DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
Document Control Center – WO66-G609
Silver Spring, MD 20993-0002

November 6, 2014

SQI Diagnostics Systems Inc.
Ms. Kate Smith, VP, Technology
36 Meteor Dr.
Toronto, ON M9W 1A4
Canada

Re: k140691
Trade/Device Name: Ig_plex Celiac DGP Panel
Regulation Number: 21 CFR 866.5660
Regulation Name: Multiple autoantibodies immunological test system
Regulatory Class: II
Product Codes: MVM, MST, NSU
Dated: October 6, 2014
Received: October 7, 2014

Dear Ms. Smith:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Parts 801 and 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulations (21 CFR Parts 801 and 809), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638 2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Maria M. Chan -S

Maria M. Chan, Ph. D.
Director
Division of Immunology and Hematology Devices
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Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: January 31, 2017
See PRA Statement below.

510(k) Number *(if known)*
k140691

Device Name
Ig_plex Celiac DGP Panel

Indications for Use *(Describe)*
The Ig_plex Celiac DGP Panel is an in vitro diagnostic test for the semi-quantitative detection of the IgA and IgG immunoglobulin classes of antibodies to deamidated gliadin peptide (DGP) and tissue transglutaminase (tTG) in human serum. The test is intended for use in clinical laboratories as an aid in the diagnosis of celiac disease in conjunction with other laboratory and clinical findings, and requires the sqid-X system.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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Section 8.0 (revised): 510(k) Summary

510(k) Summary

Name:	SQI Diagnostics Systems Inc.
Address:	36 Meteor Drive Toronto, Ontario Canada M9W 1A4
Phone:	416-674-9500 x 329
FAX:	416-674-9300
Contact:	Kate Smith
Email:	ksmith@sqidiagnostics.com
Date Prepared:	November 4, 2014
Trade Name:	Ig_plex® Celiac DGP Panel
Common Name:	Multiplexed DGP IgA, DGP IgG, tTG IgA and tTG IgG Microarray Assay
Classification:	Class II
Product Code:	MST: Antibodies, gliadin MVM: Autoantibodies, Endomysial (Tissue Transglutaminase) NSU: Instrumentation for Clinical Multiplex Test Systems
Regulation Number:	21 CFR §866.5750: Radioallergosorbent (RAST) immunological test system 21 CFR §866.5660: Multiple autoantibodies immunological test system Transglutaminase) 21 CFR §862.2570: Instrumentation for Clinical Multiplex Test Systems
Substantial Equivalence:	Inova Diagnostics, Inc. assays: ▪ Quanta Lite™ Gliadin IgA II (k052143) ▪ Quanta Lite™ Gliadin IgG II (k052142) ▪ Quanta Lite™ h-tTG IgA ELISA (k011566) ▪ Quanta Lite™ h-tTG IgG ELISA (k011570) ▪ SQI Diagnostics SQiDworks™ Diagnostics Platform (k102490)

Intended Use

The Ig_plex® Celiac DGP Panel is an *in vitro* diagnostic test for the semi-quantitative detection of the IgA and IgG immunoglobulin classes of antibodies to deamidated gliadin peptide (DGP) and tissue transglutaminase (tTG) in human serum. The test is intended for use in clinical laboratories as an aid in the diagnosis of celiac disease in conjunction with other laboratory and clinical findings, and requires the sqid-**X**™ system.

Device Description

The Ig_plex Celiac DGP Panel is a consumable reagent kit. It is designed to run on the sqid-**X** system. The kit includes a microarray plate, reporter mix, standards, controls, sample diluents, wash buffer concentrates and a CD-ROM.

The assay detects the presences of the IgA and IgG classes of anti-DGP antibody, and the IgA and IgG classes of anti-tissue transglutaminase antibody. This is performed in an integrated fashion on the sqid-**X** system that reports all analytes simultaneously to aid in the diagnosis of celiac disease.

The system is a multiplex immunoassay analyzer that semi-automates the protocol of a specific Ig_plex assay from plate washing to reporting of all assay markers for each individual patient sample. The system combines manual liquid handling (samples and reagents) with automated steps for washing, scanning, data analyses and reporting. Results for each patient sample are obtained simultaneously for each of the four markers using the results from one well containing one aliquot of the patient's serum. Results are reported independently.

Comparison to Predicates

The Ig_plex Celiac DGP Panel uses the same ELISA assay principles of capture antigen, sample addition/incubation, reporter addition/incubation and fluorescent signal interpretation as the predicates with the improvement of multiplexing. The intended use of the Ig_plex Celiac DGP Panel and its predicates are all to aid in the diagnosis of celiac disease.

