DIAGNOSTIC SERVICES

ALBERTA

YEAR IN REVIEW

JANUARY – DECEMBER 2020

Diagnostic Services “Year in Review” statistics are based on a January to December calendar year. The calendar year provides better correlation with Health Canada birth statistics.

SENIOR STAFF AND CONTACT INFORMATION

Laboratory Medical Director Dr. Judith Hannon, MD, FRCPC	780-431-8714 judy.hannon@blood.ca
Diagnostic Services Manager Lhevinne Ciurcovich, MLT	604-707-3449 lhevinne.ciurcovich@blood.ca
Technical Supervisor Diagnostic Services Gerri Barr, MLT	780-431-8724 gerri.barr@blood.ca
Supervisor, Testing Brenda Caruk, MLT	780-431-8725 brenda.caruk@blood.ca
Supervisor, Genotyping Kirsten Hannaford, MLT	780-431-8705 kirsten.hannaford@blood.ca
Supervisor, Operational Support Taunya Mielke, MLT	780-431-8737 taunya.mielke@blood.ca
Supervisor, Operational Support Tammy Bartok, MLT	780-431-8779 tammy.bartok@blood.ca

Perinatal Laboratory
Phone # 780-431-8759
Fax # 780-431-8747

Reference Laboratory
Phone # 780-431-8765
Fax # 780-431-8779

Laboratory Services Website https://blood.ca/en/hospital-services/laboratory-services

TABLE OF CONTENTS

FIGURES

TABLES

PERINATAL LABORATORY

The Perinatal Laboratory within Diagnostic Services at Canadian Blood Services provides diagnostic testing of pregnant women for blood type and red blood cell antibodies. Results from this screening assist physicians, midwives and nurse practitioners in ensuring the appropriate management of a pregnancy for both the mother and baby.

A. Testing Performed

Canadian Blood Services Perinatal Laboratory routinely performs the following tests:

- ABO/Rh blood type
- Screen for red blood cell antibodies
- Antibody Identification
- Antibody Titration
- Phenotyping
- Fetal Bleed Screening Test
- Kleihauer-Betke Test for quantitation of fetal-maternal hemorrhage
- Postnatal Testing

B. Testing Frequency

Mothers – Initial Testing: All women should be tested upon their first prenatal visit.

Mothers – 26-28 Weeks Gestation: All Rh negative women should be retested at 26-28 weeks gestation. Rh positive women should also be retested at 26-28 weeks gestation when there is only one blood group result available (usually first pregnancy) or if patient is at increased risk of allo-immunization (e.g. previous transfusion, maternal trauma or obstetrical procedure).

Mothers – Antibody Present: If the antibody is known to cause HDFN, it is recommended that specimens be submitted monthly in the first and second trimester and every two weeks in the last trimester. More frequent testing may be indicated if the antibody titre rises rapidly or if clinical monitoring mandates that additional sampling would provide helpful information. Less frequent sampling may also be recommended for antibodies that are unlikely to be clinically significant or in cases where clinical monitoring through fetal Doppler ultrasound has commenced.

Mothers – Postnatal: Following delivery, specimens from the mother and her baby should be tested if the Rh of the mother is unknown, the mother is Rh negative, the mother has a clinically significant antibody or if the baby shows signs of HDFN (i.e. anemia or jaundice). Midwives or hospitals that do not perform transfusion medicine testing should submit specimens to Canadian Blood Services. A fetal bleed screening test is performed if an Rh negative woman delivers an Rh positive baby. The Kleihauer-Betke assay is performed when the mother has a positive fetal bleed screening test.

Newborns (Cords): Cord blood or neonatal specimens must be submitted with the mother's specimen as noted above. ABO/Rh and direct antiglobulin testing is performed on cord or neonatal specimens submitted to Canadian Blood Services. The direct antiglobulin test is performed if the mother has a clinically significant

antibody or on request if the baby shows signs of HDFN (i.e. anemia or jaundice). This is especially important when the mother is Rh negative or when the mother has a clinically significant antibody. If the baby has unexpected anemia or jaundice assessment of the cord blood sample for blood group and DAT may also be helpful.

Partners: When a woman has an antibody capable of causing HDFN, specimens from the partner will be requested for ABO/Rh and antigen phenotyping. This will assist in assessing the probability of the baby being affected by the antibody. Partners' specimens may also be tested to assess Rh Immune Globulin (RhIG) eligibility of Rh negative mothers.

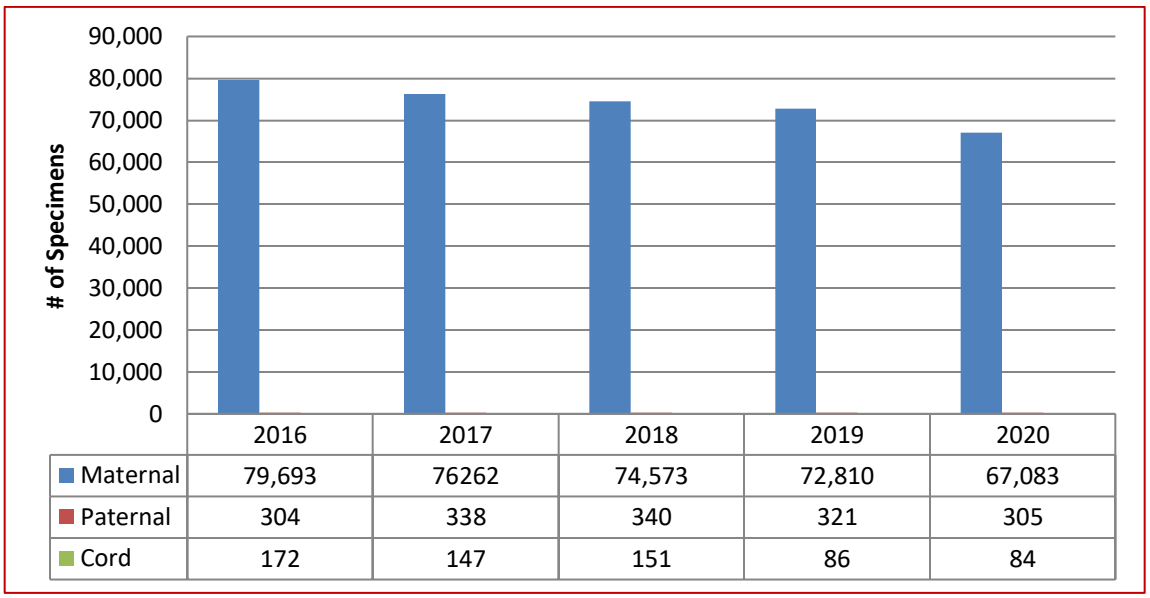
C. Specimens Tested

The data includes all women tested.

Table 1: Perinatal Specimens Tested

Specimen Type	Test Type	2016	2017	2018	2019	2020
Maternal	Type and Screen	79,693	76262	74,573	72,810	67,083
Paternal	ABO/Rh	304	338	340	321	305
Cord	ABO/Rh	172	147	151	86	84
Total # of Specimens Tested		**80,169**	**76,747**	**75,064**	**73,217**	**67,472**
Total # of Patients Tested		**Not reported**	**Not reported**	**Not reported**	**Not reported**	**60,639**

Figure 1: Total Perinatal Specimens Tested



Antibodies Identified

In 2020, a total of 419 antibodies were reported (see *Table 2*). This is lower than higher where 381 antibodies were reported. Of 419 antibodies identified in 2020, eighty-four (84) women had multiple antibodies. Passive anti-D data has been excluded from the preceding numbers.

