

Observations of HAA in A Blood Donor/Recipient System in Thailand

Principal Investigators :
Robert B. Cotton, MAJ, MC
Michael W. Benenson, CPT, MC
Dumrong Chiewsilp, M.D.*
Richard A. Grossman, LTC, MC
Rapin Smitbhan, M.D.
Franklin H. Top, Jr., LTC, MC

Associate Investigators :
Department of Epidemiology
Sirinipa Srillikit
Songsri Buranakarl

Department of Medicine
Nathada Plavooth

Assistant Investigators :
Praong Toochinda
Sajee Pinnoi
Somnuk Lumjiak
Chuanchom Pravichpram

Department of Medicine
Bunterng Dechjun
Pranom Vangnai
Chariya Hussen
Ovath Tonglee
Yupadee Vanichakorntanes
Suthida Thonggarm

Laboratory Investigators :
Chomduen Satavuthi
Choomphun Chavachart
Srirat Sela, C.P.O. 1*
Suleela Seemachibovorn
Vipa Thirwuthi
Vuth Duangsoithong, Sub.Lt., RTN*
Yeepu Keokarn

DESCRIPTION :

Background: Studies in the United States have left little question that patients receiving blood containing HAA run a greater risk of post-transfusion hepatitis than patients receiving blood that does not contain HAA. The attack rate, however, appears to be a function of the population of recipients studied. While Gocke (1) has shown that over 50% of recipients of HAA positive blood develop evidence of hepatitis, Cherubin (2) reported a much lower attack rate, and speculated that his study population, a low socio-economic group, many of whom were parenteral drug users, was largely immune to serum hepatitis.

In view of this discrepancy in results between different populations in the United States, it would be hazardous to extrapolate these findings to Thailand and other areas of Southeast Asia, which have a number of pertinent differences from the United States. Whereas the prevalence of blood donors positive for HAA is 0.1–0.5% in the United States, 5–10% or more of the presumably healthy people in parts of Southeast Asia and other tropical areas are carriers of HAA. Furthermore, some investigators have presented evidence that the distribution of the carriers in these populations is genetically determined.

* Thai Component

Assuming that the prevalence of HAA in Thailand would be high, as in other areas in Southeast Asia, the Hepatitis Study Group at this Laboratory felt it worthwhile to undertake a survey of Thai blood recipients in order to learn what happens to the recipient of blood containing HAA. The primary goal of this survey is to assess the risk of post-transfusion hepatitis in a patient who receives blood containing HAA. In addition, the survey allows us to describe responses by the recipient other than the development of hepatitis.

Study Site. The Royal Thai Army Hospital (Pramongkutklao Hospital) was selected to provide the study population of blood recipients. This is a large, multispecialty general hospital administered by the Royal Thai Army.

The blood requirement of the Royal Thai Army Hospital is provided by the Blood Bank of the Royal Thai Army Institute of Pathology, located adjacent to the Hospital. Virtually all the blood processed by the Blood Bank is used to fill requests submitted by the Royal Thai Army Hospital. Almost 90% of the blood comes from a group of paid donors who donate blood at the Blood Bank. The remainder is supplied by the Thai Red Cross.

In February, 1971, permission was given SEATO Laboratory to obtain a blood specimen and questionnaire information from all donors at the Blood Bank. If donors were not present, as in the case of Red Cross blood, extra serum from the "side tubes" accompanying the blood unit would be made available to our laboratory. In addition, the Blood Bank agreed to let SEATO Laboratory establish a screening station in series with the regular donor processing system. This permitted us to create a complete donor registry of our own, enabling donor identity to be double-checked.

In March, 1971, permission was obtained from the hospital commander to follow all blood recipients. The project was explained to the chiefs of services, who agreed to cooperate actively in helping this laboratory study their patients.

In order to test the HAA status of recipients before they receive blood, the Blood Bank sets aside part of the "type and crossmatch" specimen for our use. To ensure that an adequate volume of serum would be available for these additional tests the Blood Bank persuaded the Hospital, whenever possible, to submit 10 ml of blood along with each "type and crossmatch" request. As a result of this cooperative measure we are missing pre-transfusion HAA results in less than 5 percent of the recipients.

Each week, an average of 122 units of blood are "deposited" in the Blood Bank. Of these approximately 110 are withdrawn and transfused at the Royal Thai Army Hospital. The remaining units either are used in clinics not a part of Royal Thai Army Hospital, or are lost through contamination or expiration. Blood components and derivatives are only rarely used by the Hospital.