Test Studies

A series of test studies were conducted in support of the comparability, safety and effectiveness of the Ig_plex Celiac DGP Panel and its predicates. The studies completed with the results as shown in the following pages.

Expected Values

126 presumed normal, 56 other autoimmune disease, and 110 celiac patient specimens were evaluated for accurate determination of each analyte's cut-off in the Ig_plex Celiac DGP Panel (see Table 1).

Samples are negative for the analyte if the result is less than or equal to the respective cut-off and positive if the result is greater than the respective cut-off.

The system reports values within the Assay Measuring Range (linear range) of the assay as shown in Table 1.

Table 1: Cut-Off Values and Assay Measuring Range

Analyte	Cut-Off Values (U/mL)	Assay Measuring Range (U/mL)
tTG IgA	20.0	16.0 – 140.0
tTG IgG	36.0	24.0 – 100.0
DGP IgA	15.0	8.0 – 110.0
DGP IgG	13.0	9.0 – 120.0

Analytical Interference

Two (2) celiac diagnosed samples and one (1) negative sample were evaluated for levels of interferents above physiological ranges to establish analytical specificity. Table 2: lists the levels (mg/mL) of interferents reporting clinically acceptable recoveries (bias ≤15%).

Table 2: Analytical Interference

Analyte	Interferent (mg/mL)			
	Bilirubin	Hemoglobin	Triglycerides	Human IgG
tTG IgA	0.15	5.00	5.00	0.50
tTG IgG	0.15	5.00	5.00	0.50
DGP IgA	0.15	5.00	5.00	0.50
DGP IgG	0.15	5.00	5.00	0.50

Sensitivity and Specificity

The sensitivity and specificity of the Ig_plex Celiac DGP Panel for each of the four analytes were determined from 378 samples including: 128 celiac biopsy confirmed samples, and 250 samples from other autoimmune diseases including rheumatic and infectious diseases. The resulting clinical sensitivities and specificities are shown in Table 3.

Table 3: Clinical Sensitivity and Specificity

Analyte	% Sensitivity (95% CI)	% Specificity (95% CI)
tTG IgA	98.4 (97.3-99.5%)	100.0 (100.0-100.0%)
tTG IgG	46.9 (42.5-51.3%)	98.8 (98.1-99.5%)
DGP IgA	79.7 (76.1-83.2%)	99.2 (98.6-99.8%)
DGP IgG	89.1 (86.3-91.8%)	99.6 (99.2-100.0%)

The cross-reactivity with other autoimmune diseases was determined by analyzing the 250 patient samples diagnosed with various autoimmune diseases that were tested for the sensitivity and specificity study. Specificity was calculated for each disease with the results as shown in Table 4.

Table 4: Specificity of Other Autoimmune Diseases

Disease Classification	Specificity (%)			
	tTG IgA	tTG IgG	DGP IgA	DGP IgG
SLE	100.0	96.7	100.0	100.0
Sjogren's Syndrome	100.0	100.0	100.0	100.0
Wheat Allergy	100.0	100.0	100.0	100.0
IBD (Crohn's Disease)	100.0	100.0	100.0	100.0
IBD (Ulcerative Colitis)	100.0	100.0	100.0	100.0
Lactose Intolerant	100.0	100.0	87.5	100.0
Osteoarthritis	100.0	100.0	100.0	100.0
Celiac 1^{o} Relative	100.0	100.0	100.0	100.0
IgA Deficient, non-Celiac	100.0	100.0	66.7	100.0
Rheumatoid Arthritis (RA)	100.0	96.2	100.0	96.2
Hashimoto’s Thyroiditis	100.0	95.0	100.0	100.0
Vasculitis	100.0	100.0	100.0	100.0
EBV Positive	100.0	100.0	100.0	100.0
Syphilis Positive	100.0	100.0	100.0	100.0
Diabetes Mellitus Type 2	100.0	100.0	100.0	100.0
Type 1 Diabetes	100.0	100.0	100.0	100.0
Grave’s Thyroiditis	100.0	100.0	100.0	100.0
Suspected celiac, normal biopsy	100.0	100.0	100.0	100.0
Other Autoimmune Diseases	100.0	100.0	100.0	100.0

Method Comparison

Method comparisons consisted of testing 229 positive celiac patient samples, 132 presumptively normal samples, and 18 other autoimmune disease samples with the Ig_plex Celiac DGP Panel and with a commercially available predicate method for each of the analytes. The results are presented in Table 5.

