Test Definition: CHRGB

Chimerism-Recipient Germline (Pretransplant), Varies

Overview

Useful For

Evaluating the recipient cells prior to bone marrow transplant

Testing Algorithm

Complete chimerism analysis requires 3 specimens, under 3 separate orders, for the 3 separate tests listed below. These specimens should be submitted when collected. An interpretive report will be provided once all specimens are received.

Pretransplant:
-CHRGB / Chimerism-Recipient Germline (Pretransplant), Varies
-CHIDB / Chimerism-Donor, Varies
-ADONO / Additional Chimerism Donor (Bill Only), if applicable

Posttransplant:
-CHIMU / Chimerism Transplant No Cell Sort, Varies or CHIMS / Chimerism Transplant Sorted Cells, Varies

Billing occurs with the following tests:
Pretransplant:
-CHRGB / Chimerism-Recipient Germline (Pretransplant), Varies
-ADONO / Additional Chimerism Donor (Bill Only), if applicable

Posttransplant:
-CHIMU / Chimerism Transplant No Cell Sort, Varies
-CHIMS / Chimerism Transplant Sorted Cells, Varies
-SORT1 / Chimerism Cell Sort 1 (Bill Only)
-SORT2 / Chimerism Cell Sort 2 (Bill Only)

For more information see Chimerism-Recipient Germline Testing Algorithm

Special Instructions

- Buccal Swab Collection Instructions
- Chimerism Analysis Information
- Chimerism-Recipient Germline Testing Algorithm

Method Name

Polymerase Chain Reaction (PCR) Amplification/Capillary Electrophoresis

NY State Available

Yes

Specimen

Specimen Type
Varies

Ordering Guidance
This test is for the pre-bone marrow transplant evaluation of the recipient specimen.

Shipping Instructions
1. Specimen must arrive within 7 days of collection.
2. Collect and package specimen as close to shipping time as possible.

Necessary Information
The following information is required. Provide either as answers to the Order Questions or on Chimerism Analysis Information (T594) if not ordering electronically. **Testing will be delayed if this information is not provided:**
Donor:
-Full name and date of birth (DOB)
-If unrelated donor, provide full identification number and date of birth (DOB). If DOB is not provided, an arbitrary date such as 01/01/2020 can be used.
Specimen type

Specimen Required
Submit only 1 of the following specimens:

Specimen Type: Whole blood
Container/Tube:
Preferred: Lavender top (EDTA)
Acceptable: Yellow top (ACD)
Specimen Volume: 4 mL
Collection Instructions:
1. Invert several times to mix blood.
2. Label specimen as blood.
3. Send whole blood specimen in original tube. **Do not aliquot**.

Specimen Type: Bone marrow
Container/Tube:
Preferred: Lavender top (EDTA)
Acceptable: Yellow top (ACD)
Specimen Volume: 2 mL
Collection Instructions:
1. Invert several times to mix bone marrow.
2. Label specimen as bone marrow.
3. Send bone marrow specimen in original tube. **Do not aliquot**.

Specimen Type: Extracted DNA from blood or bone marrow
Container/Tube: 1.5- to 2-mL tube
Specimen Volume: Entire specimen
Collection Instructions:
1. Label specimen as extracted DNA from blood or bone marrow
2. Indicate volume and concentration of the DNA

Specimen Type: Buccal swab
Supplies: Buccal Swab Kit (T543)
Container/Tube: Buccal smear collection kit
Specimen Volume: 2 Cyto-Pak brushes-1 per cheek
Collection Instructions:
1. Patient should rinse out mouth vigorously with mouthwash for approximately 15 seconds.
2. Remove Cyto-Pak brush from container only touching "stick" end. Save container.
3. Using **medium** pressure, rotate brush several times on inside of cheek.
4. Return brush to container and cap.
5. Repeat steps 2 through 4 on other cheek using second brush.
6. It is important that patient's buccal cells are not contaminated with cells from any other source. Do not touch bristles. Do not brush too vigorously. If blood appears, discard brush and restart collection process.
7. Label each container with patient's name and order number or hospital/clinic number.
Additional Information: It is important that the cells do not dry out during shipping. Ensure that container is tightly sealed.

Forms

1. Chimerism Analysis Information Sheet (T594)
2. If not ordering electronically, complete, print, and send a Hematopathology/Cytogenetics Test Request (T726)) with the specimen.

Specimen Minimum Volume

Whole blood: 3 mL
Bone marrow/buccal swab: See Specimen Required
Extracted DNA from blood or bone marrow: 50 microliters at 20 ng/microliter
Lesser volumes may be acceptable, depending on white cell count.
Call 800-533-1710 or 507-266-5700 with questions.

Reject Due To

Gross hemolysis	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container

Varies	Ambient (preferred)	7 days	
	Refrigerated	7 days	

Clinical & Interpretive

Clinical Information

Patients who have had donor hematopoietic cells infused for the purpose of engraftment (ie, bone marrow transplant recipients) may have their blood or bone marrow monitored for an estimate of the percentage of donor and recipient cells present. This can be done by identifying unique features of the donor's and the recipient's DNA prior to transplantation and then examining the recipient's blood or bone marrow after the transplantation procedure has occurred. The presence of both donor and recipient cells (chimerism) and the percentage of donor cells are indicators of transplant success.