We offered to provide the Blood Bank with our HAA test results as soon as possible, so that units of blood containing HAA could be removed before transfusion. Since the CF test was to be our method of HAA testing, results would not be available for at least 24 hours after donation. Thus, the recipients of blood positive for HAA would come from that group of patients who received blood before the HAA test results were known. Once the study began, however, the Blood Bank Director elected not to remove units of blood containing HAA.

Survey Population. A "potential" recipient is assigned a study number the first time the Blood Bank receives a "type and crossmatch" request. When that "potential" recipient receives blood, he becomes an "actual" recipient (see Fig. 1). "Actual" recipients may be inpatients (IN) or outpatients (OUT). They may reside in the Bangkok-Thonburi area (BT) or outside this area (BT). If outpatients, they may be alive (ALIVE) or dead (DEAD). They may become lost (LOST) to follow-up. If a patient receives blood within 6 months before entry into the survey, or receives blood during the survey that has not been tested for HAA, he is a recipient of uncharacterized blood units (UBU). Otherwise, he is a recipient of only characterized blood units (CBU). Recipients are further characterized according to the HAA status of the blood received. They may be recipients of blood positive (RPH), indeterminate (RIH), or negative (RNH) for HAA (see below).

Because of the numerous difficulties in following a large number of recipients for six months, we have imposed criteria to restrict the number of patients that we follow actively. This active category is made up of recipients from boxes a through g in Fig. 1. In order to assess the risk of post-transfusion hepatitis following the receipt of blood containing HAA, comparisons will be made between the RPH recipients (boxes a, b, and e) and the RNH recipients (boxes d and g).

For the purposes of this survey, recipients represented by the numbered boxes in Fig. 1. are considered "inactive" and are not followed actively. "Active" recipients are followed weekly or biweekly while inpatients. After discharge from the hospital, we attempt to follow the recipient every two weeks. In some cases, it has only been possible to contact the recipient monthly.

At each follow-up visit, blood is obtained from the recipient for HAA and liver function tests. A medical history emphasizing the signs and symptoms of hepatitis is obtained from each recipient initially and medical progress notes are recorded at subsequent contacts. We attempt to follow each active recipient for 6 months.

Interpretation of HAA Test Results. Initially, only the CF test was used for the detection of HAA and anti-HAA. The advantages of the IEOP test for the detection of HAA, and more recently, anti-HAA, soon became apparent, and we began routinely testing all sera obtained in this survey by both techniques.

Experience with the CF test convinced us that modification of the classic scheme of reporting results would be necessary. According to this modification, there are 5 possible CF test results:

1. " $<1:2$ " This report indicates that the serum is negative for HAA by complement fixation.
2. " $\leq 1:2$ " This report indicates that some (<4 U) complement is fixed at a serum dilution of 1:2, and that fixation disappears over subsequent dilutions. Although this result would be reported as $<1:2$ according to the classic rules of CF testing, we have encountered such a result frequently as the titer of HAA falls during convalescent period of HAA positive hepatitis, indicating that HAA is probably present, but in an amount too small to fix at least 4 of the 5 units of complement.
3. " $1:D$ " This report indicates that the serum is positive for HAA up to dilution D ($2 \geq D \geq 64$).
4. "PF" This report indicates that there is a partial fixation of complement, the degree of which either rises and falls, or remains constant, over several dilutions. This result does not reflect very low titer HAA (as does the result " $\leq 1:2$ "), but indicates that the HAA present does not react with the antiserum for optimal complement fixation. Most of the sera that yield this result are positive by IEOP.
5. "AC" This report indicates that the serum is anti-complementary.

All sera collected in this survey are now tested for HAA and anti-HAA by IEOP, as well as by CF. IEOP results are recorded as "positive" or "negative". When the precipitin line is very faint, the serum is retested until the examiner is satisfied with his interpretation of the reaction.

Classification of a Serum Specimen: After a serum specimen is tested for HAA (and anti-HAA) by CF and IEOP, it is classified as "positive", "indeterminate", or "negative" according to the scheme shown in Fig. 2. This scheme also is used when the serum specimen is tested by only one method. If only CF were used, the IEOP result is called "negative" in this scheme. Similarly, if only IEOP were used, the CF result is called " $<1:2$ " and the serum is then classified using the same scheme.

The use of this scheme permits us to minimize false negatives and to acknowledge and identify indeterminate results that could complicate the later interpretation of survey findings.