Antibodies identified are considered to be clinically significant if they have been reported to cause HDFN. The most common clinically significant antibodies identified were: anti-E, anti-c, anti-D, anti-K, anti-M (IgG), (see *Figure 2*) which together represented 85% of the total antibodies identified. IgG Anti-M can be considered clinically significant as it may cause HDFN and/or delayed neonatal anemia in rare cases.
Titres for 15 of the clinically significant antibodies increased from non-critical to critical levels during the pregnancy with a total of 53 antibody titres at critical levels (see *Table 3*). Recommendations were made for all patients with a critical titre level (current or previous pregnancy) and all Kell system antibodies to be referred to a High-Risk Fetal Assessment Clinic for further follow-up and monitoring during pregnancy.

Table 2: Total Number of Perinatal Antibodies Detected

Maternal Antibodies Identified					
Clinically Significant Antibodies	**2016**	**2017**	**2018**	**2019**	**2020**
Anti-D	58	56	48	54	52
Anti-C	13	20	26	6	11
Anti-Cw	1	0	0	0	
Anti-c	43	43	65	29	25
Anti-E	106	108	150	135	121
Anti-e	6	10	4	7	9
Anti-f	0	0	0	0	
Anti-G	1	6	6	2	2
Anti-K	53	59	70	52	43
Anti-M*	29	40	52	38	36
Anti-S	7	11	13	4	8
Anti-s	1	1	0	2	2
Anti-U	0	0	2	1	
Anti-Fya	12	18	12	4	7
Anti-Fyb	0	1	3	1	
Anti-Jka	18	30	28	20	30
Anti-Jkb	1	2	4	3	3

Maternal Antibodies Identified					
Anti-JK3	0	0	0	0	1
Anti-Lua	2	0	2	1	
Anti-Lub	1	0	2	1	
Anti-Dia	0	0	0	1	1
Anti-Kpa	0	0	2	0	
Anti-Wra	5	2	5	1	2
Anti-Jsa	0	1	0	0	
Anti-Mia	0	2	1	1	
Anti-Joa	0	0	1	0	
Anti-Yta	0	0	2	1	
Anti-Mur	0	0	1	0	
Anti-PP1Pk	0	0	1	0	
Anti-Sc2	0	0	0	1	
Anti-Cob					1
Panreactive Autoantibody					16
Antibody to a Low Prevalence Antigen					1
Total	**357**	**410**	**500**	**364**	**371**

*Anti-M – IgG antibody detected

Clinically Insignificant Antibodies	**2016**	**2017**	**2018**	**2019**	**2020**
Anti-A1				10	2
Anti-Lea	8	12	20	11	15
Anti-Leb	1	1	3	3	2
Anti-N	1	2	1	2	1
Anti-P1	0	1	2	1	
Anti-VS	1	0	0	0	
Cold agglutinin					9
Unidentified Antibody					21
Passive Anti-D *(not included in totals)*	497	680	555	855	726
TOTAL: Clinically Insignificant Antibodies	**11**	**16**	**26**	**17**	**18**

Table 3: Perinatal Patient Antibody Titres 2020

Antibody	Critical Level	Non-Critical Level	Non-Critical to Critical
Anti-C		9	
Anti-c	2	24	2
Anti-Ce		2	
Anti-CG		4	
Anti-Cw		1	
Anti-D	14	32	8
Anti-D/C/G		1	
Anti-DC	2	1	1
Anti-DE		1	
Anti-DG		1	
Anti-Dia	1	1	
Anti-E	9	111	4
Anti-e	1	6	
Anti-Ec	2	2	1
Anti-Fya	1	7	
Anti-Fyb			
Anti-G		2	
Anti-Jka	1	34	1
Anti-Jkb		4	
Anti-Jk3		1	
Anti-Lub		1	
Anti-M	1	37	
Anti-Mia &/or Mur		1	
Anti-S		7	
Anti-s	1	2	1
Anti-U	1	1	1
Anti-Wra	1	6	
Anti-Vel	1		
Rh Antibody	1	1	
Anti-Cob		1	
Unidentified antibody		3	

* There are 15 critical + 33 non-critical anti-D for a total of 48, which is less than the 53 listed, as antibodies are not titred if they reached a critical titre in a previous sample or pregnancy.

