Milestones and Results of Voluntary Non-Remunerated Donation (VNRD) Program in Taiwan

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Outline of the presentation

• Taiwan at a glance
• Brief introduction of Taiwan Blood Services Foundation (TBSF)
• Donor recruitment and selection
  Historical review
  Donor recruitment
  Young Blood program
  Donor retention
  Donor selection
• Plasma contract fractionation
Taiwan at a glance

- Area: 36,000 km$^2$
- Population: 23 million
- Capital: Taipei City
- 6 metro cities, 15 cities/counties
- Life expectancy: Male 76.72 years
  Female 83.19 years (2014)
- Infant mortality: 2.2 per 1,000 (2014)
- Maternal mortality: 6.6 per 100,000 (2014)
Organization of Taiwan Blood Services Foundation

- **Non-Profit Private Organization**
  - Operation
  - Research

- **TBSF**
  - Administration
  - Information System
  - Finance
  - Public Relations
  - Medical Affairs

- **Board of Directors**

- **6 Blood Centers**
  - Donor Recruitment
  - Blood Collection
  - Data Processing
  - Component Preparation
  - Laboratory Tests
  - Blood Supply

- **12 Blood Stations**
  - Blood Collection
  - Component Preparation
  - Blood Supply
Taiwan Blood Services Foundation

- 6 Blood Centers
- 12 Blood Stations
- 2 Laboratory Centers
- 59 Fixed Blood Collection Sites
<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1974 | Taiwan Blood Donation Association  
       Taipei Blood Center |
| 1975 | Taichung Blood Center |
| 1976 | Kaohsiung Blood Center |
| 1981 | Tainan Blood Center |
| 1990 | Taiwan Blood Donation Association *(Ministry of Interior)*  
       Taiwan Blood Donation Services Foundation *(Ministry of Health and Welfare)* |
| 1991 | Hualien Blood Center |
| 1992 | Hsinchu Blood Center |
Annual Blood Collection Units, 1974-2015

- Total blood donation units (WB+PH)


Units:
- 1974: 3,817
- 1991: 1,066,082
- 2001: 2,065,193
- 2015: 2,583,183
- 2015: 2,556,109
<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1987</td>
<td>Hospital-based paid donor blood bank Community-based Red Cross paid donor blood bank</td>
</tr>
<tr>
<td>1974</td>
<td>Taiwan Blood Donation Association established  (Duel system: the coexisting paid donor system and VNR donor system )</td>
</tr>
<tr>
<td>1974 - 1990</td>
<td>Social Campaign of Voluntary NR Blood Donation</td>
</tr>
<tr>
<td>1987</td>
<td>Paid donor prohibited Hospital-based and Red Cross paid donor blood banks closed</td>
</tr>
<tr>
<td>1995</td>
<td>National Health Insurance (NHI) inaugurated, and the blood, blood components and blood products are fully reimbursed by NHI.</td>
</tr>
</tbody>
</table>
伸出你熱情的手，做個快樂的捐血人！

1990年
台灣血液基金會 Taiwan Blood Services Foundation

前總統李登輝先生長期支持捐血活動，為首位挽袖捐血的國家元首。

前總統陳水扁先生於91年6月6日響應臺大醫院捐血活動，完成第6次捐血紀錄。

總統馬英九先生於台北市長任內經常利用午休時間前往市府捐血室參加「公職捐血典禮」，目前捐血178次。
第三節 血量、失血、輸血和血型

人體的血量，約占體重的十三分之二。

血液是血管之外可失血。少量的失血，由於身體有調節作用，並無
危險。但大量失血時，需要立即輸血，以補充所失去的血液。否則，可能
危及生命。

輸血對於因外傷或疾病失血過多的人，是必需的。有些外科手術，必
須在手術過程中輸血，才避免手術後出血。輸血所用的血液，是由捐
血人給予受血人，或由血庫供應。但所輸的血液與受血人的血液必須能配
合，否則會發生血凝現象，堵塞小血管，因而危及生命，所以輸血時應選用
同型的血液。輸血時，必須先先做五至十四天的血液，量差不多，體內可再
生補充，所以捐血（圖 I-6-2）是對別人有益，對自己無害的善舉，值得
提倡、鼓勵。但年老及體弱的人，不宜捐血。

根據人類血液相容同會不會發生凝集的特性，血液可分為許多型別。主
要的血液有O型、A型、B型及AB型。除此外，每個人的血液還
分Rh陽性和Rh陰性。血型是遺傳的，藉血型的鑑定，可以判定親子
關係。
A nationwide social campaign

Advocate voluntary non-remunerated blood donation and disclosure the high risks of paid donors.

