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PHILIPPINES PHARMACEUTICAL INDUSTRY DEVELOPMENT STUDY

DP/PHI/87/019

PHILIPPINES

Technical report: The Supply of Source Materials for the Production of Human Serum Albumin and Gamma Globulin in the Philippines*

Prepared for the Government of the Philippines
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of F. Peterfy
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United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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1. SUMMARY

Present supply of human plasma is about 2000 liters per annum, while 108.75 kg human albumin and 4.54 kg standard gamma globulin were purchased in hospitals and drug stores in 1987. The imported human albumin preparatories cover only 1 percent of the amount needed, but the use of blood derivatives is limited by the purchasing power. The rate of grow in the purchase of human albumin is high, the evolution index reached 187 in 1987. It can be projected that 300-350 kg of albumin will be used in 1990. 20,000 litres of human plasma is sufficient to provide solutions containing 330 kgs of albumin.

Only fragmented data are available on blood collection and utilization, and it is strongly recommended to gather reliable information before an important decision is made.

On the basis of data collected it was estimated that by a recruiting and educational campaign spearheaded by the Philippine Blood Coordinating Council the plasma collection can reach the level of 20,000 l/year 9 years later. If blood centers are supported with $ 5 millions, the same level can be reached in 4 years time.

The investment cost for a classical fractionation plant can be considered to be about $12 million, working capital requirement is about P10 million, the cost of electricity P4 million. A well trained, highly qualified staff is a must.

If a fractionation plant is used at the 10 per cents of its capacity, the production cost is considerably higher and the yield of plasma derivatives is lower. The price of albumin will be above the world price by about 30 per cents if 20,000 lts of plasma are fractionated in a year. The establishment of a fractionation plant is advisable when the plasma supply is above 30,000 litres.

It is recommended to develop the fractionation project in successive stages.

i. Freeze dryed plasma production, if it is required by the armed forces.
ii. Contract fractionation and local quality control, formulating and packaging.

iii. Local fractionation.

Placenta should be considered as an alternative source material, because the blood supply from voluntary unpaid donors is not adequate. It is possible to collect enough placenta to cover the consumption.

A plant for placenta extraction is more costly by 50 per cents than a plasma fractionation unit, and probably royalty payment is required for the technology.

It is recommended to ask UNIDO to conduct a feasibility study to evaluate the different possibilities:

i. The establishment of a government owned company to cover the need of the Philippines using placental and venous blood collected in the country.

ii. Attracting a foreign firm by political and financial means to set up a fractionation plant. It can be viable if the placenta is collected in the whole South-East Asian region.

2. SUPPLY OF HUMAN BLOOD IN THE PHILIPPINES:

Three major sources of supply exist in the country: The Philippine National Red Cross, hospital blood banks and commercial blood banks.

2.1 The Philippine National Red Cross

The Red Cross/PNRC/ use voluntary donors only and it operates nationally collecting and dispensing blood in the whole area.

PNRC National Blood Program Network

Institutions	Number	No. of Units Collected in 1987
National Blood Center	1	6,941
Regional Blood Center	3	19,056
Chapter Blood Center	34	53,228
Blood Extension Services	26	13,642
Blood Stations	4	290

(Source: Dr. C. O. Samson, Director, P.N.R.C. National Blood Program)

The National Blood Center and the Regional Blood centers employ doctors, but in the other institutions doctors work on voluntary basis. The Blood Centers have facilities for testing as well as to collect, process and preserve blood. Blood Extension Services collect and store blood but no test is done. Blood Stations work on temporary basis only. The National Blood Center has two blood mobiles to collect blood from large organizations.

Half of the blood donations are taken into 300ml bags because of the insistance of donors. The great majority of blood are taken into single packs, and 5-10% of them are separated to components. Packed red cell concentrate, frozen fresh plasma,platelet concentrate, white cell concentrate and cryoprecitate are produced on request from hospitals. All of the separated plasma was used for infusion. A few bags of outdated blood were sent back to the PNRC during the year.

The society actively participating in donor recruitmentactivities organized by the Philippine Blood Coordinating Council.There is a significant grow in the number of donations.

Consolidated Collection of PNRC National Blood Center and Regional Blood Centers

No. of Units Collected

	1985	1986	1987
National Blood Center	27,053	24,958	26,393
Eastern Visayas Regional Blood Center	8,787	9,495	11,175
Western Visayas Regional Blood Center	11,589	12,779	12,120
Mindanao Regional Blood Center	40,431	43,178	43,469
Total	87,860	90,410	93,157

Source: Dr. C.O. Samson, Director, P.N.R.C. National Blood Program

There is a considerable variation on the yearly collection between the Chapter Blood Centers (88-12,501) and Blood Extension Services (124-3,524) and it suggests that there is a room for improvement (See Annex II and Annex III)

Recruitment of donors is hindered by the high level of iron deficiency and poor health status. At some institutions 80 percent of voluntary donors were rejected for nutritional problems (anemia, underweight, low blood pressure)

95% of blood are screened for HBsAg with reverse possive hemagglutination (Green Cross, Japan). Price is relatively low: P 10/test. Blood is screened for HIV antibody at the National Blood Center by DuPont and Pasteur ELISA tests at a price of P 37/test. Biotest typing sera are used.

Because of its tax exempt status PNRC can purchase the CPDblood packs at reasonable prices: P 30-38 for single bag andP 85 for double bags.

The production cost of whole blood is P 150/unit (overhead costs are not included). It is given to charity patients for P 50 and for paying patients for P75.

The PNRC is funded by donations only.

2.2 Hospital Blood Banks

The Bureau of Research and Laboratories (Department of Health) is responsible for the licensing of blood banks, but the DOH running and funding only the blood bank associated with Government hospitals.

Hospital Blood Banks

	Government	Private
Metro Manila	10	21
Provinces	44	56
Total	54	77

A survey conducted by DOH gives a picture on the use blood products at different hospitals.

	National/Special Hospital	Medical Center Reg'l.Hospital	Provincial Hospital	District Hospital	Sanitaria	Total
No. of units collected	7,833	17,414	24,581	19,623		69,450
No. of units transfused	11,197	97,195	58,637	37,661	275	204,965
- Whole blood	10,664	53,244	55,084	35,152	275	154,400
- Packed Red Cells	3,551	5,374	1,259	233	18	10,435
- Plasma	717	249	---	11	---	977
- Others	975	74	---	11	---	1,059
Crossmatching	24,748	105,431	65,316	38,352	275	234,122

Source: Undersecretary Dr. T. Maramba, DOH

34 percent of blood transfused were collected in hospital blood banks, and 66 percent were either received from PNRC or purchased from commercial blood banks.

The proportion of packed red cell concentrate/whole blood is the highest at National/Special Hospitals (0.33) and the lowest at the District Hospitals (0.0066).

As statistics on blood collection and processing were not complete a separate survey were conducted at four leading hospital blood banks.

2.2.1 At the Makati Medical Center (Dr. Amelia Garcia, Dept. Head) only blood from the Center's own blood bank is used.

A few voluntary donors are recruited from the relatives of patients, but mainly a roster of paid donors is used to provide the quantity and quality needed. 700-800 units are collected per month, but only 5% of it is separated, because the doctors are not familiar with component therapy.

HBsAg and HIV antibody are tested by Abbott instrument and reagents. Biomedics monoclonol typing sera and Ortho antibody screen panel are used. Blood tested for syphilis and malaria as well.

The price of whole blood are P 400-500/bag, and additionallythe cost of HIV test is charged on patients in suites.

2.2.2 At the Polymedic General Hospital (Dr. Norma Martinez-Ona, Chairman.Blood Bank Committee)

90 percents of blood are obtained from paid donors, 5-10 percents from relatives of patients and 0-5 percent are purchased from commercial blood banks. 100-150 units are collected in a months, and 50-60% of them are separated to components. This high proportion was achieved by in-house education and by a request form where the doctors have to give reasons for a requested blood product. More packed red cell concentrate is used than fresh frozen plasma, so a surplus of plasma is generated. According to the calculations of the expert the amount of unused human plasma is about 100 liters in a year.

Blood are screened for HBsAg (reverse possive hemagglutination,Abbott), for syphilis and malaria. Organon reagent are used for blood typing.

The price of the whole blood is P 250/unit.

