Ordered Items: **Celiac Disease HLA DQ Assoc.; Venipuncture**

Date Collected:	Date Received:	Date Reported:	Fasting:

Celiac Disease HLA DQ Assoc.

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
DQ2 (DQA1 0501/0505,DQB1 02XX) [01]	Negative			
DQ8 (DQA1 03XX, DQB1 0302) [01]	Negative			

```
Final Results:
DQA1*01:DMNEZ,01:DMWEC
DQB1*05:DMPXJ,05:DMZDX
Code Translation:
DMNEZ            01/04/05/12/18/22/26/27/29/34/35/37/49/53
                 /55/56
DMPXJ            05:01/05:07/05:11/05:12/05:18/05:20/05:21
                 /05:22/05:25/05:27/05:30/05:31/05:32/05:44
                 /05:45/05:48/05:49/05:51/05:54/05:55/05:61
                 /05:62/05:68/05:71/05:72/05:73/05:74/05:75
                 /05:76/05:80/05:81/05:82/05:84/05:88/05:89
                 /05:92/05:93/05:95/05:103/05:104/05:105
                 /05:107/05:110N/05:111/05:112/05:114
                 /05:115/05:120/05:122/05:124/05:126
                 /05:128N/05:133/05:137/05:138/05:139
                 /05:144/05:148/05:150/05:151/05:152/05:154
                 /05:155/05:157/05:158/05:159/05:160/05:162
                 /05:163/05:164/05:166/05:167/05:168/05:169
                 /05:171/05:173/05:176/05:177/05:180/05:182
                 /05:183/05:184/05:185N/05:188/05:190
                 /05:193/05:194/05:195/05:197/05:215N
                 /05:216/05:217/05:219/05:223/05:225/05:226
                 /05:228/05:230/05:232/05:234/05:237/05:240
                 /05:242/05:246/05:248/05:249/05:252/05:255
                 /05:256/05:258/05:261/05:263/05:266/05:267
                 /05:268/05:269/05:270/05:271/05:272
DMWEC            01/02/04/05/12/18/22/26/27/29/34/35/37/49
                 /53/55/56
DMZDX            05:03/05:06/05:08/05:10/05:13/05:15/05:16
                 /05:23/05:24/05:28/05:38/05:39/05:40
                 /05:41N/05:42/05:43/05:50/05:56/05:60
                 /05:66/05:67/05:78/05:85/05:91/05:96/05:98
                 /05:108/05:109/05:121/05:130/05:134/05:140
                 /05:147/05:149/05:161/05:191/05:200/05:201
                 /05:202/05:203/05:204/05:205/05:206N
                 /05:207/05:208N/05:209/05:211/05:212
                 /05:213/05:214/05:218/05:220/05:221
                 /05:224N/05:233/05:235N/05:236N/05:244
                 /05:245/05:259/05:260/05:264/05:265N
                 /05:273N
The patient is not positive for any of the HLA DQ risk
alleles.  Celiac Disease risk from the HLA DQA/DQB
genotype is approximately 1:2518 (<0.04%).
Allele interpretation for all loci based on IMGT/HLA
```

Celiac Disease HLA DQ Assoc. (Cont.)

database version 3.43.0
HLA Lab CLIA ID Number 34D0954530
Greater than 95% of celiac patients are positive for either DQ2 or DQ8 (Sollid and Thorsby, (1993) Gastroenterology 105:910-922). However these antigens may also be present in patients who do not have Celiac disease.