Classification of a Recipient: As described above, a recipient is classified as RPH, RIH, or RNH according to the HAA status of the transfused blood. The HAA status of a bottle of blood is determined by the CF and IEOP tests for HAA performed using serum obtained from the donor at the time the bottle of blood was donated. Thus, the status of a unit of blood may be positive, indeterminate, or negative for HAA (and anti-HAA). Consequently, each "active" recipient (see Fig. 1) can be assigned to one of three categories:

1. Recipient of blood positive for HAA (RPH): One who has received at least one unit of blood positive for HAA.
2. Recipient of blood indeterminate for HAA (RIH): One who has received at least one unit of blood indeterminate for HAA and no units of blood positive for HAA.
3. Recipient of blood negative for HAA (RNH): One who has received only units of blood negative for HAA.

Personnel. Nurses from the Department of Medicine work in the Blood Bank processing donors Monday through Friday. A nurse—assistant is kept on duty to log in all "type and crossmatch" requests and to separate an aliquot of serum from the "type and crossmatch" blood sample.

Public Health nurses from the Department of Epidemiology and nurses from the Department of Medicine follow the active recipients. After discharge from the hospital, these nurses visit the recipients at home or, in some cases, arrange for the recipient to return to SEATO Laboratory for follow-up.

A nurse and nurse—assistant log in all blood samples generated by the survey. These two workers also separate the serum into aliquots for HAA and liver function tests.

Six technicians working under the supervision of Dr. Dumrong Chiewsilp of the Thai Component perform the CF and IEOP tests for HAA and anti-HAA. Two technicians working under the supervision of Dr. Rapin Snilbhan in the Department of Virology perform the IEOP test for HAA.

Biochemical liver function tests (SGOT, SGPT, total and direct bilirubin, alkaline phosphatase, and thymol turbidity) are performed by the staff of the Biochemistry Laboratory of the Department of Experimental Pathology.

There is one full time data processing specialist who is responsible for the transfer of primary data from manually—entered data sheets to Hollerith cards for later automatic processing.

Data Processing. The large number of data transactions and the complexity of the information flow associated with this survey created a need for automatic data processing assistance. This aspect of the survey is described in a separate report.

PROGRESS:

Donors. Since 1 March 1971, 7349 units of blood have been deposited into the Blood Bank. Three thousand three hundred nineteen paid donors gave 6367 of these units. The remaining 982 units came from Red Cross sources.

Comparison of CF and IEOP test results: Figure 3 shows the distribution of CF and IEOP results obtained from testing 2571 serum specimens from blood donors. (In some cases, there were 2 or more sera from one donor.) The " $\leq 1:2$ " and "PF" CF result categories have been combined. Based on the scheme of HAA test result interpretation described earlier, 10.7% of these sera were positive for HAA, 3.6% were indeterminate, and 85.7% were negative.

Prevalence of HAA in donors: Table 1 shows the results of testing sera from 1322 donors. Each serum was tested by both CF and IEOP.

Prevalence of HAA by blood group: There was no apparent difference in the distribution of ABO blood groups between HAA positive and HAA negative donors (Table 2). The HAA indeterminate group was not included in this analysis.

HAA status and SGOT level: The distribution of SGOT levels in 1080 HAA negative donors and 128 HAA positive donors is displayed in Fig 4. The mean SGOT level of the HAA negative donors was 26.7 Sigma Units (standard deviation = 7.9) and the median level was in the 25-29 interval. Twelve (1.1%) HAA negative donors had an SGOT level of 70 Sigma Units or more. The mean SGOT level of the HAA positive donors was 32.8 Sigma Units (standard deviation = 10.6) and the median level was in the 30-34 interval. Seven (5.5%) HAA positive donors had an SGOT level of 70 Sigma Units or more. There is a tendency for HAA positive donors to have a slightly higher SGOT level than the HAA negative donors. In individual cases, however, the SGOT level does not discriminate between the HAA positive and HAA negative donor.

Recipients. From March, 1971, through March, 1972, there were 1929 requests for transfusion, of which 594 did not receive blood. Thus 1335 (69.2%) of the "potential" recipients became "actual" recipients. Of these 1335 patients, 369 (27.6%) received one or more HAA positive units. There were 525 positive units transfused; 91 patients received more than one HAA positive unit. The maximum number of positive units given to a recipient was 14.

Pre-transfusion sera were not available for testing from 86 patients. Of the remaining 1843 patients, 133 (7.2%) were positive for HAA before receiving any blood; 25 (1.3%) were positive for anti-HAA by CF testing.* This prevalence of HAA in the serum of ill patients requiring a transfusion is similar to the prevalence in an urban population of Bangkok (see Huay Khwang report) and in the donor population, both presumably healthy groups of people.

At the time of this report (April 1972) 123 patients have been followed for at least ten weeks (Table 3). Seventy-nine patients received at least one unit of HAA positive blood (RPH group) and 44 patients received only negative units of blood (RNH group).

