DIAGNOSTIC SERVICES
TORONTO

YEAR IN REVIEW
JANUARY – DECEMBER 2013

CANADIAN BLOOD SERVICES TORONTO

DIAGNOSTIC SERVICES - TORONTO

TABLE OF CONTENTS

DIAGNOSTIC SERVICES

SENIOR STAFF AND CONTACT INFORMATION

Medical Director Dr. Wendy Lau, MD, FRCPC	(416) 313-4560 wendy.lau@blood.ca
Manager Zofia Salomon de Friedberg	(416) 313-4430 zofia.salomondefriedberg@blood.ca
Senior Technologist Shamim Jivraj	(416) 313-4567 shamim.jivraj@blood.ca
Senior Technologist Christopher Sumner	(416) 313-4563 christopher.sumner@blood.ca
Diagnostic Services Laboratory Telephone Fax	 (416) 313-4567/4477 (416) 313-4675
Website:	www.blood.ca/diagnosticservices

Diagnostic Services Toronto Overview

The Diagnostic Services department is made up of two laboratories: Immunohematology and HLA/Platelet Immunobiology. The Diagnostic Services department is staffed by two Senior Technologists and four Technologists. The majority of staff are cross-trained in both laboratories to help meet the needs of our hospital clients.

The **Immunohematology Laboratory** performs simple and complex patient referral red cell antibody testing and ABO discrepancy testing for hospitals in the Central Ontario Region and Hamilton Region, and for private laboratories. It also coordinates Red Cell Genotyping referral through the Canadian Blood Services National Immunohematology Reference Laboratory (NIRL). The Toronto laboratory is also responsible for maintaining the Central Ontario Sickle Cell Registry.

The **HLA/Platelet Immunobiology Laboratory** investigates cases of neo-natal alloimmune thrombocytopenia (NAIT) for hospitals of the Central Ontario Region and for hospitals within Atlantic Canada. The laboratory also coordinates with CBS Winnipeg Centre, the HLA/HPA testing of Apheresis donors, and HLA matching for patients refractory to platelets. The Toronto laboratory also performs a screening test for HLA and platelet specific allo-antibodies in patients suspected of having post-transfusion purpura (PTP). Samples from patients and donors in cases of suspected Transfusion Related Acute Lung Injury (TRALI) are referred from this laboratory to CBS Winnipeg Centre for investigation.

2013 MILESTONES

Red Cell Genotyping:

Having the facility to perform red cell genotyping is very beneficial when working to resolve antibody investigations. This expertise is particularly valuable for those patients who have received multiple red cell transfusions, patients with multiple antibodies, or patients with a rare phenotype. In 2013, hospital clients were able to refer samples to Diagnostic Services sites in order to have red cell genotyping performed through the National Immunohematology Reference Laboratory in Ottawa. Coupling the information gained through red cell genotyping with the serological expertise of staff within Diagnostic Services provides optimal benefit to area hospitals.

In 2013, 10 hospitals within the Central Ontario area referred 40 samples for red cell genotyping.

Scientific Publications:

In May 2013, the annual meeting of the Canadian Society of Transfusion Medicine was held in Quebec City. This meeting provides a forum for transfusion medicine professionals to meet and exchange experiences, information and practices to advance the field of Transfusion Medicine. The Toronto Diagnostic Services laboratory submitted an abstract describing our experience with testing eluates using gel technology. The abstract was accepted for the meeting and a poster was presented at the May meeting.

Maintenance of Technical Competency:

As well as receiving extensive on-the-job training, all staff are encouraged to pursue Continuing Education opportunities. This enrichment is promoted through participation in case review and presentation among colleagues, attendance at scientific meetings (local or international) and the preparation and presentation of scientific abstracts or posters. In 2013, staff attended the CSTM (Canadian Society of Transfusion Medicine) Annual Meeting as well as the AABB (American Association of Blood Banks) Annual Meeting. In 2013, Toronto Diagnostic Services staff collectively, earned 270 hours of Continuing Education in their efforts to gain exposure of the current transfusion medicine practices and to share knowledge with colleagues and subject matter experts.