Comment: [01]

This test was performed using Polymerase Chain Reaction/(PCR)Sequence Specific Oligonucleotide Probes (SSOP) (Luminex) technique. Sequence Based Typing (SBT) and/or Sequence Specific Primers (SSP) may be used as supplemental methods when necessary. Please contact HLA Customer Service at 1-800-533-1037 if you have any questions.
Director of HLA Laboratory
Dr George C Maha, PhD

Additional Information: [01]

357:1731-1743.
2. Megiorni F, Mora B, Bonamico M et al. HLA-DQ and risk gradient for celiac disease. Hum Immunol 2009; 70:55-59.
3. Pietzak MM, Schofield TC, McGinnis FM et al. Stratifying risk for celiac disease in a large at-risk United States population by using HLA alleles. Clin Gastroenterol Hepatol 2009; 7:966-971.
4. Sollid LM and Lie BA. (2005). Celiac Disease Genetics: Current Concepts and Practical Applications. Clin Gastroenterol and Hepat 3:843-851.
5. Snyder CL, Young DO, Green PHR, et al. Celiac Disease. In: Pagon RA, Bird TC, Dolan CR, Stephens K, editors. GeneReviews (Internet), University of Washington, Seattle, July 3, 2008:1-27. http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=genepart=celiac PMID 20301720 (PubMed)
6. Treem W. Emerging concepts in celiac disease. Curr Opin Pediatr 2004;16:552-559.

Disclaimer
The Previous Result is listed for the most recent test performed by Labcorp in the past 3 years where there is sufficient patient demographic data to match the result to the patient.

Icon Legend
▲ Out of reference range ■ Critical or Alert

Performing Labs

Patient Details

Phone:
Date of Birth:
Age:
Sex:
Patient ID:
Alternate Patient ID:

Physician Details

Request A Test
7027 Mill Road Suite 201, BRECKSVILLE, OH, 44141

Phone: **888-732-2348**
Physician ID:
NPI:

Specimen Details
Specimen ID:
Control ID:
Alternate Control Number:
Date Collected:
Date Received:
Date Entered:
Date Reported:
Rte:

LabCorp
Laboratory Corporation of America

Printed Date

Specimen Number	BM Specimen #	Patient Name	Sex	Age	Date of Birth	Account #	Account Phone	Route

Control Number	Patient ID	Patient SSN	Physician Name	NPI	Physician ID

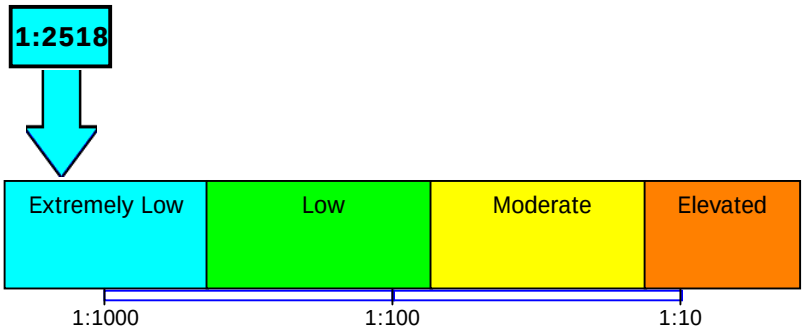
Patient Address	Patient Phone	Account Address

Additional Information	Party ID	NMDP/UNOS ID	Drive Number
	Date Collected	Date Entered	Date Reported

Celiac Disease HLA DQA/DQB Association

Result: NEGATIVE for celiac-associated allele(s)

Genetic Risk: Extremely Low



HLA DQ alleles detected	DQA1*01:DMNEZ, 01:DMWEC DQB1*05:DMPXJ, 05:DMZDX	
DQ2	DQA1*05:01/05:05 DQB1*02:01/02:02	NEGATIVE for DQ2
DQ8	DQA1*03:XX DQB1*03:02	NEGATIVE for DQ8

HLA allele intepretation based on IMGT/HLA database version 3.43.0

The patient is not positive for any of the HLA DQ risk alleles. Celiac Disease risk from the HLA DQA/DQB genotype is approximately 1:2518 (<0.04%).

