each blood donation center to meet the goals of speed, accuracy, and safety.

The specimen will undergo a centrifugal operation process.



Tubes are ranked in order, and a fast fully automated barcode scan is performed.

A variety of automated test equipment

Freedom EVOlyzer:

Fully automated to test HBsAg, anti-HCV, anti-HTLV, and anti-HIV. To monitor the performance of these test, British working standards are used for each test run.

Beckman AU5800:

Fully automated ALT, Cholesterol, and LDL-C test equipment.

Beckman PK7400:

Fully automated blood type, syphilis test equipment, and irregular antibody screening.

TIGRIS:

Fully automated viral nucleic acid test (HBV, HCV, and HIV-1)

Since December 5, 2018, the TBSF has expanded its tests on the Mia antigens. All the Mia antigen test results are indicated on each bag of red blood cell products, so that if a patient needs to transfuse the antigen-negative blood products, the hospital can directly select the right blood products according to the labeling on the blood bags and immediately inject them to the patient. The labeling of Mia blood group antigen on each blood bag effectively improve blood transfusion safety in Taiwan.

Blood donor services

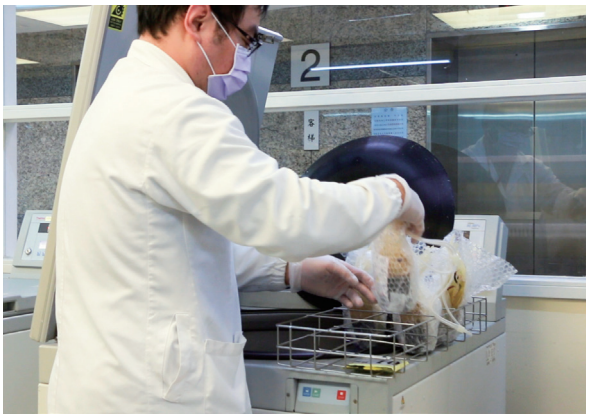
In addition to the routine donation testing, our Foundation has also performed three tests, namely, Total Cholesterol, LDL-C, & HbA1c, every three years for regular blood donors who are older than 40 years old. The BMI of a blood donor is shown in the test report. Furthermore, for blood donors who are older than 40 years old and have donated blood more than once within the past two years, if they have donated whole blood more than 100 times or apheresis blood more than 500 times, they can receive one free abdominal ultrasonic examination in one of our Foundation's appointed hospitals.

Component processing

After non-remunerated blood donated is returned to the blood donation center, it will go through the counting process, computer input, blood component processing, checking and bacteria testing (Apheresis platelet) to be made into a variety of final blood products. These final products will be supplied to each hospital for patient blood transfusions after undergoing strict blood testing processes.

Generally, blood will be sent to the Component Process Section within 8 hours of blood collection.

The number of blood units is counted and recorded in the computer.



Based on different centrifugal criteria, different final blood products can be produced.

Blood can be separated into plasma in the upper layer and red blood cells in the lower layer based on the principle of different blood composition density. The automatic blood components extractor can squeeze plasma out into adjunct bags to be sealed.

Using a leukocyte reduction filter or inline filtration blood bags, white blood cells triggering an immune response can be removed to make the blood safer for transfusion recipients.

Packed RBC is sealed into four sections for blood group testing and cross matching in the future. Each blood bag tubing has a unique blood section number for further tracing, checking, and testing.

Every blood bag has a unique barcode and blood type label for further tracing, checking, and testing.

Qualified blood products are put in blue baskets while unqualified ones are put in red baskets; while ones with quarantined blood products are put in green baskets, and ones that have not been examined are in yellow baskets.

Separated plasma and each final product needs to be carefully placed neatly to avoid stacking for uniform freezing.

Each qualified component needs to be labeled and placed neatly in blue baskets. These items are then managed in the warehouse according to different temperature conditions.

Other matters

Each unit of apheresis platelets is supplied only after passing bacteria testing to ensure the safety of transfusion recipients.

The preservation time, temperature, and material cost for each final product are listed in the table below:

Component	Expiration	Storage temperature	Cost (Dollar/ unit)
Packed RBCs	35 days	1~6°C	475
Washed red blood cells	24 hours	1~6°C	675
Deglyceride Frozen RBC	24 hours	1~6°C	1,375
PLT Concentrate	5 days	20~24°C	300
White blood cell	1 day	20~24°C	300
Apheresis platelets	5 days	20~24°C	4,300
Fresh frozen plasma	1 year	< -20°C	300
Frozen plasma	5 years	< -18°C	200
Cryoprecipitates	1 year	< -20°C	150
Whole blood	35 days	1~6°C	575
Leukocyte-Reduced RBC	35 days	1~6°C	925
Pre-storage Leukocyte-Reduced Apheresis Platelet	5 days	20~24°C	7,300

Distribution

The management, allocation, and transportation of blood for medical use are monitored based on the strictest standards in the five blood donation centers. The blood storage warehouse in each blood donation center sets different conditions for preservation temperature, environment, and equipment for different blood products. Blood supplies for hospitals are always available 24 hours. Specific refrigerator vans for blood freezing/storage are responsible for the allocation and transportation of blood for medical use in each hospital blood bank.

Current blood supply channels include five blood centers, 13 blood stations, and several proxy-supply hospitals.

Each blood storage warehouse of a blood center is equipped with a central temperature monitoring system to monitor blood temperature 24 hours/day. In addition to written documents, relevant information about temperature is filed and stored in electronic files so the records are more complete and accurate, and both the blood items and the equipment are safer and more secure. Each blood transportation vehicle of a blood donation center is equipped with the latest cold-storage/freezing system to monitor whether the temperature is stable and maintained within the standardized range so that the quality of each blood item can be ensured.

Blood supplies are currently classified into two categories: individual and group. Individual blood supply refers to the approach for an individual to get blood from the blood center when patients in hospitals that neither have blood banks nor a signed group-supply contract for the need of a blood transfusion. Group blood supply refers to hospitals that have blood banks or have signed a "group-supply contract" with a blood center. With this approach, the blood center will regularly deliver blood products needed to each hospital for storage so that blood is ready for transfusion at any time.

Meanwhile, each blood center has established a list of blood donors filed by red blood cell antigen. If a blood usage emergency occurs, the center will contact blood donors for immediate support.

The blood supplies of each blood center are available to hospitals 24 hours/day.

The quantity of stored blood in each blood center needs to be maintained at more than seven days for safety concerns. Four to seven days of storage are a bit lower, while less than four days of storage is considered dangerous. There is a safe storage quantity signal display set up on the official website of Taiwan Blood Services Foundation so that people can check the latest information of each blood donation center.

Each kind of final blood product to be dispatched to hospitals will be checked by computer one by one to ensure safety.

Based on the needs of each hospital, final products are put into boxes with clear labels for blood-type and blood item name.

Each packaged box of blood items will be put into a dedicated incubator bags.

They are put in specific transportation vehicles according to the temperature requirement of the blood item with temperature-monitored equipment and are ready to be delivered to each hospital.

In line with the health policy of "National blood used by the nation", our Foundation started to collect source plasma in January 2007 to ease the difficult situation of a lack of blood plasma derivatives in Taiwan. The collected blood plasma's original material is delivered by batch to the CSL plasma fractionation factory in Australia to be further processed into blood plasma derivatives. Four blood plasma derivatives of the TBSF are made: 20% Human albumin for Intravenous Use, Human Immunoglobulin for Intravenous Use, 250IU Blood Coagulation Factor VIII Concentrate, and 500IU Blood Coagulation Factor IV Concentrate.

Reference laboratory

As medical treatment improves, the demand for each subtype of blood clinically provided to patients receiving long-term blood transfusion also increases. Some blood types are quite rare. We continue to provide red cell testing services, transfusion reactions, and transfusion infection survey services, as well as source red cell to produce the testing reagents for pre-transfusion antibody screening. The clinical safety of blood transfusion is ensured through the following actions,

1. To provide HLA- or HPA-matched platelets.

2. To supply antigen-negative red blood cells (mainly E-, c-, Mia-).

3. Screening for leukocyte (HLA & HNA) antibodies among female apheresis platelet donors.

Research

We completed the initial study of the comparison of factor VIII activity at different storage intervals in fresh frozen plasma produced at 8 hours and 24 hours after blood donation, and the DNA sequence variation around the intron 1 +5.8-kb site of ABO gene is associated with ABO blood type, these reports were posted at the ISBT in 2021. To improve blood quality and increase blood safety, we continue our research programs. All research programs have been reviewed by the IRB (Institutional Review Board), and the IRB of our Foundation has passed the audit by the Ministry of Health and Welfare. Our research results are primarily recognized by blood transfusion medical experts and published in academic journals and at medical associations of blood transfusion both internationally and domestically. Our publication in English during 2021 are as the following:

1. Evaluating the Effect of Inert Recruiting on Blood Donations Immediately After the Consecutive Earthquakes. Disaster Medicine and Public Health Preparedness 2021:Feb;1-8

2. Deterrent factors of blood donation among lapsed blood donors in the fixed sites of Taiwan. ISBT Science Series 2021;16:12-23

3.Quality validation of platelets obtained from the Haemonetics and Trima Accel automated blood-collection systems Transfusion Clinique et Biologique 2021;28:44–50

4. Risk of HBV infection among male and female first-time blood donors born before and after the July 1986 HBV vaccination program in Taiwan. BMC Public Health 2021:21;1831

5.Clinical use of intravenous immunoglobulin in Taiwan: A 10-year population study. Journal of the Formosan Medical Association 2021:120;1921-1925

6.Universal Detection of Mia Antigen and Frequencies of Glycophor in Hybrids among Blood Donors in Taiwan by Human Monoclonal Antibodies against Mia (MNS7), Mur (MNS10), and MUT (MNS35) Antigens. Diagnostics 2021; 11: 806-815

Blood transfusion safety

To assist the hospitals in seeking possible causes of blood transfusion adverse reactions, we have established Taiwan Haemovigilance System with Taiwan Society of Blood Transfusion since 2016, which five hospitals (namely National Taiwan University Hospital, Taipei Veterans General Hospital, Far Eastern Memorial Hospital, Linkou Chang Gung Memorial Hospital, and Tri-Service General Hospital) have taken the lead in demonstrating how to send notifications since 2017. In the year of 2021, 65 hospitals have been qualified for notification, and the participation rate of medical centers was 85%. It is expected that after the system is gradually expanded to all the hospitals in Taiwan, we will be able to collect and analyze blood data from patients, provide better blood transfusion strategies to solve those issues related to blood donation and transfusion,

and help to improve blood transfusion safety. On the other hand, we have re-written the “Handbook of Blood Component Therapy”. Adding the concept of PBM (Patient Blood Management), we published brand new “Handbook of Precise and Practical Blood Transfusion” which has been distributed to hospitals from June, 2020. Due to the continuous advancement of medical technology, we believe it is necessary to revise it. We convened the original editors and a review team to re-examine the content in 2021. It is expected that the second edition of "Handbook of Precise and Practical Transfusion" will be launched in May, 2022. Further, to reduce the risk of transfusion-related acute lung injury (TRALI), the policy of supplying male-donor-predominant plasma has been implemented since July 11th, 2015. Female blood donors for apheresis donation must pass the leukocyte antibody screening, which has led to the reduction in donations of antibody-positive blood. Therefore, more protection is provided for our blood supply. In addition, through the whole year, medical doctors at our Foundation actively hosted medical lectures about blood transfusion in each hospital to advocate the concepts of “Blood transfusion adverse reactions and preventive measures”, “Blood component therapy-usage of pre-storage leukocytes reduced blood components”, and “Proper and effective blood transfusion (Patient Blood Management)”, “Taiwan Haemovigilance System and Practice”. These concepts can help to reduce the possibility of patient adverse events caused by blood transfusion, improve recovery, and reduce hospitalization costs so that the medical quality of blood transfusions can be promoted even further.