Figure 2: Total Number of Perinatal Antibodies

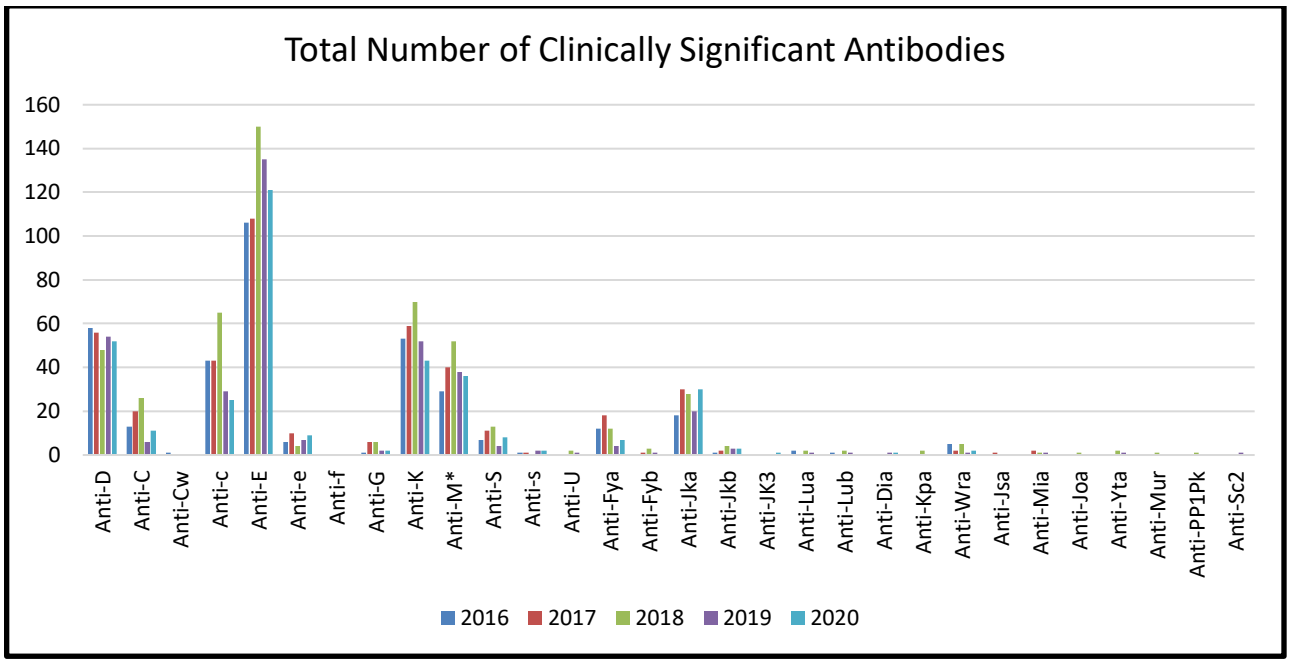


Figure 3: Frequency of Clinically Significant Antibodies

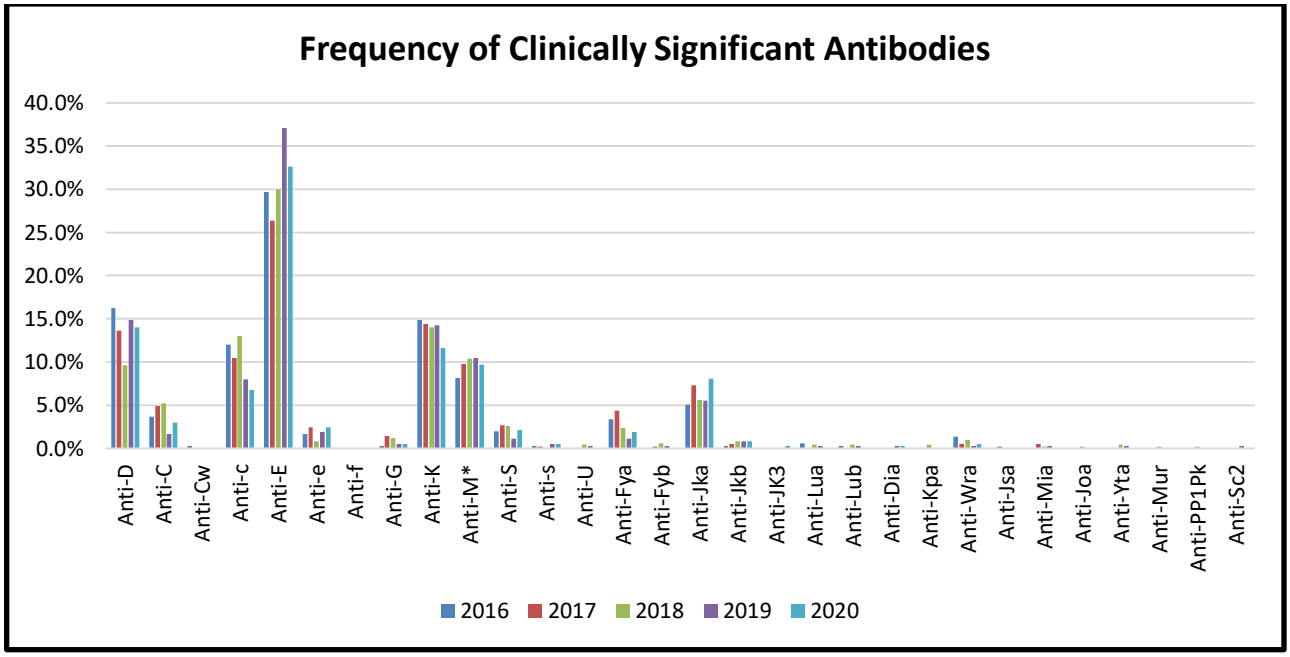


Table 4: Perinatal Combination Antibodies 2020

Combination Antibodies	Prenatal
Anti-c Anti-Fya Anti-Jkb	1
Anti-C Anti-Fyb Anti-Jka Anti-Mta Unidentified Antibody	1
Anti-c Anti-K	1
Anti-c Anti-K Unidentified Antibody	1
Anti-c Anti-Lea Unidentified Antibody	1
Anti-C Anti-S	1
Anti-C Autoantibody Unidentified Antibody	1
Anti-C Panreactive Autoantibody	1
Anti-C Unidentified Antibody	1
Anti-D Anti-C	6
Anti-D Anti-C Anti-Jka	1
Anti-D Anti-E	2
Anti-D Anti-G	1
Anti-E Cold Agglutinin Unidentified Antibody	1
Anti-E Anti-c	11
Anti-E Anti-c Anti-Cw Anti-Lea Anti-Leb Unidentified Antibody	1
Anti-E Anti-c Anti-Jka	1
Anti-E Anti-c Anti-Wra	2
Anti-E Anti-c Anti-Wra Unidentified Antibody	1
Anti-E Anti-Fya	2
Anti-E Anti-K	3
Anti-E Anti-K Unidentified Antibody	2
Anti-E Anti-Lea	2
Anti-E Anti-S	1
Anti-E Anti-S Anti-Jka Unidentified Antibody	1
Anti-e Panreactive Autoantibody	1
Anti-E Unidentified Antibody	4
Anti-e Unidentified Antibody	1
Anti-Fyb Anti-Jka	1
Anti-Jka Anti-Wra	1
Anti-K Anti-Lea	1
Anti-K Anti-Jka	2
Anti-K Anti-Kpa Unidentified Antibody	1
Anti-K Unidentified Antibody	1
Anti-Lea Anti-Leb	1

Combination Antibodies	Prenatal
Anti-Mia Anti-Mur	1
Anti-N Anti-S	1
Anti-N Cold Agglutinin	1
Anti-S Anti-Wra Autoantibody Unidentified Antibody	1
Anti-S Panreactive Autoantibody	1
Anti-s Unidentified Antibody	1
Anti-Sc1 Unidentified Antibody	1
Anti-Wra Unidentified Antibody	1
Anti-Yta Unidentified Antibody	1
Cold Agglutinin Unidentified Antibody	1
Panreactive Autoantibody Cold Agglutinin	3
Panreactive Autoantibody Unidentified Antibody	1
Total	75

REFERENCE LABORATORY

The Reference Laboratory, Edmonton Diagnostic Services provides testing for hospital transfusion medicine laboratories. Hospital patients who are repeatedly transfused may develop red cell antibodies and as a result may have difficulty in tolerating transfusions. Diagnostic Services has specialized and experienced technologists that assist and provide consultation to hospital transfusion medicine laboratories. The Reference Laboratory identifies red cell antibodies, blood group discrepancy resolution, direct antiglobulin testing, fetal bleed screening and other serological testing.

Staff within our department may collaborate with other references laboratories such as the National Immunohematology Reference laboratory (NIRL).

Diagnostic Services Red Cell Antibody Investigations

In 2020, hospitals have referred 248 requests for red cell antibody identification.

Diagnostic Services provides support to hospitals in Alberta, Northwest Territories, northeastern British Columbia and Lloydminster, Saskatchewan. Referring hospitals have different capabilities and expertise in resolving red cell antibody investigations. Some hospitals have limited reagents for antibody identification or phenotyping of patient or donor units. Others have access to a wider variety of reagent red cell panels and methods as well as on site immunohematology expertise. A few hospital transfusion medicine laboratories have the resources to resolve the majority of serological problems and send only complex investigations for additional serological or genotyping studies.

Canadian Blood Services, Diagnostic Services provides consultation and testing support including antibody investigation, advanced or alternative techniques where required, and recommendations for compatibility testing methods and selection of appropriate donor unit phenotypes if necessary.

Reporting may include interim, final and supplemental reports, depending on the urgency of the testing, the need for patient transfusion and the complexity of the investigation. When a new antibody is identified by the Diagnostic Services Laboratory, a patient wallet card may be provided.

A. Testing Performed

The Reference Laboratory routinely performs the following tests:

- ABO/Rh blood type
- Screen for red blood cell antibodies
- Antibody Identification, if antibodies are detected
- Phenotyping
- Direct Antiglobulin Test
- Elution and Adsorption
- Cold Agglutinin Screen

Antibody Screening is routinely performed by solid phase testing. Combinations of solid phase testing and indirect antiglobulin tube testing using PEG for enhancement are the primary antibody identification methods. PEG IAT is also the manual back-up method for antibody screening.

As a Reference Laboratory, the laboratory performs complex antibody investigations.