Table 5: Method Agreement

Analyte	% Positive Agreement (95% CI)	% Negative Agreement (95% CI)	% Overall Agreement (95% CI)
tTG IgA	100.0 (97.2-100.0%)	87.9 (82.5-91.8%)	92.9 (89.5-95.2%)
tTG IgG	94.1 (84.1-98.0%)	84.6 (79.3-88.7%)	86.3 (81.8-89.9%)
DGP IgA	93.3 (87.8-96.5%)	95.1 (90.9-97.4%)	94.3 (91.2-96.4%)
DGP IgG	98.5 (94.6-99.6%)	90.3 (85.3-93.7%)	93.6 (90.4-95.7%)

Precision and Reproducibility

The precision of Ig_plex Celiac DGP Panel was evaluated according to CLSI EP5-A2 -Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline—Second Edition.

The inter-assay precision study consisted of testing negative and positive samples covering the entire measuring range in replicates of two, twice a day for 20 days by two operators using one lot on one system.

The lot-to-lot reproducibility study consisted of testing negative and positive samples covering the entire measuring range in replicates of five per kit, using two kits per lot, on three kit lots on one instrument.

The multi-instrument study consisted of testing negative and positive samples covering the entire measuring range in replicates of five per kit, using two kits per lot, on three kit lots, on three different instruments at three sites.

Table 6 through Table 16 (following pages) present the precision and reproducibility results for each analyte.

Table 6: tTG IgA Inter-assay Precision and Reproducibility

Mean (U/mL)	Within Run		Between Run		Between Day		Total Precision	
	SD	%CV	SD	%CV	SD	%CV	SD	%CV
17.29	0.643	3.7%	0.666	3.9%	0.000	0.0%	0.926	5.4%
24.46	0.997	4.1%	0.624	2.6%	0.534	2.2%	1.292	5.3%
32.35	1.615	5.0%	0.557	1.7%	0.000	0.0%	1.708	5.3%
35.19	1.383	3.9%	0.744	2.1%	1.710	4.9%	2.321	6.6%
43.29	1.946	4.5%	1.790	4.1%	0.000	0.0%	2.644	6.1%
60.05	3.261	5.4%	1.417	2.4%	1.207	2.0%	3.754	6.3%
85.55	4.365	5.1%	0.000	0.0%	3.400	4.0%	5.533	6.5%
120.73	7.515	6.2%	1.898	1.6%	2.917	2.4%	8.282	6.9%
136.63	6.419	4.7%	3.287	2.4%	1.841	1.3%	7.444	5.4%

Table 7: tTG IgA Lot-to-Lot Precision and Reproducibility

Lot-to-Lot Reproducibility (n=30)		
Mean (U/mL)	SD	%CV
11.91	0.651	5.5%
19.54	1.140	5.8%
32.6	2.191	6.7%
38.05	2.311	6.1%
44.31	3.018	6.8%
60.49	3.709	6.1%
95.28	4.301	4.5%
135.2	9.164	6.8%

Table 8: tTG IgA Instrument-to-Instrument Precision and Reproducibility

Instrument-to-Instrument Reproducibility (n=90)		
Mean (U/mL)	SD	%CV
19.22	1.064	5.5%
32.12	2.040	6.4%
46.76	3.998	8.6%
65.78	4.236	6.4%

Table 9: tTG IgG Inter-assay Precision and Reproducibility

Mean (U/mL)	Within Run		Between Run		Between Day		Total Precision	
	SD	%CV	SD	%CV	SD	%CV	SD	%CV
27.56	1.036	3.8%	1.187	4.3%	0.691	2.5%	1.721	6.2%
28.22	2.011	7.1%	1.182	4.2%	1.091	3.9%	2.575	9.1%
33.72	2.538	7.5%	0.000	0.0%	1.016	3.0%	2.734	8.1%
40.65	2.297	5.7%	2.189	5.4%	1.393	3.4%	3.465	8.5%
48.39	3.397	7.0%	1.490	3.1%	0.000	0.0%	3.710	7.7%
50.61	3.189	6.3%	0.000	0.0%	1.386	2.7%	3.478	6.9%
78.54	4.840	6.2%	1.995	2.5%	2.994	3.8%	6.031	7.7%
87.78	3.717	4.2%	2.442	2.8%	3.281	3.7%	5.527	6.3%
99.21	6.200	6.2%	3.507	3.5%	3.218	3.2%	7.817	7.9%

Table 10: tTG IgG Lot-to-Lot Precision and Reproducibility

Lot-to-Lot Reproducibility (n=30)		
Mean (U/mL)	SD	%CV
29.58	1.962	6.6%
34.4	2.803	8.1%
43.83	2.981	6.8%
50.13	4.737	9.5%
62.01	4.698	7.6%
65.06	4.871	7.5%

Table 11: tTG IgG Instrument-to-Instrument Precision and Reproducibility

Instrument-to-Instrument Reproducibility (n=90)		
Mean (U/mL)	SD	%CV
29.52	2.927	9.9%
47.76	4.681	9.8%
51.00	5.157	10.1%
63.68	6.325	9.9%