BMS, a smart management blood donation and supply process information system

The blood donation and supply information system that was used since 1999, until 2011 the hardware and software were gradually inadequate. All its software and hardware were no longer able to carry and calculate millions of pieces of data. In the face of the leap forward in digital technology and the need to update many functional requirements. Therefore, it is imperative to upgrade the information system. Realizing that the package system may not be suitable for Taiwan, decided to customize it in 2015, re-evaluated its user requirements, network architecture, programming language, and database.

Adopt a cloud website, develop an ubiquitous, intelligent and paperless system, and integrate big data from each blood donation center.

The "Blood Management information System" enabled in 2018, Undergoing the process of system analysis, program writing, unit testing, integration testing, user acceptance testing, data conversion, parallel testing, environmental construction, and education and training.

BMS with two major features:

Ubiquitous: Let the blood donation cart be able to do blood donation wherever there is a mobile network. The "Blood Donor Area" can download test reports, blood donation records,

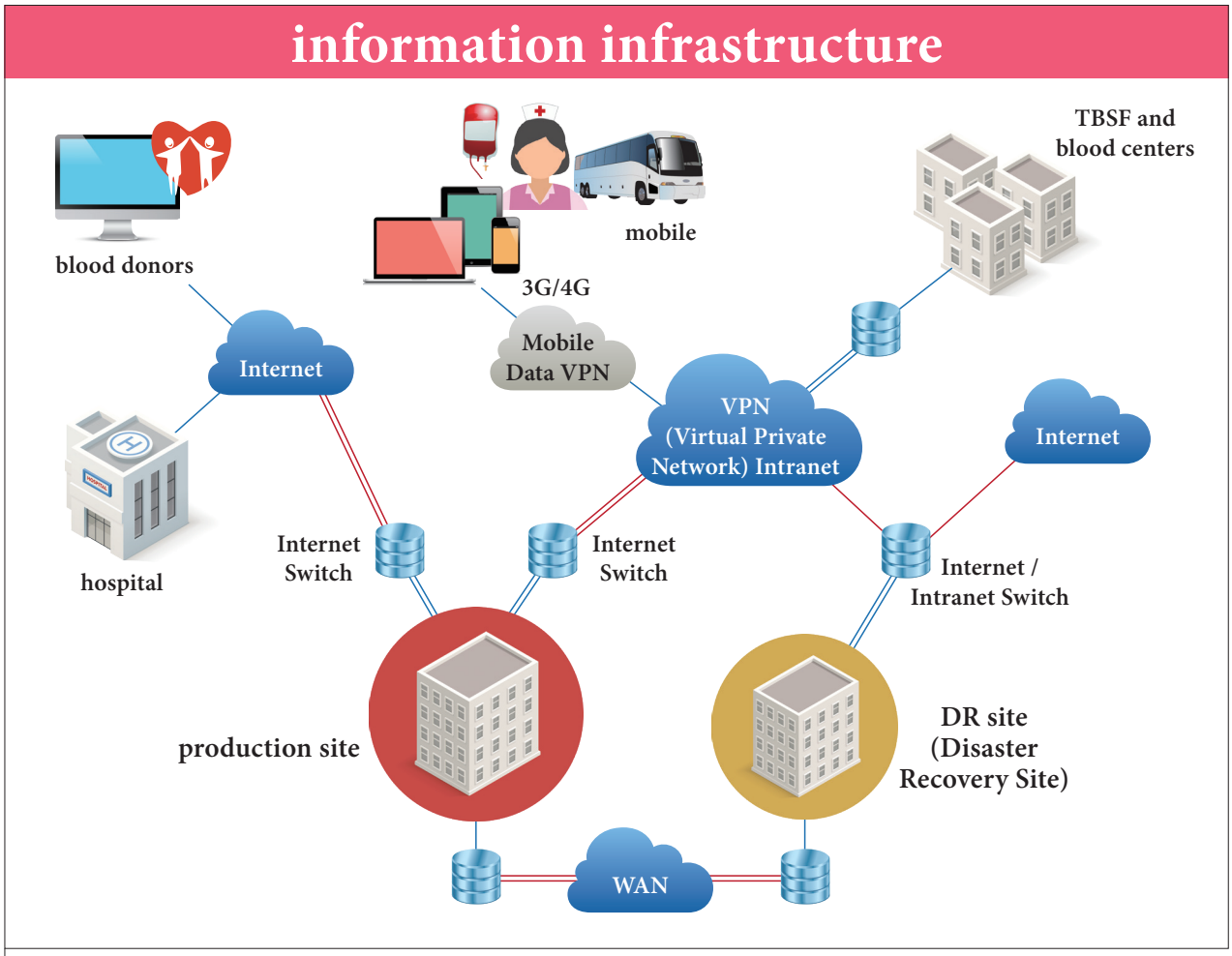


Illustration: Our Foundation provides the internet framework for the blood donation/supply system. Via a high-speed internet cable and wireless transportation, the information of blood donors can be checked quickly and accurately at each blood donation site.

and make appointments for blood donation. The "Hospital Network Operating Platform" provides online order blood and EDI (Electronic Data Interchange) download.

Intelligence: Automatically review blood donation and blood product eligibility. The establishment of a quarantine code mechanism can set multiple controls and quarantine on blood donors and blood products, and comprehensively control the safety of blood products. The special blood product intelligence matching function improves the quality and efficiency.

TBSF has not only overcome the overwhelming challenge in transferring the information on blood donors that has been accumulated for more than 40 years to the new system, but has also incorporated the databases originally scattered in the blood donation centers across the country into the era of cloud synchronization and virtual and real integration. In the part of the blood donation process, the TBSF has used the cross-platform APPs in the cloud technology to import by a single click the blood donor's data into the database, making the work and service processes even more rigorous

and smoother. All high-end information devices are placed in the professional IDC (Internet Data Center) computer rooms, so as to synchronize remote backup and improve system stability and availability.

The most significant change for blood donors is the high degree of electronization of the process and the simultaneous uploading of the blood donor data to the database. After a blood donor logs in the system, he or she can key in through a tablet the blood donation registration form and the health questionnaire and then confirms his or her personal information by a digital signature. As this data collection process is digitized and can be carried out online in advance.

This paperless movement is not only more environmentally friendly but also more convenient in that a blood donor can either insert his or her health insurance card or read the barcode on his or her ID card to get his or her name and other personal information, accelerating the data display time and replacing the manual operation with automation for double certification to greatly reduce human errors. It is particularly worth mentioning that the health questionnaire is designed to be more rigorous. This is to strengthen blood safety management by linking a donor's reply to each question in the front-end health questionnaire to each of the blood products and the control code of donors in the blood management information system.

If any condition not suitable for blood donation is triggered, the system will automatically intercept the blood donor and trace back all the blood products in the past according to the conditions set by the system, forming a completely monitored protection network in the blood safety management.

In order to shorten the waiting time for the blood donors, the Blood Management Information System provides an appointment service for making blood donations. Those who donate whole blood can make appointments in advance within one month, and the system will take the initiative to remind the donors by email 2 days before the appointment date. Those who donate blood by apheresis can make 2 appointments within a month, but if your blood donation conditions are not met, the system will suspend your appointment for blood donation.

In the "Blood Donor Area" system, you can check the previous blood donation records, the next donation date, the records of praise and recognition, and even download the blood donation certificate online. All of these operations can be done not only on a personal computer, but also on your mobile phone or tablet.

The processes and services before and after blood donation are more convenient, and closer to the donors, making blood donation a convenient and simple good thing! For the hospitals, we have also constructed a "hospital network operation platform" on the system. Not only can the hospital blood bank directly subscribe to various required blood products through the platform, but it can also answer in the system such information as blood uses, blood

transfusion investigation, blood consultation application, etc. This horizontal integration of the hospital's blood and blood supply operations improves the response efficiency, making the two-way management of blood products more rapidly and more reliably. It not only provides better and more efficient services for the hospitals, but also improves the blood quality for medical uses.

BMS certified by Symbol of National Quality (SNQ) with "Comprehensive Blood Quality Control - The Unique Blood Management System with Ubiquitous Intelligence in Taiwan". In addition, awarded the Bronze of 2021 National Biotechnology and Medical Care Quality Award in the Public Services, Medical Supplies and Services Category.

Information security issue is never ending

TBSF officially has an ISO 27001 certification in Feb 2022. ISO 27001 is an international standard for Information Security management. It provides a model to establish, implement, maintain and continually improve a risk-managed Information Security Management System (ISMS).

We build the information security system on the Gateway of the TBSF main office and the end points of each of the TBSF Blood Donation Centers so as to strengthen information security and meet the requirements of the regulations. To ensure the security of the TBSF computer information system, we need not only to continuously update the antivirus software, but also to establish the gateway to enhance the filtering of malware and viruses from the email and URL system. When the system judges an attachment of an email to be malicious software, the email attachment will be deleted automatically by the system. We conduct information asset risk assessments on information equipment and materials every year and control the possible risk levels to a low risk range. Outsourcing Security Operation Center (SOC) to continuously monitor and improve security posture while preventing, detecting, analyzing, and responding to cybersecurity incidents.

The enhancement of information security requires a high degree of cooperation from all our colleagues. As everyone must have a correct concept, we hold annual all-round education and training to give lectures and conduct assessments and continue to deepen the publicity of security issues, so that our colleagues can collect, handle and utilize personal information according to relevant laws, administrative orders or internal norms.

Reward records

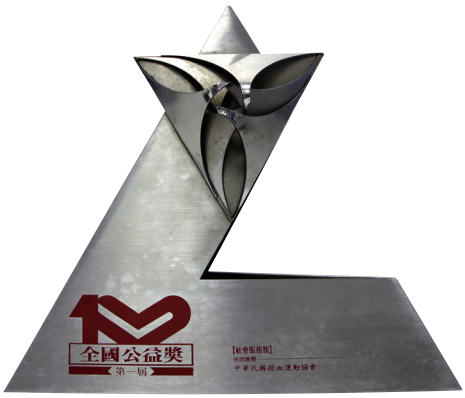
1992

Gold Medal of Times Advertising Awards in the Corporate Charity category

Award-winning work: "Jackie Chan and Blood Donation" TV Ad

1992

The 1st National Public Welfare Award



1993

"Creator of History" Charity Model Award

1995

Honorable Mention of the 2nd Best Advertising Slogan Awards

Award-winning work: "Give Blood, Save Lives."

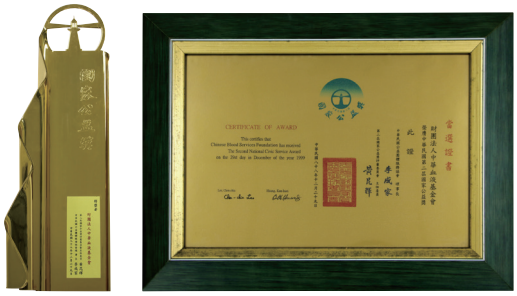
1996

Bronze Medal of the 3rd Best Advertising Slogan Awards

"I thank you even though I don't know who you are!"

1999

National Public Welfare Award



2008

Internet Activity Award Contribution Award

Website Vitality Award

2018

The certification of SNQ (Symbol of National Quality) and Bronze Award in the National Biotechnology Clinical Quality Award.

