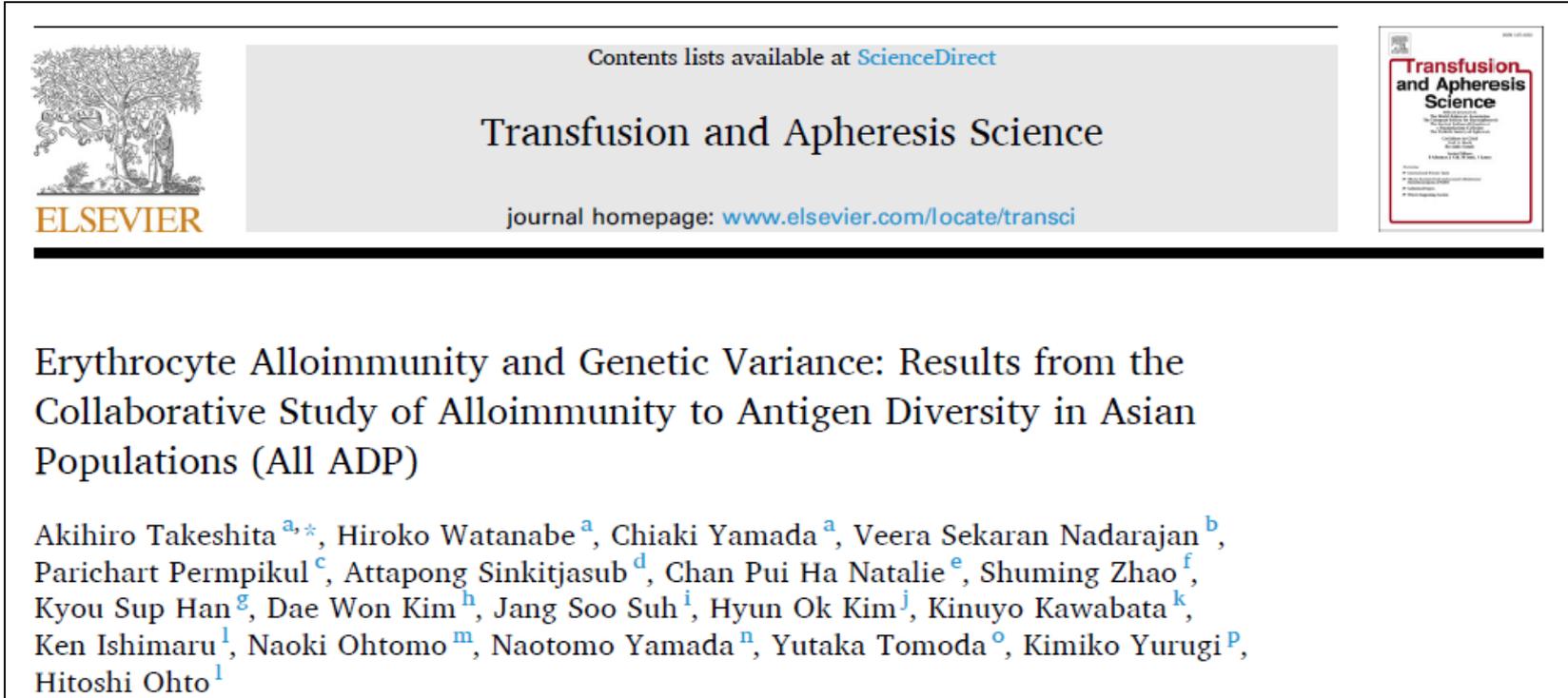


アジアにおける赤血球不規則抗体に  
関する共同研究  
— 結果報告 —

浜松医科大学医学部附属病院  
輸血・細胞治療部

山田千亜希

# 不規則抗体に関する日本とアジア共同研究



The image shows the cover of the journal 'Transfusion and Apheresis Science'. At the top left is the Elsevier logo featuring a tree and a figure, with the word 'ELSEVIER' below it. In the center, the text reads 'Contents lists available at ScienceDirect' above the journal title 'Transfusion and Apheresis Science'. Below the title is the journal homepage URL: 'journal homepage: www.elsevier.com/locate/transci'. On the right side, there is a small thumbnail of the journal cover itself, showing the title and some text. The main title of the article on the cover is 'Erythrocyte Alloimmunity and Genetic Variance: Results from the Collaborative Study of Alloimmunity to Antigen Diversity in Asian Populations (All ADP)'. Below the title is a list of authors with their affiliations indicated by superscript letters: Akihiro Takeshita<sup>a,\*</sup>, Hiroko Watanabe<sup>a</sup>, Chiaki Yamada<sup>a</sup>, Veera Sekaran Nadarajan<sup>b</sup>, Parichart Permpikul<sup>c</sup>, Attapong Sinkitjasub<sup>d</sup>, Chan Pui Ha Natalie<sup>e</sup>, Shuming Zhao<sup>f</sup>, Kyou Sup Han<sup>g</sup>, Dae