

## Overview

### Useful For

Identifying *MYCN* amplification, *MYC* amplification, and monosomy of chromosome 6 (detected using *MYB* probe), to aid in the classification of medulloblastoma patients into specific clinical categories

### Reflex Tests

Test ID	Reporting Name	Available Separately	Always Performed
_PBCT	Probe, +2	No, (Bill Only)	No
_PADD	Probe, +1	No, (Bill Only)	No
_PB02	Probe, +2	No, (Bill Only)	No
_PB03	Probe, +3	No, (Bill Only)	No
_IL25	Interphases,	No, (Bill Only)	No
_I099	Interphases, 25-99	No, (Bill Only)	No
_I300	Interphases, >=100	No, (Bill Only)	No

### Testing Algorithm

This test does not include a pathology consult. If a pathology consultation is requested, PATHC / Pathology Consultation should be ordered and the appropriate FISH test will be ordered and performed at an additional charge.

This test includes a charge for application of the first probe set (2 FISH probes) and professional interpretation of results.

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Additional charges will be incurred for all reflex probes performed. Analysis charges will be incurred based on the number of cells analyzed per probe set. If no cells are available for analysis, no analysis charges will be incurred

### Method Name

Fluorescence In Situ Hybridization (FISH)

### NY State Available

Yes

## Specimen

### Specimen Type

Tissue

### Necessary Information

**A reason for referral and pathology report are required in order for testing to be performed.** Send information with specimen. Acceptable pathology reports include working drafts, preliminary pathology or surgical pathology reports.

## Specimen Required

Submit only 1 of the following specimens:

**Specimen Type:** Tissue

**Preferred:** Tissue block

**Collection Instructions:** Submit a formalin-fixed, paraffin-embedded (FFPE) tumor tissue block. Blocks prepared with alternative fixation methods may be acceptable; provide fixation method used.

**Acceptable:** Slides

**Collection Instructions:** Six consecutive, unstained, 5 micron-thick sections placed on positively charged slides, and 1 hematoxylin and eosin-stained slide.

## Forms

[If not ordering electronically, complete, print, and send an Oncology Test Request \(T729\)](#) with the specimen.

## Specimen Minimum Volume

Four consecutive, unstained, 5-micron-thick sections placed on positively charged slides, and 1 hematoxylin and eosin-stained slide.

## Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

## Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Tissue	Ambient (preferred)		
	Refrigerated		

## Clinical and Interpretive

### Clinical Information

Medulloblastoma is the most common malignant brain tumor in children. Current treatment decisions are based on clinical variables. Biomarkers have been identified that allow classification of medulloblastoma into subtypes that are associated with a specific clinical behavior. FISH analyses for the *MYCN*, *MYB*, and *MYC* loci may be useful in medulloblastoma patients to help provide prognostic information and guide treatment.

### Reference Values

An interpretive report will be provided.

### Interpretation

*MYCN*:

-The *MYCN* locus is reported as amplified when the *MYCN*:D2Z1 ratio is 2.0 or greater and demonstrates 8 or more

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copies of the *MYCN* locus.

-A tumor with a *MYCN*:D2Z1 ratio <2.0 or demonstrating a ratio of 2.0 or greater with <8 copies of *MYCN*, is considered to lack amplification of the *MYCN* locus.

*MYB*:

Monosomy of chromosome 6 is reported when the percent of cells with the abnormality exceeds the normal cutoff for the probe set.

*MYC*:

-The *MYC* locus is reported as amplified when the *MYC*:D8Z2 ratio is 2.0 or greater and demonstrates 8 or more copies of the *MYC* locus.

-A tumor with a *MYC*:D8Z2 ratio <2.0 or demonstrating a ratio of 2.0 or greater with <8 copies of *MYC*, is considered to lack amplification of the *MYC* locus.

### Cautions

This test is not approved by the US Food and Drug Administration and is best used as an adjunct to existing clinical and pathologic information.

Fixatives other than formalin (eg, Prefer, Bouin) may not be successful for FISH assays, however nonformalin-fixed samples will not be rejected.

Paraffin-embedded tissues that have been decalcified are generally unsuccessful for FISH analysis. The pathologist reviewing the hematoxylin and eosin-stained slide may find it necessary to cancel testing.