The Theme: "The comprehensive and highly efficient laboratory testing of donor blood to ensure transfusion safety in Taiwan"


SNQ國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
台灣血液基金會
全方位、高效能的捐血檢驗 守護國人輸血安全
參加2018 SNQ國家品質標章 醫療選邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 108 年 12 月 31 日止
This is to certify that The comprehensive and highly efficient laboratory testing of donor blood to ensure transfusion safety in Taiwan of Taiwan Blood Services Foundation has been awarded The Symbol of National Quality in the Public Service Group, Medical Periphery Category by Research Center for Biotechnology and Medicine Policy.
Date of Validity: Until Dec. 31st, 2019

2017

The certification of SNQ (Symbol of National Quality) and Silver Award in the National Biotechnology Clinical Quality Award.

The Theme: "The Pioneer of Safe and Sufficient Blood Supply"


SNQ國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
醫療財團法人台灣血液基金會
安全醫療用血來源的領航者－台灣血液基金會
參加 2017 SNQ 國家品質標章 醫療選邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 107 年 12 月 31 日止
This is to certify that The Pioneer of Safe and Sufficient Blood Supply-Taiwan Blood Services Foundation of Taiwan Blood Services Foundation has been awarded The Symbol of National Quality in the Public Service Section, Medical Periphery Category by Institute for Biotechnology and Medicine Industry.
Date of Validity: Until Dec. 31st, 2018

2019

The certification of SNQ (Symbol of National Quality) and Bronze Award in the National Biotechnology Clinical Quality Award.

The Theme: "Guardian angel for patients in southern Taiwan, remote areas and offshore islands --Kaohsiung Blood Center"


SNQ國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
醫療財團法人台灣血液基金會高雄捐血中心
南台灣、偏鄉、離島病患用血的守護神－高雄捐血中心
參加 2019 SNQ 國家品質標章 醫療選邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 109 年 12 月 31 日止
This is to certify that Guardian angel for patients in southern Taiwan, remote areas and offshore islands --Kaohsiung Blood Center of Taiwan Blood Services Foundation, Kaohsiung Blood Center has been awarded The Symbol of National Quality in the Public Services/Medical Supplies & Services Category by Research Center For Biotechnology and Medicine Policy.
Date of Validity: Until Dec. 31st, 2020

2020

The certification of SNQ (Symbol of National Quality) and Bronze Award in the National Biotechnology Clinical Quality Award.

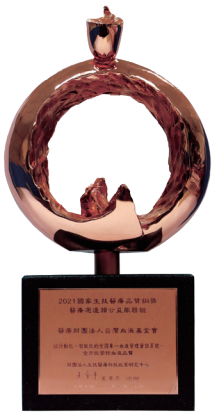
The Theme: "The pioneer in detection for the expression of Miltenberger blood-group antigen by using human monoclonal antibody, anti-Mia (HIRO-377T)"


SNQ 國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
台灣血液基金會
全球首創人類單株抗體檢測米田堡血型、輸血安全更上層樓
參加 2020 SNQ 國家品質標章 醫療週邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 110 年 12 月 31 日止
This is to certify that The pioneer in detection of Miltenberger antigen by using human monoclonal antibody anti-Mia (HIRO-377T) of Taiwan Blood Services Foundation has been awarded The Symbol of National Quality in the Public Services, Medical Supplies & Services Category by Research Center For Biotechnology and Medicine Policy.
Date of Validity: Until Dec. 31st, 2021

2021

The certification of SNQ (Symbol of National Quality) and Bronze Award in the National Biotechnology Clinical Quality Award. The Theme: "Comprehensive Blood Quality Control: The Unique Blood Management System with Ubiquitous Intelligence in Taiwan"


SNQ 國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
醫療財團法人台灣血液基金會
以行動化、智能化的全國單一血液管理資訊系統－
全方位管控血液品質
參加 2021 SNQ 國家品質標章 醫療週邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 111 年 12 月 31 日止
This is to certify that Comprehensive Blood Quality Control - The Unique Blood Management System with Ubiquitous Intelligence in Taiwan of Taiwan Blood Services Foundation has been awarded The Symbol of National Quality in the Public Services, Medical Supplies & Services Category by Research Center For Biotechnology and Medicine Policy.
Date of Validity: Until Dec. 31st, 2022



Quality assurance

1999

Approval of the Medicines Control Agency (MCA, UK) to meet their standards of the blood quality.

2001

Implementation of the ISO 9001 quality system.


SGS
TAIWAN BLOOD SERVICES FOUNDATION
ISO 9001:2015

2006

Approval of the Therapeutic Goods Administration (TGA, Australia) to meet their standards of the blood quality.

2010

The testing laboratories accredited by the Taiwan CDC for syphilis, HIV and HCV.

2012

ISO 15189 laboratory accreditation.

2012

GMP manufacturing facilities licensed by the Taiwan Food and Drug Administration (TFDA).

2018

GDP Distribution facilities licensed by the TFDA.

2021

Implementation of the ISO27001 quality system.

Sound internal control and audit

TBSF formulated its " Internal Control and Auditing System" in November 2019 and has since drafted its annual audit plans accordingly. The purpose is to ensure operational effectiveness and efficiency, reliable financial and non-financial reporting and compliance with relevant laws and regulations.

According to "TBSF's Annual Internal Audit Plan", we conducted an overall audit in 2021 on eight major cycles, including procurement and payment, supply and collection, organization and personnel, production management, finance and accounting, property management, information systems, research and development and others (audit of compliance with laws and regulations, audit of proceedings of board of directors, audit of pension fund management operations, audit of asset acquisition or disposal procedures, and audit of implementation of annual work plans). Internal audit was carried out to provide improvement suggestions timely and implement internal control effectively.

Practice social responsibility and promote sustainable development

The United Nations adopted the Sustainable Development Goals in 2015. To formulate our sustainable development report to ensure safe blood supply for medical treatment and to uphold the principles of integrity, harmony, efficiency, and innovation to deepen the vision of sustainable development, the TBSF has thus specified the key points for the formulation of the Sustainable Development Promotion Committee and set up a

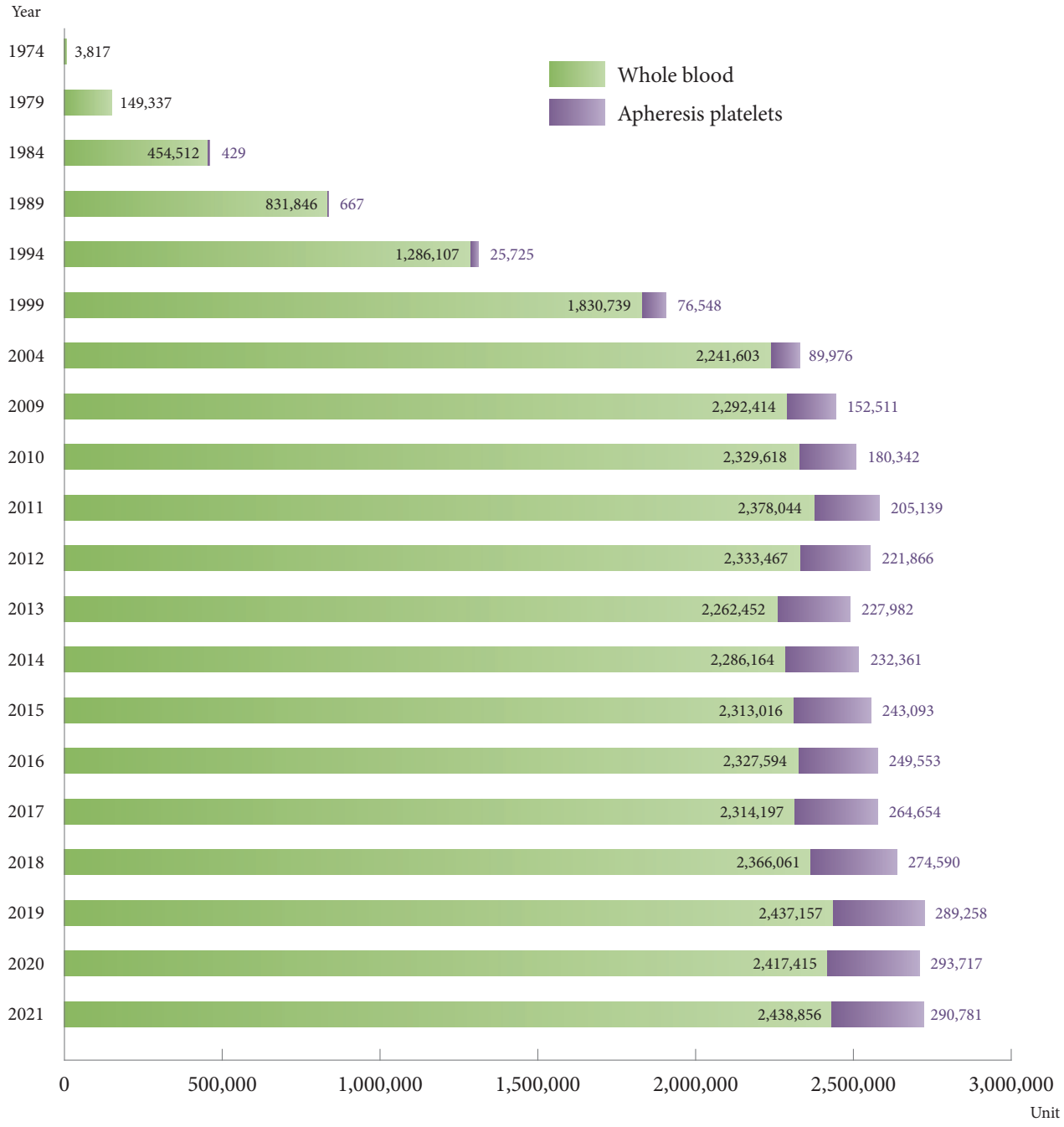
working group.

To strengthen the concept of sustainable development among our colleagues and to make them fully understand the spirit of sustainability, we have held various education and training programs, including a supervisor workshop in which Dr. Tian-sheng Tsai was invited to lecture on how to write a sustainability report and the participation of our staff from each unit in the "Corporate Sustainability Elite Training Course" organized by the Taiwan Academy of Corporate Sustainability Academy (TACS). On November 18, Deputy Director Jian-tai Fu of Shin Kong Hospital was invited to give a speech on "Sustainability Report Writing Preparation - From the Perspective of Understanding SDGs/ GRI" for which not only did all our staff at the TBSF Headquarters participate, but our workers also took part in via the webinar at each blood center.

To implement the concept of sustainability, Deputy Director Jian-Tai Fu of Shin Kong Hospital was invited to give a speech on "Sustainability Report Writing Preparation - From the Perspective of Understanding SDGs/GRI". Through the webinar, our staff at the TBSF Headquarters and each blood center can improve and deepen their knowledge.

STATISTICS

Annual blood collection, 1974-2021



Note: 1. 250ml per unit for whole blood and 500ml counts for 2 units.

2. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

Annual blood collection by blood centers, 1974-2021

Unit

Year \ Blood centers	Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Hualien blood center	Total
1974	3,817	-	-	-	-	-	3,817
1979	92,730	-	24,723	-	31,884	-	149,337
1984	187,362	-	101,219	60,123	106,237	-	454,941
1989	312,578	-	231,199	119,179	169,557	-	832,513
1994	406,604	161,765	252,889	173,297	252,897	64,380	1,311,832
1999	553,940	266,497	378,516	257,309	360,060	90,965	1,907,287
2004	642,945	333,898	489,079	321,441	437,362	106,854	2,331,579
2009	718,841	326,619	487,230	382,251	420,616	109,368	2,444,925
2010	738,274	343,531	500,298	389,938	423,333	114,586	2,509,960
2011	753,611	347,807	507,104	405,553	453,274	115,834	2,583,183
2012	752,304	343,225	504,362	405,409	434,767	115,266	2,555,333
2013	737,642	336,853	487,170	401,442	414,876	112,451	2,490,434
2014	743,926	337,408	485,767	409,314	431,181	110,929	2,518,525
2015	744,106	355,943	498,956	418,909	423,721	114,474	2,556,109
2016	771,779	364,244	507,973	421,457	447,145	64,549	2,577,147
2017	841,241	360,146	520,231	420,428	436,805	-	2,578,851
2018	869,019	373,358	536,306	424,617	437,351	-	2,640,651
2019	894,031	393,568	551,889	426,291	460,636	-	2,726,415
2020	896,115	387,625	620,102	362,506	444,784	-	2,711,132
2021	860,089	391,556	643,307	375,515	459,170	-	2,729,637

Note: 1. Total blood collection units: calculated by both whole blood and apheresis collection.

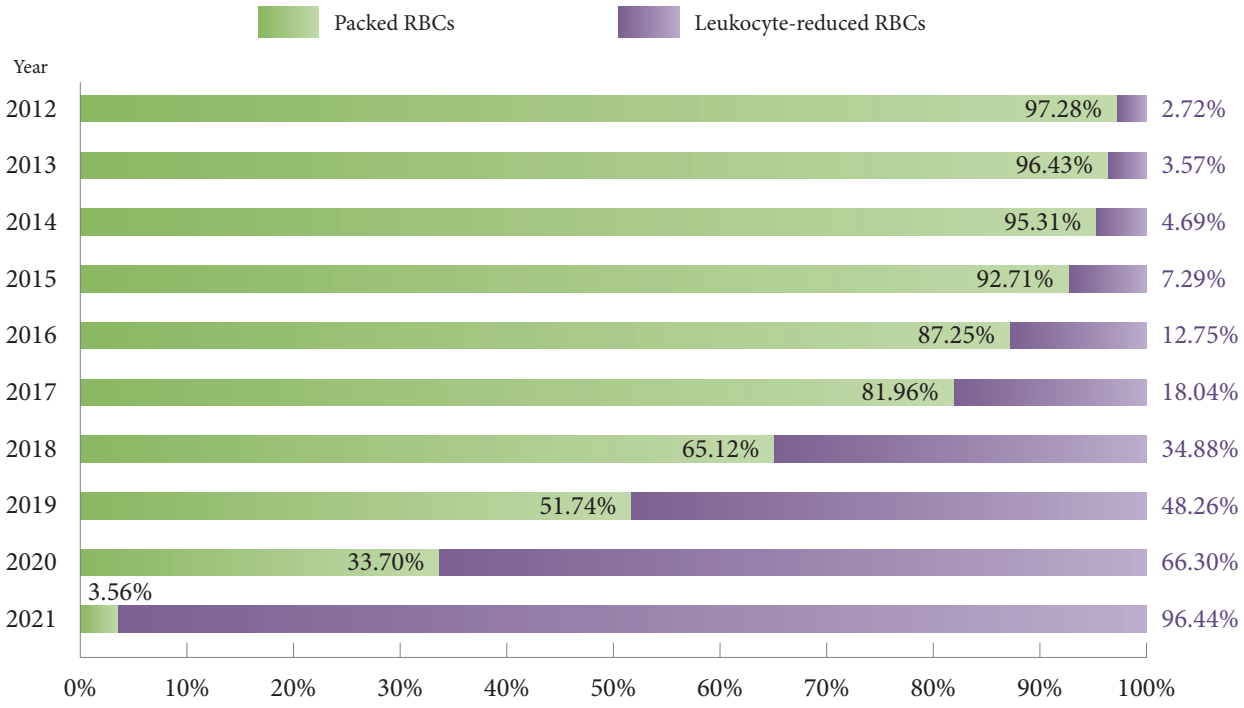
2. 250ml per unit for whole blood and 500ml counts for 2 units.

3. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

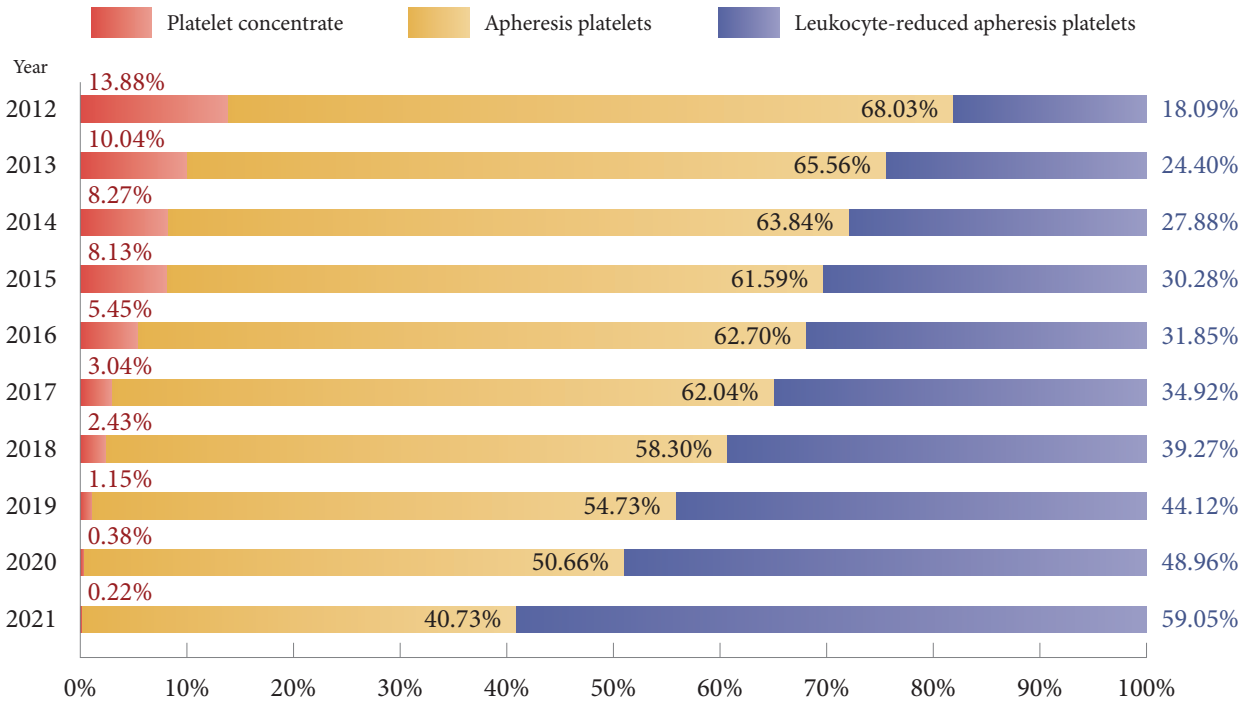
Annual blood supply, 2012-2021

Unit

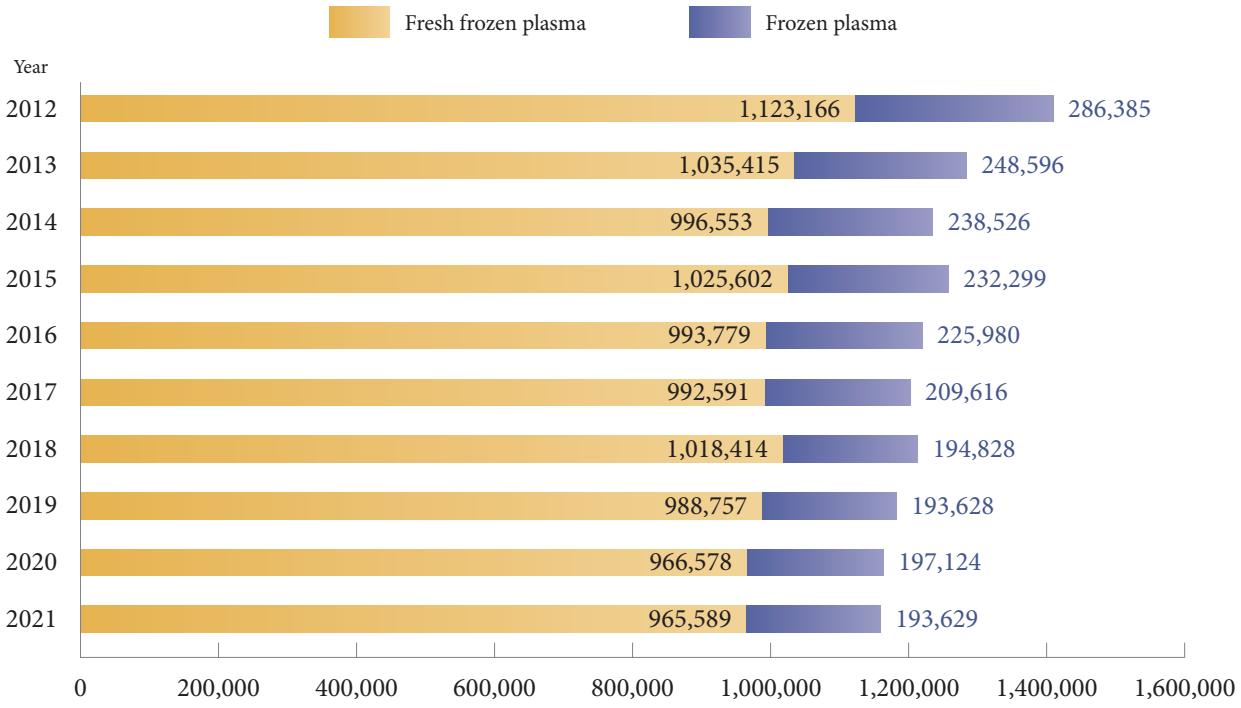
Red blood cell products



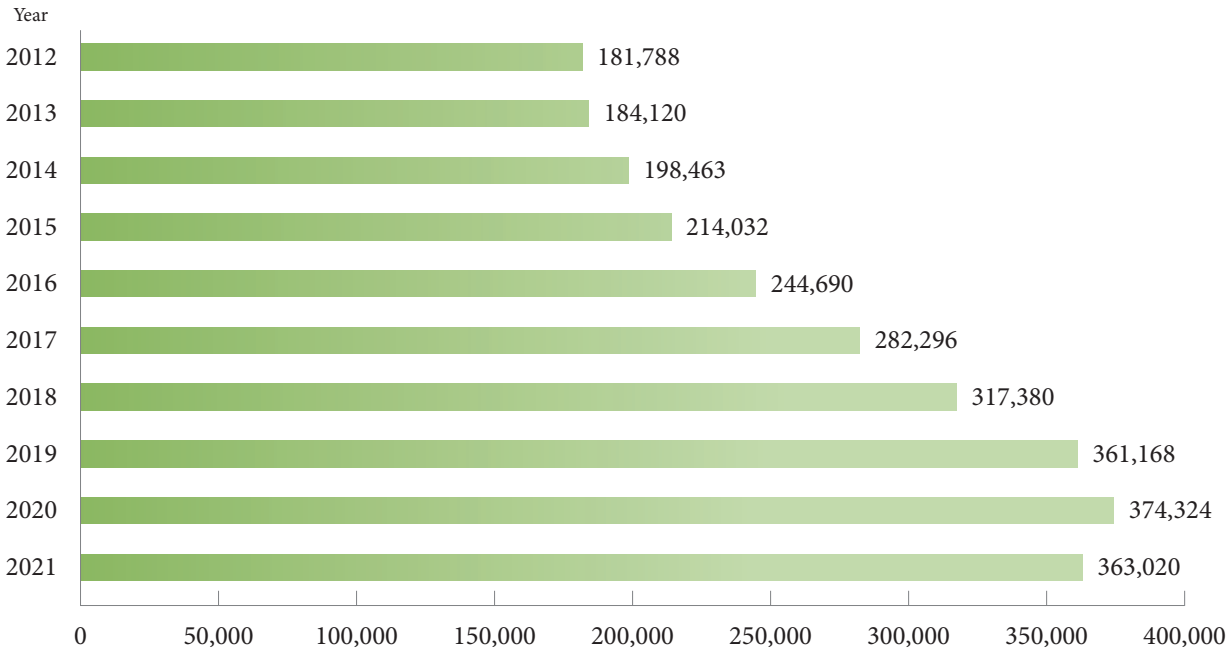
Platelet products



Plasma products



Cryoprecipitate



Note: 1. 250ml per unit for whole blood and 500ml counts for 2 units.

2. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

3. Platelet concentrate per dose for adults 12 units.

Blood and blood components issued in 2021

Unit

1. Whole blood

Blood \ Blood centers		Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Total
RBCs	Whole blood	6,989	3,513	1,457	1,760	932	14,651
	Packed RBCs	11,874	15,089	3,717	28,954	24,196	83,830
	Washed RBCs	7,765	1,462	3,557	3,390	4,623	20,797
	Leukocyte-reduced RBCs	710,176	329,860	560,535	284,565	387,025	2,272,161
	Frozen thawed deglycerolized RBCs	0	0	0	0	0	0
Subtotal		736,804	349,924	569,266	318,669	416,776	2,391,439
Plasma	Fresh frozen plasma	294,873	156,379	226,196	145,252	142,889	965,589
	Frozen plasma	45,079	23,046	43,576	26,063	55,865	193,629
Cryoprecipitate		147,024	49,626	81,062	51,142	34,166	363,020
Platelet concentrate		2,336	3,146	2,032	30	0	7,544
WBC concentrate		7,668	30	138	0	0	7,836
Total units issued		1,233,784	582,151	922,270	541,156	649,696	3,929,057
Rate of components		99.43	99.40	99.84	99.67	99.86	99.63
Rate of whole blood		0.95	1.00	0.26	0.55	0.22	0.61
PR ratio		46.14	51.28	47.39	53.76	47.69	48.47

2. Apheresis

Blood \ Blood centers	Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Total
Apheresis platelets	43,719	9,517	27,997	18,230	17,913	117,376
Leukocyte-reduced apheresis platelets	66,184	25,473	33,210	16,080	29,195	170,142
Total	109,903	34,990	61,207	34,310	47,108	287,518

Note: 1. 250ml per unit for whole blood and 500ml counts for 2 units.

2. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

3. The plasma numbers issued are for medical usage only, plasma for fractionation not included.

4. PR ratio=Plasma/RBCs

Whole blood collection per 1000 head of population, 2012-2021

Liter/1,000 population

Year	Item \ Blood centers	Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Hualien blood center	Total
2012	Blood collection (Liter)	167,283	80,345	118,749	92,669	98,441	25,880	583,367
	Population	7,086,152	3,525,575	4,496,195	3,397,242	3,734,579	1,021,830	23,261,573
	Liter/1,000 population	23.61	22.79	26.41	27.28	26.36	25.33	25.08
2013	Blood collection (Liter)	163,347	78,323	113,190	91,759	93,637	25,359	565,613
	Population	7,131,766	3,555,325	4,510,598	3,394,334	3,733,713	1,018,477	23,344,213
	Liter/1,000 population	22.90	22.03	25.09	27.03	25.08	24.90	24.23
2014	Blood collection (Liter)	164,463	78,068	112,667	93,876	97,458	25,009	571,541
	Population	7,160,559	3,579,347	4,517,652	3,388,101	3,728,935	1,017,442	23,392,036
	Liter/1,000 population	22.97	21.81	24.94	27.71	26.14	24.58	24.43
2015	Blood collection (Liter)	164,554	81,996	114,808	95,724	95,492	25,681	578,254
	Population	7,187,196	3,623,818	4,532,292	3,379,761	3,724,569	1,013,926	23,461,562
	Liter/1,000 population	22.90	22.63	25.33	28.32	25.64	25.33	24.65
2016	Blood collection (Liter)	165,198	83,228	116,315	96,395	101,248	19,516	581,899
	Population	7,192,687	3,687,412	4,557,494	3,366,498	3,940,509	789,180	23,533,780
	Liter/1,000 population	22.97	22.57	25.52	28.63	25.69	24.73	24.73
2017	Blood collection (Liter)	184,975	81,657	117,976	95,089	98,853	-	578,550
	Population	7,979,516	3,712,819	4,564,263	3,361,871	3,934,001	-	23,552,470
	Liter/1,000 population	23.18	21.99	25.85	28.28	25.13	-	24.56
2018	Blood collection (Liter)	191,341	84,391	121,787	95,958	98,039	-	591,516
	Population	7,969,664	3,753,798	4,578,749	3,351,546	3,925,863	-	23,579,620
	Liter/1,000 population	24.01	22.48	26.60	28.63	24.97	-	25.09
2019	Blood collection (Liter)	196,210	88,549	125,071	95,623	103,838	-	609,291
	Population	7,965,793	3,788,788	4,580,226	3,338,816	3,917,408	-	23,591,031
	Liter/1,000 population	24.63	23.37	27.31	28.64	26.51	-	25.83
2020	Blood collection (Liter)	196,175	87,679	139,799	80,689	100,013	-	604,354
	Population	7,951,116	3,819,253	5,258,714	2,646,137	3,908,603	-	23,583,823
	Liter/1,000 population	24.67	22.96	26.58	30.49	25.59	-	25.63
2021	Blood collection (Liter)	187,561	88,683	145,206	84,609	103,655	-	609,714
	Population	7,888,571	3,838,418	5,243,305	2,631,412	3,885,803	-	23,487,509
	Liter/1,000 population	23.78	23.10	27.69	32.15	26.68	-	25.96

Note: 1. Mid-year population, data from the ministry of interior.

2. 250ml per unit for whole blood.

Blood donation by blood centers, 2012-2021

Donation

Year	Item \ Blood centers	Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Hualien blood center	Total
2012	Blood donation	526,216	248,420	371,259	304,184	300,906	83,536	1,834,521
	Population	7,086,152	3,525,575	4,496,195	3,397,242	3,734,579	1,021,830	23,261,573
	Donation rate	7.43%	7.05%	8.26%	8.95%	8.06%	8.18%	7.89%
2013	Blood donation	513,907	241,765	351,790	294,771	278,740	79,992	1,760,965
	Population	7,131,766	3,555,325	4,510,598	3,394,334	3,733,713	1,018,477	23,344,213
	Donation rate	7.21%	6.80%	7.80%	8.68%	7.47%	7.85%	7.54%
2014	Blood donation	509,548	239,797	345,234	295,028	287,690	76,822	1,754,119
	Population	7,160,559	3,579,347	4,517,652	3,388,101	3,728,935	1,017,442	23,392,036
	Donation rate	7.12%	6.70%	7.64%	8.71%	7.72%	7.55%	7.50%
2015	Blood donation	509,230	251,630	349,238	296,569	282,832	78,382	1,767,881
	Population	7,187,196	3,623,818	4,532,292	3,379,761	3,724,569	1,013,926	23,461,562
	Donation rate	7.09%	6.94%	7.71%	8.77%	7.59%	7.73%	7.54%
2016	Blood donation	511,032	253,135	349,751	293,792	296,706	58,592	1,763,008
	Population	7,192,687	3,687,412	4,557,494	3,366,498	3,940,509	789,180	23,533,780
	Donation rate	7.10%	6.86%	7.67%	8.73%	7.53%	7.42%	7.49%
2017	Blood donation	570,695	248,783	356,189	288,466	288,391	-	1,752,524
	Population	7,979,516	3,712,819	4,564,263	3,361,871	3,934,001	-	23,552,470
	Donation rate	7.15%	6.70%	7.80%	8.58%	7.33%	-	7.44%
2018	Blood donation	590,235	256,830	361,137	283,349	288,327	-	1,779,878
	Population	7,969,664	3,753,798	4,578,749	3,351,546	3,925,863	-	23,579,620
	Donation rate	7.41%	6.84%	7.89%	8.45%	7.34%	-	7.55%
2019	Blood donation	608,656	269,379	366,544	285,584	303,388	-	1,833,551
	Population	7,965,793	3,788,788	4,580,226	3,338,816	3,917,408	-	23,591,031
	Donation rate	7.64%	7.11%	8.00%	8.55%	7.74%	-	7.77%
2020	Blood donation	608,463	263,954	407,256	241,042	291,700	-	1,812,415
	Population	7,951,116	3,819,253	5,258,714	2,646,137	3,908,603	-	23,583,823
	Donation rate	7.65%	6.91%	7.74%	9.11%	7.46%	-	7.68%
2021	Blood donation	583,263	266,077	422,648	249,962	301,376	-	1,823,326
	Population	7,888,571	3,838,418	5,243,305	2,631,412	3,885,803	-	23,487,509
	Donation rate	7.39%	6.93%	8.06%	9.50%	7.76%	-	7.76%

Note: 1. Mid-year population, data from the ministry of interior.

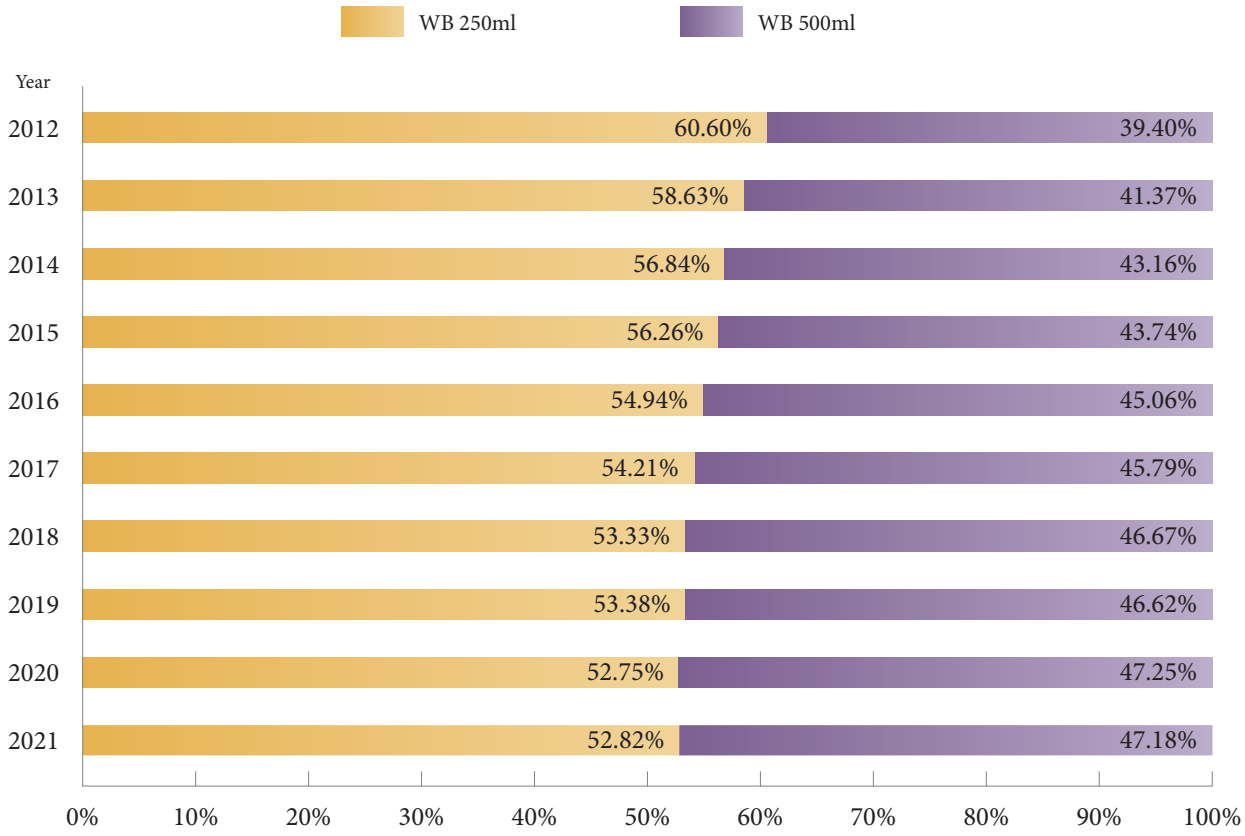
2. Both whole blood and apheresis donations are included.