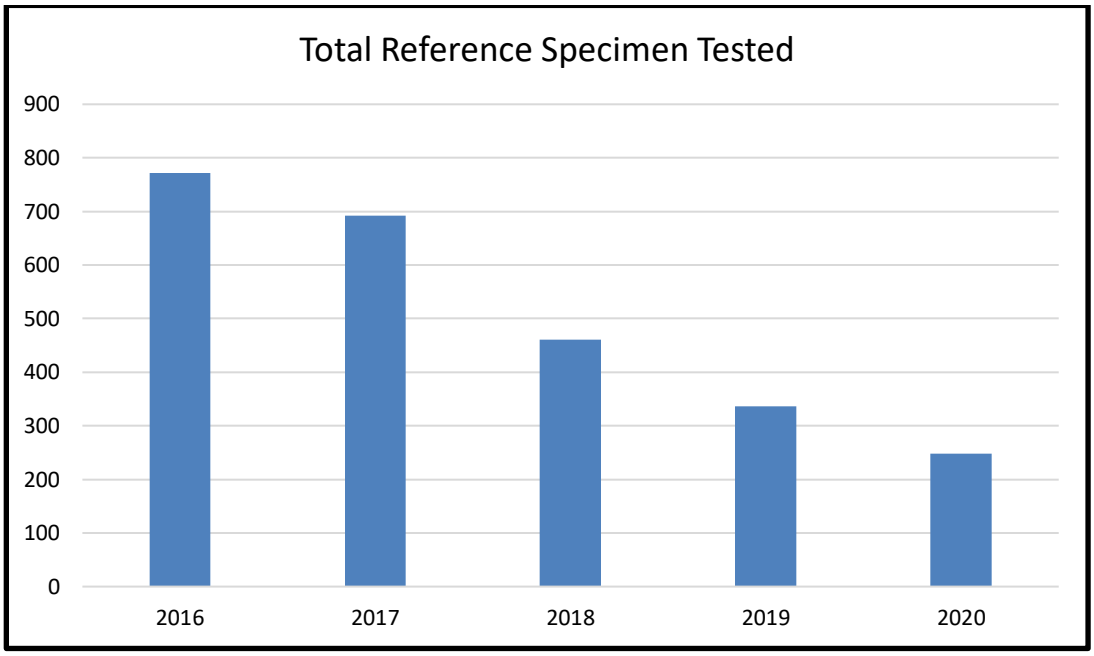
B. **Specimens Tested**

The data in this report reflects a calendar year period to enable better correlation to other government statistical data (Statistics Canada birth statistics).

Table 5: Reference Specimens Tested

Specimen Type	2016	2017	2018	2019	2020
Total Reference Antibody Investigations	772	692	461	337	248

Figure 4: Total Reference Specimens Tested



C. Antibodies Identified

In 2020, a total of 281 antibodies were reported (see *Table 6*). The total number of antibodies detected is higher than in 2019, but the distribution of the most common antibodies remains consistent. One hundred and thirty-eight (138) patients had antibodies identified, and of these, thirty-nine (39) patients had multiple antibodies.

Antibodies identified are considered to be clinically significant if they have been reported to cause acute or delayed hemolytic transfusion reactions. The most common clinically significant antibodies identified were anti-D, anti-C, anti-E, anti-K and anti-Jk^a (see *Figure 5*) which together represented 27% of the total antibodies identified.

Table 6: Total Number of Reference Antibodies Detected

Reference Antibodies Identified (Including Passive D) – *Prior to 2019 numbers included Crossmatch samples.					
Antibodies	**2016**	**2017**	**2018**	**2019**	**2020**
Anti-D	31	15	14	8	10
Anti-C	19	10	11	4	7
Anti-Cw	1	2	1	2	1
Anti-c	9	8	10	2	6
Anti-E	65	57	52	25	24
Anti-e	7	5	5	4	2
Anti-G					1
Anti-K	54	44	47	24	25
Anti-k	1	0	0	0	
Anti-Kpa					1
Anti-M	9	18	8	9	4
Anti-N	0	0	0	0	1
Anti-S	3	8	6	1	4
Anti-s	0	0	0	2	1
Anti-U					1
Anti-Fya	10	16	9	3	5
Anti-Fyb	1	1	1	0	1
Anti-Jka	13	16	12	9	10
Anti-Jkb	3	2	2	0	7
Anti-Lea	8	3	2	2	3
Anti-Leb	0	0	0	0	
Anti-Lua	1	1	0	0	
Anti-Lub	1	0	0	0	
Anti-Fy3	0	0	1	0	
Anti-Kpa	1	1	3	1	

Reference Antibodies Identified (Including Passive D) – *Prior to 2019 numbers included Crossmatch samples.					
Anti-Wra	1	2	0	2	4
Anti-A1	2	2	1	0	
Anti-P1	1	0	1	0	
Anti-Cob	0	0	0	0	1
Anti Yta	0	1	0	0	
Anti-IH	0	0	0	1	
Anti-JMH	0	0	0	1	
Panreactive Autoantibody				16	22
Antibody to a Low Prevalence Antigen*				0	1
Unidentified Antibody*				6	19
Cold Agglutinin*				20	18
Autoantibody*				1	2
Panreactive Antibody*				5	12
Passive Anti-D*					88
Total	**241**	**212**	**186**	**148**	**281**