2.2.3. Philippine Heart Center (Dr. Carmen T. Narciso, Section Chief, Blood Bank & Trnasfussion Services, President, Philippine Blood Coordinating Council) has a well organized blood bank with examplary record keeping 2,989 units of blood was taken in 1987, mainly from paid donors. Additional 1334 units were purchased from commercial blood banks. 63 percent were reported, so 1255 units of whole blood, 2131.5 units of packed red cell concentrate and 933 units of fresh frozen plasma 970 units of cryoprecipitate and 1071 units of platelet concentrate were infused. From these data it can be calculated that 200-300 of unused human plasma was generated in 1987. Organon reverse passive hemagglutination test (P 2900/100 test) is used for HBsAg screening, and the presence of HIV antibody is tested with organon ELISA kit on demand. Wellcome VDRL test is used for screening.

The price of the whole blood was P 250-340 / unit, for prices of other components see annex III.

The Philippine Blood Coordinating Council is doing a good job by promoting the voluntary blood donations (see Annex IV) and by propagating the component therapy through seminars.

The problem of the low level of the general status of health was noticed in the records of the Blood Bank of the Philippine Heart Center too. From the 5169 potential blood donors 2692 were rejected for health reasons.

2.2.4 The National Kidney Institute (Dr. Honorata G. Baylon, Section Head, Blood Bank and Transfusion Service and Serology) has a well run blood bank. 23315 units were transfused in 1987 and on exceptionally high percentage of blood was used for component therapy (see Annex V). No. excess plasma was generated in 1987 because the use of fresh frozen plasma was enccuraged.

Organon ELISA kits are used for the detection of HBsAg and HIV antibody, and Organon reagents for blood typing.

2.3 Commercial Blood Banks

There are 15 commercial blood banks in Metro Manila and 10 additional ones in the provinces. No data were available on the collected amount, but they provide a substantial part of blood supply. It was estimated that more than 150000 units were collected by commercial blood banks in 1984 (P. Schiff Technical report VC/RAS/83/234). Only paid donors are used for a fee of P60-75.

One single blood pack is purchased for P 40-45/bag on a wholesale price, and they sell the blood for P 150-170/ unit. The properly equipped hospital laboratories test the purchased blood for HBsAg, VDRL, etc and 10-20 percent of Blood are rejected with infectious agentss for contamination. Some of the hospital blood banks have facilities for storage of blood but not for screening or processing (Rizal Medical Center), and the blood purchased from commercial blood banks are transfused without testing for morkers of infectious agents. Recently the Bureau of Research and Laboratories (DOH) confiscated the contaminated blood units, and it prevents the reselling of blood that were sent back to commercial blood banks.

The expert was informed that there are other hospital blood banks in the category of Philippine Heart Center concerning the level of blood component production (Lung Center of the Philippine, University of Santo Tomas Hospital), there are some other similar to Makati Medical Center with respect to the quality of facilities and testing instruments (St. Lukes Medical Center, piscopalian ospital) and many other hospital blood banks in the category of Rizal Medical Center.

Recently human plasma is considered to be a by-product, because more packed red cell is used in the component therapy than fresh frozen plasma or cryo-supernatant. For this reason it is thought of to be a cheap source of material for albumin and gonimc globulin production. There are no data available on the amount of surplus human plasma produced in a year, but the estimated volume is between 1000 and 3000 liters.

In countries where the proportion of blood donations to the population is more than ten times higher than in the Philippines, more plasma is used than the red cells. Human plasma is not a cheap source material there, because it has to absorve the cost of blood packs, processing, testing and even the

termination of red cells. But only at this stage is viable to start plasma fractionation.

In the Philippines there is an extensive donor recruitment program, spearheaded by the Philippine Blood Coordinating Council and the Philippine National Red Cross. The education of doctors on component therapy is helped by the Philippine Society of Hematology and Blood Transfusion (Dr. Hermogenes B. Purungganan, President) too. But several factors hinder the quick progress: malnutrition, low purchasing power, lack of funds.

For a viable plasma fractionation about 200000 liters of plasma is needed in a year. The starting level can be at 30000-40000 liters per annum, if the government is willing to absorb the higher production costs.

3. CONSUMPTION OF PLASMA FRACTION IN THE PHILIPPINES

Data on annual consumption were collected from Central Bank information service and from the issues of Business Statistics Monitor January 1987-June 1988, based on Customs data but only the import of 5,6 kg of human albumin was registered with a value of $13,500 FOB:

Human Albumin and Gamma Globulin (S) Products Registered in PIMS, April 1987

Name	Serum Protain	Producer	Price
Plasbumin-25	Albumin 25%	Cutter/Bayer	P2,890/100 ml
Plasmanate	PPF 5%	Cutter/Bayer	1,155/250 ml
Albumer	Albumin 25%	Merieux	-
Albuman Berna	Albumin 25%	Swiss SVI	-
Gamastan IM	Gamma globulin 16%	Cutter/Bayer	277.2/10 ml
Gamma 16	Gamma globulin 16%	Merieux	-
Globuman Berna	Gamma globulin 16%	Swiss SVI	-
IG Gamma	Gamma globulin 16%	Sclavo	75/2 ml

Only the standard gamma globulin preparates are listed, because the hypersimman or intravenous gamma globulin can be produced in a second phase.

Data regarding annual consumption of preperates listed above were collected from IMS Philippine Pharmaceutical audits, 1987.

Purchase of Human Albumin and Gamma Globulin in 1987

	Hospital Government & Private		Drug Store		Evolution Index *
	Volume /Kg/	Value P x 1000	Volume /Kg/	Value P x 1000	
Blood Product					
Albumin	102.5	11,733	6.25	668	187.2
Gamma Globulin	2.88	678	1.66	396	100.2

The evolution index indicates no increase in the use of standard gamma globulin. The albumin consumption is substantial, but much less than in the USA or Europe, where 200-300 Kg of albumin are used per annum by 1 million inhabitants

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* Evolution Index : Market Share This Year x 100
Market Share Last Year

It was noticed during the analysis of IMS data, that from the 108.75 Kg imported albumin only 5 Kg was isolated from human plasma, while 103.75 kg. was extracted from human placenta

4. AVAILABILITY OF HUMAN PLACENTA IN THE PHILIPPINES

Human placenta can be collected in paraffin carton boxes placed into chest type freezers after deliveries.

Instruction from a manufacturer

The placentas collected are intended for the manufacture of ALBUMIN AND IMMUNO-GLOBULIN (gamma-globulin).

a/ The placentas shall be collected with a maximum quantity of blood; that will be used for the preparation of human abumin and immuno-globin.

b/ Only placentas shall be store in the freezer.

c/ None of the following materials shall be mixed with the placenta: water, druga, urine, faeces, surgical instruments, bandaging materials, etc.

d/ Placentas shall not be collected from women who suffer any of the folling diseases:
- syphilis,
- hepatitis,
- tuberculosis,
- parasitic diseases of blood such as malaria, etc.
- malignancies,
- AIDS,
- or take drugs.

Placentas shall not be collected from still born babies or aborted foetuses.

The presence of meconium is to be avoided.

e/ The placenta with the maximum quantity of blood shall be placed into a vessel with paraffin as quickly as possible but in any case within 30 minutes of delivery.

f/ It shall be ensured that every vessel is properly filled before a new one is started; each vessel should contain about 22 placentas.

g/ A vessel is considered full, when the placenta level is ± 1 cm from the rim.

The production scheme for human albumin and immunglobulins:

Human placental extract (haemolyzed)

25% ethanol, pH 6.8, - 8oC ——> Immunoglobulins

!

V

Supernatant

25% ethanol, 0.6% CHCl3, +22oC

!

V

Supernatant

25% ethanol, 0.042 M TCA, -8oC

!

V

Precipitate

Silica gel adsorption

!

V

Supernatant

75% ethanol, 0.08 M TCA, -10oC

!

V

Precipitate

0.0241 M Na-caprylate, pH5, +60oC

!

V

Supernatant

40% ethanol, pH 4.8 -8oC

!

V

Precipitate

Aluminium hydroxide adsorption

!

V

Supernatant

Ultrafiltration, heat inactivation

!

V

Albumin

Placen . can be collected only in hospitals, because they should be put into a freezer as soon as possible. The Department of Health provided data on the distribution of deliveries.

DELIVERIES BY PLACE OF OCCURRENCE
PHILIPPINES

YEAR	TOTAL BIRTHS	BIRTHS DELIVERED IN	
		HOME	HOSPITAL
1978	1,429,814	1,083,794	346,020
1980	1,456,860	1,095,954	360,906
1981	1,461,204	1,100,273	360,931
1982	1,474,491	1,109,475	365,016
1983	1,506,356	1,130,157	376.199

Source: Philippine Health Statistics, 1979-1983

The cost of collection depends on the numbers of hospitals where placentas have to be gathered to get adequated supply, because chest type freezers should be installed and freezer transport is necessary.

A survey was conducted to prepare the list of hospitals with considerate number of deliveries, but it still not complete.