### Supportive Data

FISH analysis was performed on 15 formalin-fixed, paraffin-embedded samples from patients diagnosed with medulloblastoma. For each probe set, a series of normal control samples were used to generate the normal cutoffs. *MYCN* amplification was detected in 1 (7%) of the samples, monosomy 6 was detected in 2 (13%) samples, and *MYC* amplification was detected in 1 (7%) of the samples, which correlated with pathology review.

### Clinical Reference

1. Ellison DW, Kocak M, Dalton J, et al: Definition of disease-risk stratification groups in childhood medulloblastoma using combined clinical, pathologic, and molecular variables. *J Clin Oncol* 2011;29:1400-1407
2. Pfister S, Remke M, Benner A, et al: Outcome prediction in pediatric medulloblastoma based on DNA copy-number aberrations of chromosomes 6q and 17q and the *MYC* and *MYCN* loci. *J Clin Oncol* 2009;27:1627-1636
3. Ryan S, Schwalbe E, Cole M, et al: *MYC* family amplification and clinical risk-factors interact to predict an extremely poor prognosis in childhood medulloblastoma. *Acta Neuropathol* 2012 Apr;123(4):501-513
4. Tomlinson FH, Jenkins RB, Scheithauer BW, et al: Aggressive medulloblastoma with high-level *N-myc* amplification. *Mayo Clin Proc* 1994;69:359-365

### Performance

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## Method Description

This test uses commercially available *MYCN* and *MYC* dual-color enumeration probe strategy probe sets and a laboratory-developed *MYB* dual-color enumeration probe strategy probe set. Paraffin-embedded tissues are cut at 5 microns and mounted on positively charged glass slides. The selection of tissue and the identification of target areas on the hematoxylin and eosin (H and E)-stained slide are performed by a pathologist. Using the H and E-stained slide as a reference, target areas are etched with a diamond-tipped etcher on the back of the unstained slide to be assayed. Using the *MYCN* and *MYC* probe sets, the probes are hybridized to the appropriate target areas and 2 technologists each analyze 30 interphase nuclei (60 total) per probe set with the results expressed as a ratio of target loci to control probe signals. Using the *MYB* probe set, the probes are hybridized to the appropriate target areas and 2 technologists each analyze 50 interphase nuclei (100 total) with the results expressed as a percentage of nuclei with abnormal signal patterns. (Unpublished Mayo method)

## PDF Report

No

## Day(s) and Time(s) Test Performed

Samples processed Monday through Sunday. Results reported Monday through Friday, 8 a.m.-5 p.m. CST.

## Analytic Time

7 days

## Maximum Laboratory Time

10 days

## Specimen Retention Time

Slides and H&E used for analysis are retained by the laboratory in accordance to CAP and NYS requirements. Client provided paraffin blocks and extra unstained slides (if provided) will be returned after testing is complete.

## Performing Laboratory Location

Rochester

## Fees and 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 Regional Manager. For assistance, contact [Customer Service](#).

### Test Classification

This test was developed using an analyte specific reagent. Its performance characteristics were determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the U.S. Food and Drug Administration.

### CPT Code Information

88271x2, 88291  $\text{\AA}$  DNA probe, each (first probe set), Interpretation and report

88271x2  $\text{\AA}$  DNA probe, each; each additional probe set (if appropriate)

88271x1  $\text{\AA}$  DNA probe, each; coverage for sets containing 3 probes (if appropriate)

88271x2 DNA probe, each; coverage for sets containing 4 probes (if appropriate)

88271x3 DNA probe, each; coverage for sets containing 5 probes (if appropriate)

88274 w/modifier 52 Interphase in situ hybridization, <25 cells, each probe set (if appropriate)

88274 Interphase in situ hybridization, 25 to 99 cells, each probe set (if appropriate)

88275 Interphase in situ hybridization, 100 to 300 cells, each probe set (if appropriate)

**LOINC® Information**

Test ID	Test Order Name	Order LOINC Value
MEDF	Medulloblastoma, FISH, Ts	In Process

Result ID	Test Result Name	Result LOINC Value
55193	Result Summary	50397-9
55194	Interpretation	69965-2
55196	Result	62356-1
CG937	Reason for Referral	42349-1
55197	Specimen	31208-2
55198	Source	31208-2
55199	Tissue ID	80398-1
55200	Method	49549-9
55201	Additional Information	48767-8
55202	Disclaimer	62364-5
55223	Released By	18771-6