Types of blood donation in 2021

Donation

Type / Blood centers	Whole blood				Apheresis				Total
	250ml	%	500ml	%	Apheresis - 1U	%	Apheresis - 2U	%	
Taipei blood center	278,889	47.82	235,678	40.41	27,548	4.72	41,148	7.05	583,263
Hsinchu blood center	131,419	49.39	111,656	41.96	9,179	3.45	13,823	5.20	266,077
Taichung blood center	199,576	47.22	190,624	45.10	2,413	0.57	30,035	7.11	422,648
Tainan blood center	121,692	48.68	108,372	43.36	2,717	1.09	17,181	6.87	249,962
Kaohsiung blood center	143,582	47.64	135,519	44.97	0	0	22,275	7.39	301,376
Subtotal	875,158	48.00	781,849	42.88	41,857	2.30	124,462	6.83	1,823,326

Types of whole blood donation, 2012-2021



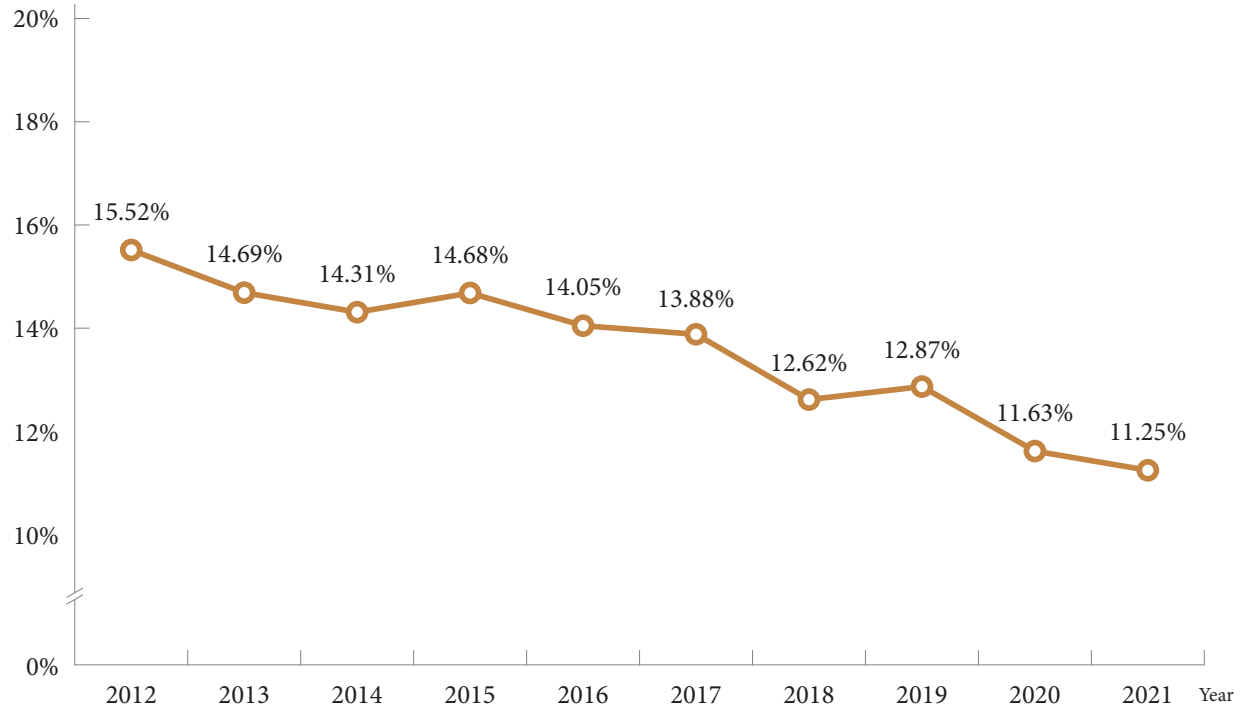
First-time Donors in 2021

Donor

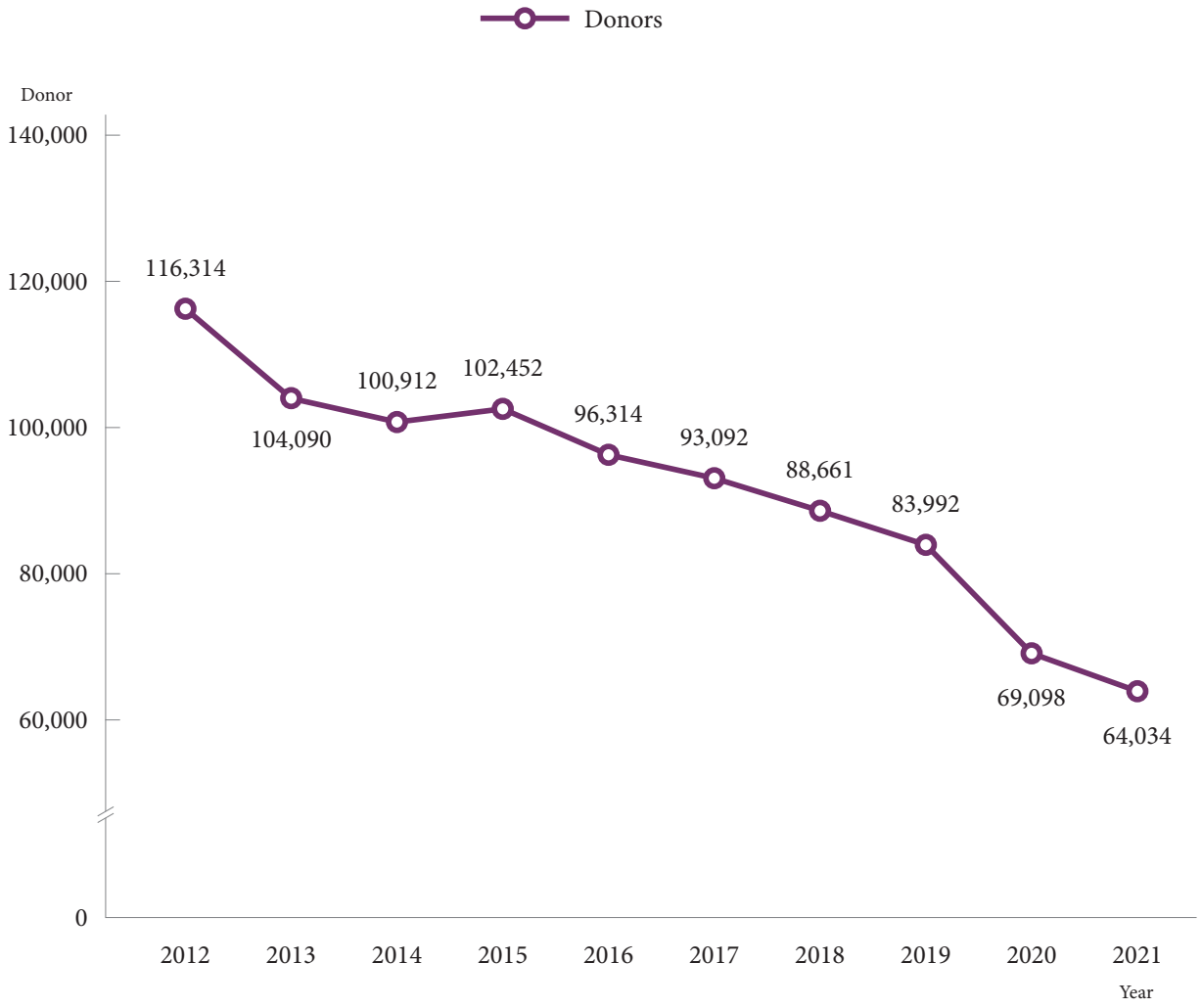
Item \ Blood centers		Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Total
Total donors(A)		334,280	154,313	249,494	137,134	168,005	1,011,066
First-time donors	No.(B)	38,186	17,498	25,782	14,791	17,463	113,720
	%(B/A)	11.42%	11.34%	10.33%	10.79%	10.39%	11.25%
First-time donors Age≦24	No.(C)	19,591	9,227	14,813	9,715	10,685	64,031
	%(C/B)	51.30%	52.73%	57.45%	65.68%	61.19%	56.31%

Note: Donors who donated on more than one occasion in this year would be counted as once.

Trends in the rate of first-time donors, 2012-2021



≤24 Age first-time donors , 2012-2021



Distribution of donor by gender and age in 2021

Donor

Age / Gender	≤20	21~30	31~40	41~50	51~65	>65	Total
Male	38,847 (6.70%)	120,646 (20.81%)	154,996 (26.74%)	147,780 (25.49%)	129,554 (22.35%)	1,267 (0.22%)	579,721 (57.34%)
Female	43,870 (10.17%)	102,308 (23.72%)	104,496 (24.23%)	92,134 (21.36%)	96,013 (22.26%)	678 (0.16%)	431,356 (42.66%)
Total	82,717 (8.18%)	222,954 (22.05%)	259,492 (25.67%)	239,914 (23.73%)	225,567 (22.31%)	1,945 (0.19%)	1,011,066 (100.00%)

Note: Both whole blood and apheresis donations are included.