Code/G Group Translation

DMNEZ 01/04/05/12/18/22/26/27/29/34/35/37/49/53/55/56

DMPXJ 05:01/05:07/05:11/05:12/05:18/05:20/05:21/05:22/05:25/05:27/05:30/05:31/05:32/05:44/05:45/05:48/05:49/05:51/05:54/05:55/05:61/05:62/05:68/05:71/05:72/05:73/05:74/05:75/05:76/05:80/05:81/05:82/05:84/05:88/05:89/05:92/05:93/05:95/05:103/05:104/05:105/05:107/05:110N/05:111/05:112/05:114/05:115/05:120/05:122/05:124/05:126/05:128N/05:133/05:137/05:138/05:139/05:144/05:148/05:150/05:151/05:152/05:154/05:155/05:157/05:158/05:159/05:160/05:162/05:163/05:164/05:166/05:167/05:168/05:169/05:171/05:173/05:176/05:177/05:180/05:182/05:183/05:184/05:185N/05:188/05:190/05:193/05:194/05:195/05:197/05:215N/05:216/05:217/05:219/05:223/05:225/05:226/05:228/05:230/05:232/05:234/05:237/05:240/05:242/05:246/05:248/05:249/05:252/05:255/05:256/05:258/05:261/05:263/05:266/05:267/05:268/05:269/05:270/05:271/05:272

DMWEC 01/02/04/05/12/18/22/26/27/29/34/35/37/49/53/55/56

LabCorp
Laboratory Corporation of America

Printed Date

Specimen Number	BM Specimen #	Patient Name	Sex	Age	Date of Birth	Account #	Account Phone	Route

Control Number	Patient ID	Patient SSN	Physician Name	NPI	Physician ID

Patient Address	Patient Phone	Account Address

Additional Information	Party ID	NMDP/UNOS ID	Drive Number
	Date Collected	Date Entered	Date Reported

Code/G Group Translation

DMZDX 05:03/05:06/05:08/05:10/05:13/05:15/05:16/05:23/05:24/05:28/05:38/05:39/05:40/05:41N/05:42/05:43/05:50/05:56/05:60/05:66/05:67/05:78/05:85/05:91/05:96/05:98/05:108/05:109/05:121/05:130/05:134/05:140/05:147/05:149/05:161/05:191/05:200/05:201/05:202/05:203/05:204/05:205/05:206N/05:207/05:208N/05:209/05:211/05:212/05:213/05:214/05:218/05:220/05:221/05:224N/05:233/05:235N/05:236N/05:244/05:245/05:259/05:260/05:264/05:265N/05:273N

The range of genetic risk for individuals with a celiac disease-associated genotype is 1:1842 (0.05%) to 1:7 (14.3%). See table "Genetic Risk from HLA-DQA/DQB Genotypes" on page 2.

The ACTUAL risk for this individual to have celiac disease may be significantly higher if there are symptoms of celiac disease, positive results from celiac antibody tests, positive intestinal biopsy, or family members with celiac disease.

Greater than 90% of celiac patients are positive for DQ2, 5-10% carry DQ8, and the remaining carry half of the DQ molecules (Green and Cellier, 2007). However, the majority of individuals positive for celiac-associated HLA alleles do not develop celiac disease, and detection of these alleles alone is not sufficient for a diagnosis of celiac disease. Relatives of individuals positive for one or more celiac-associated HLA alleles are also at risk for being positive.

This test was performed using a Polymerase Chain Reaction/(PCR) Sequence Specific Oligonucleotide Probes (SSOP) technique on the Luminex platform. This test has been cleared by the U.S. Food and Drug Administration. Analytic sensitivity and specificity are >99.9%. Sequence-based Typing (SBT) and/or Sequence Specific Primers (SSP) may be used as supplemental methods when necessary. This test evaluates HLA-DQA and DQB genotypes and cannot detect abnormalities elsewhere in the genome. It should be realized that there are many possible sources of diagnostic error including sample misidentification, rare technical errors, trace contamination of PCR reactions, and rare genetic variants that interfere with analysis.

This laboratory is certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA-88) as qualified to perform high complexity clinical laboratory testing. Please contact HLA customer service at 1-800-533-1037 if you have any questions.

