MAYO CLINIC LABORATORIES

# Test Definition: GLIOF

1p/19q Deletion in Gliomas, FISH, Tissue

## Overview

### Useful For

Aids in diagnosing oligodendroglioma tumors and predicting the response of an oligodendroglioma to therapy

May be useful in tumors with a complex "hybrid" morphology requiring differentiation from pure astrocytomas to support the presence of oligodendroglial differentiation/lineage

Indicated when a diagnosis of oligodendroglioma, both low-grade World Health Organization (WHO, grade II) and anaplastic (WHO, grade III) is rendered

Strongly recommended when a diagnosis of mixed oligoastrocytomas is rendered

### Reflex Tests

| Test Id | Reporting Name | Available Separately | Always Performed |
|---|---|---|---|
| _I099 | Interphases, 25-99 | No, (Bill Only) | No |
| _I300 | Interphases, >=100 | No, (Bill Only) | No |
| _IL25 | Interphases, <25 | 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 |
| _PBCT | Probe, +2 | 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 fluorescence in situ hybridization (FISH) test will be 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. 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.

Appropriate ancillary probes may be performed at consultant discretion to render comprehensive assessment. Any additional probes will have the results included within the final report and will be performed at an additional charge.

Chromosomal microarray (CMAPT / Chromosomal Microarray, Tumor, Formalin-Fixed Paraffin-Embedded), rather than FISH, may be of benefit to evaluate for acquired alterations associated with the molecular classification of glioma.(1) For more information and frequently asked questions, see Clarity on Reason for and Benefits of Chromosomal Microarray.

### Method Name

Fluorescence In Situ Hybridization (FISH) Using DNA Probes

### NY State Available

Yes

## Specimen

### Specimen Type

Tissue

### Shipping Instructions

Advise Express Mail or equivalent if not on courier service.

### Necessary Information

**A reason for testing 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.
**Additional Information:** Broken or cracked unstained slides will be rejected. Stained slides that were broken and repaired (ie, double mounted) at the client site will not be rejected, as, in most cases, they can still be reviewed under the microscope. However, due to the double mounting, digital scanning cannot be performed.

### 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

| | |
|---|---|
| Broken or cracked unstained slides | Reject |
| Broken or | Reject |

| | |
|---|---|
| cracked stained slides that cannot be repaired | |

### Specimen Stability Information

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

## Clinical & Interpretive

### Clinical Information

Astrocytomas, oligodendrogliomas, and mixed oligoastrocytomas are the major histologic types of human gliomas; histologic differentiation among these tumors can be difficult. It has been shown that specific genetic alterations are highly associated with specific morphologic types of gliomas. In addition, specific genetic alterations seem to predict prognosis (survival), as well as response to specific chemotherapeutic and radiotherapeutic regimens, irrespective of tumor morphology.

Deletions of the short arm of chromosome 1(1p) and long arm of chromosome 19 (19q), are strongly correlated with gliomas of oligodendroglial morphology. Approximately 70%, 50%, and 50% of oligodendrogliomas have deletions of 19q, 1p, and of both 19q and 1p, respectively.

Combined 1p and 19q loss is infrequent in gliomas of astrocytic origin. Thus, the presence of combined 1p/19q loss is strongly suggestive that a glioma is of oligodendroglioma lineage.

Gains of chromosome 19 and of the 19 q-arm are associated with gliomas of astrocytic origin.

Deletions of 1p and of both 1p and 19q also have been associated with response to various chemotherapeutic and radiotherapeutic regimens. These responses have been especially associated with high-grade oligodendrogliomas (anaplastic oligodendrogliomas).

Chromosomal microarray (CMAPT / Chromosomal Microarray, Tumor, Formalin-Fixed Paraffin-Embedded), rather than fluorescence in situ hybridization, may be of benefit to evaluate for acquired alterations associated with the molecular classification of glioma.(1) For more information and frequently asked questions, see Clarity on Reason for and Benefits of Chromosomal Microarray.

### Reference Values

An interpretive report will be provided.

### Interpretation

The presence of short arm of chromosome 1(1p) deletion and combined 1p and long arm of chromosome 19 deletion supports a diagnosis of oligodendroglioma may indicate that the patient may respond to chemotherapy and radiation

therapy.

The presence of gain of chromosome 19 supports a diagnosis of high-grade astrocytoma (glioblastoma multiforme).

A negative result does not exclude a diagnosis of oligodendroglioma or high-grade astrocytoma.

### Cautions

This test is not approved by the US FDA, and it is best used as an adjunct to existing clinical and pathologic information.

Broken or cracked unstained slides are not compatible with the instrumentation used in our performing laboratories and will be rejected. Additional material may be requested.

Attempts will be made to repair broken or cracked stained slides; however, if they are unable to be repaired (ie, shattered in transit), they will be rejected and discarded due to safety concerns.

### Supportive Data

Adult gliomas are classified by IDH-mutation and 1p/19q codeletion status.(1)

| Tumor classification | IDH-mutation | 1p/19q codeletion status |
|---|---|---|
| Glioblastoma | IDH-wildtype | Never have whole arm codeletion by CMAPT, can rarely have codeletion by FISH (due to small deletions that include the FISH probes). May have +19, 19p+ or 19q+ (one or both of the FISH probes gained) |
| Astrocytoma | IDH-mutant | Never have whole arm codeletion by CMAPT, can rarely have codeletion by FISH (due to small deletions that include the FISH probes). May have 19q- (loss of the FISH probe, with retention of the 1p, 1q and 19p probes). |
| Oligodendroglioma | IDH-mutant | Defined by whole arm codeletion by CMAPT and loss of the 1p and 19q FISH probes |

### Clinical Reference

1. WHO Classification of Tumours Editorial Board. Central Nervous System Tumours: WHO Classification of Tumours. Vol 6. 5th ed. IARC Press; 2022:19-55

2. Ball MK, Kollmeyer TM, Praska CE, et al. Frequency of false-positive FISH 1p/19q codeletion in adult diffuse astrocytic gliomas. Neurooncol Adv. 2020 Aug 27;2(1):vdaa109. doi: 10.1093/noajnl/vdaa109

## Performance

### Method Description

The test uses 2 commercially available enumeration strategy probe sets: 1p36(*TP73*)/1q25(*ABL2*) and 19p13(D19S221)/19q13.3(*EHD2*). Formalin-fixed 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 is 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. The probe sets are hybridized to the appropriate target areas. For each probe set, 2 technologists each analyze 50 interphase nuclei (100 total for each probe set) with the results expressed as a ratio of the total number of 1p36:1q and 19q13.3:19p signals.(Unpublished Mayo method)

### PDF Report
No

### Day(s) Performed
Monday through Friday

### Report Available
8 to 12 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
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 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 US Food and Drug Administration.

### CPT Code Information
88271x2, 88291- DNA probe, each (first probe set), Interpretation and report
88271x2- DNA probe, each; each additional probe set (if appropriate)
88271x1- 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)

### LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|

| | | |
|---|---|---|
| GLIOF | 1p/19q Deletion, Glioma, FISH, Ts | 107239-6 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| 52107 | Result Summary | 50397-9 |
| 52109 | Interpretation | 69965-2 |
| 52108 | Result | 62356-1 |
| CG739 | Reason For Referral | 42349-1 |
| 52110 | Specimen | 31208-2 |
| 52111 | Source | 31208-2 |
| 52112 | Tissue ID | 80398-1 |
| 52113 | Method | 85069-3 |
| 54579 | Additional Information | 48767-8 |
| 52114 | Released By | 18771-6 |
| 53836 | Disclaimer | 62364-5 |