Won Kim<sup>h</sup>, Jang Soo Suh<sup>i</sup>, Hyun Ok Kim<sup>j</sup>, Kinuyo Kawabata<sup>k</sup>, Ken Ishimaru<sup>l</sup>, Naoki Ohtomo<sup>m</sup>, Naotomo Yamada<sup>n</sup>, Yutaka Tomoda<sup>o</sup>, Kimiko Yurugi<sup>p</sup>, and Hitoshi Ohto<sup>l</sup>.

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# 方法

## 【調査対象期間】

2006年1月－2013年12月

## 【調査項目】

### ① 施設背景

ベッド数、輸血を必要とする手術件数、輸血件数、血液型検査件数、交差試験検査件数、不規則抗体検査件数

### ② 患者背景

性別、妊娠歴、輸血歴

### ③ 不規則抗体の検査方法

検査方法(生理食塩液法、間接抗グロブリン試験、酵素法)、検査手技(試験管法、カラム法、固相法)、反応増強剤、試薬キット

### ④ 各不規則抗体の発現頻度

D, C, c, E, e, f, Ce, P1, M, N, S, s, Mi<sup>a</sup>, Le<sup>a</sup>, Le<sup>b</sup>, Jk<sup>a</sup>, Jk<sup>b</sup>, Jk3, Fy<sup>a</sup>, Fy<sup>b</sup>, K, k, Kp<sup>a</sup>, Kp<sup>b</sup>, Di<sup>a</sup>, Di<sup>b</sup>, Lu<sup>a</sup>, Lu<sup>b</sup>, Xg<sup>a</sup>, H

# 参加施設

(全81施設)



# 不規則抗体同定症例数

(number of cases)

	male	female	total
Japan	5,092	7,193	12,285
South Korea	2,114	3,655	5,769
Thailand	1,036	1,695	2,731
Malaysia	287	688	975
Hong Kong	237	375	612
Shanghai	100	181	281
Total	8,866	13,787	22,653

# 日本における不規則抗体の発現率

The frequency of irregular erythrocyte antibodies and their relationship to gender, previous transfusion, and pregnancy in Japan

