TRAINING UPDATE

Lab Location:	SGAH and WAH	**Date Implemented:**	12.8.2014
Department:	Blood Bank	**Due Date:**	12.31.2014

DESCRIPTION OF PROCEDURE REVISION

Name of procedure:

Antigen Typing

Description of change(s):

1. Updated SOP to reflect changes to antisera (new monoclonal antisera in use for Jka, Jkb, Fya, S, s).
2. Created new antigen typing mnemonics for all antigens typed during molecular testing (we can now enter all in the LIS).
3. Updated billing: Billing should be performed on TRRC sample instead of TS unless we are setting up units for a patient with an antibody.
4. Added new second tech review requirements. See the bottom of the form.
5. Updated form.

Electronic Document Control System

Quest Diagnostics

Document No.: WAH.BB08[3]
Title: ANTIGEN TYPING
Owner: LESLIE.X.BARRETT LESLIE BARRETT
Status INWORKS
Effective Date: 04-Jan-2015 **Next Review Date:**

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Technical SOP

Title	**Antigen Typing**	
Prepared by	Leslie Barrett	Date: 10/16/2009
Owner	Stephanie Codina	Date: 3/26/2012

Laboratory Approval	**Local Effective Date:**	
Print Name and Title	**Signature**	**Date**
Refer to the electronic signature page for approval and approval dates.		

Review		
Print Name	**Signature**	**Date**

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1. TEST INFORMATION

Assay	Method/Instrument	Order Code	Local Code
Antigen Typing	Tube test	N/A	N/A

Synonyms/Abbreviations
Red Cell Typing, Red Cell Phenotyping

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2. ANALYTICAL PRINCIPLE

The procedures used with these reagents are based on the principle of agglutination. Normal red blood cells will agglutinate in the presence of antibody directed against antigens on those cells. No agglutination indicates the absence of the demonstrable antigen or antibody.

3. SPECIMEN REQUIREMENTS

Refer to procedure 'Sample Specifications for Blood Bank Testing' for labeling requirements.

3.1 Patient Preparation

N/A

3.2 Specimen Type & Handling

Criteria		
Type -Preferred **-Other Acceptable**	Preferred: EDTA Other acceptable: ACD, CPD, CPDA-1, CP2D, oxalate, or clotted blood	
Collection Container	Vacutainer or donor unit segments	
Volume - Optimum **- Minimum**	1 ml 1 ml	
Transport Container and Temperature	Transport vacutainer at room temperature, donor unit on wet ice 1 to 10 C	
Stability & Storage Requirements	Room Temperature:	within 8 hours
	Refrigerated:	$2 - 6^{o}C$ Patient samples: • 48 hours for pre-transfusion samples • Post-transfusion samples may be tested for the life of the sample (example = workup of suspected delayed serologic transfusion reaction) Donor units: Up to the expiration date of the unit for transfusion; 90 days past unit expiration for transfusion reaction investigations
	Frozen:	N/A
Timing Considerations	EDTA samples must be tested within 48 hours of collection.	
Unacceptable Specimens & Actions to Take	Heparin, sodium citrate, or vacutainers with gel separators are not acceptable and must be recollected.	
Compromising Physical Characteristics	Specimens must be aseptically collected.	
Other Considerations	Not applicable	

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4. REAGENTS

Refer to the Material Safety Data Sheet (MSDS) supplied with the reagents for complete safety hazards. Refer to the section in this procedure covering "SAFETY" for additional information.

4.1 Reagent Summary

Reagents	Supplier & Catalog Number
Anti-A_1 Lectin	Immucor, Cat #12280, or equivalent
Anti C (Monoclonal) Gamma-clone	Immucor, Cat #66421, or equivalent
Anti-c (Monoclonal) Series 1	Immucor, Cat #66425, or equivalent
Anti-E (Monoclonal) Gamma-clone	Immucor, Cat #66422, or equivalent
Anti-e (Monoclonal Blend) Gamma-clone	Immucor, Cat #66424, or equivalent
Anti-Fy^a	Immucor, Cat #4816, or equivalent
Anti Fy^b	Immucor, Cat #7594, or equivalent
Anti-Jk^a	Immucor, Cat #4812, or equivalent
Anti-Jk^b	Immucor, Cat #4813, or equivalent
Anti K (Monoclonal) Gamma-clone	Immucor, Cat #66451, or equivalent
Anti-Lea (Murine Monoclonal) Gamma-clone	Immucor, Cat #4861, or equivalent
Anti-Leb (Murine Monoclonal) Gamma-clone	Immucor, Cat #4864, or equivalent
Anti-M (Murine Monoclonal) Gamma-clone	Immucor, Cat #4802, or equivalent
Anti-N (Murine Monoclonal) Gamma-clone	Immucor, Cat #4807, or equivalent
Anti-P_1 (Murine Monoclonal) Gamma-clone	Immucor, Cat #4501, or equivalent
Anti-S	Immucor, Cat #4814, or equivalent
Anti-s	Immucor, Cat #4815, or equivalent
Anti-IgG	Immucor, Cat #409210, or equivalent
Saline, 0.9%	Fisher, Cat #23062125, or equivalent