By the celebrities, movie stars, singers, musician, politicians, medical societies, military units, blood donation association and government (Included Ministry of Education, Ministry of Defense, and Ministry of Health and Welfare).
• Since then, the blood donation has grown along with advancement in medical care and national health insurance, and the units peaked at 2,583,138 in 2011 and the whole blood donation rate is 8.13 %.

• In 1996, an article in Transfusion recognized Taiwan’s blood services as one of the fourteen advanced countries in the world with a single national blood program.
• Blood donation rate (WHO, 2012)
  • High income countries 3.68%
  • Middle income countries 1.17%
  • Low income countries 0.39%

• Taiwan blood donation rate 7.54% (2015)
Blood Donation Rate, 2011-2015

- Blood donation rate = Donations (WB+PH) / Populations
Whole Blood Collection per 1000 population, 2011-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Liter / 1000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>25.6</td>
</tr>
<tr>
<td>2012</td>
<td>25.1</td>
</tr>
<tr>
<td>2013</td>
<td>24.2</td>
</tr>
<tr>
<td>2014</td>
<td>24.4</td>
</tr>
<tr>
<td>2015</td>
<td>24.6</td>
</tr>
</tbody>
</table>
Increasing double units WB and Apheresis Donation

**Donations of Whole Blood**

- 250 mL
- 500 mL

**Donations of Apheresis**

- 1U
- 2U
The Facts
The blood donation is a common practice among Taiwanese.

- 23 million population
- 7 million ever donate blood
- 1 million donate blood in 2015
- 1.8 million donations in 2015
- 2.5 million units (250 ml) of WB collected in 2015
- 220,000 units (standard unit) of platelets collected in 2015
Donor Participation Rate, 2011-2015

- Participation rate = No. of donors / No. of eligible populations

Year: 2011-2015
- 2011: 6.7%
- 2012: 6.4%
- 2013: 6.1%
- 2014: 6.1%
- 2015: 6.2%
Participation Rate by Age and Sex, 2015

- **15 - 19**: Male 11%, Female 6%
- **20 - 24**: Male 10%, Female 7%
- **25 - 29**: Male 9%, Female 6%
- **30 - 34**: Male 8%, Female 6%
- **35 - 39**: Male 7%, Female 4%
- **40 - 44**: Male 6%, Female 4%
- **45 - 49**: Male 5%, Female 3%
- **50 - 54**: Male 4%, Female 3%
- **55 - 59**: Male 4%, Female 3%
- **60 - 64**: Male 3%, Female 2%
- **65 - 69**: Male 2%, Female 2%
Age-Specific Participation Rate in Males


Age Group
Age-Specific Participation Rate in Females

Age Group
17 - 19
20 - 24
25 - 29
30 - 34
35 - 39
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64

Years
2000
2005
2010
2015

Participation Rate (%)
A Decline Trend of Young Donors

Age Distribution of Donations, 2000-2015
A Decline Trend of First Time Donors

New Donor Enrollment Rate, 2000-2015

New Donor Enrollment Rate = No. of first time donors / No. of total donors
Participation Rate in Age 17-20, 2000-2015

Year | Young Male | Young Female
--- | --- | ---
2005 | 14.5% | 14.1%
2006 | 14.5% | 14.1%
2007 | 14.1% | 14.1%
2008 | 13.8% | 13.8%
2009 | 13.5% | 13.5%
2010 | 13.2% | 13.2%
2011 | 12.9% | 12.9%
2012 | 12.6% | 12.6%
2013 | 12.3% | 12.3%
2014 | 12.0% | 12.0%
2015 | 11.5% | 10.2%
Donations in Age 17-20, 2005-2015

Donations

Year


Young Male

Young Female
Donation Units per Donation in Age 17-20, 2005-2015


- Young Male
- Young Female
• For young donors, the size of eligible population, blood donation participation rate, and donation frequency are all decreasing.

• Only double units donation (500ml) increased a little bit among the young male adults.
2015 Young Blood Program
Retention of Donor - Donor Health

Body weight, height, BMI  Routine check-up
Blood pressure
Hb
CBC for apheresis donor

Ferritin for first time donor and frequent donor  Study

Total Cholesterol, Low Density Cholesterol  Health check-up
HbA1c ,
Liver Ultrasound Scan  for frequent donor
Retention of Donor - Facility and Environment
Proportion of Blood Collection in Fixed Sites, 2011-2015