Donation frequency by gender and age in 2021

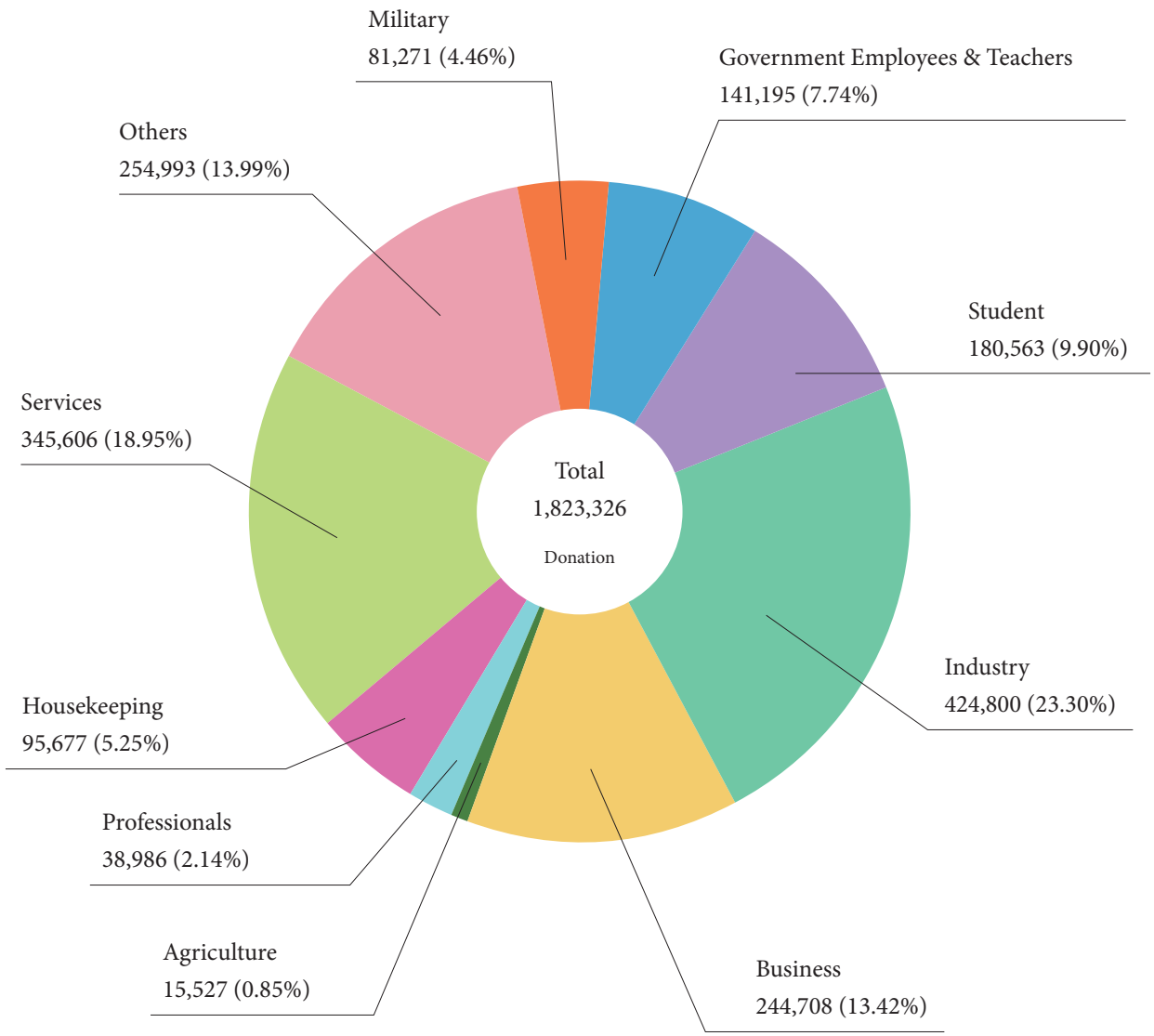
Age / Gender		Donation frequence	
≤20	Male	1.30	1.34
	Female	1.37	
21-30	Male	1.55	1.52
	Female	1.50	
31-40	Male	1.85	1.73
	Female	1.56	
41-50	Male	2.07	1.91
	Female	1.65	
51-65	Male	2.22	2.04
	Female	1.79	
>65	Male	2.91	2.63
	Female	2.11	
Total	Male	1.93	1.80
	Female	1.63	

Blood collection by sites in 2021

Donation

Blood centers / Sites	Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Total
Fixed site	337,410	146,877	216,746	146,853	181,418	1,029,304
	57.85%	55.20%	51.28%	58.75%	60.20%	56.45%
Mobiles	245,853	119,200	205,902	103,109	119,958	794,022
	42.15%	44.80%	48.72%	41.25%	39.80%	43.55%
Total	583,263	266,077	422,648	249,962	301,376	1,823,326

Occupational distribution of donors in 2021



Pre-donation donor deferral in 2021

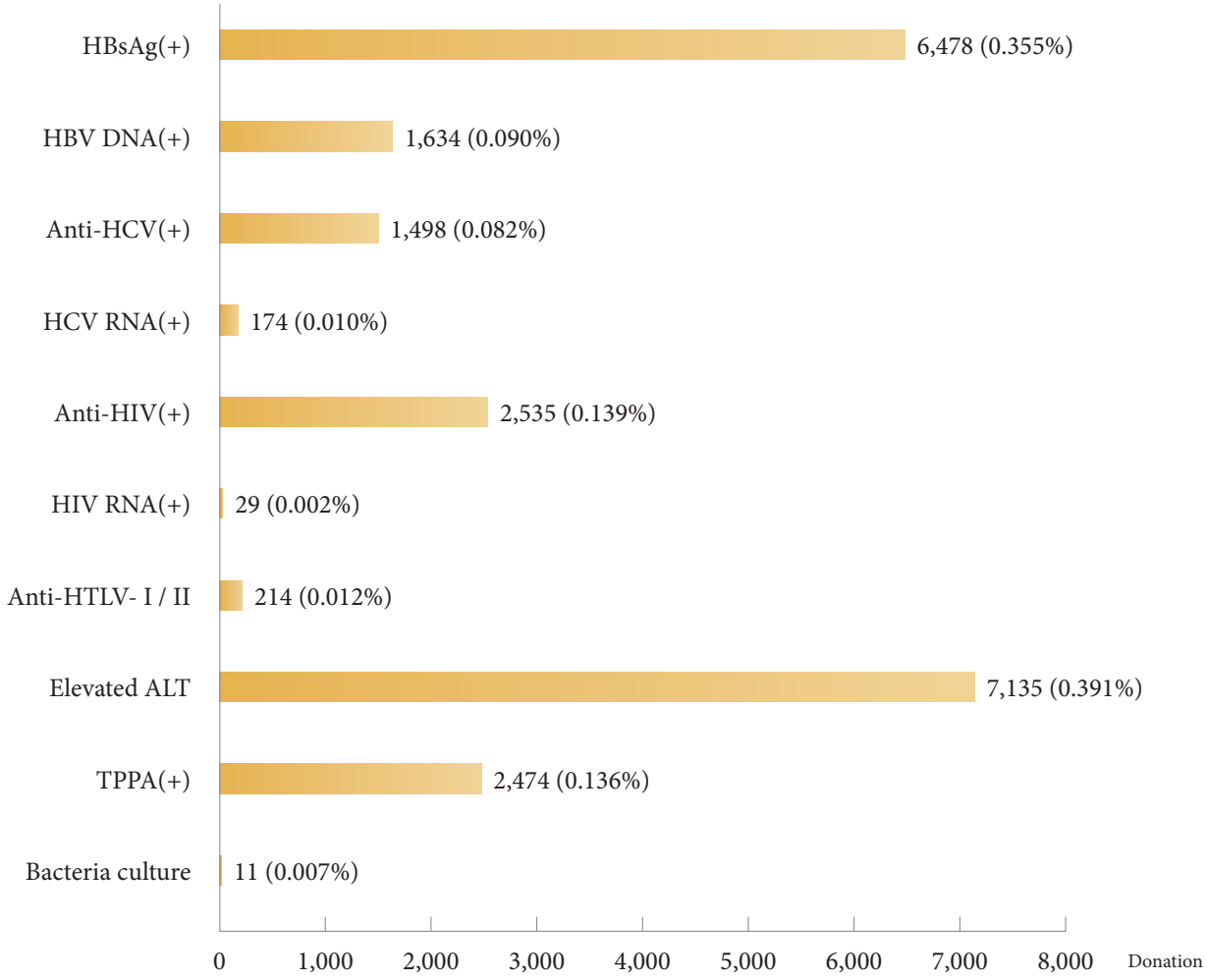
Participants

Reasons of deferral \ Blood centers		Taipei blood center	Hsinchu blood center	Taichung blood center	Tainan blood center	Kaohsiung blood center	Total
1	Low hemoglobin	37,395	7,687	30,841	12,079	24,202	112,204
2	Health questionnaire defferal	28,407	7,234	13,582	9,878	8,475	67,576
3	Blood pressure too high or too low	5,762	2,424	3,295	1,005	1,613	14,099
4	Blood vessels too thin	652	142	800	449	214	2,257
5	Low body weigh	494	164	199	273	274	1,404
6	Platelet count less than 150,000/μl or more than 600,000/μl	406	51	380	120	139	1,096
7	Body temperature too high	147	67	11	15	8	248
8	Tension	59	16	55	33	80	243
9	Other abnormalities	6,432	2,130	3,048	1,173	3,077	15,860
Deferred participants		79,754	19,915	52,211	25,025	38,082	214,987
Total participants		663,017	285,992	474,859	274,987	339,458	2,038,313
%		12.03%	6.96%	11.00%	9.10%	11.22%	10.55%

Note: Total participants include deferred participants and successful donations.

Infectious disease screening for blood issue in 2021

Positive rate：1.14%



Note: Only platelet apheresis donations were tested for bacteria culture.

Irregular erythrocyte antibody detected in 2021

Sample: 5,817

Irregular erythrocyte antibody reactive: 5,607 donations (0.3%)

Antibody	Number		Antibody	Number	
Anti-C	31	0.50%	Anti-Jk^{a}	3	0.05%
Anti-c	96	1.54%	Anti-Jk^{b}	2	0.03%
Anti-D	54	0.86%	Anti-Jk^{3}	1	0.02%
Anti-E	1,028	16.47%	Anti-Mi^{a}	2,169	34.74%
Anti-e	33	0.53%	Anti-P1	564	9.03%
Anti-Ce	1	0.02%	Anti-I/HI	1,046	16.75%
Anti-G	5	0.08%	Anti-Ku	1	0.02%
Anti-M	404	6.47%	Anti-Di^{a}	33	0.53%
Anti-N	1	0.02%	Anti-Wr^{a}	2	0.03%
Anti-S	35	0.56%	Anti-Jr^{a}	3	0.05%
Anti-s	0	0.00%	Anti-LW^{a}	3	0.05%
Anti-Le^{a}	355	5.69%	Anti-Pr	2	0.03%
Anti-Le^{b}	193	3.09%	LFA	1	0.02%
Anti-Fy^{a}	1	0.02%	Cold Agglutinin	62	0.99%
Anti-Fy^{b}	18	0.29%	Other	96	1.54%

Detection of donor Mi^{a} antigen in 2021

Donation

	Taipei blood center		Hsinchu blood center		Taichung blood center		Tainan blood center		Kaohsiung blood center		Total	
Mi^{a}+	27,957	4.8%	13,262	5.0%	17,937	4.2%	9,180	3.7%	13,068	4.3%	81,404	4.5%
Mi^{a}-	555,303	95.2%	252,813	95.0%	405,192	95.8%	240,991	96.3%	288,589	95.7%	1,742,888	95.5%

Statistics of ABO and RhD in 2021

Donation

Blood group	RhD+	RhD-	Total	%
A	485,579	2,070	487,649	26.75%
B	421,895	2,074	423,969	23.25%
O	798,910	3,770	802,680	44.02%
AB	108,444	554	108,998	5.98%
Total	1,814,828	8,468	1,823,296	100.00%
%	99.54%	0.46%		

Note: Sample amounts are not the same as the total donations, because of the blood drive records but some of them have no testing results.