4.2 Reagent Preparation and Storage

NOTES: Date and initial all reagents upon opening. Each container must be labeled with (1) substance name, (2) lot number, (3) date of preparation, (4) expiration date, (5) initials of tech, (6) any special storage instructions; check for visible signs of degradation.
Refer to the Material Safety Data Sheet (MSDS) for a complete description of hazards. If a specific hazard is present, it will be noted in this procedure when the hazard is first encountered in a procedural step.

Reagent	Anti-IgG, Antisera listed in table 4.1
Container	10ml (anti-sera container size varies)
Storage	1-10°C
Stability	Stable until manufacturer's expiration date.
Preparation	Ready to use as supplied.

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Reagent	Saline, 0.9%
Container	10L or 20L cube
Storage	Room Temperature
Stability	Expires 30 days after open or manufacturer's expiration, whichever is sooner
Preparation	Ready to use as supplied.

5. CALIBRATORS/STANDARDS

N/A

6. QUALITY CONTROL

6.1 Controls Used

Controls	Supplier and Catalog Number
Coombs Control cells (IgG coated)	Immucor, Cat.# 2227 or equivalent
Reagent red blood cells, 2-4%	Immucor 2381 (Panoscreen), Immucor, 3023 (Panocell 10), 2332 (Panocell 16), 5020 (Panocell 20), or equivalent

6.2 Control Preparation and Storage

NOTE: Date and initial all controls upon opening. Each container should be labeled with (1) substance name, (2) lot number, (3) date of preparation, (4) expiration date, (5) initials of tech, and (6) any special storage instructions; check for visible signs of degradation.

Control	Screening Cells (I, II, III), Panocells, Checkcells
Preparation	Resuspend red cells before use by gently inverting each vial several times.
Storage/Stability	1-10C, Stable until manufacturer's expiration date.

6.3 Frequency

Antisera must be tested with positive and negative controls each day of use. When possible, heterozygous positive cells should be used.

6.4 Tolerance Limits

Control material must perform as expected.

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- Positive control must demonstrate macroscopic agglutination at a strength ≥2+ at any test phase.
- Negative control must show no macroscopic agglutination at any test phase (except check cells).

If controls do not react appropriately, results are invalid and the testing must be repeated. Check the following:

- Verify proper technique was used.
- Verify centrifuge set at appropriate speed.
- Verify cell washer is functioning properly.
- Check reagent dating.
- Verify that the appropriate positive and negative control cells were used.
- Check for control/red cell material contamination.

6.5 Review Patient Data

N/A

6.6 Documentation

Manual antigen typing is documented on the Antigen Typing Form. Interpretations are entered into the laboratory information system. Result review is performed by another tech within 16 hours.

6.7 Quality Assurance Program

Participation in CAP proficiency testing.

7. EQUIPMENT and SUPPLIES

7.1 Assay Platform

N/A

7.2 Equipment

Serological centrifuge
Automatic cell washer
37°C dry heat incubator
Timer
Agglutination Viewer

7.3 Supplies

12 x 75 mm test tubes and rack
Transfer pipettes
Saline, 0.9%

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8. PROCEDURE

NOTE: For all procedures involving specimens, buttoned lab coats, gloves, and face protection are required minimum personal protective equipment. Report all accidents to your supervisor.

The package insert for a new lot of kits must be reviewed for any changes before the kit is used.

General Considerations

1	The following antisera are routinely stocked in house: A_1 lectin Rh o Anti-C o Anti-c o Anti-E o Anti-e Kell o Anti-K Kidd o Anti-Jk^a o Anti-Jk^b Duffy o Anti-Fy^a o Anti-Fy^b MNS o Anti-S o Anti-s o Anti-M o Anti-N Lewis o Anti-Le^a o Anti-Le^b
2	Follow the manufacturer's directions for the specific antisera. Direction circulars are kept in the notebook labeled "Manufacturer's Instructions."
3	Screening for compatible units may be accomplished several ways, usually depending on the available quantity of antisera and patient serum, and the incidence of the antigen. A. Screen for compatible units using the crossmatch if multiple antibodies are present or if there is a limited quantity of antiserum. B. Perform antigen typing first if there is a limited amount of test plasma available or if the antibody is no longer reacting in the patient plasma. C. Antigen typing and crossmatching can be performed concurrently when the patient needs blood quickly or when the antigen incidence is low.