Recipients of HAA positive blood (RPH): For purposes of analysis, three patients with a pre-transfusion sera positive for HAA and two patients positive for anti-HAA were excluded, leaving 74 patients for consideration. There were 42 (57%) males and 32 (43%) females in this group. The mean age overall is 35.4 years and median age, 34.0 years.

The most frequent diagnoses in the group receiving positive units were trauma (30%), followed by obstetric and gynecologic disorders (16%), gastrointestinal disorders (13%), carcinoma (12%), hematological problems (8%), and liver disease (3%). There were 6 deaths in the RPH group. Patients in this group received a mean of 8.8 units of blood, females averaging 6.0 units and males 10.9 units.

Thirteen of the 74 recipients in the RPH group developed detectable HAA in their sera following transfusion. Of these 13, 6 were antigenemic without convincing biochemical or clinical evidence of hepatitis (Fig 5), 6 had anicteric hepatitis (Fig. 6), and 1 had icteric hepatitis (Fig. 7). HAA became detectable from 1-98 (median 21) days after receipt of the first blood containing HAA. In 6 recipients, HAA has continued to be detectable 41 to 231 days after receipt of the initial positive unit. Antigenemia has continued longer than 15 weeks in 4 of these patients. There are no obvious differences in sex, age, number of units received, titers of units received, blood group, or SGOT levels between those recipients persistently antigenemic and those antigenemic for only a short time.

* Anti-HAA data in this report result from the CF test only. IEOP results for anti-HAA are not used.

Twenty-two recipients developed anti HAA between 1 and 54 days (median 7 days) after receipt of the first blood containing HAA. Anti-HAA was detectable for a short time in 19 recipients. In the other 3 recipients, antibody has remained detectable throughout the follow-up period, 49, 64, and 68 days after it was initially detected. The remaining 40 members of the RPH group developed neither HAA nor anti-HAA. Although none of these 62 recipients (the 40 that developed neither HAA nor anti-HAA and the 22 that did develop anti-HAA) developed detectable HAA, 5 had SGOT levels greater than 90 Sigma Units sometime during follow-up. In 4 of these, the SGOT elevation was associated with a CF antibody response, raising the possibility that an immune response may play a role in mediating hepatic cellular necrosis. The recipient record in Fig. 8 represents such a case.

Recipients of only HAA negative blood (RNH): Forty-four recipients in this category have been followed for at least 10 weeks, 26 (59%) females and 18 (41%) males. The mean age over all is 35.6 years with a median age of 34.5 years. The predominance of females and their younger age is likely due to the input from the obstetric and gynecologic service. On this service the patients tend to be young and usually do not require multiple transfusions.

Diagnoses in this category (RNH) of recipients, in contrast to the RPH group, included a larger proportion of obstetric and gynecologic disorders (48%) and a smaller proportion of traumatic injuries (11%). The percentages for the other diagnosis are essentially the same as in the RPH group.

Patients in the RNH group received a mean of 2.7 units of blood (males, 3.1; females, 2.4).

None of the recipients in the RNH group developed detectable HAA during follow-up, and only 3 have had an SGOT level greater than 90 Sigma Units. Only one of these appeared to have acute hepatitis. Another had cirrhosis and jaundice. The elevated SGOT level (98 Sigma Units) in third was unexplained.

Literature Cited

1. Gocke, DJ: A prospective study of post-transfusion hepatitis: the role of Australia antigen. *JAMA* 219:1165, Feb. 28, 1972.
2. Cherubin, CE: Risk of post-transfusion hepatitis in recipients of blood containing SH antigen at Harlem Hospital. *Lancet* 1:627, Mar. 27, 1971.

Table 1.
Prevalence of HAA in Thai blood donors

HAA RESULT	No.	%
Positive	139	10.5
Indeterminate	39	3.0
Negative	1,144	86.5
TOTAL	1,322	100.0

Table 2.
Blood group distribution in Thai blood donors

Blood group	HAA (N = 139) Positive	HAA (N = 1144) Negative
O	44 %	41 %
A	19 %	18 %
B	31 %	35 %
AB	6 %	6 %

Table 3.
Active Recipients Followed Ten or More Weeks

	RPH	RNH
Number of patients	74 (100%)	44 (100%)
Males	42 (57%)	18 (41%)
Females	22 (43%)	26 (59%)
Mean age	35.4	35.6
Males	32.5	37.1
Females	39.2	34.7
Median age	34.0	34.5
Males	24.5	39.0
Females	40.5	33.0
Units per recipient	8.8	2.7
Males	10.9	3.1
Females	6.0	2.4
Developed detectable HAA	13 (18%)	0
Males	6 (14%)	0
Females	7 (32%)	0
Developed detectable anti-HAA	22 (30%)	0
Males	12 (29%)	0
Females	10 (45%)	0