Perinatal Advisory Committee (PNAC):

Once annually, the Diagnostic Services Director, Medical Directors, Managers and Supervisors from all of the Canadian Blood Services Diagnostic Laboratory sites (in Vancouver, Edmonton, Regina, Winnipeg and Toronto) meet to discuss operational issues and ‘best practice’ approaches for serological and perinatal laboratory testing. In discussions where expert advice is required, guest speakers are invited to provide input and direction. Working groups are set up as required to investigate specific issues and bring recommendations forward. Input is obtained from relevant stakeholders on planned policy changes.

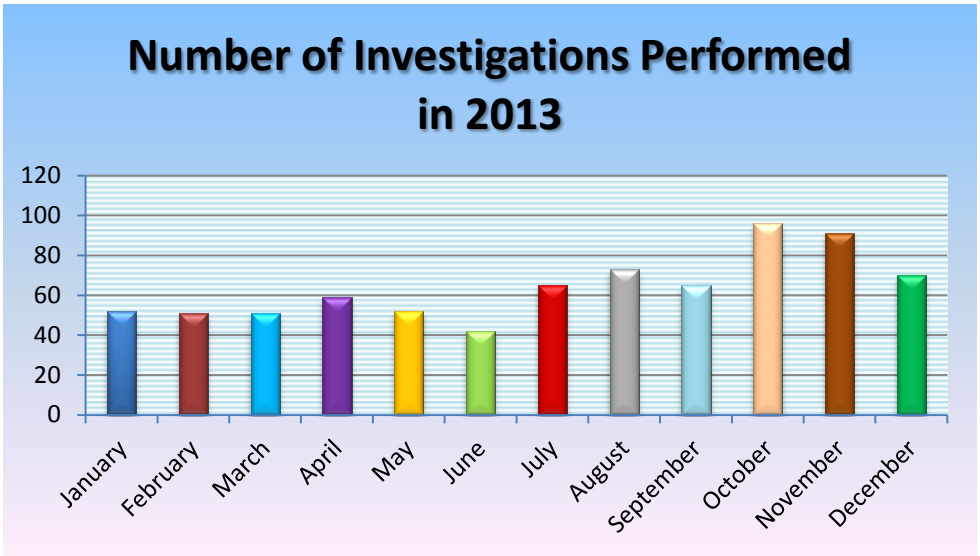
One of the topics under discussion included the process of testing fetal DNA in maternal plasma. Standardization of the criteria for testing across the country is an important goal of this group. Past meetings have resulted in the adoption of the practice of no longer performing titrations for prenatal patients with a critical antibody titre of 16. Also standardized is the practice to discontinue routine titrations for any prenatal patients with demonstrable levels of anti-K as even low levels of anti-K can cause severe hemolytic disease of the fetus and newborn (HDFN).

A review of literature regarding anti-M revealed that, although this antibody is rarely implicated in HDFN, it may cause suppression of fetal erythropoiesis and late onset anemia (Trans Med Rev 2014: 28:1-6). The Perinatal Advisory Committee recommended that a comment be added to reports of anti-M advising that the baby be monitored for symptoms of late onset anemia for up to 2 months of age.

Some of the current initiatives being undertaken by group members include the determination of critical titres of maternal antibodies other than anti-D, the monitoring of recent advances and international developments in testing for HDFN and neonatal alloimmune thrombocytopenia (NAIT).