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Step	Action
4	The patient must be typed (and shown to be negative) the first time the antibody is detected. Typing is invalid if the patient has been transfused in the past three months or has a positive DAT (IgG phase antisera only).
5	When testing for Le^a or Le^b antigens, the specimen should be tested against both antiserum to rule out spontaneous agglutination due to macromolecular additive.
6	Refer to the crossmatch procedure to determine if antigen typing is required for a particular antibody.
7	When screening donor units for multiple antigens, screen in order of incidence. A. Screen for the antigen with the highest incidence (the antigen that will have the lowest number of negative donors) first. B. Once units negative for a single antigen have been found, screen those units for the antigen with the next highest incidence. C. Continue until an appropriate number of antigen-negative units have been located. D. Screening for multiple antigens at one time wastes reagents and tech time.
8	Refer to the Galileo Echo procedures for automated antigen typing procedures and quality control processes.

Quality Control

Step	Action
1	Quality control is performed for antisera on each day of use.
2	Quality control is performed using the same method as the testing that will be performed. A. Quality control must be performed for the antisera on the Echo if the Echo will be used for testing. B. Quality control must be performed by manual tube method if manual tube method will be used for testing.
3	Whenever possible, select a heterozygous (single-dose) cell as the positive control. This will help to ensure the antisera's ability to detect weaker antigens. Heterozygous cells are generally available for all routinely-tested antigens except for Le^a and Le^b.
4	Whenever possible, select PANEL cells as antigen typing controls. This serves as periodic QC of the panel as well as the antisera.

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Step	Action
5	Patient results are invalid and must be repeated if controls do not react at strengths ≥2+, if improper control cells were used, or for any other reason that may impact the reliability of test results.
6	Quality control results are documented on the Antigen Typing Form.

Selecting Donor Units for Testing

Step	Action
1	Refer to the crossmatch procedure to help determine whether antigen-negative units are required for a particular patient.
2	Determine the prevalence of compatible units. A. If multiple antibodies are present, the prevalence can be determined by multiplying the prevalence of each antigen for which blood must be negative. B. Units should be requested from the reference laboratory when: a. The transfusion is scheduled, and time permits ordering units into inventory. b. The likelihood of finding compatible units is low (<5%). c. The statistical formula indicates more than 20 units must be screened to find the requested number of antigen negative units. d. Inventory is below normal due to a regional shortage. e. The required antiserum is temporarily unavailable. f. Workload does not allow antigen typing within the timeframe needed without impacting patient care.
3	Antigen typing on units obtained from the reference laboratory does not need to be confirmed.
4	Hints for selecting units: A. Ensure the units selected meet the recipient's transfusion criteria. B. Select fresher units for antigen typing. C. When possible, select group A or group O units. This will increase the probability that they can be used for another patient if the recipient is not transfused. However, please note multiple transfusions of non-group-specific blood products can cause ABO testing difficulties. D. When possible, select Rh-negative units when antigen-typing for C (big C) and Rh-positive units when antigen-typing for c (little c).

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Step	Action
5	Label a test tube with the full unit number, pull a segment from the unit, and place the segment in the labeled test tube. Note: When antigen typing on the Echo, use a barcoded unit label when available.
6	Pierce one end of each segment using a segment cutting device and drip the donor sample into the corresponding labeled test tube.

Manual Testing

Step	Action
1	Obtain an Antigen Typing Form and complete the following fields: A. Antisera identification (Example = anti-K or anti-E) B. Date of testing C. Identification of tech performing testing D. Antisera manufacturer, lot number, and expiration date E. Patient name, medical record number, and accession number a. Only a pre-transfusion specimen should be used for testing b. Document the accession number of the specimen used for testing; this may differ from the accession number of the specimen used for antibody identification
2	Determine whether quality control must be performed. A. Quality control needs to be performed on each day of testing. B. If QC has already been performed, check the box indicating QC is not needed. C. If QC has not been performed, document the lot number, expiration date, and cell ID number of the positive and negative control cells that will be used.
3	Review the manufacturer's instructions for the antiserum to be used. If incubation is required, indicate in the phase column: A. The temperature at which incubation occurred a. Write RT for room temperature b. Write 37 for 37°C B. The time period of the incubation (ex = 10' for 10 minute incubation)

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Step	Action
4	Label test tube for testing to be performed. A. All tubes should be labeled with the antigen that is being tested. B. The patient tube should be labeled with the patient's initials or the first 3 letters of the last name. C. Tubes for the donor units should be labeled with a minimum of the last 3 letters of the donor unit number. Additional identifiers must be used if necessary to differentiate between units. D. Control tubes should be labeled with "Pos" and "Neg."
5	Prepare a cell suspension of each donor unit to be tested. Wash the cell suspension if indicated in the manufacturer's instructions for the antigen typing to be performed.
6	Add the appropriate amount of antisera to each tube.
7	Add the appropriate amount of test cells to each tube.
8	Read at the appropriate phase as outlined by the manufacturer's instructions.
9	Document results on the form in the appropriate columns.
10	Enter results into the LIS per procedure and bill the antigen typing. NOTE: Antigen typing performed on a patient is billed differently than antigen typing performed on a donor unit.
11	Have a second tech perform a review of the data entry and sign off.
12	File the printouts with the antigen typing results.
13	Label the units with label or tie-tag indicating what antigen typing has been performed and the results.

