MAYO CLINIC LABORATORIES

Test Definition: CHIMU

Chimerism Transplant No Cell Sort, Varies

Overview

Useful For

Determining the relative amounts of donor and recipient cells in a specimen

An indicator of bone marrow transplant success

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.

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

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

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

Post-Transplant:
-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

- 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 post-bone marrow transplant evaluation of the presence of donor cells in the post-transplant recipient specimen. For post-bone marrow transplant testing to determine the relative amounts of donor and recipient cells, see CHIMS / Chimerism Transplant Sorted Cells, Varies

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
Specimen Type is required, either as an answer to the Order Questions or on Chimerism Analysis Information (T594) if not ordering electronically. **Testing will be delayed if this information is not provided.**

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. Only 1 tube is required.
2. Invert several times to mix blood.
3. Label specimen as blood.
4. 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.**

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: 1 mL
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
Moderately to severely clotted	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Varies	Ambient (preferred)	7 days	PURPLE OR PINK TOP/EDTA
	Refrigerated	7 days	PURPLE OR PINK TOP/EDTA

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.

Reference Values

An interpretive report will be provided.

Interpretation

An interpretive report will be provided, which defines unique features of the donor's cells.

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 donor cells are 90% or greater, 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.

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 after allogeneic stem cell transplantation is associated with longer survival time. Biol Blood Marrow Transplant. 2014;20(8):1139-1144. doi:10.1016/j.bbmt.2014.04.003

3. 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;132(6):1555-1573. doi:10.1007/s00414-018-1817-5

4. 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;21(3):483-490. doi:10.1016/j.jmoldx.2019.01.007

5. 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;26(8):1821-1828. doi:10.1038/leu.2012.66

Performance

Method Description

Genomic DNA is extracted from blood or bone marrow aspirate samples using an automated extraction machine and used in a commercial kit 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 on a genetic analyzer. For the initial sample on any patient, the test is performed on 3 separate DNA samples: donor germline DNA, recipient germline DNA, and recipient posttransplant 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.(Thiede C, Florek M, Bornhauser M, et al. Rapid of mixed chimerism using multiplex amplification of short tandem repeat markers and fluorescence detection. Bone Marrow Transplant. 1999;23[10]:1055-1060). 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.(Package

insert: GlobalFiler PCR Amplification Kit. User Guide. Applied Biosystems, 2019; Thiede C, Florek M, Bornhauser M, et al. Rapid quantitation of mixed chimerism using multiplex amplification of short tandem repeat markers and fluorescence detection. Bone Marrow Transplant. 1999;23[10]:1055-1060)

The sensitivity of this analysis is approximately 5% in a posttransplant specimen (donor and recipient DNA mixed chimerism).

PDF Report
No

Day(s) Performed
Monday through Friday

Report Available
4 to 8 days following receipt of Pre and Donor Specimens

Specimen Retention Time
Whole blood/Bone marrow: 2 weeks; Extracted DNA: 3 months

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
81267-Chimerism (engraftment) analysis, post hematopoietic stem cell transplantation specimen, includes comparison to previously performed baseline analyses, without cell selection

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CHIMU	Chimerism Transplant No Cell Sort	34574-4

Result ID	Test Result Name	Result LOINC® Value
MP026	Specimen Type	31208-2
37313	Final Diagnosis	34574-4

621998	Donor 1 ID	44780-5
621997	Donor 1 (%)	In Process
622000	Donor 2 ID	In Process
622797	Donor 2 (%)	In Process
621999	Recipient (%)	In Process