Antibody	Number of cases (frequency)				Transfusion			During pregnancy		
	Total	Male	Female	p-value	Yes	No or unknown	p-value	Yes	No	p-value
	(n = 12285)	(n = 5092)	(n = 7193)		(n = 3581)	(n = 7609)		(n = 983)	(n = 4348)	
E	3563 (29.0)	1235 (24.3)	2328 (32.4)	<0.001	1480 (41.3)	1832 (24.1)	<0.001	218 (22.2)	1321 (30.4)	<0.001
Le <sup>a</sup>	2852 (23.2)	1433 (28.1)	1419 (19.7)	<0.001	391 (10.9)	2227 (29.3)	<0.001	223 (22.7)	1033 (23.8)	0.474
P1	1010 (8.2)	451 (8.9)	559 (7.8)	0.031	136 (3.8)	778 (10.2)	<0.001	86 (8.7)	402 (9.2)	0.626
M	890 (7.2)	357 (7.0)	533 (7.4)	0.401	105 (2.9)	675 (8.9)	<0.001	106 (10.8)	373 (8.6)	0.029
c + E	591 (4.8)	205 (4.0)	386 (5.4)	<0.001	309 (8.6)	190 (2.5)	<0.001	81 (8.2)	129 (3.0)	<0.001
Fy <sup>b</sup>	493 (4.0)	265 (5.2)	228 (3.2)	<0.001	132 (3.7)	332 (4.4)	0.094	26 (2.6)	146 (3.4)	0.253
Di <sup>a</sup>	398 (3.2)	178 (3.5)	220 (3.1)	0.178	132 (3.7)	243 (3.2)	0.177	13 (1.3)	127 (2.9)	0.005
Le <sup>b</sup>	324 (2.6)	140 (2.7)	184 (2.6)	0.514	62 (1.7)	228 (3.0)	<0.001	31 (3.2)	121 (2.8)	0.528
C + e	208 (1.7)	85 (1.7)	123 (1.7)	0.863	114 (3.2)	72 (0.9)	<0.001	15 (1.5)	51 (1.2)	0.366
Jk <sup>a</sup>	183 (1.5)	74 (1.5)	109 (1.5)	0.780	132 (3.7)	45 (0.6)	<0.001	5 (0.5)	29 (0.7)	0.573
D	178 (1.4)	39 (0.8)	139 (1.9)	<0.001	25 (0.7)	112 (1.5)	<0.001	37 (3.8)	84 (1.9)	<0.001
C	134 (1.1)	54 (1.1)	80 (1.1)	0.786	66 (1.8)	63 (0.8)	<0.001	5 (0.5)	42 (1.0)	0.166
S	129 (1.1)	42 (0.8)	87 (1.2)	0.039	35 (1.0)	83 (1.1)	0.584	11 (1.1)	57 (1.3)	0.628
Le <sup>a</sup> +Le <sup>b</sup>	125 (1.0)	67 (1.3)	58 (0.8)	0.006	12 (0.3)	103 (1.4)	<0.001	10 (1.0)	45 (1.0)	0.961
Jr <sup>a</sup>	109 (0.9)	8 (0.2)	101 (1.4)	<0.001	11 (0.3)	69 (0.9)	<0.001	27 (2.7)	64 (1.5)	0.005
e	60 (0.5)	23 (0.5)	37 (0.5)	0.623	25 (0.7)	30 (0.4)	0.032	4 (0.4)	16 (0.4)	0.857
c	52 (0.4)	10 (0.2)	42 (0.6)	0.001	14 (0.4)	28 (0.4)	0.853	7 (0.7)	22 (0.5)	0.428
Fy <sup>a</sup>	52 (0.4)	24 (0.5)	28 (0.4)	0.490	9 (0.3)	41 (0.5)	0.033	2 (0.2)	25 (0.6)	0.138
Jk <sup>b</sup>	49 (0.4)	15 (0.3)	34 (0.5)	0.123	30 (0.8)	13 (0.2)	<0.001	5 (0.5)	6 (0.1)	0.021
E + Jk <sup>a</sup>	48 (0.4)	13 (0.3)	35 (0.5)	0.043	36 (1.0)	10 (0.1)	<0.001	1 (0.1)	6 (0.1)	0.777
Xg <sup>a</sup>	41 (0.3)	34 (0.7)	7 (0.1)	<0.001	18 (0.5)	23 (0.3)	0.102	0 (0.0)	4 (0.1)	0.341
E + Le <sup>a</sup>	41 (0.3)	17 (0.3)	24 (0.3)	0.999	11 (0.3)	27 (0.4)	0.686	3 (0.3)	13 (0.3)	0.974
E + Di <sup>a</sup>	41 (0.3)	12 (0.2)	29 (0.4)	0.113	16 (0.4)	23 (0.3)	0.226	0 (0.0)	17 (0.4)	0.050
P1+Le <sup>a</sup>	40 (0.3)	21 (0.4)	19 (0.3)	0.155	10 (0.3)	27 (0.4)	0.516	3 (0.3)	13 (0.3)	0.974
K	33 (0.3)	19 (0.4)	14 (0.2)	0.060	7 (0.2)	21 (0.3)	0.427	5 (0.5)	7 (0.2)	0.038
others	641 (5.2)	271 (5.3)	370 (5.1)		263 (7.3)	314 (4.1)		59 (6.0)	195 (4.5)	

# 日本における不規則抗体の発現率

- 日本における不規則抗体の発現率について、最新のデータが明らかとなった。
- 各不規則抗体の発現率を、性別、妊娠歴別、輸血歴別に解析し、その差異を明らかにすることができた。
- 今後、日本の赤血球同種免疫を研究する上で基本となる重要なデータを提示した。

# 検査法別の不規則抗体の検出率

The efficacy of detection methods between the IAT and enzyme method for the first detection of antibodies