Data Entry Review

Step	Action
1	All antigen typing results (electronic and manual) are reviewed by a second tech within 16 hours of testing. A. If more than one tech is on the shift, review should be performed as soon as possible after testing. B. If only one tech is on the shift, the incoming shift should review results as soon as possible after arrival.

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Step	Action
2	Verify that all antigen typing results were entered into the LIS correctly. A. Look up the patient results using Laboratory Inquiry. B. Look up unit results using Blood Bank Inquiry.
3	Verify that all reagents and controls are within the expiration date. Document the review on the antigen typing form. Notify a supervisor immediately if expired reagents/controls were used for testing.
4	Verify that appropriate controls were used and results are acceptable. A. Positive control results should demonstrate at strengths ≥2+. B. A heterozygous cell should be used for the positive control. C. A negative cell should be used for the negative control. Document the verification on the antigen typing form. Check the box when a heterozygous positive control is not available (such as for Le typing).
5	Verify that the appropriate number of unit and number of patient antigen typing charges were billed. Document the number of each typing billed on the antigen typing form.
6	Initial the appropriate box for data entry review on the antigen typing form.
7	The group lead will re-verify the information in steps 1-6 above and sign the appropriate box on the form.

9. CALCULATIONS

N/A

10. REPORTING RESULTS AND REPEAT CRITERIA

10.1 Interpretation and Repeat Criteria

Negative Result: No macroscopic agglutination of red cells at any tested phase. **Note**: Hemolysis, if obtained, should not be interpreted as a positive test. If hemolysis is present, repeat test and check test material, if repeat still demonstrates hemolysis, test is invalid.

Positive Result: Macroscopic Agglutination of red cells at any test phase.
Any IgG phase test that cannot be confirmed with Coombs Control Cells with a reaction of at least 2+ is invalid and the test must be repeated.

10.2 Rounding /Units of Measure/Clinically Reportable Range (CRR)

N/A

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10.3 Reporting Results

Results are reported as positive or negative for the antigen.

11. EXPECTED VALUES

11.1 Reference Ranges

N/A

11.2 Critical Values

None established

11.3 Priority 3 Limit(s)

None established

12. CLINICAL SIGNIFICANCE

Patients who have current or historical antibodies that are clinically-significant will only be transfused red blood cell products that lack the corresponding antigens. The crossmatch procedure outlines when antigen typing must be performed.

13. PROCEDURE NOTES

- **FDA Status:** FDA Approved/cleared
- **Validated Test Modifications:** None
- Aged blood specimens may yield weaker reactions than those obtained with fresh samples.
- Falsely positive or falsely negative test results can occur from bacterial or chemical contamination of test materials, inadequate incubation time and temperature, improper centrifugation, improper storage of materials, or omission of test reagents.
- The positive reactions of red blood cells from persons with unusual genotypes may be weaker than those obtained with randomly selected positive control red blood cells tested in parallel.
- Red cells that are coated with alloantibodies or autoantibodies of the same or similar specificity of the antisera can yield weak results due to a decreased availability of antigen sites caused by antigen blocking or steric hindrance.
- For antisera tested at the AHG phase, antibodies directed towards blood group antigens of low-incidence sometimes occur as contaminants in blood grouping reagents.
- Variant sialoglycoproteins exist that may cause aberrant reactions when testing human red blood cells with anti-M, N, S, and s reagents. The presence of 'N' on glycophorin B can cause weak reactivity of N- red blood cells.
- Variant E antigens such as E^w may not react reliably with E antisera.
- Anti-A_1 lectin may react with red blood cells that are Tn-polyagglutinable or Cad-positive.

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- Cord bloods should not be used to type for A_1 and blood from small children should not be used to type for Lewis antigens. These antigens are not completely developed in these age groups and can yield false results.

14. LIMITATIONS OF METHOD

14.1 Analytical Measurement Range (AMR)

N/A

14.2 Precision

N/A

14.3 Interfering Substances

N/A

14.4 Clinical Sensitivity/Specificity/Predictive Values

N/A

15. SAFETY

The employee has direct responsibility to avoid injury and illness at work. Nearly all harmful exposures to infectious substances and chemicals, and other injuries, can be avoided with effective training and consistent safe work practices.

Become familiar with the Environmental Health and Safety (EHS) Manual to learn the requirements on working safely and protecting the environment from harm. Although lab work typically focuses on the hazards of working with specimens and chemicals, we must also control other important hazards.

