THE SEROLOGICAL STATUS OF SOLOMON ISLAND BLOOD DONORS

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Abstract. The serological status of Solomon Island blood donors in 1995 and in particular the seroprevalence of antibodies to Hepatitis B and C and prevalence of risk factors for these chronic infections was studied. A questionnaire of risk factors for Hepatitis B and C was undertaken. All blood donors had been previously screened for HIV antibody without any positive cases recorded. 598 donors had serum collected of which 36 samples (6.0%) were third generation HCV EIA antibody positive and 3 samples were RIBA positive but none were PCR positive. 25.1% of samples were positive for HBsAg and anti-HBc antibody was found in 84.4%. Elevated ALT levels (>35 U/l) were found in 6.5% of samples but there was no statistically significant association with HCV or HBsAg status. 15.4% were TPHA positive and 5.4% had RPR titers more than or equal to 1. Anti-HTLV-1 antibody was positive in 12.3% randomly selected samples. All 10 positive samples were then found to be antibody indeterminate with Western blot assay. Of the 585 samples with completed questionnaires, analysis of the relationship between anti-HCV status with tattoo status and ear piercing also failed to reach statistical significance. Consistent with other studies from tropical malaria-prone countries, a positive anti-HCV antibody test even by the third generation EIA is probably a false positive test in most cases. In addition, high prevalence rates of HBV, yaws or syphilis infection were demonstrated.

INTRODUCTION

The policy of the Honiara Blood Bank has been to provide a safe blood transfusion service for Honiara Central Hospital, a tertiary referral hospital for the Solomon Islands (SI). However, island communities within the Solomon Islands have carriage rates of HBsAg ranging from 8-40% amongst the Lau people on Malaita (Blumberg *et al*, 1974). Anti-HBs antibody has been recorded in the Santa Cruz Islands between 16-40% (Mazzur *et al*, 1981).

Anti-HCV antibody prevalence amongst the Kwaio group in 1990 on Malaita Island in the SI was found to be as high as 76.5% from sera collected in 1966 using a first generation (Chiron/Ortho) ELISA test although the authors concluded that the results were probably false positives (Wong *et al*, 1990). In comparison, amongst blood donors from Australia rates are less than 1% (Allain *et al*, 1991).

In 1991 a Kirribati population was found to have anti-HCV antibody positive rates of 4.8% using first generation EIA tests confirmed by supplementary RIBA assay however Vanuatu had a low prevalence (<1%) (Tibbs *et al*, 1991). HCV PCR was not tested in either study however.

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There is evidence that people tested from tropical countries with endemic malaria may have false positive hepatitis C antibody tests (using second or third generation EIA testing kits). This effect is presumably a result of either hyperglobulinemia or aged/stored sera (McFarlane *et al*, 1990) rather than cross-reactivity with other flaviviruses or pestiviruses (Miller and Purcell, 1990).

Syphilis and yaws are also endemic in SI however no blood donors at the time of writing had tested positive to HIV (Honiara Blood Bank, personal communication).

HTLV-1 is prevalent in the Pacific region with notification rates as high as 13.9% amongst central Australian Aboriginal people but much lower (0-0.5%) in northern coastal regions of Australia. HTLV-1 is also known to be present in the SI and PNG (Heard, 1993). It is not currently policy in SI to screen for HTLV-1 but it was decided to include this test on a limited number of donors for the study.

At the time of the study (1994/5), blood donors in Honiara were tested for HBV, HIV and VDRL but as a result of cost constraints, not for HCV or HTLV-1. Volunteers with positive serology for HIV, Hep Bs antigen and VDRL are rejected as blood donors. In contrast, blood donors from remote regions of the SI, who are usually selected from the relatives of patients, are not tested for any microbial pathogens whatsoever because of limited re-

sources and expertise.

There have been no previously published reports of the seroprevalence of important transmissable pathogens of SI blood donors. This prevalence study of HCV, HBV, HTLV-1 and syphilis/yaws amongst SI blood donors was undertaken to document the potential infection risk to blood recipients. Assessment of demographic and risk factors for blood borne viruses by questionnaire was also undertaken. HIV antibody has not been detected amongst SI blood donors at the time of the study (1995) and therefore has not been further examined.

MATERIALS AND METHODS

Five hundred and ninety-eight (598) consecutive, individual blood donors from 49 bleeding stations had serum collected throughout 1994/5. Thirteen of the blood samples did not have questionnaires attached and although the blood was able to be tested there was no demographic data available for these samples. Samples were referred to Royal Brisbane Hospital Division of Microbiology, Australia (a state reference laboratory) for testing.

All blood samples were tested for HBV (HBsAg, anti-HBc) (Sanofi Pasteur Institute). HBsAg positive sera underwent a confirmatory test (Sanofi Pasteur) and anti-HCV IgG (Ortho ELISA 3.0). Positive HCV IgG samples were checked further with a Chiron RIBA 3.0 (SIA 1994) test and a PCR (Roche Amplicor) test.

The RIBA 3.0 SIA detected c100(p), c22(p) and NS5. Two or more bands were required to react before the test was called positive. If only one band was positive the result was reported as "indeterminate".

RPR (CSL), TPHA (Fujireba) and ALT (Hitachi) levels were also assessed using the reference range for Royal Brisbane Hospital. HTLV-1 antibody (Abbott 2.0 EIA) was performed on 81 randomly selected samples and confirmatory testing was performed on positive specimens with the Biotechnology HTLV-1 Western Blot 2.4 assay. Two or more bands were required before the test was called positive, only one band positive meant an indeterminate result.

Samples were collected in the field, initially stored in a cooler, then on arrival at Honiara Hospital, centrifuged and the serum frozen. The samples were then transported, frozen in containers with dry ice, to Brisbane.