Hospitals with 3000 and more deliveries in 1986

Dr Jose Fabella Memorial Hospital	31,351
Davao Medical Center	5,133
East Avenue Medical Center	5,044
Philippine General Hospital	4,616
Central Luzon Regional Hospital	4,403
Corazon Locsin Montelibano Memo. Hospital	4,306
Tondo General Hospital	4,296

Cebu Peuriculture Center	4,086
Makati Medical Center	4,031
Chinese General Hospital	3,963
Zamboanga General Hospital	3,880
University Ste. Thomas Hospital	3,833
Tondo Medical Center	3,666
Rizal Medical Center	3,701
Dr. Jose Reyes Memo. Medical Center	3,597
Hospital ng Maynila	3,546
Our Lady of Lourdes Hospital	3,250
Dr. Efraim Montemayor Memo. Med. Center	3,187
IPHO-Quezon Memorial Hospital	3,185
Quirino Memorial Hospital	3,168
Governor Teofilo Sison Memo. Hospital	3,081
IPHO-Tarlac Provincial Hospital	3,060
Dr. P. F. Garcia Memo. Res. &	3,038
	115,421

Source: Annual Report of the Philippine Obstetrical & Gynecological Society, Inc. 1987 and Bureau of Medical Services, DOH

These data show that it is possible to gather more than 100.000 placenta per annum, and it provides sufficient material to start with.

The advantageus position concerning collection is demonstrated by the fact, that placentas are already collected in several hospitalsand shipped abroad. The broker firm pays P 4/kg placenta.

5. CONCLUSIONS

5.1 Venous plasma

A fractionation plant shall be of suitable size, construction and location to facilitate their proper operation, cleaning, and maintenance in accordance with general rules of hygiene. The separation of serum proteins should be done in a building isolated from the manufacture or processing of non-

human proteins or microbiological materials.

The physical investment cost for a classical fractionation plant can be considered to be about 12 million dollars.

Working capital requirement is about 500,000 dollars for a monthly fractionation capacity of 2,500 litres. The important requirement for circulating capital is due to the duration of the production cycle and to the cost of human plasma.

The cost of electricity is between P3.5 and 4.5 millions and it is only sligthly dependent on the volume of fractionation.

The success of plasma fractionation depends to a large degree on manpower: acquired experience, practical expertise. The training of staff, regular up-dating and adaptation of their knowledge over the years should constitute a priority. One PhD, two MSc and four BSc holders and about 20 technicians are required as qualified personnel. The fractionation process requires qualified technicians to work in cold rooms, and experts on quality assurance and process monitoring.

Quality assurance is essential at each stage of the process from the bleeding of donor to the testing of the final packaged product.

The facilities and equipment for quality assurance, filling, packaging, labelling, cleaning are almost the same in plants with 20,000 l and 200,000 l per annum capacity, because the smallest filling, labelling instruments are sufficient even for a big plant, but they shall not be used for other purposes. The costs of quality assurance, salaries, energy, management are only slightly lower if batches of 500 l instead of 1500 l of plasma is fractionated. The cost of reagents is proportional, but it is a small fraction of the cost of processing.

The yield is also dependent on the size of batches. From a batch of 500 l plasma 8.36 kg of albumin can be expected as a finished product, while from a batch of 1500 l plasma 34.86 kgs of albumin can be received. In the preparation of plasma de-ivatives a considerable amount of loss is due to

samples for quality assurance, and the proportion of final products taken as test or check samples is higher, if the batch is small.

Presently the price of fresh human plasma is about P/900 per liter (see: Annex IV). It may be realistic to calculate with this price in the near future too, because the effect of inflation might be balanced by a lower cost of blood bags. The world prices for the bulk forms of human serum albumin and gamma globulin were about $1800 and $450 per kilogram, respectively, in 1988. From a batch of small size (500 l) albumin worth of P/990 and gamma globulin worth of P/45 can be expected from one liter of plasma.

Source material

As no data is available on the supply of human plasma, an estimate was made on the basis of interviews. No surplus plasma was generated at the Philippine National Red Cross, Makati Medical Center, National Kidney Institute and Rizal Medical Center. About 200-300 lts of plasma was gathered at the Philippine Heart Center and Polymedic General Hospital per annum. On the basis of interviews the amount of human plasma presently available for fractionation is about 1000 lts in a year.

An independent estimate can be made on the basis of data provided by DOH (see paragraph 2.2), and according to the calculations of the expert about 2000 lts of surplus plasma was generated per annum.

It is difficult to make a reliable forecast because of the lack of data. On the basis of data collected (see paragraphs 2.1 and 2.2) and Dr. Schiff's report (UC/RAS/83/234) the number of blood units collected is growing by 3%, and the proportion of the separated components to whole blood is increasing by 1.5% annually. If this trend is maintained by vigourous recruiting and educational campaigns the threshold of 30,000 lts of plasma per annum can be reached in 14 years time. If Government funds are available to support the blood collection to reach a grow rate of 6 per cents and an increase of separation rate by 3 per cents the same threshold can be reached in 8 years time.

Preparation of blood bags

The prices of blood bags depends on the sources and the tax levied, but compared to European prices they are not unreasonable.

	Prices of blood bags		
User	Single	Double	Triple
Red Cross (PNRC)	P 38	85	95
Commercial Blood Bank	P 45	95	110
Hospital Blood Bank	P 50.7	146.7	282
European Blood Center	$ 2.5	8.1	12.3

The establishment of a blood bag production plant needs a careful preliminary study. It is possible to prepare single plastic bags at a cost of $ 1.1 in a small scale too, but the cost of small scale production of stabilizer, the manual filling, sterilizing and the quality control is high: $ 1.9 per bag at a production level of 300,000 bags per annum.

Consumption of albumin

According to IMS 108.75 kg human albumin was used in 1987. The evolution index was very high and it is possible to exceed the 300 kg level in 1990. The calculated need for the country is about 110,000 kg per annum.

Production of albumin

20,000 litres of human plasma is sufficient to provide solutions containing 330 kg of albumin, but if it is a yearly production of a plant, the cost of energy, maintenance, salaries, quality control is near to the cost of plasma, consequently the price of albumin will be above the world price by about 30 per cents. If a fractionation plant processes 200,000 litres a year, the proportion of the cost of energy and salaries in the production cost is about 15 per cents, and it can be economically viable.

Recommendations

It is advisable to develop the fractionation project in successive stages.

As a first step freeze dryed plasma can be produced from the surplus material. The armed forces were the main users of this product, so it is recommended to contact these organizations to find out the quantities required,

if any. If it is substantial, a freeze dryer can be installed to an existing blood bank, like the Philippine Heart Center. The unsuccess story of the blood plasma dehydration unit under the DOH where 38-44 litres of plasma were processed per annum with a presumably high overhead cost between 1982 and 1984 should not be repeated. A pilot scale freeze dryer with 3 technicians can process 4-5 thousand litres a year.

The second step may be a contract fractionation: an agreement can be negotiated with a public or private fractionator with excess capacities who, for a fee, will receive plasma from the Philippines and will return the plasma products obtained. This has always been the policy of the American Red Cross which fractionates its own plasma by sub-contractors. It allows the Philippines to remain in control of its own plasma, while gradually attaining self-sufficiency. Substantial saving can be made also by purchasing plasma products in bulk forms in the world market and prepare the final forms in contract basis.

The establishment of a fractionation plant is advisable, when the plasma supply is above 30,000 litres per year. It is recommended to install first facilities to quality control, formulation and packaging for the bulk products produced on contract to acquire practical expertise and start the actual fractionation later.

5.2 Placental blood

Placental blood can replace venous blood as a source material, and it should be considered seriously when the need for blood exceeds the donations of voluntary unpaid donors. There is a danger of abuse if professional donors are required from the lower classes. There are no political or religious obstacles in the Philippines that prevent the collection of placentas.

In theory the supply of placental blood is good: there are about 1.5 million deliveries per annum, which represents about 750 tons of placentas, and it is sufficient for the isolation of 2,250 kgs of human albumin. However it is not possible to collect all of existing placentas, because a large proportion of births takes place either at home or in small and/or isolated hospitals, and it makes collection problematical and expensive. Placentas have

to be frozen within 30 minutes of delivery and kept at low temperatures during storage and transportation, which requires efficient organization, an infrastructure of freezing capacities and communication network. Additionally a certain number of placentas should be rejected, because some of the donors are not clinically healthy and free of infectious diseases.

It was possible to get data from some hospitals (see paragraph 4), and it seems that it is possible to collect 100,000 pieces of placentas from 23 hospitals. To cover the projected consumption in 1990 (300 kg of human albumin) 200,000 pieces should be collected, and it is not an unrealistic target.