- Slips, trips, and falls cause many serious injuries. Please ensure that spills are cleaned quickly (to avoid slippery floors) and that you can see and avoid obstacles in your path.
- Ergonomic injuries result from performing tasks with too much repetition, force, or awkward position. Ergonomic injuries include strains and back injuries. Learn about ergonomic hazards and how to prevent this type of injury.
- Scratches, lacerations, and needlesticks can result in serious health consequences. Attempt to find ways to eliminate your risk when working with sharp materials.

Report all accidents and injuries immediately to your supervisor or the business unit Environmental Health and Safety Manager or Specialist.

16. RELATED DOCUMENTS

Form: Antigen Typing Form (AG.F174)
SOP: Sample Specifications for Blood Bank Testing
SOP: Crossmatch
SOP: Manual Wash Technique

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SOP: Preparing a 2-4% Cell Suspension for Testing
SOP: Galileo Echo Daily Reagent Quality Control
SOP: Galileo Echo Testing Patient Specimens

17. REFERENCES

Fung, MK, Grossman, BJ, Hillyer, CD, and Westhoff, CM. 2014. Technical Manual of the AABB, 18th edition. AABB Publishing, Bethesda, Maryland.

18. REVISION HISTORY

Version	Date	Section	Reason	Reviser	Approval
			Supersedes SOP SWB.006.001		
000	3.26.12		Update owner	L.Barrett	N.Cacciabeve
000	3.26.12	3.2 4.1 8 19	Added donor unit to acceptable specimen Updated reagent names and manufacturer information Updated format. Added requirement to antigen type for Lea and Leb together, added Echo information, added request to use panel cells for QC testing, added requirement that QC is ≥2+ in strength, added hints for selecting units. Added appendices A-E.	S.Codina	N.Cacciabeve
001	6.25.14	6.4 App A	Updated to reflect that positive control must react at a strength ≥2+. Updated sickle mnemonic from NSIK/PSIK to HBGN/HBSP	SCodina	NCacciabeve
		Footer	Version # leading zero's dropped due to new EDCS in use as of 10/7/13	LBarrett	
2	12.2.14	4.1	Updated reagent summary with new antisera information (Fya, Jka, Jkb, S, s)	S.Codina	N.Cacciabeve
		6.6	Edited review requirements. Removed note about antibody ID and antigen typing agreement.		
		App A	Added new Ag typing mnemonics		
		App C	Updated billing information; billing will be added to TRRC instead of T&S routinely		
		App E	Updated to reflect new antisera (Fya, Jka, Jkb, S, s)		

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19. ADDENDA

Appendix A: Antigen Typing Mnemonics
Appendix B: Entering Patient Antigen Typing into the LIS
Appendix C: Entering Donor Unit Antigen Typing into the LIS
Appendix D: Incidence of Blood Group Antigens
Appendix E: Antigen Typing Quick View

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Appendix A
Antigen Typing Mnemonics

	Negative	Positive
A1	NA1	PA1
C (Big)	NBGC	PBGC
c (small)	NSMC	PSMC
Co^a	NCOA	PCOA
Co^b	NCOB	PCOB
C^w	NCW	PCW
Di^a	NDIA	PDIA
Di^b	NDIB	PDIB
Do^a	NDOA	PDOA
Do^b	NDOB	PDOB
E (Big)	NBGE	PBGE
e (small)	NSME	PSME
Fy^a	NFYA	PFYA
Fy^b	NFYB	PFYB
Hy	NHY	PHY
Jk^a	NJKA	PJKA
Jk^b	NJKB	PJKB
Jo^a	NJOA	PJOA
Js^a	NJSA	PJSA
Js^b	NJSB	PJSB
K (Big)	NKEL	PKEL
k (cellano)	NCEL	PCEL
Kp^a	NKPA	PKPA
Kp^b	NKPB	PKPB
Le^a	NLEA	PLEA
Le^b	NLEB	PLEB
Lu^a	NLUA	PLUA
Lu^b	NLUB	PLUB
LW^a	NLWA	PLWA
LW^b	NLWB	PLWB
M	NBGM	PBGM
N	NBGN	PBGN
S (Big)	NBGS	PBGS
s (small)	NSMS	PSMS
Sc1	NSC1	PSC1
Sc2	NSC2	PSC2
Sickle	HBSN	HBSP
Wr^a	NWRA	PWRA

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Appendix B
Entering Patient Antigen Typing Into the LIS

Step	Action
1	Access Sunquest function "Blood Order Processing."
2	In the "Lookup by" prompt, click on the dropdown menu and select "Patient ID."
3	In the "Value" prompt, type the patient's medical record number and click on the "Search" button.
4	If more than one patient appears, select the correct patient by clicking on the name.
5	Click on the "Search All" button.
6	Click on the sample with the correct accession number.
7	Click in the "Add Spec Test" field and type: A. ";AGI" or "M" to order patient antigen typing. B. ";AGCHG" to add billing for patient antigen typing.
8	Click on the AGI (Antigen Info) test. Enter the antigen typing results. A. Type a semi-colon (;) B. Enter the mnemonic that corresponds to the antigen typing interpretation performed on the patient. C. Press the tab key. D. Repeat for all antigen typing results.
9	Click on the AGCHG (Antigen Typing Charge) test. Type a semicolon and the number of antigen typing results to be billed. A. Do not bill for quality control testing. B. Bill one test for each antigen typing performed on the patient.
10	Click on the "Save" button.