Year

2011 | 2012 | 2013 | 2014 | 2015
---|---|---|---|---
Taipei | 60.2 | 60.7 | 64.2 | 63.6 | 61.9
Hsinchu | 52.7 | 57.2 | 59.8 | 60.9 | 59.7
Taichung | 41.9 | 44.7 | 47.6 | 49.8 | 49.2
Tainan | 35.8 | 36.2 | 37.3 | 36.4 | 39.5
Kaohsiung | | | | | |
Hualien | Data of Hualien is unavailable before 2012.
Blood donation campaigns by groups, 2011-2015

Year | Society | Company/Government | Military | School | Other
--- | --- | --- | --- | --- | ---
2011 | 700,000 | 250,000 | 50,000 | 100,000 | 10,000
2012 | 650,000 | 200,000 | 30,000 | 150,000 | 5,000
2013 | 620,000 | 220,000 | 40,000 | 120,000 | 2,000
2014 | 630,000 | 210,000 | 45,000 | 130,000 | 3,000
2015 | 670,000 | 230,000 | 55,000 | 140,000 | 5,000

Donation
Pre-Donation Donor Deferral Rate, 2003-2015

Pre-donation donor deferral rate = No. of deferrals / No. of total donations and deferrals
Causes of Pre-Donation Deferrals, 2015

<table>
<thead>
<tr>
<th>Items</th>
<th>Number of Deferrals</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Hemoglobin</td>
<td>133,004</td>
<td>38.61%</td>
</tr>
<tr>
<td>Abnormal Blood pressure</td>
<td>30,350</td>
<td>8.81%</td>
</tr>
<tr>
<td>Aspirin or other medications</td>
<td>26,967</td>
<td>7.83%</td>
</tr>
<tr>
<td>Temporary Deferral</td>
<td>22,312</td>
<td>6.48%</td>
</tr>
<tr>
<td>Shorter Interval of Donations</td>
<td>16,369</td>
<td>4.75%</td>
</tr>
<tr>
<td>Lack of Sleeping</td>
<td>12,174</td>
<td>3.53%</td>
</tr>
<tr>
<td>Recipient of Blood or Surgery</td>
<td>11,651</td>
<td>3.38%</td>
</tr>
<tr>
<td>Under Medical Treatment</td>
<td>11,138</td>
<td>3.23%</td>
</tr>
<tr>
<td>Recent visit to TTIs epidemic country/ area</td>
<td>6,599</td>
<td>1.92%</td>
</tr>
<tr>
<td>Acupuncture, Dental Extraction</td>
<td>6,126</td>
<td>1.78%</td>
</tr>
<tr>
<td>High-Risk Sexual Behaviors</td>
<td>5,877</td>
<td>1.71%</td>
</tr>
<tr>
<td>Heart, Kidney, Lung Disease or Cancer</td>
<td>5,323</td>
<td>1.55%</td>
</tr>
<tr>
<td>Underweight</td>
<td>5,308</td>
<td>1.54%</td>
</tr>
<tr>
<td>Vaccinations</td>
<td>5,170</td>
<td>1.50%</td>
</tr>
<tr>
<td>Menstruation</td>
<td>5,146</td>
<td>1.49%</td>
</tr>
<tr>
<td>Other Abnormalities</td>
<td>40,984</td>
<td>11.90%</td>
</tr>
<tr>
<td>Total Deferrals</td>
<td>344,498</td>
<td>100.00%</td>
</tr>
<tr>
<td>Total Donations and Deferrals</td>
<td>2,112,379</td>
<td></td>
</tr>
<tr>
<td>% of Deferrals</td>
<td>16.31%</td>
<td></td>
</tr>
</tbody>
</table>
The Positive Rate of Post-donation Screening Test 1974 to 2015

- **1974**: ABO, Rh, ALT, STS, and HBsAg
- **1988**: Anti-HIV
- **1992**: Anti-HCV
- **1996**: Anti-HTLV 1/2
- **2013**: NAT
# Blood Screening Tests, 2015

<table>
<thead>
<tr>
<th>Items</th>
<th>Donations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg(+)</td>
<td>3,025</td>
<td>0.17%</td>
</tr>
<tr>
<td>HBV DNA(+)</td>
<td>2,282</td>
<td>0.13%</td>
</tr>
<tr>
<td>Anti-HCV(+)</td>
<td>1,199</td>
<td>0.07%</td>
</tr>
<tr>
<td>HCV RNA(+)</td>
<td>413</td>
<td>0.02%</td>
</tr>
<tr>
<td>Anti-HIV(+)</td>
<td>1,447</td>
<td>0.08%</td>
</tr>
<tr>
<td>HIV RNA(+)</td>
<td>59</td>
<td>0.003%</td>
</tr>
<tr>
<td>Anti-HTLV- I / II</td>
<td>262</td>
<td>0.01%</td>
</tr>
<tr>
<td>Elevated ALT (&gt;68 U/L)</td>
<td>21,163</td>
<td>1.20%</td>
</tr>
<tr>
<td>TPPA(+)</td>
<td>5,918</td>
<td>0.33%</td>
</tr>
<tr>
<td>Irregular Antibody(+)</td>
<td>4,924</td>
<td>0.28%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,767,881</strong></td>
<td></td>
</tr>
</tbody>
</table>
Prevalence of HIV, HBV and HCV infections in blood donors