*Not counted in previous years

Figure 5a: Total Number of Reference Antibodies

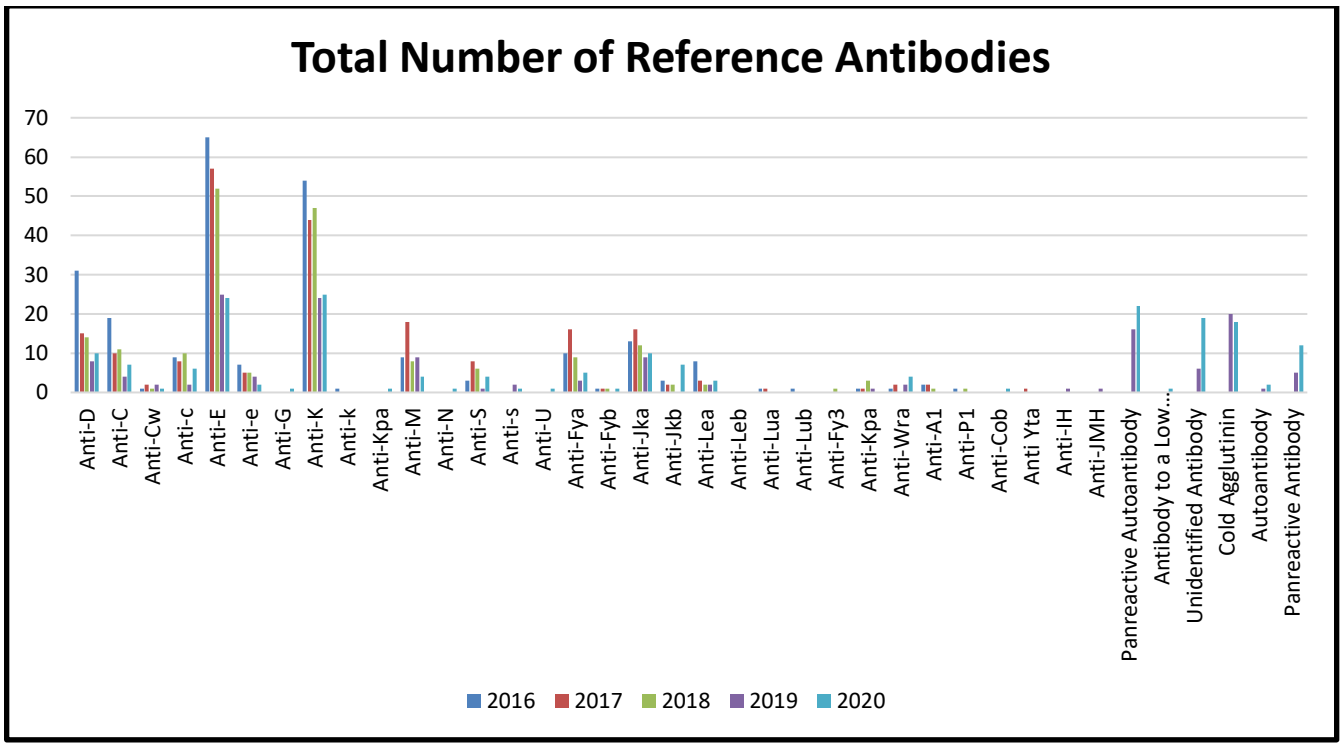


Figure 5b: Frequency of Reference Antibodies

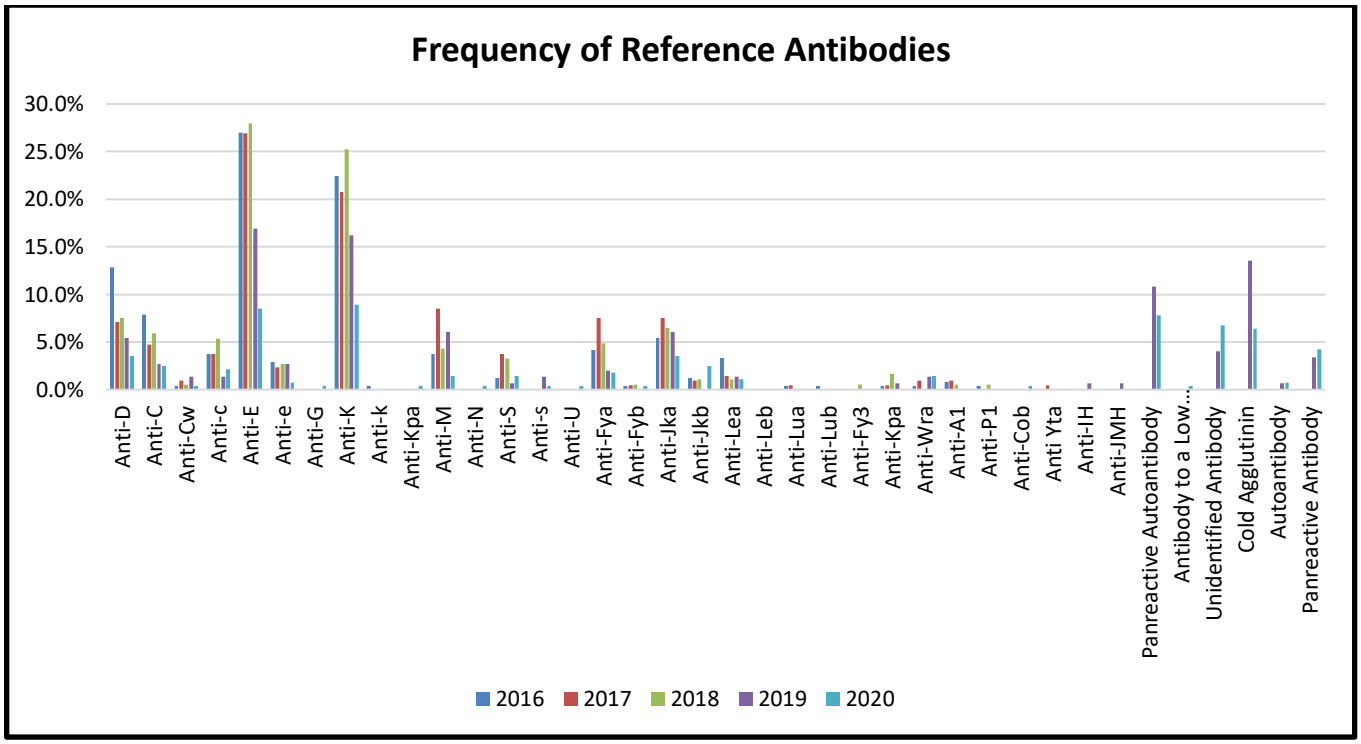


Table 7: Combination Reference Antibodies 2020

Combination Antibodies	Serology
Anti-c Anti-Jkb	1
Anti-C Anti-K Anti-Wra Unidentified Antibody	1
Anti-C Panreactive Antibody Cold Agglutinin	1
Anti-C Unidentified Antibody	1
Anti-Cw Anti-K	1
Anti-Cw Anti-K Autoantibody Cold Agglutinin	1
Anti-D Anti-C	1
Anti-D Anti-C Anti-Fya	1
Anti-E Anti-c	3
Anti-E Anti-c Cold Agglutinin Unidentified Antibody	1
Anti-E Anti-Fya Anti-Jkb Cold Agglutinin	1
Anti-e Anti-Fyb	1
Anti-E Anti-K	1
Anti-E Anti-K Anti-Kpa Anti-Wra	1
Anti-E Anti-Lea Unidentified Antibody	1
Anti-E Anti-Lua	1
Anti-E Anti-S Anti-K Anti-Fya	1
Anti-E Unidentified Antibody	1
Anti-Fya Panreactive Antibody Cold Agglutinin	1
Anti-K Anti-Fya	1
Anti-K Anti-Jkb Cold Agglutinin	1
Anti-K Anti-Kpa	2
Anti-K Panreactive Antibody	1
Anti-S Cold Agglutinin Unidentified Antibody	1
Anti-s Unidentified Antibody	1
Autoantibody Cold Agglutinin	1
Cold Agglutinin Unidentified Antibody	4
Panreactive Antibody Cold Agglutinin	1

Combination Antibodies	Serology
Panreactive Antibody Unidentified Antibody	1
Panreactive Autoantibody Cold Agglutinin	2
Panreactive Autoantibody Panreactive Antibody	1

FETAL GENOTYPING

Canadian Blood Services in Alberta refers specimens for fetal genotyping on maternal plasma to the International Blood Group Reference Laboratory (IBGRL) of the National Health Services (NHS) in Bristol, United Kingdom. Amniotic fluid samples are rarely sent to the Versiti (formerly Blood Center of Wisconsin) for fetal genotyping. Testing on maternal blood samples is preferred because sample collection does not represent a risk to the fetus.

Specimens are submitted through the Maternal Fetal Medicine clinics in Edmonton or Calgary and are accepted if they meet the following criteria:

- The mother has an antibody capable of causing hemolytic disease of the fetus/newborn (HDFN), AND
- The father is heterozygous for the corresponding antigen (or unknown), AND
- The antibody titre has reached a critical level, OR
- There has been a previous fetus/newborn affected by HDFN, OR
- The antibody is anti-K, OR
- Amniocentesis is being performed for another indication (ie advanced maternal age), even if the mother's antibody titre is at a non-critical level.

Discussion with a Canadian Blood Services physician is required prior to submitting specimens for testing outside of these criteria.

The number of specimens referred for fetal genotyping has ranged between 18 and 24 specimens in recent years.