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Appendix C
Entering Donor Unit Antigen Typing Into the LIS

Step	Action
1	Add the antigen typing results to the unit(s). A. Access Sunquest function "Blood Product Testing." B. At the "Unit #" prompt, scan the donation identification number. C. At the Component prompt, scan the product code from the donor unit. This will autofill both the product codes and division fields. D. Click the "Add" button. E. Continue steps B-D until all units have been entered. F. Select a unit from the list and click the "Continue" button. G. Click on the first open box in the "Test" column ant type ";AO" to add "Ag/Aby Info (on units)." H. A pop-up message will appear, "Confirm adding test: AO." Click the "Yes" button. I. The first empty box in the result column will highlight. Type the mnemonic that corresponds to the antigen typing performed in the box. a. Type a semi-colon (;). b. Type the mnemonic. c. Press the "Tab" button. d. Repeat steps A-C until all antigen typing values have been entered. J. Click the "Save" button. K. A QA message may appear if antigen typing is entered on a unit that already has antigen typing. Answer the QA failure and continue with data entry L. If you do not have the authority to override the QA failure: a. Access Sunquest function "Blood Product Entry." b. Click on the "Modify Unit" box (lower left-hand corner). c. Enter the unit number and component type in the pop-up box. d. Enter the antigen-typing results in the "Ag/Ab" field. e. Click the "Save" button.
2	Bill for the unit antigen typing to the transfuse order. A. Access the patient transfuse order (TRRC) using function "Blood Order Processing." B. Type ";UANCH" in the "Add Spec Test" field and enter to add the test to the battery. C. The UANCH test will appear with a comment, "Billed for services performed." a. With your cursor on the billed comment, press the tab key to open a new billing line. b. Type a semicolon (;) followed by the number of antigen typing charges to be billed. Do not bill for QC. c. Press the tab key until the number billed appears on the same line as the billing comment. D. To result the billing, enter a semicolon (;) and the number of tests to be billed in the field then press the "Tab" button. E. Click on the "Save" button.

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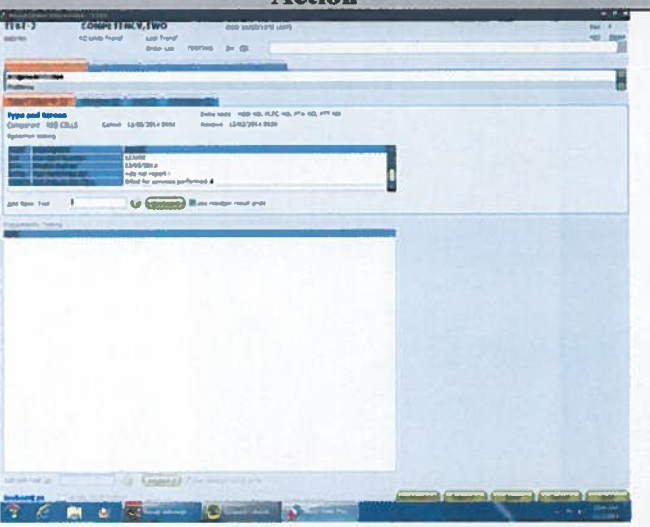
Step	Action
	

Billing edits:

A. If additional units are requested and antigen typed, add the new billing charges on to the new TRRC order. **DO NOT ATTEMPT TO EDIT THE BILLING IN STEP 2. If you edit the billing in Sunquest, the number will change, but the number of billing codes sent to the HIS will not change. This will result in too few tests being billed.**

B. If too few antigen typing charges were billed, additional charges may be added to the T&S specimen following the above procedure. Document that billing is split between two accessions on the antigen typing form.

C. If too many antigen typing charges were billed, credit the extra charges by ordering the test "UANCR" using the above procedure.

If antigen typing was performed to crossmatched units for a patient with clinically-significant antibodies per protocol (when no TRRC is ordered), add the charges to the TS order following the above procedure.