IMMUNOHEMATOLOGY LABORATORY

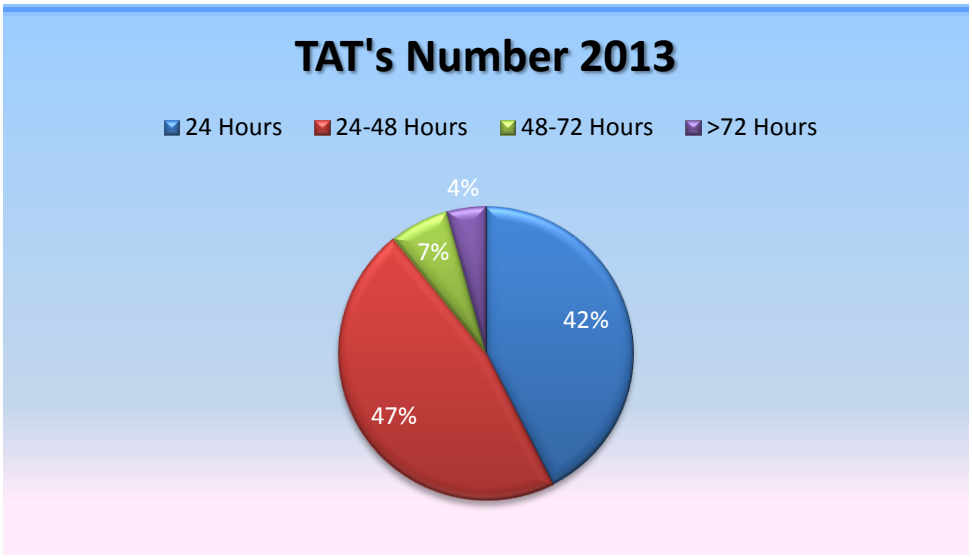
2013 Snapshot



The above graph represents the number of samples received and tested for each month of the 2013 calendar year. 767 samples representing 728 patients were received and tested in 2013.

TAT's

Turn-around-times (TAT's) are monitored by CBS to ensure timely reporting of patient test results. The target is to have greater than 85% of cases resolved and reported within 72 hours of receipt.



The 2013 calendar year data shows that 96% of samples received and tested had the investigations completed and reported to the requesting facility within 72 hours.
The remaining 4% required further investigative work for resolution.

Hospital use of laboratory services

During the 2013 calendar year, 54 hospitals and 3 private laboratories within the Central and Hamilton regions utilized the services offered by the Immunohematology Laboratory.

52% of all requests were accounted for by investigations referred to this laboratory by 10 facilities. Of these, 23% of all samples originated from facilities within the Greater Toronto Area (GTA) and the remaining 29% were referred to Toronto Centre from facilities outside the GTA, within the Central Ontario and Hamilton regions.

Testing /Techniques

The following tests/techniques are used in the Immunohematology Laboratory.

- SIAT, MTS GEL, PEG-IAT
- Enzyme: Papain IAT, Ficin MTS GEL
- Elution
- Autoadsorption
- Differential Alloadsorption
- Extended phenotyping
- Titrations
- Pre-warm
- Saline replacement
- Differential DAT
- DTT treated cells to assist in the identification of high incidence antibodies

Reagents/Aids available

- Monoclonal antisera for Rh, Kell, Kidd, S
- Coombs antisera for other common antigens
- In-house patient antisera to rare antigens
- Rare cells (approximately 1000)
- W.A.R.M. Kit
- Papain
- ELU Kit
- HCl
- Alsevers + ATP

Complexity

The investigations that are referred to the Diagnostic Services Immunohematology laboratory are classified into two categories. Depending on the investigation's 'complexity' they are tracked as follows:

Complexity 1 – antibody investigation: uncomplicated investigation
eg. single antibody / no antibody

Complexity 2 – antibody investigation: complicated
eg. multiple antibodies, autoantibodies

A breakdown of complexity 1 and 2 cases for 2013 calendar year follows.