Table 8a: Fetal Genotyping Results Summary

	2016	2017	2018	2019	2020
Total samples sent	23	24	26	31	32
# of patients tested	**22**	**24**	**21**	**28**	**28**
# of patients not requiring MFM follow-up. (Fetus tested negative for the corresponding antigen)	**9**	**5**	**12**	**8**	**11**

Table 9b: Fetal Genotyping Results Summary 2020

Patient	Maternal Antibody	Predicted Fetal Phenotype	Follow-up Required
1	Anti-K	K Neg	No
2	Anti-D	RhD Pos	Yes
3	Anti-E	RhE Neg	No
4	Anti-E, c	Rhc Neg & RhE Neg	No
5	Anti-K, E	K Neg & RhE (NSQ)	Yes
6	Anti-D	RhD Pos	Yes
7	Anti-D	RhD Pos	Yes
8	Anti-E	RhE Neg	No
9	Anti-E, c	RhE Pos (c not tested)	Yes
10	Anti-E	RhE Pos	Yes
11	Anti-D	RhD Neg	No
12	Anti-D	RhD Pos	Yes
13	Anti-K	K Inconclusive	Yes
14	Anti-K	K Neg	No
15	Anti-K	K Inconclusive	Yes
16	Anti-D	RhD Pos	Yes
17	Anti-D	RhD Pos	Yes
18	Anti-D	RhD Pos	Yes
19	Anti-D	RhD Pos	Yes
20	Anti-D, C	RhD Pos (C not tested)	Yes
21	Anti-K	K Neg	No
22	Anti-K	K Pos	Yes
23	Anti-E	RhE Pos	Yes
24	Anti-E	RhE Neg	No
25	Anti-E, c	RhE & Rhc Inconclusive	Yes
26	Anti-K	K Neg	No
27	Anti-E, c	RhE Pos & Rhc Pos	Yes
28	Anti-E	RhE Neg	No
29	Anti-D	RhD Pos	Yes
30	Anti-E	RhE Neg	No
31	Anti-K	K Neg	No
32	Anti-D	RhD Pos	Yes

RHD RED CELL GENOTYPING

Canadian Blood Services in Alberta provides RHD red cell genotyping for facilities in cases where the predicted RhD status of a patient cannot be determined due to discrepant, weak or inconclusive serological RhD testing. The following 2020 testing algorithm was used within Canadian Blood Services laboratories to determine which samples require RHD genotyping.

Figure 6: RhD Testing Algorithm

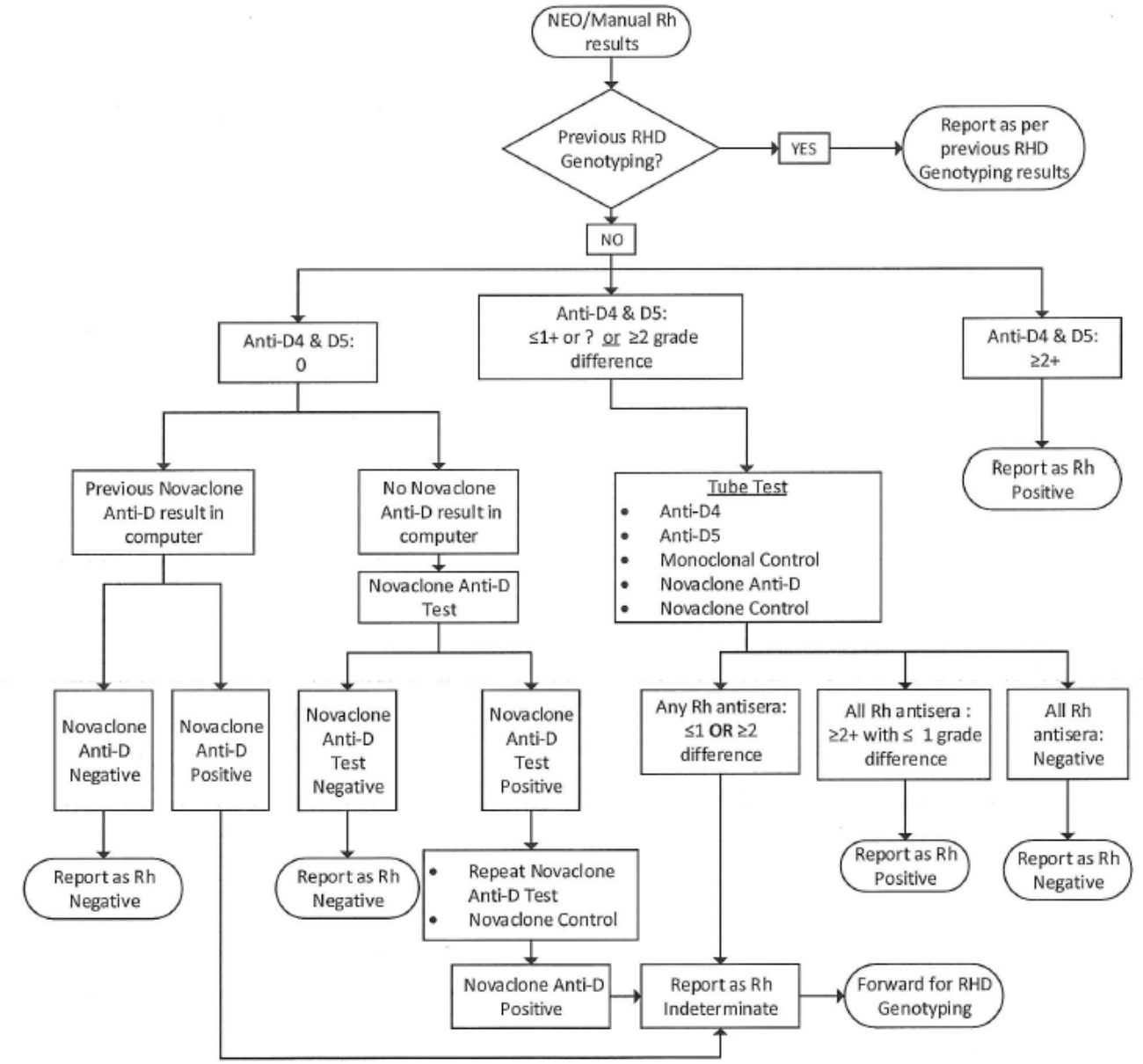


Table 10: Patient # - RHD Type/Result 2020

2020 RHD Genotyping Results	
RHD Variant	**Number Identified**
Normal RHD	**509**
Weak D type 1	217
Weak D type2	**114**
Weak D type 3	78
Weak D type 4.0 or 4.3	**47**
Weak D type 4.1	11
RHD Deletion	**25**
DAR	34
RHD psi (Pseudogene)	**6**
DAU2	8
DAU3	**1**
DAU4 or DV type 5	8
DAU5 or DV type1 or DBS2	**1**
DCSI or DFV	3
DFR or DFR3	**2**
DHMi	4
DIIIc	**1**
DIV type 4	3
DOL or DOL2	**2**
DV type 2 or DBS1	3
DVI	**4**
Weak D type 11	1
Weak D type 14 or 40 or 51	**1**
Weak D type 5	4
DIIIa-CE(4-7)-D	**3**
Normal RHD with a variant allele (D+)	19
Heterozygous variant alleles (D-)	**37**
Total	**1146**

The array used for RHD genotyping (Immucor's BioArray BeadChip™ Molecular Assay) is extensive and can detect the most common mutations of the *RHD* gene. The most common variants detected are weak D type 1, weak D type 2 and weak D type 3. Individuals with these phenotypes can be safely treated as Rh positive as it has been established that they will not form alloanti-D. Patients with any other weak or partial D phenotypes may be capable of forming alloanti-D and should be treated as Rh negative. When none of the variants present on the array are detected, the software will produce a result of "Possible D". Prior to 2018, it was decided to err on the side of caution, and Canadian Blood Services recommended that patients with a result of "Possible D" be treated as Rh negative. However, based on clinical experience and sequencing studies, it has been confirmed that the vast majority of these patients do not have a mutation of the *RHD* gene. In 2018 the reporting was changed to reflect this and patients with results of "Possible D" were reported as Rh positive individuals.

Table 11: RHD Genotyping – Number of Rh Negative and Rh Positive Predicted Phenotypes

	2016	2017	2018	2019	2020
Rh Negative	338	390	153	280	209

QUALITY INDICATORS

The laboratories monitor many quality indicators and the two which are most relevant to this document are turnaround times and rejected specimens which are presented below.