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Appendix D--Incidence of Blood Group Antigens

Blood System	Antigen	Published Data for Caucasions (% Positive)	Prevalence of Antigen-Negative Blood Products (% Negative)	Helpful Hints
Rh	D	85.0	15.0	Screen Rh-negative units to find D, C, and/or E-neg blood products
	C	68.0	32.0	
	c	80.0	20.0	
	E	29.0	71.0	
	e	98.0	2.0	
	C^w	2.0	98.0	
Kell	K	9.0	91.0	It is only necessary to screen units for Kp^a and Js^a when the antibody demonstrates at strength ≤1+
	k	99.8	0.2	
	Kp^a	2.3	97.7	
	Js^a	Rare	>99.0	
Kidd	Jk^a	77.0	23.0	
	Jk^b	74.0	26.0	
Duffy	Fy^a	66.0	34.0	
	Fy^b	83.0	17.0	
MNS	M	78.0	22.0	It is not necessary to screen units for M or N antigens unless a warm autoantibody is present
	N	72.0	28.0	
	S	55.0	45.0	
	s	89.0	11.0	
Lewis	Le^a	22.0	78.0	It is not necessary to screen units for Lewis antigens
	Le^b	72.0	28.0	
Lutheran	Lu^a	8.0	92.0	It is not necessary to screen units for Lutheran antigens
	Lu^b	99.8	0.2	
Diego	Di^a	0.0	100.0	It is only necessary to screen units for Di^a and Wr^a when the antibody demonstrates at strength <1+
	Di^b	100.0	0.0	
	Wr^a	<1.0	>99.0	
Colton	Co^a	99.9	0.1	It is only necessary to screen units for Co^b when the antibody demonstrates at strength <1+
	Co^b	10.0	90.0	
Dombrock	Do^a	67.0	33.0	It is not necessary to screen units for Dombrock, Joseph, or Holly antigens
	Do^b	82.0	18.0	
	Jo^a	100.0	0.0	
	Hy	100.0	0.0	
LW	LW^a	100.0	0.0	
	LW^b	<1.0	>99.0	
Scianna	Sc^1	99.0	1.0	It is not necessary to screen units for Scianna antigens
	Sc^2	<1.0	>99.0	

To find the incidence of antigen negative blood products for multiple antibodies,

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multiply the prevalence of antigen negative blood products for each specific antigen by the others.

Example: Patient has anti-c, anti-Fya, and anti-S. (Refer to column 4 above.)
- Prevalence of c-negative = 20%
- Prevalence of Fya-negative = 34%
- Prevalence of S-negative = 45%

Prevalence of compatible units = .2 x .34 x .45 = 0.03 = 3%

References:

- Roback JD, Grossman BJ, Harris T, and Hillyer CD. Technical Manual of the AABB, 17th ed. AABB Press, Bethesda, MD. 2011
- Reid ME and Lomas-Francis C. The Blood Group Antigen FactsBook, 2nd ed. Elsevier Academic Press, New York, NY. 2004.

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Appendix E–Antigen Typing Quick View

Antisera	Manufacturer	Manufacturer Number	StockClerk Number	Insert Code	Key Procedural Steps for Manual Testing
Anti-A1 Lectin (Dolichos biflorus) Blood Grouping Lectin	Immucor	12280	75647	313-6	1 drop of anti-A_1 + 1 drop of 3% cell suspension Centrifuge at immediate spin and read Reactions ≥2+ indicate cells are A_1 positive Further investigate cells with reactions ≤1+
Anti-C (Monoclonal) Gamma-clone	Immucor	66421	140830	3007-1	1 drop of anti-C + 1 drop of 3% cell suspension Centrifuge at immediate spin and read Incubate weak/negative reactions at room temp 15-30 minutes Recentrifuge and read
Anti-c Series 1 (Monoclonal)	Immucor	66425	75594	365-8	1 drop of anti-c + 1 drop of 3% cell suspension Incubate at 37°C for 5 min Centrifuge and read Incubate weak/negative reactions at 37°C for 10 more minutes Recentrifuge and read
Anti-E (Monoclonal) Gamma-clone	Immucor	66422	100284	3009-1	1 drop of anti-E + 1 drop of 3% cell suspension Centrifuge at immediate spin and read Incubate weak/negative reactions at room temp 15-30 minutes Recentrifuge and read
Anti-e (Monoclonal Blend) Gamma-clone	Immucor	66424	143946	3010-1	1 drop of anti-e + 1 drop of 3% cell suspension Centrifuge at immediate spin and read Incubate weak/negative reactions at room temp 15-30 minutes Recentrifuge and read
Anti-Fya (Monoclonal) by IAT	Immucor	4816	177150	3052-1	Wash cells at least 1 time before preparing cell suspension Add 1 drop of anti-Fy^a + 1 drop of 3% cell suspension Incubate at 37°C for 10-15 minutes Wash and add 2 drops of anti-IgG Centrifuge and read Add check cells to confirm negatives

Note: Always refer to manufacturer's instructions.