Methods	Number of cases (percentage)							
	Anti-C (n = 43)	Anti-c (n = 64)	Anti-E (n = 350)	Anti-e (n = 28)	Anti-Jk <sup>a</sup> (n = 22)	Anti-Jk <sup>b</sup> (n = 11)	Anti-Le <sup>a</sup> (n = 44)	Anti-Le <sup>b</sup> (n = 6)
Only by IAT	0 (0.0)	0 (0.0)	4 (1.1)	0 (0.0)	4 (18.2)	3 (27.3)	0 (0.0)	0 (0.0)
By both methods	Detected earlier by IAT	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Detected earlier by enzyme method	7 (16.3)	9 (14.1)	40 (11.4)	7 (25.0)	0 (0.0)	0 (0.0)	8 (18.2)
	Concurrently detected by both methods	16 (37.2)	32 (50.0)	152 (43.4)	12 (42.9)	18 (81.8)	6 (54.5)	18 (40.9)
Only by enzyme method	20 (46.5)	23 (35.9)	153 (43.7)	9 (32.1)	0 (0.0)	2 (18.2)	18 (40.9)	3 (50.0)

IAT, indirect antiglobulin test.

- 日本における各不規則抗体の検出率について検査法別に解析し、酵素法と間接抗グロブリン試験の長短所を示すことができた。

# 日本における不規則抗体の発現率 — 臨床的意義の高い抗体と低い抗体 —

Overall antibody prevalence based on postulated clinical significance of antibodies according to gender, transfusion and pregnancy.

	Number of cases (frequency)							
	Male	Female	Transfusion (Total)		Transfusion (Male)		During pregnancy	
			Yes	No or unknown	Yes	No or unknown	Yes	No
Patients with antibody/ies Identified *	(n = 5,053)	(n = 7,054)	(n = 3,556)	(n = 7,497)	(n = 1,820)	(n = 3,233)	(n = 946)	(n = 4,264)
Patients with antibodies of clinical significance	2,508 (49.6)	4,205 (59.6)	2,803 (78.8)	3,362 (44.8)	1,379 (75.8)	1,129 (34.9)	470 (49.7)	2,233 (52.4)
Patients with antibodies of low clinical significance †	2,545 (50.4)	2,849 (40.4)	753 (21.2)	4,135 (55.2)	441 (24.2)	2,104 (65.1)	476 (50.3)	2,031 (47.6)
p-value		<0.001		<0.001		<0.001		0.135

\* Excluding patients who only had anti-D detected.

† Includes anti-M, anti-N, anti-Le<sup>a</sup>, anti-Le<sup>b</sup>, anti-P1, anti-Xg<sup>a</sup>, anti-JMH, anti-Knops, anti-Bg<sup>a</sup>, anti-Mi<sup>a</sup>, anti-LW, anti-HI and anti-KANNO.

- 不規則抗体の発現率について、臨床的意義の高い抗体と低い抗体に分けて解析し、輸血歴や妊娠歴との関係を示した。

# アジア諸国における不規則抗体の発現率

Specificity and frequency of irregular erythrocyte antibodies in each country / city.