Several advantages and disadvantages can be listed concerning the establishment of a fractionation plant based on placenta as a raw material.

Advantages:

- placentas are more readily available than surplus venous plasma
- placenta is cheaper as source material (about P900/l plasma and P70/placenta of equivalent amount)
- facilities for placenta processing may be used for plasma fractionation too.

Disadvantages:

- the establishment of placenta collection and the equipment for fractionation is more expensive. At first glance the investments can be considered to represent about 18 million dollars.
- the technology is a sophisticated one, and it is not as available as the classical Cohn's method. A royalty payment should be negotiated for it.
- the process of purification is long and complex, the costs of reagents are high and it balances the advantage of the cheap raw material.

- It is recommended to ask UNIDO to conduct a feasibility study on fractionation of placental serum. That study may focus on different possibilities:

- the establishment of a government owned company to cover the need of the Philippines using placental and venous blood collected in the country.
- attracting a foreign firm by political and financial means to set up a fractionation plant. It can be viable if the placenta is collected in the whole South-East Asian region.

ANNEX I

PHILIPPINES
DP/PHI/87/019
List of Persons Met

1.	Dr. Alfredo Bengzon	- Secretary of Health
2.	Mr. Khais Gamboa	- Undersecretary of Health
3.	Dr. Quintin Kintanar	- Director PCHRD, Assistant Secretary of Health
4.	Dr. Patricia Navarro	- President Phil. Obstetrical & Gynecological Society
5.	Dr. Vicente X. Genato	- Vice-President Polymedic General Hospital
6.	Dr. Juanito P. Cruz	- Univ. Clinic, Ateneo de Manila University
7.	Dr. Augusto L. Lingao	- President, Philippine Society of Allergology & Immunology
8.	Dr. Augusto Litonjua	- President Philippine Diabetes Association
9.	Dr. Amelia A. Garcia	- Department Head, Makati Medical Center
10.	Dr. Alberto K. Alcantara	- President, Philippine Society of Microbiology
11.	Capt. Larry Laughlin	- US Naval Medical Research Units NZ
12.	Dr. Thomas Maramba	- Undersecretary DOH
13.	Dr. Manuel V. Cruz	- Professor, Department Obstetrics & Gynecology, UST
14.	Dr. Fortunato Sevilla	- Director, Research Center for Natural Science, UST
15.	Dr. Beatrice Guevarra	- Research Center for Natural Science, UST
16.	Dr. Manuel Navarro	- Professor, Research Center for Natural Science, UST
17.	Ms. Criselda G. Abesamis	- Pathologist, Blood Coordinating Council
18.	Ms. Carmen T. Narciso	- Hematologist, Chief Blood Bank, Heart Center
19.	Mr. Celso O. Samson	- Director, Philippine Red Cross
20.	Dr. Ditas B. Javier	- Department Head, Rizal Medical Center
21.	Dr. Norma Ona	- Hematologist, Polymedic General Hospital
22.	Ms. Amelia Garcia	- Hematologist, Polymedic General Hospital
23.	Dr. Mediodora Saniel	- Director, Institute of Tropical Medicine
24.	Dr. Remigio Olveda	- Head, Institute of Tropical Medicine
25.	Dr. Veronica Chan	- Professor UP College of Medicine
26.	Dr. A.D. Nazareth	- Programme Director, Molecular Biology and Biotechnology Program U.P. Diliman
27.	Ms. Alicia G. Salazar	- Head, Antibiotic Section, Bureau of Food and Drugs

Annex II

Blood Collection of Philippine National Red Cross

	NO. OF UNITS COLLECTED		
	1985	1986	1987
Chapter Collection			
National Blood Center	6,814	4,334	6,941
Regional Blood Centers *			
Cebu Blood Center	1,767	1,522	1,652
Iloilo Blood Center	6,968	6,810	5,938
Cagayan de Oro Blood Center	9,709	12,095	11,466
Chapter Blood Centers *			
Baguio City	194	240	492
Bataan	743	1,127	1,458
Bulacan	157	206	217
Camarines Norte	345	790	457
Capiz	1,392	1,453	1,381
Cotabato	227	685	1,324
Davao City	11,632	12,501	11,558
Davao del Sur	2,686	2,520	3,036
General Santos City	2,549	1,953	1,388
Iligan City	1,988	1,851	1,279
Iloccs Norte	3,128	2,384	2,994
Leyte	883	2,171	3,052
Misamis Occidental	327	402	430
Negros Occidental	2,375	3,286	3,585
Negros Oriental	2,381	2,247	2,349
Olongapo City	3,260	3,388	2,957

Ozamis City	1,615	1,608	1,310
Palawan	1,006	1,398	-
Pampanga	108	238	99
Pangasinan	234	131	88
Quezon City	2,511	2,269	2,150
Rizal	3,366	3,203	2,923
Surigao del Norte	398	805	886
Surigao del Sur	204	201	191
Tarlac	498	564	546
Zamboanga City	4,206	4,480	4,750
Zamboanga del Norte	322	438	330

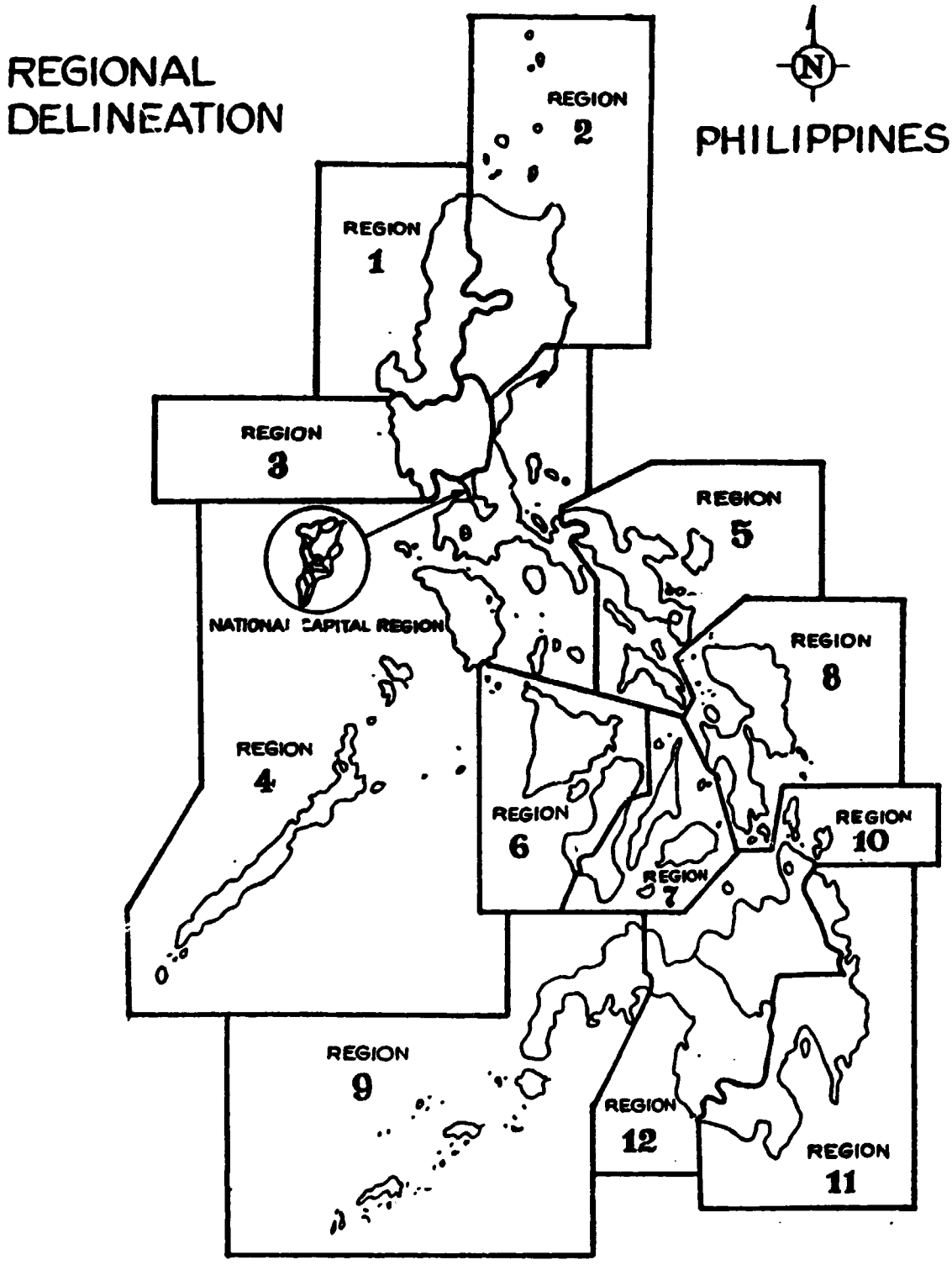
Blood Extension Services **

Aklan	443	307	139
Antique	411	923	1,077
Basilan	664	508	565
Bohol	1,038	857	828
Camarines Sur	583	392	430
Cavite	187	176	220
Davao	3,130	3,524	3,428
Davao Oriental	124	147	1,019
Cindoog City	131	124	293
Laguna	268	281	189
La Union	340	381	243
Masbate	161	392	574
Quezon-Lucena	1,715	1,535	1,849
San Pablo City	256	158	170
South Cotabato	2,487	1,872	2,052
Zambales	455	484	556

Blood Stations***

Albay-Legaspi	49	139	52
Mindoro Occidental	107	109	56
Caloocan City	53	122	6
Pasay	68	116	176

Annex III Map of the Philippines



REGIONS	13
PROVINCES & SUB PROVINCES	73 plus 2
CITIES	60
MUNICIPALITIES	1,531
BARANGAYS	41,196

The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations Industrial Development Organization.