Complexity count for 2013:

Month	% Complexity 1	% Complexity 2	# of Samples
January	50%	50%	52
February	37%	63%	51
March	49%	51%	51
April	42%	58%	59
May	46%	54%	52
June	50%	50%	42
July	52%	48%	65
August	58%	42%	73
September	49%	51%	65
October	51%	49%	96
November	44%	56%	91
December	63%	37%	70
OVERALL	50%	50%	767

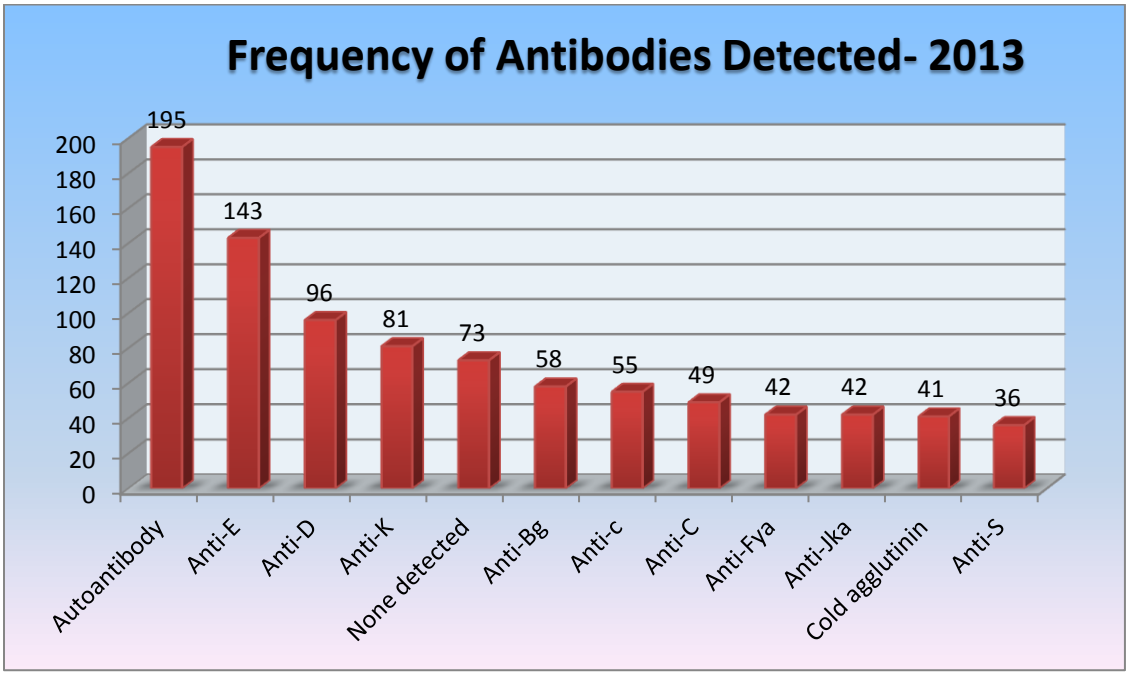
Clinically Significant Antibodies

In 2013, the most common clinically significant red cell antibodies detected were anti-E (26.1%), followed by anti-D (17.7%), and anti-K (15.0%). A breakdown of the detected antibodies is listed in the table below.

Clinically Significant Antibodies	# of times identified 2013	% of total requests 2013
Anti-c	55	10.2%
Anti-C	49	9.1%
Anti-C^w	12	2.2%
Anti-D	96	17.7%
Anti-e	15	2.8%
Anti-E	141	26.1%
Anti-Fy^a	42	7.8%
Anti-Fy^b	8	1.5%
Anti-Jk^a	42	7.8%
Anti-Jk^b	10	1.8%
Anti-K	81	15.0%
Anti-Kp^b	0	0.0%
Anti-s	2	0.4%
Anti-S	36	6.7%
Anti-V	1	0.2%
Anti-Vel	2	0.4%
Anti-Wr^a	7	1.3%

Antibody frequency

The frequency of the most common antibodies detected by the Immunohematology Laboratory in 2013 is summarized in the chart below:



High and Low Incidence Antibodies Frequencies

The tables below list the numbers of cases where antibodies to high incidence antigens and antibodies to low incidence antigens were detected for 2013.