Figure 1. Classification of Recipient Population

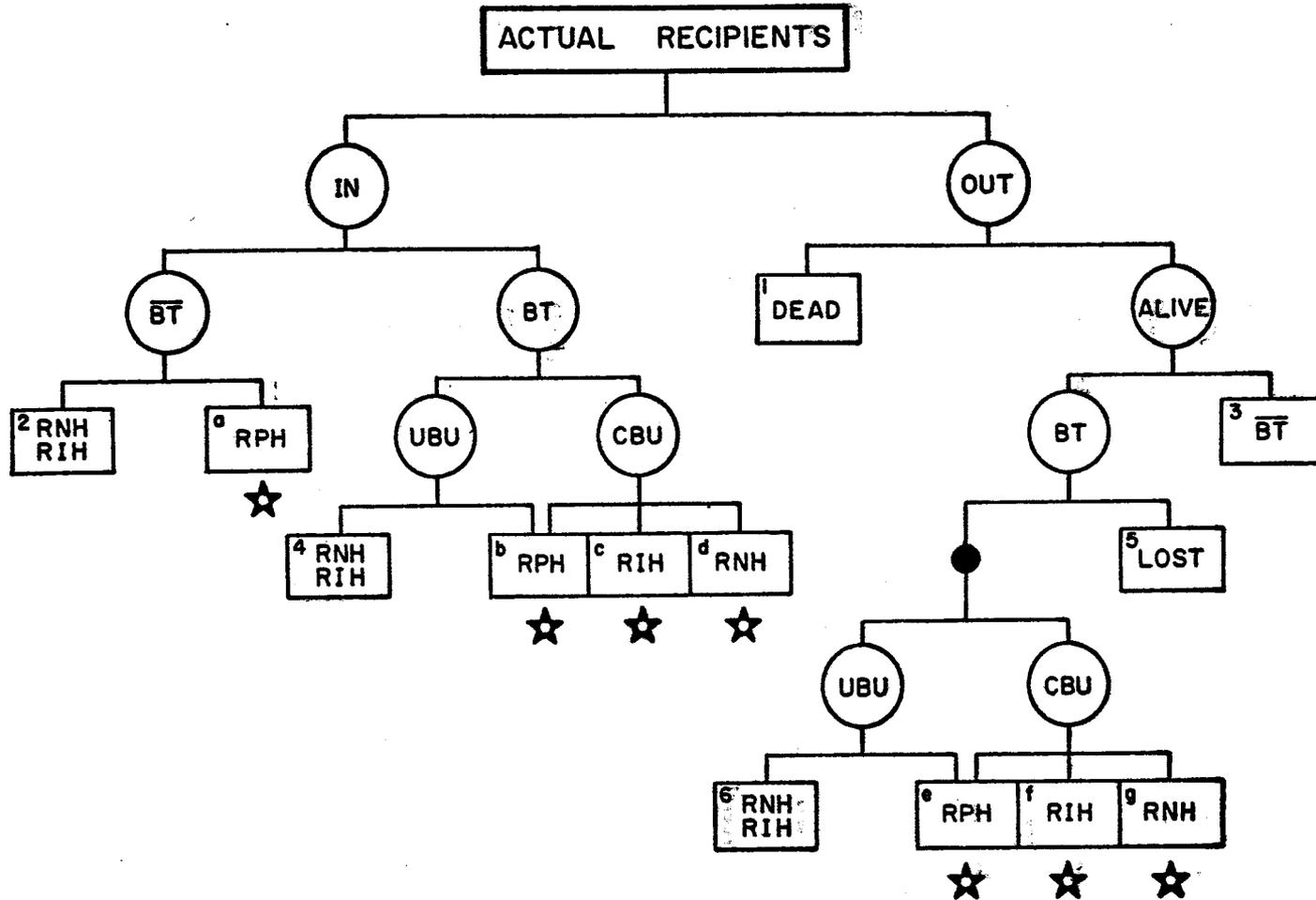


Figure 2.
Scheme Used to Derive A Consensus Result from CF and IEOP Results

		IEOP Result:	
		+	-
CF Result:	< 1:2	P	N
	\leq 1:2	P	I
	PF	P	I
	1:D	P	P
	AC	P	I

P = positive
I = indeterminate
N = negative

Figure 3.
Distribution of CF and IEOP Test Results

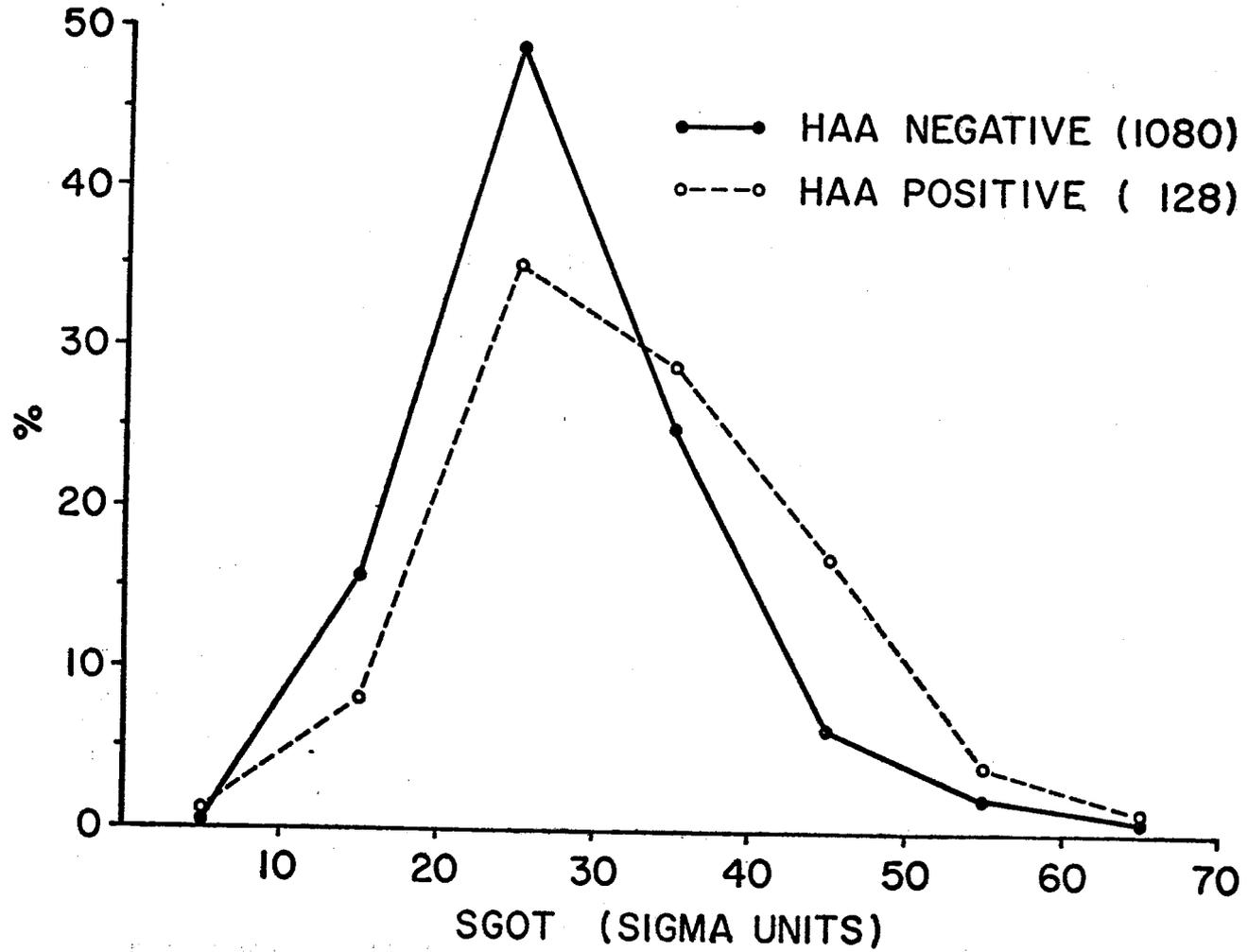
CF Result		IEOP Result	
		+	-
AC		P 0.2	I 3.2
< 1:2		P 0.5	N 85.7
1:2 to \geq 1:64		P 6.8	P 0.4
\leq 1:2 and PF		P 2.8	I 0.4

TOTAL = 100.0 %
(N = 2571)

Positive	275 (10.7 %)
Indeterminate	93 (3.6 %)
Negative	2203 (85.7 %)

Figure 4

DISTRIBUTION OF SGOT LEVELS IN THAI BLOOD DONORS



R-0296

Figure 5.

Recipient record facsimile exemplifying the development of antigenemia without convincing biochemical evidence of hepatitis.