Antibody	Number of cases (Frequency)													
	Japan		South Korea		Shanghai		Hong Kong		Malaysia		Thailand		Total	
	(n = 12285)		(n = 5769)		(n = 281)		(n = 612)		(n = 975)		(n = 2731)		(n = 22653)	
E	3563	(29.0)	1740	(30.2)	154	(54.8)	148	(24.2)	175	(17.9)	298	(10.9)	6078	(26.8)
Le <sup>a</sup>	2852	(23.2)	1054	(18.3)	24	(8.5)	50	(8.2)	296	(30.4)	258	(9.4)	4534	(20.0)
P1	1010	(8.2)	237	(4.1)	1	(0.4)	9	(1.5)	23	(2.4)	318	(11.6)	1598	(7.1)
M	890	(7.2)	389	(6.7)	11	(3.9)	43	(7.0)	42	(4.3)	84	(3.1)	1459	(6.4)
Mi <sup>a</sup>	7	(0.1)	2	(0.0)	0	(0.0)	278	(45.4)	68	(7.0)	917	(33.6)	1272	(5.6)
c + E	591	(4.8)	582	(10.1)	22	(7.8)	20	(3.3)	31	(3.2)	13	(0.5)	1259	(5.6)
Le <sup>b</sup>	324	(2.6)	423	(7.3)	3	(1.1)	2	(0.3)	50	(5.1)	230	(8.4)	1032	(4.6)
D	178	(1.4)	260	(4.5)	33	(11.7)	2	(0.3)	158	(16.2)	4	(0.1)	635	(2.8)
Fy <sup>b</sup>	493	(4.0)	86	(1.5)	4	(1.4)	5	(0.8)	0	(0.0)	4	(0.1)	592	(2.6)
Le <sup>a</sup> +Le <sup>b</sup>	125	(1.0)	100	(1.7)	0	(0.0)	1	(0.2)	4	(0.4)	340	(12.4)	570	(2.5)
Di <sup>a</sup>	398	(3.2)	42	(0.7)	3	(1.1)	0	(0.0)	0	(0.0)	17	(0.6)	460	(2.0)
C + e	208	(1.7)	206	(3.6)	2	(0.7)	1	(0.2)	2	(0.2)	9	(0.3)	428	(1.9)
Jk <sup>a</sup>	183	(1.5)	101	(1.8)	1	(0.4)	11	(1.8)	27	(2.8)	16	(0.6)	339	(1.5)
S	129	(1.1)	66	(1.1)	0	(0.0)	4	(0.7)	19	(1.9)	9	(0.3)	227	(1.0)
C	134	(1.1)	46	(0.8)	0	(0.0)	2	(0.3)	3	(0.3)	1	(0.0)	186	(0.8)
c	52	(0.4)	79	(1.4)	11	(3.9)	2	(0.3)	14	(1.4)	10	(0.4)	168	(0.7)
Jr <sup>a</sup>	109	(0.9)	21	(0.4)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	130	(0.6)
e	60	(0.5)	31	(0.5)	7	(2.5)	0	(0.0)	4	(0.4)	8	(0.3)	110	(0.5)
Jk <sup>b</sup>	49	(0.4)	37	(0.6)	1	(0.4)	5	(0.8)	4	(0.4)	6	(0.2)	102	(0.5)
E + Mi <sup>a</sup>	0	(0.0)	0	(0.0)	0	(0.0)	13	(2.1)	2	(0.2)	81	(3.0)	96	(0.4)
I	23	(0.2)	40	(0.7)	0	(0.0)	0	(0.0)	0	(0.0)	16	(0.6)	79	(0.3)
Fy <sup>a</sup>	52	(0.4)	14	(0.2)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.0)	67	(0.3)
E + Jk <sup>a</sup>	48	(0.4)	9	(0.2)	0	(0.0)	2	(0.3)	1	(0.1)	2	(0.1)	62	(0.3)
K	33	(0.3)	16	(0.3)	0	(0.0)	2	(0.3)	7	(0.7)	3	(0.1)	61	(0.3)
E + Le <sup>a</sup>	41	(0.3)	12	(0.2)	0	(0.0)	1	(0.2)	1	(0.1)	2	(0.1)	57	(0.3)
Others	733	(6.0)	176	(3.1)	4	(1.4)	11	(1.8)	44	(4.5)	84	(3.1)	1052	(4.6)

# アジア諸国における不規則抗体の発現率

- アジア諸国における各不規則抗体の発現率について、性別、妊娠歴別、輸血歴別に解析し、その差異を明らかにすることができた。
- 今後、東アジアの赤血球同種免疫を研究する上で基本となる重要なデータを提示した。

# 抗原陽性血輸血に関する共同研究

**VoxSanguinis**

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**ISBT** International Society  
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**ORIGINAL PAPER**

## A Japanese multi-institutional collaborative study of antigen-positive red blood cell (RBC) transfusions in patients with corresponding RBC antibodies

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# 総括と今後の展望

- 皆さまのご協力により、過去に前例のない多数例が解析され、日本とアジア諸国における現在の不規則抗体の発現に関し、詳細な結果が明らかとなった。
- 今回の大規模調査の経験をもとに、さらにエビデンスレベルの高い前方向研究に拡大していく。
- 前方向に連続的に登録された症例を蓄積し、RBC輸血後の各不規則抗体の発現率と抗体発現に関わる因子、抗体別のDHTRの発生率と要因について解析する。さらに不規則抗体とDHTRに関する登録システムの構築をめざす。
- 不規則抗体発現に関する前方向研究に、引き続きご参加ください。