A. Turnaround Times

To ensure timely reporting of patient test results, Canadian Blood Services monitors turnaround time (TAT) from when specimens are received at Canadian Blood Services in Edmonton to the time when the results are available. Since monitoring of this quality indicator began in 2008, the percentage of perinatal specimens has been close to the predefined TAT threshold. The percentage of reference specimens has consistently met the predefined TAT threshold. Samples whose testing failed to meet expected TATs are usually those where clinically significant antibodies are detected or where difficulty in finding compatible blood is encountered.

Table 12: Turnaround Time – Routine Criteria by Specimen Type

Specimen Type	Expected Turnaround Time	Expected % of Specimens Which Meet or Exceed Expected TAT
Routine Perinatal	72 hours	85%
Reference Testing	72 hours	85%

Table 13: Turnaround Time – Perinatal Routine TAT

Turnaround Time (TAT)	2016	2017	2018	2019	2020
% of Specimens Tested within 72 hours	84%	80%	88%	85%	85%
% of Specimens Tested > 72 hours	16%	20%	12%	15%	15%

Figure 7: Perinatal Routine TAT

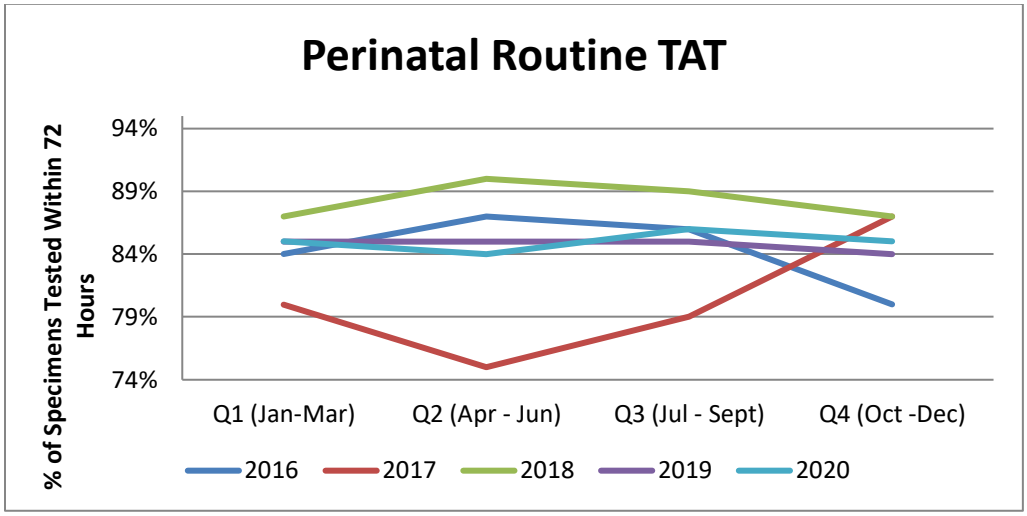
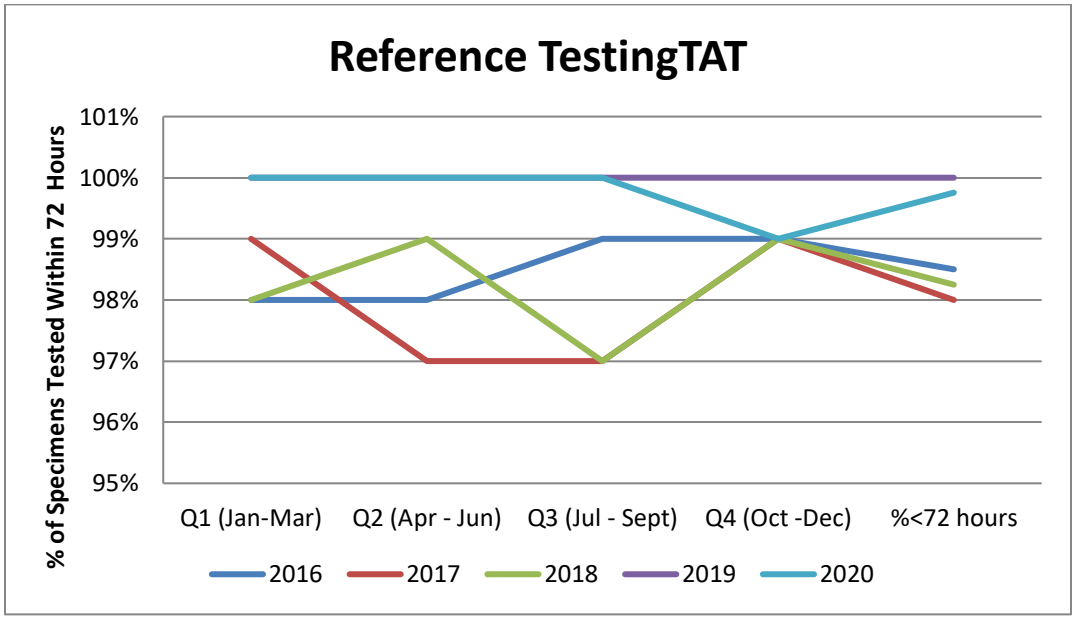


Table 14: Turnaround Time – Reference Specimens

Turnaround Time (TAT)	2016	2017	2018	2019	2020
% of Specimens Tested within 72 hours	98%	99%	99%	100%	100%
% of Specimens Tested > 72 hours	2%	1%	1%	0%	0%

Figure 8: Reference TAT



B. Rejected Specimens

Each time a specimen is rejected, a reason for rejection is entered into our Laboratory Information System. This data is then retrieved and analysed on a quarterly basis for both reference samples which are coming from hospitals and for perinatal samples which are primarily collected at community collection sites. The Diagnostic Services Laboratory is following the provincial specimen rejection guidelines for Alberta.

The reasons for rejecting specimens in the reference and the perinatal laboratories are somewhat different.

For perinatal specimens, the most common reasons for rejecting a sample for testing are patient identification labelling errors and duplicate requests for testing (duplicate specimens). Testing requests are rejected if another sample from the patient was tested within the previous 96 hours. Often a duplicate test request sample is collected when the patient has seen their family physician and then sees their obstetrician shortly after. We do ensure that the report from the initial testing is sent to the second physician making the request. Health care professionals can access Canadian Blood Services reports for Alberta patients on Netcare, Alberta's Electronic Health Record.

Table 15: Quarterly Rejection Rates – Perinatal Specimens 2020

Rejection Category	Q1	Q2	Q3	Q4
Requisition	28	19	30	40
Specimen	168	66	93	102
Discrepancies Between Requisition & Specimen	10	4	14	8
Discrepancies Between Current Requisition & Historical Records	0	0	0	0
Other (Duplicates, etc.)	4	7	6	3
Total # specimens rejected	210	96	143	153
Total # specimens received	21029	14061	16283	17772
Rejections as a % of total	1.0%	0.7%	0.9%	0.9%