Transfusions

Transf. Date	Blood Unit	Donor No.	Serum access	HAA CF	HAA IEP	HAA AGD	ANT	ANT	ANT	HAA Type
							HAA CF	HAA IEP	HAA AGD	
07 May 71	1607-0+	0997	03715	LT2			LT2			
12 May 71	1767-0+	1149	04214	64			LT2			
12 May 71	1769-0+	0236	04216	LT2			LT2			
17 May 71	1831-0+	1202	04335	32	P		AC			
10 Jun 71	2324-0+	1588	06067	LT2	-		LT2			
22 Jun 71	2500-0+	0201	06594	LT2	-		LT2			
22 Jun 71	2496-0+	1771	06590	LT2	-		LT2			
09 Jul 71	2720-0+	0894	07050	LQ2	P		LT2			
15 Jul 71	2815-0+	2059	07224	LT2	-		LT2			

Laboratory Results

Date	Serum access	HAA CF	HAA IEP	HAA AGD	ANT	ANT	ANT	HAA Type	SGOT	SGPT	TOT. BIL.	DIR. BIL.	ALK. PHO.	T.T.
					HAA CF	HAA IEP	HAA AGD							
11 May 71	04298	LT2			LT2									
17 May 71	04699	LT2	-		LT2				37	20	00.0			
25 May 71	05134	LT2	ND		LT2				21			00.0	03.3	06.8
01 Jun 71	05600	PF			LT2				36	20	00.0	00.0	01.9	04.6
08 Jun 71	06094	PF	P		LT2						00.6	00.3		
10 Jun 71	06169	PF	P		LT2									
22 Jun 71	06675	64	P		LT2									
09 Jul 71	07358	64	P		LT2									
15 Jul 71	07592	LT2	P		LT2									
10 Aug 71	09341	64	-		LT2				34		00.6	00.2	02.6	13.2
16 Sep 71	10642	64	P		LT2				41	58	00.3	00.1		11.6
30 Sep 71	11321	64	P		LT2				55	99	00.0	00.0		10.5
02 Nov 71	12520	64	P		LT2	-			29	55	00.7	00.2	04.6	13.4

R-052

Figure 6.

Recipient record facsimile exemplifying the development of anicteric hepatitis.

Transfusions

Transf. Date	Blood Unit	Donor No.	Serum access	HAA CF	HAA IEP	HAA AGD	ANT	ANT	ANT	HAA Type
							HAA CF	HAA IEP	HAA AGD	
18 Jun 71	2327-0+	0329	06070	64	P		LT2			
18 Jun 71	2431-0+	0217	06280	LT2	—		LT2			
18 Jun 71	2344-0+	0681	06087	LT2	—		LT2			
19 Jun 71	SP15-0+	1765	00000	ND			LT2			
19 Jun 71	X52350-0+	1766	06580	LT2	—		LT2			
21 Jun 71	X01996-B+	1777	06626	LT2	—		LT2			
21 Jun 71	X070 -0+	1778	00000	ND			LT2			

Laboratory Results

Date	Serum access	HAA CF	HAA IEP	HAA AGD	ANT	ANT	ANT	HAA Type	SGOT	SGPT	TOT. BIL.	DIR. BIL.	ALK. PHO.	T.T.
					HAA CF	HAA IEP	HAA AGD							
18 Jun 71	06537	LT2	—		LT2									
20 Jun 71	06574	4	P		LT2									
21 Jul 71	07864	64	P		LT2			80			00.3	00.1	01.8	03.0
04 Aug 71								218			00.8	00.4	03.8	03.3
05 Aug 71	09094	64	P		LT2									
23 Aug 71	09755	16	P		LT2			230	255		00.7	00.2	04.9	02.0
30 Aug 71	09981	PF	P		LT2			164	440		00.9	00.4	04.1	02.0
14 Sep 71	10554	LT2	—		LT2			242	112		00.8	00.4		02.1
28 Sep 71	11201	LT2	—		LT2			68	55		00.6	00.3		02.5
29 Oct 71	12377	LT2	—		LT2			19	14		00.8	00.2	01.8	02.3
30 Nov 71	14010	LT2	—		LT2			11	7		00.3	00.1	01.9	02.8

Figure 7.

Recipient record facsimile of the single recipient who developed icteric hepatitis.