Antisera	Manufacturer	Manufacturer Number	StockClerk Number	Insert Code	Key Procedural Steps for Manual Testing
Anti-Fyb by IAT	Immucor	7594	109125	3013	Wash cells at least 1 time before preparing cell suspension Add 2 drops of anti-Fy^b + 1 drop of 3% cell suspension Incubate at 37°C for 15-30 minutes Wash and add 2 drops of anti-IgG Centrifuge and read Add check cells to confirm negatives
Anti-Jka (Monoclonal) BioClone	Immucor	4812	177151	392-1	Wash red cells 1 time before making cell suspension Add 1 drop of anti-Jka or anti-Jkb + 1 drop 3% cell suspension Incubate at room temp for 5-15 minutes Centrifuge and read
Anti-Jkb (Monoclonal) BioClone	Immucor	4813	177152	392-1	
Anti-K (Monoclonal) Gamma-clone	Immucor	66451	152333	3033-4	Add 1 drop of anti-K + 1 drop of 3% cell suspension Incubate at room temperature 5-15 minutes Centrifuge and read
Anti-Lea (Murine Monoclonal) Gamma-clone	Immucor	4861	30329	3018-2	Both Lea and Leb typing should be performed on a single sample to rule out spontaneous agglutination WASH red cells and prepare a 3% cell suspension Add 1 drop of anti-Lea or anti-Leb + 1 drop of 3% cell suspension Incubate at room temperature 5-10 minutes Centrifuge and read
Anti-Leb (Murine Monoclonal) Gamma-clone	Immucor	4864	105286	3018-2	
Anti-M (Murine Monoclonal) Gamma-clone	Immucor	4802	64203	3014-1	WASH red cells (including controls) and prepare a 3% cell suspension Add 1 drop of anti-M or anti-N + 1 drop of 3% cell suspension Incubate at room temperature 15 minutes Centrifuge and read
Anti-N (Murine Monoclonal) Gamma-clone	Immucor	4807	64204	3014-1	
Anti-P1 (Murine Monoclonal) Gamma-clone	Immucor	4501	62181	3019	WASH red cells and prepare a 3% cell suspension Add 1 drop of anti-P1 + 1 drop of 3% cell suspension Incubate at room temperature for 5-30 minutes Centrifuge and read

Note: Always refer to manufacturer's instructions.

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Antisera	Manufacturer	Manufacturer Number	StockClerk Number	Insert Code	Key Procedural Steps for Manual Testing
Anti-S by IAT	Immucor	4814	177153	393-1	Wash red cells with saline once before making cell suspension Add 1 drop of anti-S or anti-s + 1 drop of 3% cell suspension Incubate at room temperature for 5-15 minutes Centrifuge and read
Anti-s by IAT	Immucor	4815	177154	393-1	

Note: Always refer to manufacturer's instructions.

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Electronic Document Control System

Document No.: AG.F174[2]
Title: ANTIGEN TYPING FORM
Owner: LESLIE.X.BARRETT LESLIE BARRETT
Status INWORKS
Effective Date: 04-Jan-2015 **Next Review Date:**

Quest Diagnostics

Shady Grove Medical Center
Washington Adventist Hospital

Antigen Typing Form

	Antisera	Anti-
	Date	
	Tech	
Antisera	Manufacturer	
	Lot Number	
	Exp Date	
	Check (√) if QC has previously been performed on day of use	
Controls	Lot Number	
	Exp Date	
	Pos Ctrl Cell ID*	
	Neg Ctrl Cell ID	
	Patient Name	
	Patient MRN	
	Accession Number	

	IS	∞	37C ∞	IgG	CC
Patient					
Pos Control					
Neg Control					

Second Tech Review:		
Are patient and unit results entered into the LIS correctly?	Yes	No
Are all controls and reagents used within the expiration date?	Yes	No
Was a heterozygous positive control used? ○ (v) check if heterzygous not available.	Yes	No
Did the positive control demonstrate at strength ≥2+?	Yes	No
Number of Patient Antigen Typing Billed (AGCHG):		
Number of Unit Antigen Typing Billed (UANCH):		
Data entry reviewed by		
Group lead review		

	Antisera	Anti-
	Date	
	Tech	
Antisera	Manufacturer	
	Lot Number	
	Exp Date	
	Check (√) if QC has previously been performed on day of use	
Controls	Lot Number	
	Exp Date	
	Pos Ctrl Cell ID*	
	Neg Ctrl Cell ID	
	Patient Name	
	Patient MRN	
	Accession Number	

	IS	∞	37C ∞	IgG	CC
Patient					
Pos Control					
Neg Control					

Second Tech Review:		
Are patient and unit results entered into the LIS correctly?	Yes	No
Are all controls and reagents used within the expiration date?	Yes	No
Was a heterozygous positive control used? ○ (v) check if heterzygous not available.	Yes	No
Did the positive control demonstrate at strength ≥2+?	Yes	No
Number of Patient Antigen Typing Billed (AGCHG):		
Number of Unit Antigen Typing Billed (UANCH):		
Data entry reviewed by		
Group lead review		

*Use a HETEROzygous Positive Cell When Available ∞Document time and temperature of incubation

Supervisor Review: _____ Date: _____

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