Figure 9: Perinatal Rejection Reasons 2020

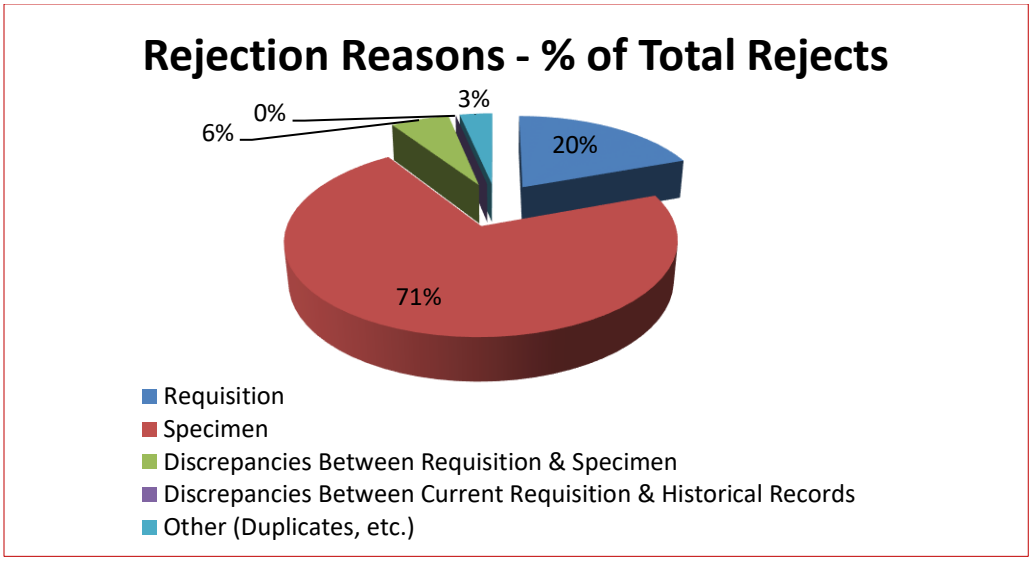
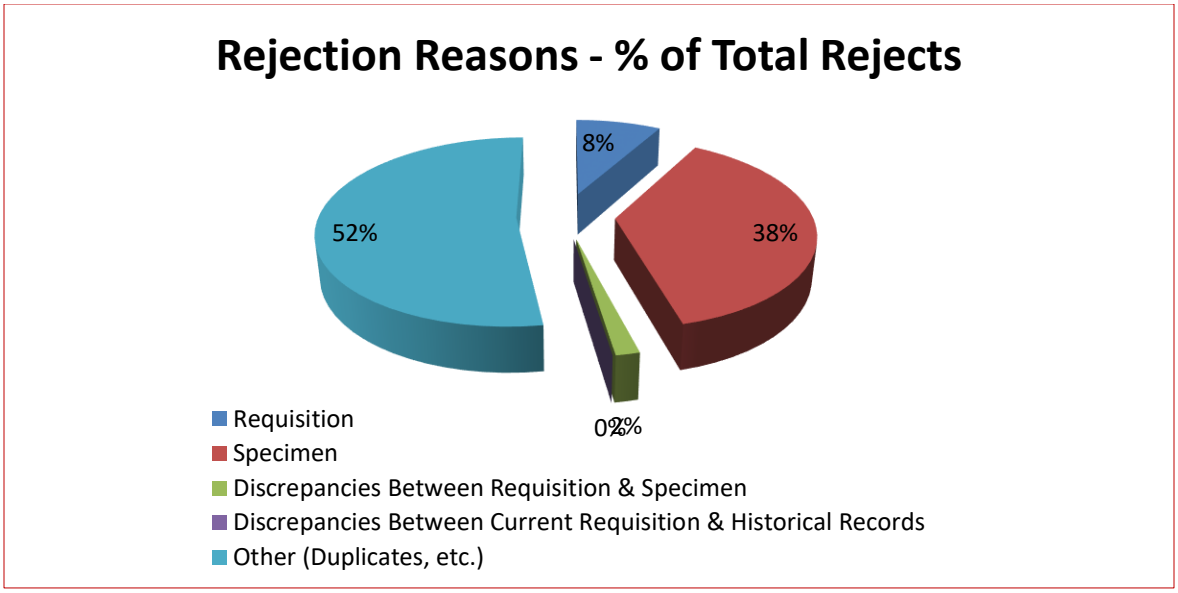


Table 16: Quarterly Rejection Rates – Reference 2020

Rejection Category	Q1	Q2	Q3	Q4
Requisition	1	0	2	2
Specimen	7	4	4	8
Discrepancies Between Requisition & Specimen	1	0	0	0
Discrepancies Between Current Requisition & Historical Records	0	0	0	0
Other (Duplicates, etc.)	9	2	12	9
Total # specimens rejected	18	6	18	19
Total # specimens received	434	348	483	597
Rejections as a % of total	4.1%	1.7%	3.7%	3.2%

Figure 10: Reference Rejection Reasons 2020



DIAGNOSTIC SERVICES UPDATES 2020

Updates pertain to all Diagnostic Services sites within Canadian Blood Services: Vancouver, Edmonton, Winnipeg and Brampton

Vancouver	**Implementation of Electronically Fillable forms onto www.blood.ca** Perinatal Screen Request MM 1000107776 (2020-05-04) converted to electronic fillable form and posted on www.blood.ca. 2020-06-01 Diagnostic Services Antibody Investigation Request Form F801802 (2020-06-15)
Edmonton	**Implementation of the New CBS PN Requisition- 2020-01-07** A new CBS PN requisition was implemented in Edmonton on 2020-01-07 (F801780)
	Implementation of Electronically Fillable forms onto www.blood.ca Request for Perinatal Testing for Red Blood Cell Serology F801780 converted to electronic fillable form and posted on www.blood.ca. 2020-06-01. Request for RHD Genotyping (EN & FR) F801723, Request for Patient Blood Group Genotyping (EDM) F801221 and Request for Serological Investigation (EDM) F801897converted to electronic fillable form and posted on www.blood.ca. 2020-09-01
	CSPSA Accreditation Renewed- 2020

Winnipeg	**Preparation of Red Cell Aliquots for Neonatal and Pediatric Transfusion** The process to implement the preparation of small volume red cell aliquots- requested as either patient dose-specific (volume specific and irradiated) or as stock (standard size and non-irradiated) was implemented on 2020-01-27.
	Implementation of Electronically Fillable forms onto www.blood.ca Request for Perinatal Testing 1000107827 (Rh101) effective 2020-06-18 Request for Pre-Transfusion Testing 1000107837 (XM101A) effective 2021-01-11 Request for Blood Components 1000107830 (XM101) effective 2021-01-11 Request for Miscellaneous Testing 1000107834 (XM104) effective 2021-01-11 Transfusion Reaction Investigation 1000107838 (CM105) effective 2021-01-11 Platelet Immunology Laboratory Requisition 1000104677 effective 2021-01-11 TRALI Patient Data form 1000104723 effective 2021-01-11
	Discontinuation of 40 Week RhIG treatments Medical collaboration with Obstetrics department to review the value of RhIG treatment at 40 weeks in light of practice to treat at delivery resulted in a joint decision to discontinue the long-standing practice to treat at 40 weeks. Although the discussions and decisions were made in 2020, the change was effective 2021-01-15
	Incorporation of clinical interpretive comments on PI reports for FNAIT testing As a customer satisfaction initiative, standardized comments were developed that would be included for the common results' scenarios found when Maternal, Paternal, and sometimes Neonatal samples are submitted for Fetal/Neonatal Allo-Immunization Testing (FNAIT). Implemented on 2020-07-27.

-

Presentations / Abstracts / Publications Listing
M Farrell,[1] G Clarke,[1,2] G Barr, [2] J Hannon[1,2] **Monitoring of Prenatal Patients Using a Combined Antibody Titre for Rh and non-Rh Antibodies** Transfusion Medicine, Volume 30 Issue 3 January 19, 2020
Antoine Lewin, Shadhiya al Khan, Lynnette Beaudin, Lynne Meilleur, Gwen Clarke, Lucie Richard. **Report on the 19th International Society of Blood Transfusion Platelet Immunology Workshop 2018** Vox Sanguinis/ Volume 115, Issue 8/ p. 767-782, 28 May 2020
Lhevinne Ciurcovich/Heba Abukhadra **Back to Typing School – A Primer on Resolving Blood Grouping Anomalies",** Presentation for CBS/ PBCO Education Day, 01 Oct 2020