ANNEX IV

PHILIPPINE HEART CENTER
East Avenue, Diliman
Quezon City

BLOOD BANK AND TRANSFUSION SECTION

	R A T E S		
	Patients, Ward, Semi-Private room inc. Semi-Private rooms in MICU SICU & IMCU	Patient in OPD, Private rooms inc. Private rooms in SICU and MICU	Patients in Suites
One unit of ABO blood (500cc)	250.00	290.00	325.00
One unit of AB blood (500cc)	260.00	300.00	340.00
250cc or less ABO whole blood	180.00	205.00	235.00
250cc or less of AB whole blood	190.00	215.00	245.00
One unit of ABO packed RBC	275.00	315.00	360.00
One unit of AB packed RBC	285.00	330.00	370.00
150cc or less of ABO packed RBC	180.00	205.00	235.00
150cc or less or AB packed RBC	190.00	215.00	245.00
One unit of ABO fresh plasma	275.00	315.00	360.00
One unit of AB fresh plasma	285.00	330.00	370.00
One unit of platelet concentrate	300.00	345.00	390.00
One unit of cryoprecipitate	300.00	345.00	390.00
One unit of cryosupernate	300.00	345.00	390.00
One unit of washed RBC	375.00	430.00	490.00
Blood package deal (packed RBC, platelet concentrate and cryoprecipitate)	750.00	860.00	975.00
ABO blood typing	40.00	45.00	50.00
RH blood typing	45.00	50.00	60.00
Three phases of cross matching	100.00	115.00	130.00
Screening of one donor	100.00	115.00	130.00
Screening and bleeding of one donor	175.00	200.00	225.00
Screening test for hepatitis surface antigen test	150.00	170.00	195.00
Screening test for VDRL test	65.00	75.00	85.00
Quantitative test for VDRL test	80.00	90.00	105.00
Direct coomb's test	70.00	80.00	90.00
Test for agglutinins	80.00	90.00	105.00
AIDTEST (Screening for AIDS)	100.00	115.00	130.00
Quantitative test for cold agglutinins	100.00	115.00	130.00
One CPD-single Blood pack	100.00	115.00	130.00
One transfer pack (300ml)	100.00	115.00	130.00
NOTE: For "STAT" request, additional ch	20%	23%	26%

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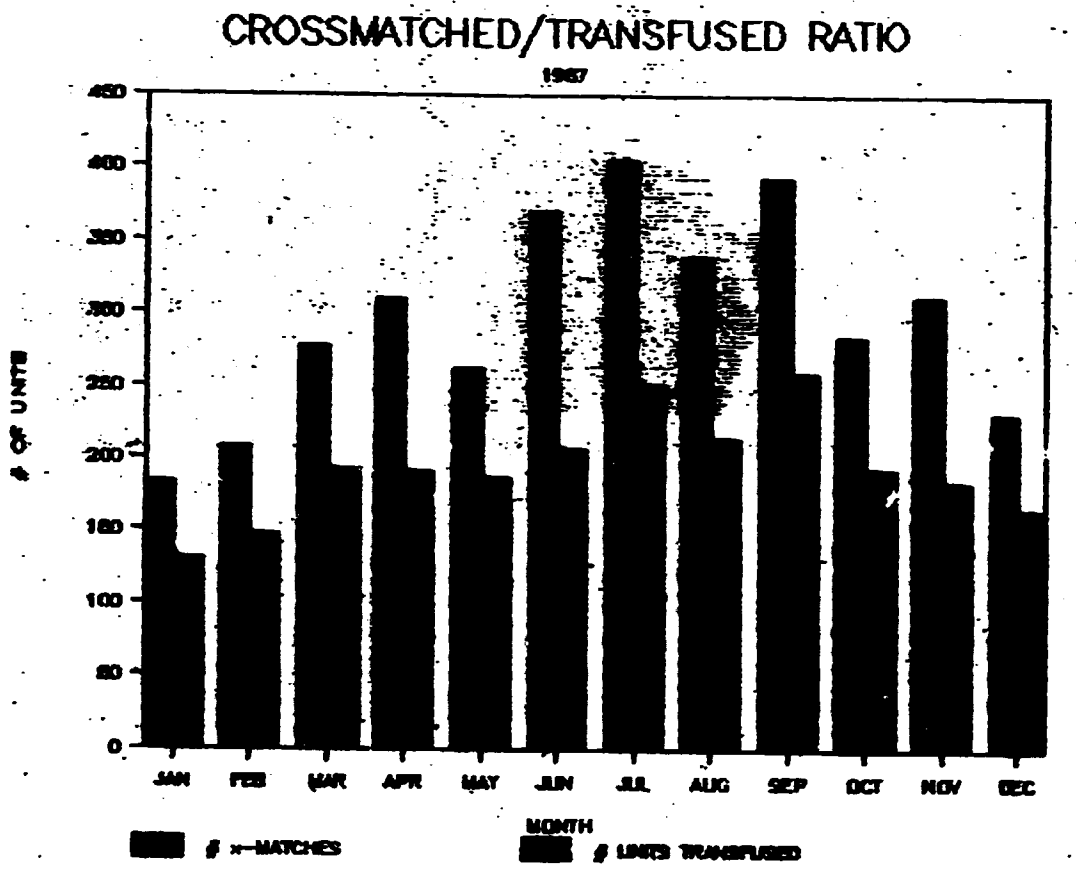
SUMMARY OF 1987 REPORT

TOTAL NUMBER OF UNITS TRANSFUSED	2315
AVERAGE NUMBER OF UNITS TRANSFUSED/MONTH	193
PERCENTAGE USAGE OF PRBC	75%
C/T RATIO	1.54
T/R RATIO	2.06
USE FACTOR	0.28

CROSSMATCHED/TRANSFUSED RATIO
1987

MONTH	# X-MATCHES	# UNITS TRANSFUSED	C/T RATIO
JAN	183	131	1.40
FEB	208	148	1.41
MAR	277	192	1.44
APR	310	190	1.63
MAY	262	186	1.41
JUN	370	206	1.80
JUL	405	251	1.61
AUG	338	214	1.58
SEP	392	258	1.52
OCT	283	192	1.47
NOV	311	183	1.70
DEC	231	165	1.40
	3570	2316	1.54