Statistics of ABO subgroups in 2021

Donation

A subgroups		B subgroups		AB subgroups		Para-Bombay	
A_2	13	B_3	724	A_2B	64	O_{Hm}^{A}	66
A_3	6	B_{el}	56	A_2B_3	1	O_{Hm}^{B}	60
A_{el}	106	B_m	1	A_3B	2	O_{Hm}	37
A_m	3	B+O chimera	1	AB_3	180	O_{Hm}^{AB}	16
A_x	1			$A_{el}B$	15		
A_{int}	9			AB_{el}	4		
A_1+O chimera	1			AmB	1		
				AwB	1		
				AxB	3		
				$A_{int}B$	8		
				B(A)	7		
				cisAB	1		
				A_1B+B chimera	3		

Inventory of rare RBCs

Blood groups		Unit
Rare blood groups	ABO blood groups	
para-Bombay	A	8
	B	4
	O	11
	AB	2
RzRz	A	2
	B	6
	O	26
	AB	2
s(-)	O	24
Lu(a-b-)	A	26
	O	10
K(-)	O	2
	AB	2
K_0	A	10
Fy(a-)	A	4
	B	2
	O	28
Fy(a-)s(-)	O	14
D(-)Fy(a-b-)	O	2
Jk(a-b-)	A	46
	B	40
	O	52
	AB	2
Di(b-)	A	4
	O	10
i adult cell	A	2
	B	1
	O	3
Jr(a-)	O	4
p phenotype	A	4
	B	1
	O	1
Lan(-)	AB	3
Dc-	O	8
D--	A	4

Human resources in 2021

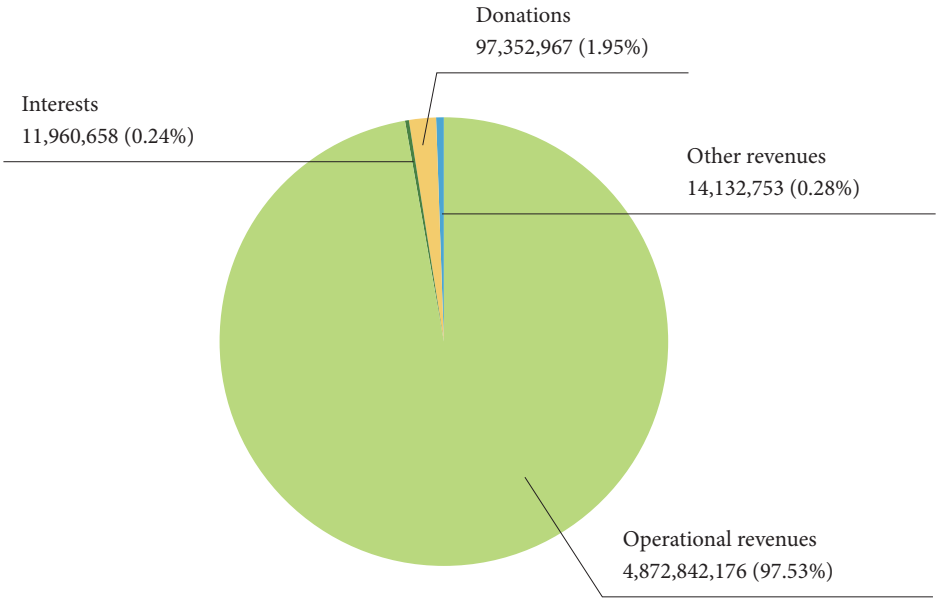
Person

Classification / Blood centers	Physician	Technician and researcher	Nursing staff	Administrative staff	Temporary	Total	%
Head Office	1	13	0	30	0	44	3.62
Taipei blood center	10	156	157	98	24	445	36.60
Hsinchu blood center	3	54	55	43	1	156	12.83
Taichung blood center	3	68	91	51	5	218	17.93
Tainan blood center	4	43	49	39	10	145	11.92
Kaohsiung blood center	5	79	66	44	14	208	17.10
Total	26	413	418	305	54	1,216	

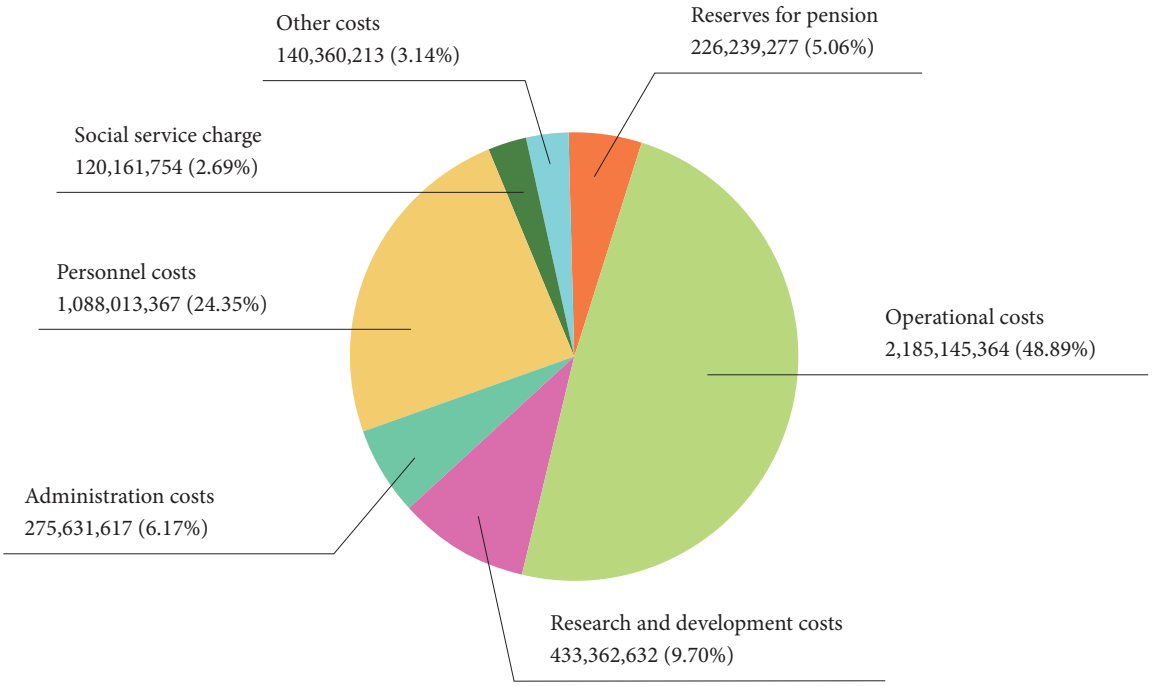
Incomes and expenditures in 2021

NT Dollar

1. Total incomes: NT$ 4,996,288,554



2. Total expenditures: NT$ 4,468,914,224



3. Balance after tax: NT$ 527,374,330

4. Capital expenditures: NT$ 98,203,658 (Equipments purchase)

APPENDIX

Blood centers in Taiwan

Head office

Taiwan Blood Services Foundation

3 FL. No. 3, Nan-Hai Road, Taipei 10066, Taiwan, R.O.C.
TEL: 886-2-2351-1600 FAX: 886-2-2395-1002
Website: www.blood.org.tw

Regional office

Taipei Blood Center

No. 123, Lih-Der Road, Taipei 112, Taiwan, R.O.C.
TEL: 886-2-2897-1600 FAX: 886-2-2897-1601
Executive Region: Taipei City, New Taipei City, Keelung City, Kinmen County, Matsu County, Hualien County, Yilan County.

Hsinchu Blood Center

No. 8, Lane 215, Guangming 11th Road, Jhubie City, Hsinchu County 302, Taiwan, R.O.C.
TEL: 886-3-555-6111 FAX: 886-3-555-0305
Executive Region: Taoyuan County, Hsinchu County, Miaoli County

Taichung Blood Center

No. 1176, Sec. 4, Taiwan Boulevard, Xitun Dist., Taichung City 407, Taiwan, R.O.C.
TEL: 886-4-2461-2345 FAX: 886-4-2461-3939
Executive Region: Taichung City, Changhwa County, Nantou County, Yunlin County

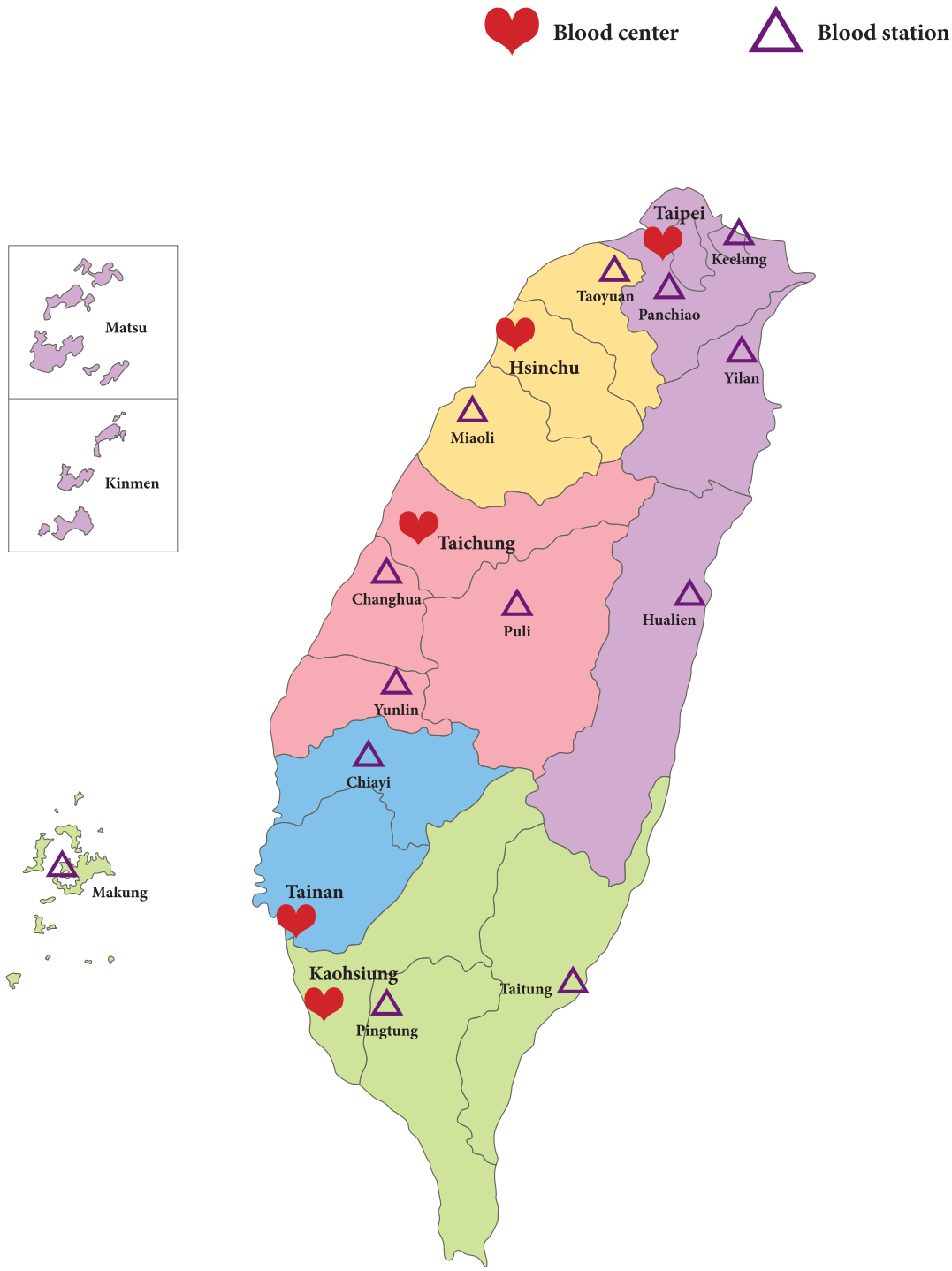
Tainan Blood Center

No. 85, Sec. 1, Yongfu Road, West Central Dist., Tainan City 700, Taiwan, R.O.C.
TEL: 886-6-213-1212 FAX: 886-6-213-3201
Executive Region: Tainan City, Chiayi City, Chiayi County

Kaohsiung Blood Center

No. 1837, Gaonan Highway, Nanzi Dist., Kaohsiung City 811, Taiwan, R.O.C.
TEL: 886-7-366-0999 FAX: 886-7-364-1556
Executive Region: Kaohsiung City, Pingtung County, Penghus County, Taitung County

Blood centers and stations



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