INFORMATION ABOUT CELIAC DISEASE GENETICS

Celiac disease is a chronic immune-mediated inflammatory disorder with multi-systemic manifestations, both gastrointestinal and non-gastrointestinal. In genetically susceptible individuals, ingestion of gluten can cause inflammation and damage to the small intestine mucosa. Celiac disease has an incidence of 1:100 in the United States.

In order for celiac disease to develop, human leukocyte antigen (HLA) molecule DQ2 (encoded by alleles DQA1*0501 or *0505 plus DQB1*0201 or *0202), half of the DQ2 molecule, or DQ8 (encoded DQA*03 plus DQB1*0302) must be present. These molecules confer susceptibility to celiac disease by binding to gluten and interacting with intestinal T cells, leading to a pathologic immune response involving autoimmunity. The familial nature of susceptibility to celiac disease is shown by an 11-18% prevalence of this disorder in siblings of individuals with celiac disease and a 70% concordance rate between identical twins.

Among celiac disease patients, >90% carry DQ2, 5-10% carry DQ8, and the remaining carry half DQ2. The presence of DQ2, half DQ2, or DQ8 alone is not sufficient for a diagnosis of celiac disease. Clinical symptoms, positive test results for endomysial, tissue transglutaminase or deamidated gliadin peptide antibodies, or abnormal small bowel biopsy results all support a diagnosis of celiac disease. Most individuals with a positive genetic result do not develop celiac disease. The risk for developing celiac disease in individuals with a positive genetic result approaches 40% if there is a known first degree relative with celiac disease.

Genetic Risk from HLA-DQA/DQB Genotypes

Genotype	Risk
DQ2 + DQ8	1:7 (14.3%)
DQ2 + DQ2 OR DQ2 Homozygous *02	1:10 (10%)
DQ8 + DQ8	1:12 (8.4%)
DQ8 + DQB1*02	1:24 (4.2%)
Homozygous DQB*02	1:26 (3.8%)
DQ2 alone	1:35 (2.9%)
DQ8 alone	1:89 (1.1%)
Population risk (genotype unknown)	1:100 (1%)
1/2 DQ2: DQB1*02	1:210 (0.5%)
1/2 DQ2: DQA1*05	1:1842 (0.05%)
No HLA-DQA/DQB susceptibility alleles	1:2518 (<0.04%)

From Megiorni et al. 2009 for all genotypes except DQ8+DQ8

DQ8+DQ8 risk is from Pietzak et al. 2009

Other influences on risk for celiac disease

The overall risk for an individual to develop celiac disease is influenced not just by genetic risk from the HLA-DQA/DQB genotype, but by presence of symptoms of celiac disease, positive results for celiac antibody tests or intestinal biopsy, and having relatives with celiac disease. Celiac disease risk is also higher in individuals with IgA deficiency, Down syndrome, Turner syndrome, and the autoimmune disorders Type I diabetes mellitus, Sjogren syndrome, and thyroiditis. There are also additional genetic influences on the development of celiac disease in individuals predisposed to the disorder.

REFERENCES

1. **Green PHR** and Cellier C. Celiac Disease. *N Eng J Med* 2007; 357:1731-1743.
2. **Megiorni F,** Mora B, Bonamico M et al. HLA-DQ and risk gradient for celiac disease. *Hum Immunol* 2009; 70:55-59.
3. **Pietzak MM,** Schofield TC, McGinnis FM et al. Stratifying risk for celiac disease in a large at-risk United States population by using HLA alleles. *Clin Gastroenterol Hepatol* 2009; 7:966-971.
4. **Sollid LM and Lie BA.** (2005). Celiac Disease Genetics: Current Concepts and Practical Applications. *Clin Gastroenterol and Hepat* 3:843-851.
5. **Snyder CL,** Young DO, Green PHR,et al. Celiac Disease.
   In: Pagon RA, Bird TC, Dolan CR, Stephens K, editors. GeneReviews (Internet), University of Washington, Seattle, July 3, 2008:1-27.
   http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=genepart=celiac PMID 20301720 (PubMed)
6. **Treem W.** Emerging concepts in celiac disease. *Curr Opin Pediatr* 2004;16:552-559.