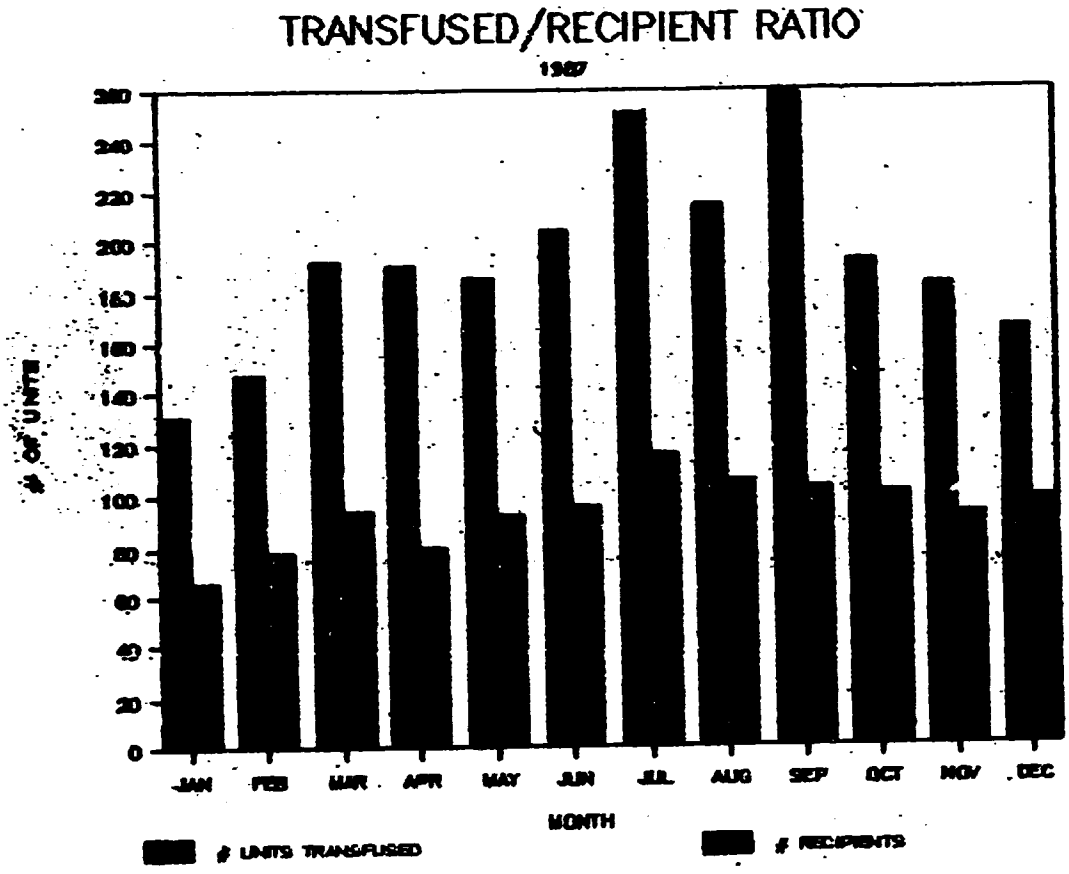
AVERAGE C/T RATIO = 1.54

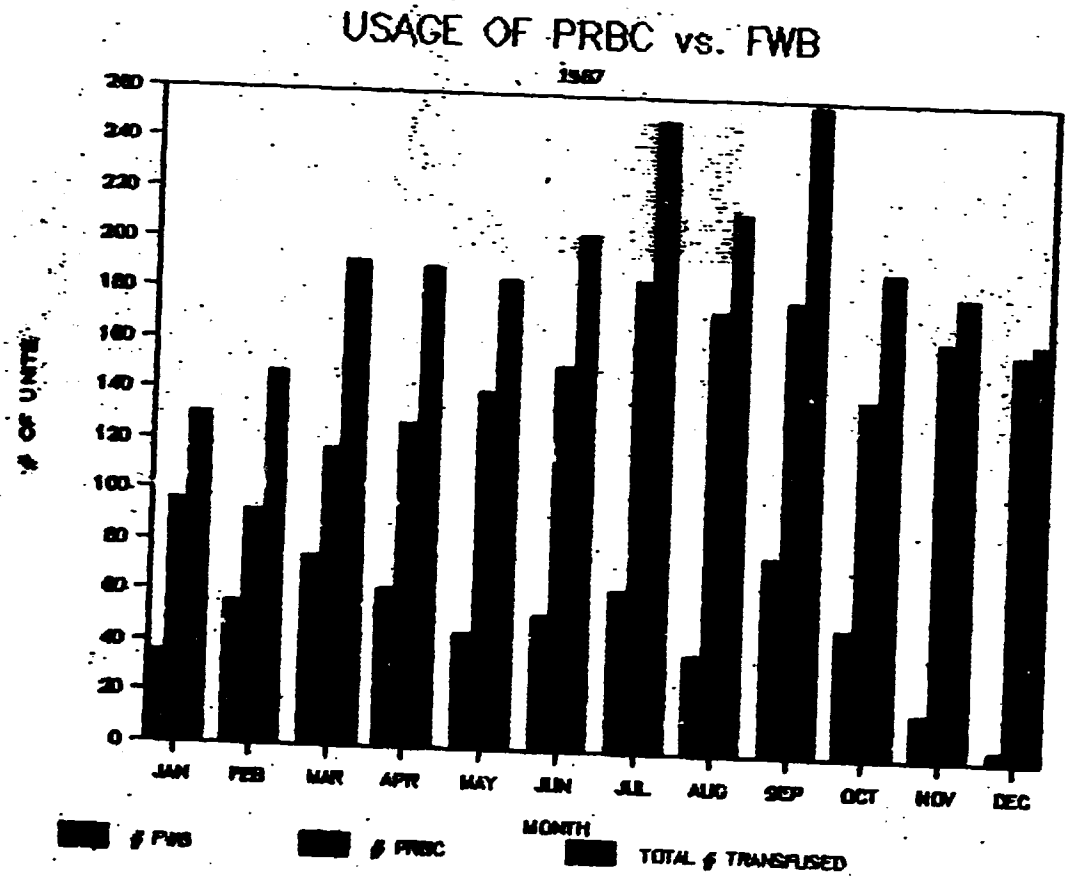

CROSSMATCHED/TRANSFUSED RATIO
1987
OF UNITS
0
100
200
300
400
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH
x-MATCHES
UNITS TRANSFUSED

TRANSFUSED/RECIPIENT RATIO
1987

MONTH	# UNITS TRANSFUSED	# RECIPIENTS	T/R RATIO
JAN	131	66	1.98
FEB	148	78	1.90
MAR	192	94	2.04
APR	190	80	2.38
MAY	186	92	2.02
JUN	205	96	2.14
JUL	251	116	2.16
AUG	214	106	2.02
SEP	258	103	2.50
OCT	192	101	1.90
NOV	183	92	1.99
DEC	165	99	1.67
	2315	1123	2.06

AVERAGE T/R ratio = 2.06


TRANSFUSED/RECIPIENT RATIO
1987
OF UNITS
0
20
40
60
80
100
120
140
160
180
200
220
240
260
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH
UNITS TRANSFUSED
RECIPIENTS


USAGE OF PRBC vs. FWB
1987
OF UNITS
0
20
40
60
80
100
120
140
160
180
200
220
240
260
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH
FWB
PRBC
TOTAL # TRANSFUSED

1987 REPORT

$$\text{A. USE Factor} = \frac{\text{\# units transfused}}{\text{hospital admissions + OPD hemodialysis sessions}}$$

$$= \frac{2315}{3731 + 4681}$$

$$= \frac{2315}{8412}$$

USE Factor = 0.2752 or 0.28

SCREENING STATISTICS
1987

	TOTAL UNITS SCREENED	HBSAg (+)	%	VDRL(+)	%
JAN	148	6	4.05		0.00
FEB	161	4	2.48	2	1.24
MAR	204	4	1.96	1	0.49
APR	212	17	8.02	6	2.83
MAY	214	36	16.82	3	1.40
JUNE	285	58	20.35	5	1.75
JULY	266	44	16.54	3	1.13
AUG	273	52	19.05	5	1.83
SEP	275	37	13.45	7	2.55
OCT	226	29	12.83	8	3.54
NOV	191	32	16.75	5	2.62
DEC	198	46	23.23	6	3.03
	2653	363		51	

HBSAg (+) AVERAGE % 12.96

VDRL (+) AVERAGE % 1.87

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

January - 1987

1.	No. of donors screened for the month of January, 1987.....	328
2.	No. of professional donors bled	114
3.	No. of private donors bled as donated by service patients..	177
4.	No. of donors rejected	148
	Low or high blood pressure	13
	Increased or decreased pulse rate	1
	Underweight	11
	Low hematocrit	22
	Positive hepatitis	10
	Positive VDRL	1
	Have just been bled	12
	With tattoo, underage, previously ill	49
	Not needed for the day	31
5.	No. of donors lost	6
6.	No. of blood purchased from outside	112
7.	No. of units of blood donated to charity	13
8.	No. of units of whole blood sold	23.5
9.	No. of units of packed RBC sold	146
10.	No. of units of platelet concentrate sold	69
11.	No. of units of cryoprecipitate sold	42
12.	No. of units of fresh plasma, fresh frozen plasma and cryo-supernate sold	68
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	4
15.	Total number of tests done	797
16.	Average tests per day	25.71
17.	Total income	₱ 198,679.75
18.	Average income per day	₱ 6,409 02