HIGH INCIDENCE	
Antibody	#
Anti-Ch	14
Anti-Yka	3
Anti-U	1
Anti-Lub	3
Anti-H	2
Anti-Rg	2
Anti-JMH	0
Anti-Kpb	2
Anti-Ge	0
Anti-McCa	0
Anti-Rga	0
Anti-Sla	0
Anti-Vel	1

LOW INCIDENCE	
Antibody	#
Anti-Wra	7
Anti-Cw	13
Anti-Cob	7
Anti-Kpa	4
Anti-Lua	6
Anti-V	2
Anti-Sc2	1
Anti-Doa	0

SICKLE CELL REGISTRY

In the early 1990's, at the request of area hospitals, a Sickle Cell Registry was created in an effort to provide one central source of red cell phenotype information for patients with Sickle Cell Disease. These patients can be admitted to any one of the hospitals in the Greater Toronto Area. Today, area hospitals forward phenotype information to the Diagnostic Services department for entry into the registry. The hospitals use the CBS registry when a Sickle Cell patient of unknown phenotype (unknown to the facility) is admitted to their facility.
The admitting hospital contacts the Toronto Centre to ask that any existing phenotype information to be faxed to the hospital's location. This process reduces the time required for the hospital to locate appropriate phenotyped red cells for these patients.

Currently there are more than 1600 patients listed on and supported by the Registry.

HLA/PLATELET IMMUNOBIOLOGY LABORATORY

Refractory Patient Samples/Apheresis Donor Selection

Samples from patients refractory to platelet transfusions are referred to the laboratory for HLA antigen testing and HLA allo-antibody investigation. These samples are referred to the UHN Histocompatibility Laboratory, also housed within 67 College St.
Using the results generated by the UHN Laboratory, CBS staff coordinates with the requesting hospital, Winnipeg CBS, and Toronto CBS Apheresis department to ensure appropriate platelet product is collected for and sent to the affected patient.
For refractory patients with particularly challenging platelet transfusion requirements, staff at the Toronto laboratory perform in-house searches which supplement the normal matched donor search procedure.

TRALI Coordination Centre

The laboratory receives samples from hospital patients and CBS donors involved in cases within the Central Ontario region of suspected Transfusion Related Acute Lung Injury (TRALI). These samples are then referred to CBS Winnipeg where investigations are performed on the submitted specimens.

NAIT Investigations

Platelet investigations for Neonatal Alloimmune Thrombocytopenia (NAIT) are performed by the laboratory. Testing includes platelet alloantibody screening and identification on the maternal sample, and platelet typing on maternal, paternal and baby (if available) samples.
A physician letter is forwarded to the referring physicians and patients when demonstrable antibody has been identified. The letter explains the test results and the implications for follow up care. A wallet sized card containing antibody information is prepared for the patient and forwarded to the patient through the referring physician's office.

Testing/Techniques

The laboratory uses the following tests/techniques for its investigations:

- Platelet allo-antibody screening
- HLA allo-antibody screening
- Platelet genotyping

Reagents available

- Lifecodes Pak® 12
- Lifecodes Thrombotype®
- QIAamp DNA Blood Mini Kit

Turn-Around-Time

The target Turn-Around-Time (TAT) for reporting results for NAIT cases is 5 business days. In 2013, results were reported within the target for 92% of referred NAIT cases. In 59% of referred cases, results were sent within 2 business days of sample receipt. In all cases, referring facilities received at least preliminary antibody results within 2 business days of sample receipt.

HLA/Platelet Immunology Laboratory Investigations Summary

In the 2013 calendar year, the laboratory performed testing on NAIT samples received from 24 Ontario hospitals and from 3 hospitals in Atlantic Canada.
69 samples from refractory patients of the Central Ontario Region were referred for HLA antigen typing and 217 samples were referred for HLA antibody testing.

	PATIENT	DONOR
Apheresis donors sent to Winnipeg (HLA/HPA Testing)	N/A	81
TRALI samples sent to Winnipeg	6	17
Refractory patient samples referred for testing	286	
Platelet genotyping	215	3
Platelet antibody screen	130	
In-house searches	106	