Table 12: DGP IgA Inter-assay Precision and Reproducibility

Mean (U/mL)	Within Run		Between Run		Between Day		Total Precision	
	SD	%CV	SD	%CV	SD	%CV	SD	%CV
9.13	0.426	4.7%	0.305	3.3%	0.000	0.0%	0.524	5.7%
15.83	0.637	4.0%	0.268	1.7%	0.311	2.0%	0.758	4.8%
20.28	0.704	3.5%	0.983	4.8%	0.000	0.0%	1.209	6.0%
28.47	1.680	5.9%	1.228	4.3%	0.660	2.3%	2.183	7.7%
36.20	2.017	5.6%	1.143	3.2%	0.586	1.6%	2.391	6.6%
47.84	1.834	3.8%	2.588	5.4%	1.155	2.4%	3.375	7.1%
54.63	2.966	5.4%	1.816	3.3%	1.561	2.9%	3.812	7.0%
78.94	4.749	6.0%	3.474	4.4%	1.430	1.8%	6.055	7.7%
104.24	3.800	3.6%	5.391	5.2%	0.000	0.0%	6.596	6.3%

Table 13: DGP IgA Lot-to-Lot Precision and Reproducibility

Lot-to-Lot Reproducibility (n=30)		
Mean (U/mL)	SD	%CV
9.35	0.878	9.4%
11.9	0.858	7.2%
15.04	0.908	6.0%
16.65	1.141	6.9%
18.66	0.878	4.7%
20.07	1.002	5.0%
59.91	3.435	5.7%
65.01	4.623	7.1%

Table 14: DGP IgA Instrument-to-Instrument Precision and Reproducibility

Instrument-to-Instrument Reproducibility (n=90)		
Mean (U/mL)	SD	%CV
8.58	0.823	9.6%
16.64	1.300	7.8%
18.73	1.410	7.5%
21.01	1.661	7.9%
61.71	5.552	9.0%

Table 15: DGP IgG Inter-assay Precision and Reproducibility

Mean (U/mL)	Within Run		Between Run		Between Day		Total Precision	
	SD	%CV	SD	%CV	SD	%CV	SD	%CV
15.38	0.712	4.6%	0.465	3.0%	0.695	4.5%	1.098	7.1%
22.09	1.006	4.6%	1.006	4.6%	0.753	3.4%	1.610	7.3%
31.89	1.261	4.0%	0.609	1.9%	0.909	2.9%	1.669	5.2%
41.51	2.018	4.9%	0.605	1.5%	0.687	1.7%	2.216	5.3%
50.08	2.606	5.2%	1.416	2.8%	1.166	2.3%	3.187	6.4%
71.35	2.737	3.8%	2.641	3.7%	0.000	0.0%	3.804	5.3%
85.57	3.215	3.8%	2.342	2.7%	0.000	0.0%	3.977	4.6%
119.12	6.063	5.1%	2.265	1.9%	0.000	0.0%	6.472	5.4%

Table 16: DGP IgG Lot-to-Lot Precision and Reproducibility

Lot-to-Lot Reproducibility (n=30)		
Mean (U/mL)	SD	%CV
11.74	0.601	5.1%
15.42	0.889	5.8%
17.98	0.841	4.7%
33.08	2.088	6.3%
46.42	2.127	4.6%
74.15	4.999	6.7%
85.92	5.118	6.0%
116.14	5.185	4.5%

Table 17: DGP IgG Instrument-to-Instrument Precision and Reproducibility

Instrument-to-Instrument Reproducibility (n=90)		
Mean (U/mL)	SD	%CV
11.28	0.981	8.7%
16.61	1.547	9.3%
32.52	2.610	8.0%
88.87	6.141	6.9%

Reference Range

Specimens from 328 presumptively normal donors (including 167 males ranging in age from 19 to 90 years, and 161 females ranging in age from 18 to 66 years) were tested. The results are presented in Table 18.

Table 18: Reference Range

Analyte	tTG IgA	tTG IgG	DGP IgA	DGP IgG
N (% Positive)	2 (0.61%)	2 (0.61%)	4 (1.22%)	10 (3.05%)
Range (U/mL)	<16.00 – 100.96	<24.00 – 54.33	<8.00 – 46.30	<9.00 – 55.04
Negative Result (U/mL)	<20.0	<36.0	<15.0	<13.0
Positive Result (U/mL)	≥20.0	≥36.0	≥15.0	≥13.0

Conclusion

In conclusion, the Ig_plex Celiac DGP Panel demonstrated performance, safety and effectiveness equivalent or superior to its predicates.