PHILIPPINE HEART CENTER
Blood Bank & Transfusion Services

MONTHLY REPORT

February - 1987

1.	No. of donors screened for the month of February, 1987	360
2.	No. of professional donors bled	96
3.	No. of private donors bled as donated by service patients.	74
4.	No. of donors rejected	187
	Low or high blood pressure	13
	Increased or decreased pulse rate	0
	Underweight	19
	Low hematocrit	28
	Positive hepatitis	12
	Positive VDRL	1
	Have just been bled	7
	With tattoo, underage, previously ill	89
	Not needed for the day	18
5.	No. of donors lost	2
6.	No. of units of blood purchased from outside	139
7.	No. of units of blood donated to charity	8
8.	No. of units of whole blood sold	135.5
9.	No. of units of packed RBC sold	190
10.	No. of units of platelet concentrate sold	97
11.	No. of units of cryoprecipitate sold	98
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	95
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	2
15.	Total number of tests done	828
16.	Average tests per day	29.57
17.	Total income	₱ 238,118.45
18.	Average income per day	₱ 8,504.23

PHILIPPINE HEART CENTER
Blood Bank & Transfusion services

MONTHLY REPORT

March - 1987

1.	No. of donors screened for the month of April, 1987	396
2.	No. of professional donors bled	94
3.	No. of private donors bled as donated by service patients	104
4.	No. of donors rejected	198
	Low or high blood pressure	11
	Increased or decreased pulse rate	4
	Underweight	22
	Low hematocrit	48
	Positive hepatitis	5
	Positive VDRL	1
	Have just been bled	13
	With tattoo, underage, previously ill	66
	Not needed for the day	24
5.	No. of donors lost	4
6.	No. of units of blood purchased from outside	135
7.	No. of units of blood donated to charity	7.5
8.	No. of units of whole blood sold	105
9.	No. of units packed RBC sold	188
10.	No. of units of platelet concentrate sold	108
11.	No. of units of cryoprecipitate sold	45
12.	No. of units of plasma, fresh frozen plasma and cryosupernate sold	76
13.	No. of units of wash RBC sold	0
14.	No. of blood bags sold	1
15.	Total number of test done	312
16.	Average test per day	26.19
17.	Total income	P 204,241.70
18.	Average income per day	P 6,587.47

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

April - 1987

1.	No. of donors screened for the month of April, 1987	232
2.	No. of professional donors bled	91
3.	No. of private donors bled as donated by service patients.	38
4.	No. of donors rejected	101
	Low or high blood pressure	5
	Increased or decreased pulse rate	1
	Underweight	7
	Low hematocrit	35
	Positive hepatitis	2
	Positive VDRL	1
	Have just been bled	6
	With tattoo, underage, previously ill	25
	Not needed for the day	19
5.	No. of donors lost	2
6.	No. of units of blood purchased from outside	111
7.	No. of units of blood donated to charity	4
8.	No. of units of whole blood sold	78.5
9.	No. of units of packed RBC sold	136
10.	No. of units of platelet concentrate sold	43
11.	No. of units of cryoprecipitate sold	49
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	63
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	3
15.	Total number of tests done	724
16.	Average tests per day	24.13
17.	Total income	₱ 165,615.15
18.	Average income per day	₱ 5,520.50

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

May - 1987

1.	No. of donors screened for the month of May, 1987	422
2.	No. of professional donors bled	103
3.	No. of private donors bled as donated by service patients.	88
4.	No. of donors rejected	225
	Low or high blood pressure	21
	Increased or decreased pulse rate	0
	Underweight	29
	Low hematocrit	34
	Positive hepatitis	9
	Positive VDRL	1
	Have just been bled	19
	With tattoo, underage, previously ill	71
	Not needed for the day	41
5.	No. of donors lost	6
6.	No. of units of blood purchased from outside	153
7.	No. of units of blood donated to charity	3
8.	No. of units of whole blood sold	145
9.	No. of units of packed RBC sold	197.5
10.	No. of units of platelet concentrate sold	77
11.	No. of units of cryoprecipitate sold	55
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	67
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	1
15.	Total number of tests done	1,008
16.	Average tests per day	32.5
17.	Total income	₱ 239,853.50
18.	Average income per day	7,737.20

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

June - 1987

1.	No. of donors screened for the month of June, 1987	477
2.	No. of professional donors bled	87
3.	No. of private donors bled as donated by service patients.	126
4.	No. of donors rejected	250
	Low or high blood pressure	44
	Increased or decreased pulse rate	0
	Underweight	32
	Low hematocrit	40
	Positive hepatitis	10
	Positive VDRL	2
	Have just been bled	7
	With tattoo, underage, previously ill	73
	Not needed for the day	42
5.	No. of donors lost	14
6.	No. of units of blood purchased from outside	199
7.	No. of units of blood donated to charity	2
8.	No. of units of whole blood sold	161
9.	No. of units of packed RBC sold	216.5
10.	No. of units of platelet concentrate sold	95
11.	No. of units of cryoprecipitate sold	78
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	94
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	1
15.	Total number of tests done	1,033
16.	Average tests per day	34.43
17.	Total income	₱ 262,830.20
18.	Average income per day	₱ 8,761.00

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

July - 1987

1.	No. of donors screened for the month of July, 1987	474
2.	No. of professional donors bled	86
3.	No. of private donors bled as donated by service patients.	138
4.	No. of donors rejected	246
	Low or high blood pressure	25
	Increased or decreased pulse rate	1
	Underweight	30
	Low hematocrit	43
	Positive hepatitis	12
	Positive VDRL	2
	Have just been bled	7
	With tattoo, underage, previously ill	72
	Not needed for the day	55
5.	No. of donors lost	4
6.	No. of units of blood purchased from outside	100
7.	No. of units of blood donated to charity	0
8.	No. of units of whole blood sold	101
9.	No. of units of packed RBC sold	215
10.	No. of units of platelet concentrate sold	109
11.	No. of units of cryoprecipitate sold	120
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	92
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	0
15.	Total number of tests done	1,001
16.	Average tests per day	32.29
17.	Total income	₱ 255,214.55
18.	Average income per day	₱ 8,232.73

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

August - 1987

1.	No. of donors screened for the month of August, 1987.....	444
2.	No. of professional donors bled	92
3.	No. of private donors bled as donated by service patients	142
4.	No. of donors rejected	197
	Low or high blood pressure	13
	Increased or decreased pulse rate	6
	Underweight	20
	Low hematocrit	41
	Positive hepatitis	11
	Positive VDRL	0
	Have just been bled	6
	With tattoo, underage, previously ill	61
	Not needed for the day	39
5.	No. of donors lost	13
6.	No. of units of blood purchased from outside	53
7.	No. of units of blood donated to charity	0
8.	No. of units of whole blood sold	70.5
9.	No. of units of packed RBC sold	189
10.	No. of units of platelet concentrate sold	93
11.	No. of units of cryoprecipitate sold	75
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	66
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	1
15.	Total number of tests done	860
16.	Average tests per day	27.74
17.	Total income	₱ 199,651.05
18.	Average income per day	₱ 6,440.35

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

September - 1987

1.	No. of donors screened for the month of September, 1987	587
2.	No. of professional donors bled	81
3.	No. of private donors bled as donated by service patients	176
4.	No. of donors rejected	297
	Low or high blood pressure	28
	Increased or decreased pulse rate	9
	Underweight	38
	Low hematocrit	37
	Positive hepatitis	12
	Positive VDRL	1
	Have just been bled	7
	With tattoo, underage, previously ill	107
	Not needed for the day	58
5.	No. of donors lost	33
6.	No. of units of blood purchased from outside	111
7.	No. of units of blood donated to charity	6
8.	No. of units of whole blood sold	95.5
9.	No. of units of packed RBC sold	101
10.	No. of units of platelet concentrate sold	132
11.	No. of units of cryoprecipitate sold	119
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	78
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	0
15.	Total number of tests done	953
16.	Average tests per day	31.77
17.	Total income	₱ 801,311.55
18.	Average income per day	₱ 26,710.39

PHILIPPINE BLOOD BANK

Blood Bank & Transfusion Services

MONTHLY REPORT

October - 1987

1.	No. of donors screened for the month of October, 1987...	529
2.	No. of professional donors bled	68
3.	No. of private donors bled as donated by service patients	146
4.	No. of donors rejected	311
	Low or high blood pressure	27
	Increased or decreased pulse rate	7
	Underweight	35
	Low hematocrit	53
	Positive hepatitis	13
	Positive VDRL	2
	Have just been bled	13
	With tattoo, underage, previously ill	97
	Not needed for the day	64
5.	No. of donors lost	33
6.	No. of units of blood purchased from outside	79
7.	No. of units of blood donated to charity	35.5
8.	No. of units of whole blood sold	85.5
9.	No. of units of packed RBC sold	205
10.	No. of units of platelet concentrate sold	97
11.	No. of units of cryoprecipitate sold	93
12.	No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold	98
13.	No. of units of washed RBC sold	0
14.	No. of blood bags sold	0
15.	Total number of tests done	930
16.	Average tests per day	30
17.	Total income	P 337,814.60
18.	Average income per day	P 10,897,25