Short tandem repeat (STR) sequences are used as identity markers. STR are di-, tri-, or tetra-nucleotide repeat sequences interspersed throughout the genome at specific sites. There is variability in STR length among people, and the STR lengths remain stable throughout life, making them useful as identity markers. Polymerase chain reaction is used to amplify selected STR regions from germline DNA of both donor and recipient. The lengths of the amplified fragment are evaluated for differences (informative markers). Following allogeneic hematopoietic cell infusion, the recipient blood or bone marrow can be evaluated again for the informative STR regions to identify chimerism and estimate the proportions of donor and recipient cells in the specimen.

This test evaluates the recipient specimen prior to bone marrow transplant.

Reference Values

An interpretive report will be provided.

Interpretation

An interpretive report will be provided under CHIMU / Chimerism Transplant No Cell Sort, Varies or CHIMS / Chimerism Transplant Sorted Cells, Varies. This includes whether chimerism is detected and, if detected, the approximate percentage of donor and recipient cells. Sorted cell analysis permits more detailed evaluation of chimeric status in T-cell and myeloid cell fractions, which can be helpful in clinical management.

It is most useful to observe a trend in chimerism levels. Clinically critical results should be confirmed with 1 or more subsequent specimens.

Cautions

Sensitivity varies with the proportions of donor and recipient cells in the specimen. For this reason, results are reported as approximate and rounded to the nearest 5% or 10%, depending on the calculated percentage of donor cells. For example, if the percent donor is 10% or less, it is reported as 5% donor cells. If the percent of donor cells is 90% or higher, it is reported as 95% donor cells. In rare cases (eg, matched related stem cell transplants), short tandem repeat patterns may be identical (ie, noninformative) and chimeric status cannot be determined with this test. Use of alternative approaches (eg, XY fluorescence in situ hybridization in patients with opposite sex transplants) may be required.

Clinical Reference

1. Antin JH, Childs R, Filipovich AH, et al: Establishment of complete and mixed donor chimerism after allogenic lymphohematopoietic transplantation: recommendations from a workshop at the 2001 Tandem Meetings of the International Bone Marrow Transplant Registry and the American Society of Blood and Bone Marrow Transplantation. Biol Blood Marrow Transplant. 2001;7(9):473-485
2. Tang X, Alatrash G, Ning J, et al: Increasing chimerism following allogeneic stem cell transplantation is associated with longer survival time. Biol Blood Marrow Transplant. 2014 Aug;20(8):1139-1144. doi: 10.1016/j.bbmt.2014.04.003
3. Tyler J, Kumer L, Fisher C, Casey H, Shike H: Personalized chimerism test that uses selection of short tandem repeat or quantitative PCR depending on patient's chimerism status. J Mol Diagn. 2019 May;21(3):483-490. doi: 10.1016/j.jmoldx.2019.01.007
4. Lion T, Watzinger F, Preuner S, et al: The EuroChimerism concept for a standardized approach to chimerism analysis after allogeneic stem cell transplantation. Leukemia. 2012 Aug;26(8):1821-1828. doi: 10.1038/leu.2012.66

Performance

Method Description

Genomic DNA is extracted using an automated extraction platform and is then used in a commercial GlobalFiler polymerase chain reaction (PCR) Amplification Kit, following the manufacturer's instructions. Briefly, 20 different short tandem repeat (STR) marker regions are amplified in single multiplex PCR using primers labeled with fluorescent tags. The products are analyzed for size and amount using capillary electrophoresis. For the initial sample on any patient, the test is performed on 3 separate DNA samples: donor germline DNA, recipient germline DNA, and recipient post-transplant sample for chimerism determination. The STR profile of the germline samples is used to identify markers that can distinguish between the donor and recipient. Based on these profiles, the percentage of donor and recipient DNA is then determined in the post-transplant sample using the assumptions and calculations outlined in Thiede et al 1999. Subsequent samples for chimerism evaluation do not need to be accompanied by samples for donor and recipient germline evaluation, as the profiles from the initial testing are kept on file for comparison.

The sensitivity of this analysis is approximately 5% in a post-transplant specimen (donor and recipient DNA mixed chimerism).(Thiede C, Florek M, Bornhauser M, et al: Rapid quantification of mixed chimerism using multiplex amplification of short tandem repeat markers and fluorescence detection. Bone Marrow Transplant. 1999 May;23[10]:1055-1060; Ludeman MJ, Zhong C, Mulero JJ, et al: Developmental validation of GlobalFiler PCR amplification kit: a 6-dye multiplex assay designed for amplification of casework samples. Int J Legal Med. 2018 Nov;132[6]:1555-1573. doi: 10.1007/s00414-018-1817-5)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

4 to 8 days

Specimen Retention Time

Blood/Bone marrow: 2 weeks; Extracted DNA: Indefinitely

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

81265-Comparative analysis using Short Tandem Repeat (STR) markers; patient and comparative specimen (eg, pre-transplant recipient and donor germline testing, post-transplant non-hematopoietic recipient germline [eg, buccal swab or other germline tissue sample] and donor testing, twin zygosity testing or maternal cell contamination of fetal cells)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CHRGB	Chimerism-Recipient Germline	31208-2

Result ID	Test Result Name	Result LOINC® Value
MP007	Donor	44780-5
MP014	Specimen Type	31208-2
83186	Chimerism-Recipient Germline	No LOINC Needed