MAYO CLINIC LABORATORIES

# Test Definition: GAL2

Probability of Hepatocellular Carcinoma, Serum

## Overview

### Useful For
Calculation of the risk for patients with chronic liver disease to develop hepatocellular carcinoma

### Method Name
Only orderable as part of a profile. For more information see HCCGS / Hepatocellular Carcinoma Risk Panel with GALAD Score, Serum

Calculation

### NY State Available
Yes

## Specimen

### Specimen Type
Serum

### Specimen Required
Only orderable as part of a profile. For more information see HCCGS / Hepatocellular Carcinoma Risk Panel with GALAD Score, Serum.

**Collection Container/Tube:**
**Preferred:** Serum gel
**Acceptable:** Red top
**Submission Container/Tube:** Plastic vial
**Specimen Volume:** 0.5 mL
**Collection Instructions:** Centrifuge and aliquot serum into a plastic vial.

### Specimen Minimum Volume
0.25 mL

### Reject Due To

| | |
|---|---|
| Gross hemolysis | Reject |
| Gross lipemia | OK |
| Gross icterus | OK |

## Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Serum | Frozen (preferred) | 90 days | |
| | Refrigerated | 5 days | |

## Clinical & Interpretive

### Clinical Information

Biomarkers of hepatocellular carcinoma (HCC) include alpha-fetoprotein (AFP), third electrophoretic form of lentil lectin-reactive AFP (AFP-L3), and des-carboxy-prothrombin (DCP). The GALAD (gender, age, AFP-L3, AFP, des-gamma-carboxy prothrombin) model combines these three biomarkers with the patient's gender and age to estimate the risk of HCC in patients with chronic liver disease based on the following equation: Z = -10.08 + 0.09 x age + 1.67 x sex + 2.34 log(10) (AFP) + 0.04 x AFP - L3 + 1.33 x log(10) (DCP), where sex = 1 for males, 0 for females.

The GALAD score is calculated using the lower limit of quantitation (LLOQ) when one or more of the following values are below the LLOQ: %L3, Total AFP, or Des-Gamma-Carboxy Prothrombin. In the event this occurs, the GALAD score is resulted as (<)GALAD score.

The GALAD model has been demonstrated to have higher diagnostic accuracy for the detection of HCC when compared to the use AFP, AFP-L3, and DCP markers alone or in combination. The performance of the GALAD score has also been reported to be superior to ultrasound for HCC detection.

### Reference Values

Only orderable as part of a profile. For more information see HCCGS / Hepatocellular Carcinoma Risk Panel with GALAD Score, Serum

Not applicable

### Interpretation

Higher GALAD (gender, age, AFP-L3, AFP, des-gamma-carboxy prothrombin) model scores correlate with increased risk of hepatocellular carcinoma (HCC). The area under the curve (AUC) of a receiver operating characteristic curve of the GALAD score was 0.95 for all HCC detection and 0.92 for the detection of early-stage HCC. Additionally, the AUC of the GALAD score (0.95) was higher than that of ultrasound alone for all HCC detection (AUC of 0.82, *P* <0.01).

The sensitivity and specificity performance characteristics of the GALAD score for HCC will be influenced by the selected GALAD score cut-off. For example, at an optimal AUC cutoff of 0.76, the GALAD score had 91% sensitivity and 85% specificity for HCC detection. At a more specific GALAD score cutoff of 0.88, the observed sensitivity was 80% for HCC detection with an observed specificity of 97%.

The GALAD model was developed and validated in patient cohorts with a prevalence of HCC ranging from 35% to 49%. The performance of the model may be altered in populations with different HCC prevalence. In addition, the clinical performance of the GALAD score varies by etiology of HCC and, therefore, may be different in different regions of the

world.

### Cautions

The total alpha-fetoprotein (AFP) and AFP-L3 test values must be obtained using the uTASWako i30 in the GALAD (gender, age, AFP-L3, AFP, des-gamma-carboxy prothrombin) score calculation.

Test results cannot be interpreted as absolute evidence for the presence or absence of malignant disease. Total AFP and AFP-L3 values are not interpretable during pregnancy for the investigation of malignant disease.

Des-gamma-carboxy prothrombin (DCP) producing tumors other than hepatocellular carcinoma can show elevated DCP values.

Medication containing vitamin K preparations may cause a negative bias with DCP values. Medication containing vitamin K antagonist or antibiotic may cause a positive bias with DCP values.

In rare cases, some individuals can develop antibodies to mouse or other animal antibodies (often referred to as human anti-mouse antibodies [HAMA] or heterophile antibodies), which may cause interference in some immunoassays. Caution should be used in interpretation of results and the laboratory should be alerted if the result does not correlate with the clinical presentation.

### Clinical Reference

1. Johnson P, Pirrie S, Cox T, et al. The detection of hepatocellular carcinoma using a prospectively developed and validated model based on serological biomarkers. Cancer Epidemiol Biomarkers Prev. 2014;23(1):144-153
2. Berhane S, Toyota H, Tada T, et al. Role of the GALAD and BALAD-2 serologic models in diagnosis of hepatocellular carcinoma and prediction of survival in patients. Clin Gastroenterol Hepatic. 2016;14(6):875-886
3. Yang JD, Addissie BD, Mara KC, et al. GALAD score for hepatocellular carcinoma detection in comparison with liver ultrasound and proposal of GALADUS score. Cancer Epidemiol Biomarkers Prev. 2019;28(3):531-538 doi:10.1158/1055-9965
4. Leerapun A, Suravarapu S, Bida JP, et al. The utility of serum AFP-L3 in the diagnosis of hepatocellular carcinoma: Evaluation in a U.S. referral population. Clin Gastroenterol Hepatol. 2007;5(3):394-402
5. Durazo FA, Blatt LM, Corey WG, et al. Des-gamma-carboxyprothrombin, alpha-fetoprotein and AFP-L3 in patients with chronic hepatitis, cirrhosis and hepatocellular carcinoma. J Gastroenterol Hepatol. 2008;23:1541-1548
6. Chaiteerakij R, Addissie BD, Roberts LR. Update on biomarkers of hepatocellular carcinoma. Clin Gastroenterol Hepatol. 2015;13(2):237-245 doi:10.1016/j.cgh.2013.10.038

## Performance

### Method Description

The GALAD (gender, age, AFP-L3, AFP, des-gamma-carboxy prothrombin) model is a statistical model for estimating the likelihood of hepatocellular carcinoma in patients with chronic liver disease. The GALAD score is calculated based on gender, age, and measured concentrations of AFL-L3, AFP, and DCP.

### PDF Report

No

### Day(s) Performed
Monday, Wednesday, Friday

### Report Available
Same day/1 to 4 days

### Specimen Retention Time
3 months

### Performing Laboratory Location
Rochester

## 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
Not Applicable

### LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| GAL2 | Probability of HCC | 96709-1 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| GAL2 | Probability of HCC | 96709-1 |