PHILIPPINE HEART CENTER

Blood Bank & Transfusion Services

MONTHLY REPORT

November - 1987

1. No. of donors screened for the month of November, 1987... 538
2. No. of professional donors bled 74
3. No. of private donors bled as donated by service patients 149
4. No. of donors rejected 309

Low or high blood pressure	29
Increased or decreased pulse rate	3
Underweight	34
Low hematocrit	52
Positive hepatitis	17
Positive VDRL	2
Have just been bled	4
With tattoo, underage, previously ill	90
Not needed for the day	78

5. No. donors lost 6
6. No. of units of blood purchased from outside 83
7. No. of units of blood donated to charity 14.5
8. No. of units of whole blood sold 95
9. No. of units of packed RBC sold 178
10. No. of units of platelet concentrate sold 109
11. No. of units of cryoprecipitate sold 92
12. No. of units of fresh plasma, fresh frozen plasma and cryosupernate sold 77
13. No. of units of washed RBC sold 0
14. No. of blood bags sold 15
15. Total number of tests done 955
16. Average tests per day 31.83
17. Total income ..... ₱ 225,262.30
18. Average income per day ..... ₱ 7,508.74

BLOOD REQUEST FROM DIFFERENT DEPARTMENT
FOR THE MONTH OF MAY 1988

	MEDICINE	SURGERY	OD GYNE	PEDIA	TOTAL
No. of patients crossmatched	41	15	14	3	73
No. of patients transfused	37	9	8	3	57
No. of blood units requested/crossmatched = 167					
Whole blood					
FRESH	18	6	3	2	29
Stock	14	17	18	0	49
Packed red cell	40	9	5	4	58
Platelet concentrate	17	0	8	0	25
Plasma	4	2	0	0	6
No. of units transfused (blood units) = 116					
Whole blood					
FRESH	12	6	0	1	19
Stock	9	5	7	0	21
Packed red cell	38	8	5	3	54
Platelet concentrate	14	0	2	0	16
Plasma	4	2	0	0	6

No. of blood transfusion reaction = 0
No. of blood units that had expired/w/protein ppt/Bacterial Contamination:
Reasons: 1. Expired = 3 units
2. Protein ppt = 4 units (heavy protein ppt)
3. Bacterial Contamination = 2 units

Dispositions:
1. Expired = Bacteriology use
2. Protein ppt = Bacteriology use
3. Bacterial contamination = discarded

No. of patients with donors = 4
No. of blood donor screened = 15
No. of blood donors bled = 7
No. of voluntary blood donors used = 7
% of blood donors rejected = 8
Reasons: 1. AAA positive = 2
2. low Hgb. Hct = 3
3. failed to return = 3

OTHERS:
No. of blood units sold to other hospital/Out patient = 2 units Type "B" +

WORLDWIDE MARKET FOR BLOOD DERIVATIVES

1984

ANNEX VIII

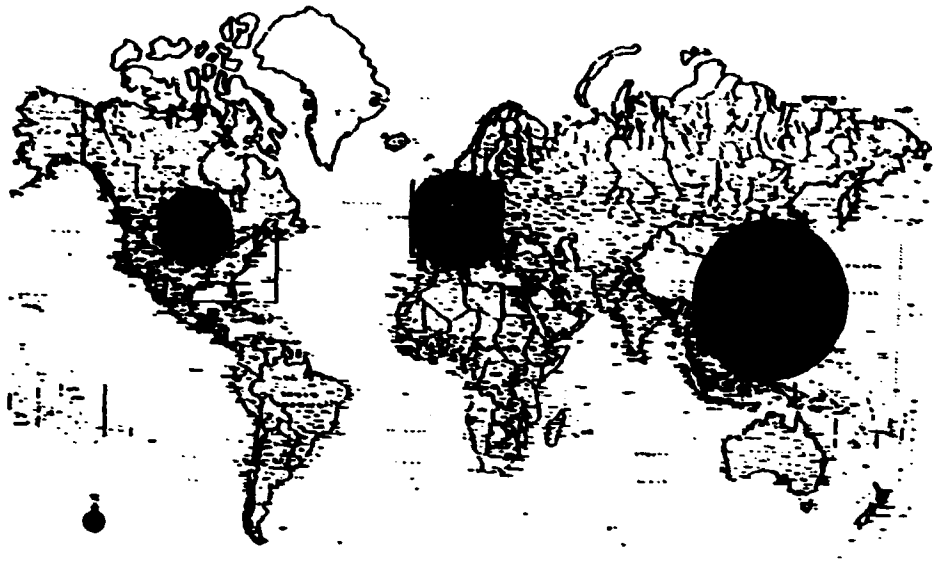


Fig. 1

WORLDWIDE PLASMA FRACTIONATION

1984

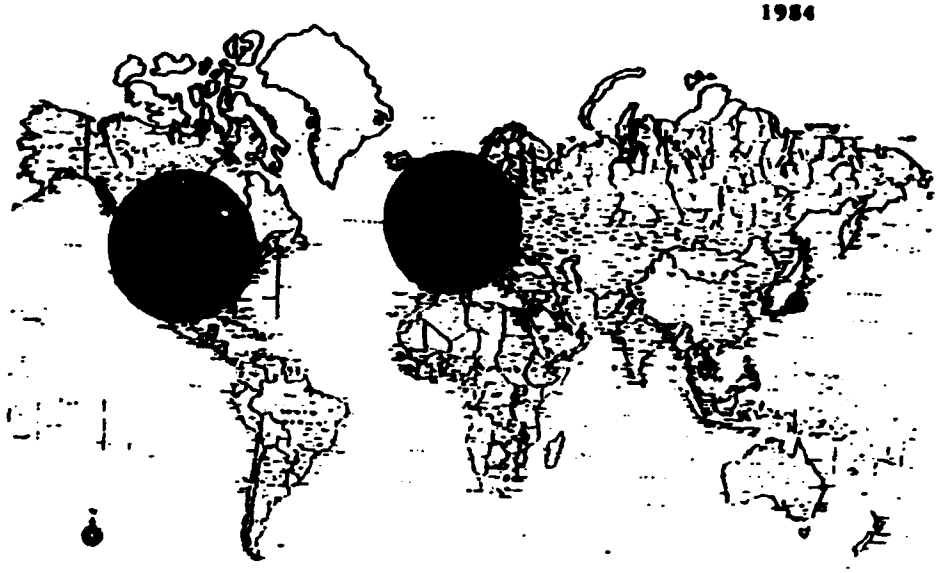


Fig. 2

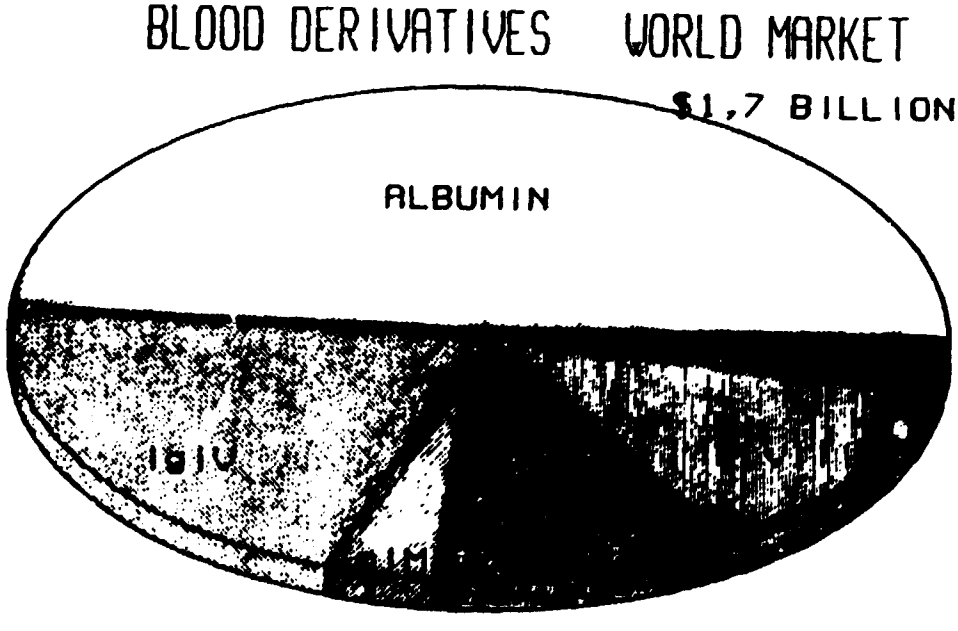


Fig. 3