Questionnaires were taken from the blood donors. Data elicited included age, sex, village and province of origin, tattoo status, ear piercing, previous blood transfusions, previous jaundice ('yellow eye').

RESULTS

The following analyses (Tables 1-4) have been carried out on the entire data set since there was little difference in the data from the blood samples

Table 1
Demographic and clinical characteristics of volunteer blood donors with and without detectable antibody to HCV.

Item n=36	HCV positive n=562	HCV negative (Chi squared test)	p-value
Mean age (range)	24.6 (19-43)	25.9 (16-59)	
years	SD 11.1	SD 10.0	ns
Male sex (%)	31 (86)	465 (82.7)	ns
Presumed source of infection	not determined		
Tattoos	21	264	0.18
(% positive)	(60)	(48.3)	(ns)
Past blood transfusion	2	23	
(% positive)	(5.6)	(4.2)	ns
Previous jaundice	0	30	-
(% positive)		(5.5)	-
Pierced ears	22	268	0.15
(% positive)	(61)	(48.8)	(ns)

SD = Standard deviation, ns = not significant *ie* p-value ≥ 0.05.

Table 2
Comparison of RIBA and PCR of the 36 anti-HCV antibody positive blood donors.

	RIBA positive	RIBA indeterminate	RIBA negative	Total
PCR positive	0	0	0	0
PCR negative	3	17	16	36
Total	3	17	16	36

Only one of the 36 sera anti-HCV positive by ELISA showed reactivity with the c-22(p) band in the RIBA test. This is regarded as a nonspecific (indeterminate) result.

Table 3
Serological and virological data of volunteer blood donors.

Variable	HCV positive n=36	HCV negative n=562	p-value (Chi squared test)
HBsAg negative (%)	26 (72.2)	422 (75.0)	ns
HBsAg positive (%)	10 (27.7)	140 (24.9)	ns
Anti-HBs ≥ 10 IU/ml (%)	15 (41.6)	152 (27.0)	ns
Anti-HBc positive (%)	31 (86.1)	474 (84.3)	ns
eAg positive (%)	6 (16.6)	53 (9.4)	
eAb positive (%)	10 (27.7)	141 (25.0)	
ALT > 35 U/l (%)	I (2.7)	40 (7.1)	
TPHA positive (%)	5 (13.8)	88 (15.6)	

There were no significant associations between positive anti-HCV status and either risk factors for HCV infection, positive HBV serology or abnormal LFT's. All PCR results were negative.

taken from those donors with either completed or absent questionnaire results. Any changes in the denominator are shown in the tables.

DISCUSSION

This is the first study in the Solomon Islands, at the time of submission, to exhaustively examine blood donors for evidence of HCV infection employing modern serological techniques including PCR and to evaluate risk factors by questionnaire. The overall number of donor specimens examined serologically was comparatively small (n=598) due to the small population in the region and constraints in the number of Blood Bank staff available to participate.

Anti-HCV IgG (by Ortho ELISA 3.0) appears infrequently, *ie* 36/598 (6.0%) in Solomon Island blood donors. Only 3/36 (8.3%) of the anti-HCV positive samples were also positive by the RIBA test. None of the anti-HCV ELISA positive samples were positive by the PCR technique, suggesting either that none of the samples had virus present, or that the samples may have had improper handling prior to testing *ie* the virus may have been degraded by room temperature storage or repeated freezing and thawing. The three RIBA positive sera may be true positives however despite the negative PCR results. In view of other studies from tropical malaria endemic countries showing high false positive HCV antibody levels, it seems likely that most of the anti-HCV ELISA positive samples (33/36) were again false positives.

A previous history of blood contact (*eg* tattooing, ear piercing, blood transfusion) did not appear to predispose to the finding of anti-HCV in the donor serum but the lack of a statistically significant association may have resulted from a small sample size (*ie* type 11 error).

A raised ALT (>35 U/l) was found in 41/598 (6.8%) of samples and did not predict the presence of anti-HCV.

HBsAg carriage rate is high (25%) and evidence of previous exposure to HBV (anti-HBc antibody) was found in approximately 85% of the donor serum examined. The high prevalence of anti-HBc antibody is probably associated with high rates of exposure to the hepatitis B virus and is unlikely to be caused by hyperglobulinemia in this population. TPHA tests were positive in 93/598 samples (15.5%). This confirms results from previous studies suggesting endemic yaws is present. It is unclear on

Table 4

Western Blot results of the 10 HTLV-1 ELISA antibody positive samples.

	Core antigens				Envelope antigens				Others		
Sample	p19	p24	p28	p53	gp 46	GD 21	rgp 46-I	rgp 46-II	p26	p32	p36
1	+	-	+	+	-	+	-	-	+	-	-
2	+	-	+	+	-	+	-	-	+	+	+
3	+	-	+	+	-	+	-	-	+	+	+
4	+	-	+	-	-	+	-	-	+	-	-
5	+	-	+	+	-	+	-	-	+	+	+
6	+	-	+	+	-	+	-	-	+	+	+
7	+	-	+	+	+	+	-	-	+	+	+
8	+	-	-	-	-	+	-	-	-	-	-
9	+	-	+	+	+	+	-	-	+	+	+
10	+	-	+	+	-	-	-	-	+	-	+

HTLV specific bands were detected on all 10 samples but did not meet the criteria for HTLV-1 or HTLV-2 seropositivity.

the basis of this study to what extent syphilis is also a contributing factor to the high prevalence of positive TPHA results.

Anti-HTLV1 antibody (Abbott 2.0 EIA) was positive in 10/81 (12.3%) randomly selected samples. Surprisingly, all 10 positive samples were then found to be antibody indeterminate only with the Biotechnology HTLV1 Western Blot 2.4 assay. This again reflects non specific immunoblot activity.

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