Transfusions

Transf. Date	Blood Unit	Donor No.	Serum access	HAA CF	HAA IEP	HAA AGD	ANT			HAA Type
							HAA CF	HAA IEP	HAA AGD	
26 Apr 71	PT10-B+	0985	03759	LT2	—		LT2			
26 Apr 71	PT12-B+	0986	03260	LT2	—		LT2			
30 Apr 71	1658-B+	1066	03827	64			LT2			
30 Apr 71	1663-B+	1069	03850	LT2			LT2			
04 Jun 71	2179-B+	1460	05682	LT2	—		LT2			
04 Jun 71	2187-B+	0294	05690	PF	P		LT2			
05 Jun 71	2258-B+	1524	05904	LT2	—		LT2			
05 Jun 71	2259-B+	1525	05905	LT2	—		LT2			
08 Jun 71	2281-B+	1541	05990	LT2	—		LT2			
08 Jun 71	2282-B+	1542	05991	LT2	—		LT2			
22 Jun 71	X53117-B+	1821	06882	64	P		LT2			
22 Jun 71	X53146-B+	1822	06680	LT2	—		LT2			

Laboratory Results

Date	Serum access	HAA CF	HAA JEP	HAA AGD	ANT			HAA Type	SGOT	SGPT	TOT. BIL.	DIR. BIL.	ALK. PHO.	T.T.
					HAA LT2	HAA IEP	HAA AGD							
26 Apr 71	03700	LT2					CF							
30 Apr 71	03925	LT2					LT2							
25 May 71	05158	32	P				LT2	34	60	01.1	00.4	05.4	04.8	
01 Jun 71	05597	64	P				LT2	1380		01.0	00.5			
04 Jun 71	05882	64	P				LT2							
08 Jun 71	06111	16	P				LT2							
15 Jun 71	06362	64	P				LT2	585	870	05.2	02.8	07.8	05.8	
22 Jun 71	06663	PF	P				LT2	635	1030	07.3	04.1	07.8	02.4	
24 Jun 71	06684	PF	P				LT2							
29 Jun 71	06992	PF	P				LT2	160		22.6	15.7	06.6	03.1	
06 Jul 71	07250	LT2	—				LT2	171		14.2	08.6	04.4	03.6	
13 Jul 71	07446	LT2	P				LT2	360	171	05.3	03.3	03.1	05.7	
20 Jul 71	07747	LT2	—				LT2	127	255	02.9	01.9	03.6	05.6	

Figure 8.

Recipient record facsimile exemplifying the development of CF anti-HAA and elevated SGOT levels.

Transfusions

Transf. Date	Blood Unit	Donor No.	Serum access	HAA CF	HAA IEP	HAA AGD	ANT	ANT	ANT	HAA Type
							HAA CF	HAA IEP	HAA AGD	
09 Apr 71	1328-0+	0667	02919	AC	—		AC			
09 Apr 71	1329-0+	0668	02920	LT2	—		LT2			
12 Apr 71	1333-0+	0672	02924	AC	—		AC			
12 Apr 71	1334-0+	0673	02925	LT2	—		LT2			
17 May 71	1917-0+	0248	04635	LT2	—		LT2			
17 May 71	1919-0+	1271	04637	LT2	—		LT2			
20 May 71	1889-0+	0102	04536	LT2	—		LT2			
20 May 71	1876-0+	1238	04523	16	P		LT2			

Laboratory Results

Date	Serum acces	HAA CF	HAA IEP	HAA AGD	ANT	ANT	ANT	HAA Type	SGOT	SGPT	TOT. BIL.	DIR. BIL.	ALK. PHO.	T.T.
					HAA CF	HAA IEP	HAA AGD							
09 Apr 71	02978	LT2	ND		LT2									
17 May 71	04728	AC	—		AC									
20 May 71	04995	AC			AC									
27 May 71	05336	LT2	—		LT2				120	160	00.8	00.6	04.3	02.8
04 Jun 71	05734	LT2	—		16									
10 Jun 71	06147	AC	—		AC				67		00.9	00.4		
17 Jun 71	06504	LT2	—		LT2				182	310	00.6	00.5	05.0	06.4
06 Jul 71	07253	LT2	—		PF				95		00.6	00.2	03.9	02.0
27 Jul 71	08253	LT2	—		LT2				445	695	00.9	00.4	04.0	04.6
10 Aug 71	09335	LT2	—		LT2				ND					
24 Aug 71	09780	LT2	—		LT2				39	31	00.5	00.2	02.6	04.7
28 Sep 71	11209	LT2	—		LT2				15	13	00.4	00.1		07.6
28 Oct 71	12346	LT2	—		LT2				37	18	00.3	00.1	02.6	10.2
30 Nov 71	14008	LT2	—		LT2				23	31	00.0	00.0	02.6	08.4
30 Dec 71	15213	LT2	—		LT2				24	20	00.6	00.2	02.1	08.6