<table>
<thead>
<tr>
<th>Countries</th>
<th>HIV</th>
<th>HBV</th>
<th>HCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-income</td>
<td>0.002%</td>
<td>0.02%</td>
<td>0.02%</td>
</tr>
<tr>
<td></td>
<td>0.0004-0.02%</td>
<td>0.008-0.24%</td>
<td>0.004-0.22%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>0.004%</td>
<td>0.13%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Middle-income</td>
<td>0.12%</td>
<td>0.64%</td>
<td>0.37%</td>
</tr>
<tr>
<td>Low-income</td>
<td>0.85%</td>
<td>3.59%</td>
<td>1.07%</td>
</tr>
</tbody>
</table>
Lower prevalence of HBV/HCV infections among blood donors in Taiwan

• High prevalence of HBV and HCV infection among adults in Taiwan
• Repeat donors had no infection in their previous blood screening test
• Most first time donors are young and have the lowest risk of HBV and HCV
  • HBV vaccination for high risk group since 1983 and universal vaccination of HBV in Taiwan since 1986
  • HCV screening in donors since 1992
HIV Cases Reported by Blood Centers, 1991-2015

[Graph showing trends in HIV cases reported by blood centers over the years from 1991 to 2015.]
Transfusion-Transmitted HIV Cases in Taiwan, 1984-2015

Total: 27 cases
Blood Products Demand Trend, 2006-2015

- RBCs
- Plasma

Year:
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015

Units:
- 0
- 500,000
- 1,000,000
- 1,500,000
- 2,000,000
- 2,500,000

Demand trend over the years from 2006 to 2015, showing the decrease in Plasma demand and the increase in RBCs demand.
Platelets Demand Trend, 2006-2015

- **Apheresis platelets**
- **Whole-blood-derived platelet concentrates***

* expressed as apheresis unit equivalents

<table>
<thead>
<tr>
<th>Year</th>
<th>Apheresis platelets</th>
<th>Whole-blood-derived platelet concentrates*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>80.978</td>
<td>105.522</td>
</tr>
<tr>
<td>2007</td>
<td>94.261</td>
<td>115.977</td>
</tr>
<tr>
<td>2008</td>
<td>94.000</td>
<td>127.937</td>
</tr>
<tr>
<td>2009</td>
<td>86.314</td>
<td>150.305</td>
</tr>
<tr>
<td>2010</td>
<td>67.620</td>
<td>177.603</td>
</tr>
<tr>
<td>2011</td>
<td>44.860</td>
<td>202.122</td>
</tr>
<tr>
<td>2012</td>
<td>35.292</td>
<td>219.007</td>
</tr>
<tr>
<td>2013</td>
<td>25.106</td>
<td>224.985</td>
</tr>
<tr>
<td>2014</td>
<td>20.705</td>
<td>229.545</td>
</tr>
<tr>
<td>2015</td>
<td>21.197</td>
<td>239.497</td>
</tr>
</tbody>
</table>
Plasma issued, 2011-2015

- Fresh frozen plasma and frozen plasma are included.
Contract Fractionation of Plasma Derived Products

- Y2000-SNBTS
- Y2007-CSL
- 25-30 Ton per year
- Surplus of F8  、 F9
- Humanitarian Aid (WFH )
Supply of plasma derived products

- **IVIG** 100% domestic need
- **Albumin** 10%
- **Factor 8** 4%
- **Factor 9** 13%

Low medical need because of NHI reimbursement policy

NHI reimburse recombinant blood products
Summary

• A nationwide social campaign at the early stage is essential to the success of VNRD program in Taiwan. If you can not build up the credibility of the program and create a social mood of altruistic behavior, it will be difficult to have a good program later on.

• The VNRD program have a character of high participation rate, small volume and moderate frequency blood donation.

• Due to the rapid change of population structure, the recruitment of young blood donors and retention of the existing donors are current important issues.
• Our donors have the lowest risks of HBV/HCV/HIV infection in Taiwan, but the pre-donation deferral rate and positive rate of post-donation tests are relatively higher than those in developed countries.

• Contract fractionation with recovered plasma provide us various blood products, however, the reimbursement policy of our NHI program is a barrier to the further expansion of plasma fractionation capacity.
Thank you!