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Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

1. Name, address, telephone number, contact person and date of preparation of summary.

Applicant's Name and Address

Astoria-Pacific, Inc.
FDA Establishment No. 3050015
14600 S. E. 82nd Drive
Post Office Box 830
Clackamas, OR 97015-0830 USA

TEL 1-503-657-3010
FAX 1-503-655-7367

Raymond. L. Pavitt, President
Official Correspondent

Signature of Applicant:

Date: March 18, 1999


Lester B. Garrison, Diagnostics Manager
Submission Correspondent

2. Name of the device, including trade or proprietary name, and classification name.

Product Classification

Product Code 81 JBL
Regulation Number 21 CFR 864.7360
510(k) Number K _____
Classification Panel Hematology Kits and Packages
Device Classification Class II

Product Nomenclature

Common Name G6PD Test
Classification Name Erythrocytic glucose-6-phosphate
dehydrogenase assay, qantitative

Proprietary Name Astoria-Pacific SPOTCHECK
G6PD 50 Hour Reagent Kit

Model Number Astoria-Pacific
Part No. 80-3000-13K

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

3. Identification of the legally marketed device for which substantial equivalence is claimed.**Product Classification**

Product Code	81 JBL
Regulation Number	21 CFR 864.7360
510(k) Number	K790211
S/E Decision Date	March 15, 1979
Classification Panel	Hematology Kits and Packages
Device Classification	Class II

Product Nomenclature

Common Name	G6PD Test
Classification Name	Erythrocytic glucose-6-phosphate dehydrogenase assay, quantitative
Proprietary Name	Glucose Phosphate Dehydrogenase
Model Number	SIGMA Chemical Company Procedure No. 345-UV

4. Description of the device as found in the labeling**G6PD 50 HOUR REAGENT KIT**

API Part No. 80-3000-13K

Glucose-6-Phosphate Dehydrogenase Test System

INTENDED USE

The Astoria-Pacific SPOTCHECK G6PD 50 Hour Reagent Kit is intended for the semi-quantitative determination of glucose-6-phosphate dehydrogenase activity in erythrocytes using the Astoria-Pacific SPOTCHECK Analyzer. Measurements of glucose-6-phosphate dehydrogenase activity are used primarily in the diagnosis and treatment of disease states associated with a G6PD deficiency. This method is intended for in vitro diagnostic use primarily as an aid in screening for decreased levels of G6PD enzyme activity. This device is intended for use by trained, qualified laboratory personnel.

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

4. Description of the device as found in the labeling (cont.)**SUMMARY AND EXPLANATION OF THE METHOD**

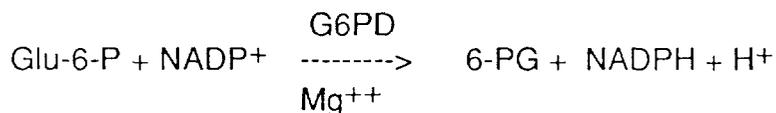
G6PD deficiency occurs in many forms. A genetic variant resulting in enzyme instability and mild enzyme deficiency, designated G6PD A, occurs among American blacks at a frequency of about 11%. A mutation that also results in enzyme lability and a much more severe deficiency, designated G6PD Mediterranean, exists in frequencies ranging from <1 to >50% in various Mediterranean populations. Other common variants exist among Asian populations. Such polymorphic enzyme deficiencies are associated with hemolytic anemia during drug administration, infection, and certain other stresses. Less common, functionally more severe mutations result in a chronic hemolytic state even when no abnormal stress is present.

The Astoria-Pacific method is based on the established spectrophotometric methods. Maleimide, an inhibitor of 6-phosphogluconate dehydrogenase (6-PGD) activity, is added to inhibit the production of NADPH by 6-phosphogluconate dehydrogenase.

CHEMICAL PRINCIPLES OF THE PROCEDURE

Enzyme activity is measured by observing NADP⁺ reduction to NADPH when glucose-6-phosphate is present as a substrate.

G6PD catalyzes the conversion of glucose -6-phosphate (Glu-6-P) to 6-phosphogluconate (6-PG) and, concurrently, the reduction of NADP⁺ to NADPH.



The fluorescent NADPH produced is proportional to the G6PD enzyme activity.

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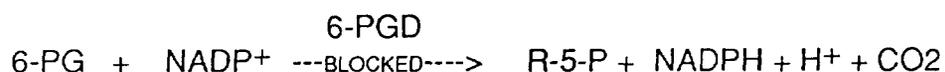
Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

4. Description of the device as found in the labeling (cont.)

Further conversion of 6-PG to ribulose-5'-phosphate (R-5-P) by 6-phosphogluconate dehydrogenase (6-PGD) is inhibited by the addition of maleimide.



REAGENTS

Reagent Name	Reactive Ingredient	Final Concentration
Extraction Buffer	Succinate Buffer pH 5.2	6 mM
Tris Buffer	Tris, pH 7.8 Triton X-100	50 mM 0.5 ml/L
G6PD Substrate	Tris, pH 7.8 Maleimide NADP Magnesium Glu-6-phosphate TRITON X-100	100 mM 13 mM 1.3 mM 1.2 mM 1.0 mM 0.5 ml/L
NADH Stock Std	TEA Buffer pH 9 NADH	50 mM 2 mM

Astoria-Pacific, Inc

000020
G6PD 50-Hour Reagent Kit

510(K) SUMMARY

5. *Statement of intended use.*

Intended Use

The Astoria-Pacific SPOTCHECK G6PD 50 Hour Reagent Kit is intended for the semi-quantitative determination of glucose-6-phosphate dehydrogenase activity in erythrocytes using the Astoria-Pacific SPOTCHECK Analyzer. Measurements of glucose-6-phosphate dehydrogenase activity are used primarily in the diagnosis and treatment of nonspherocytic congenital hemolytic anemia or drug-induced hemolytic anemia associated with a G6PD deficiency. It is for in vitro diagnostic use primarily as an aid in screening for decreased levels of G6PD enzyme activity. This device is for use by trained, qualified laboratory personnel.

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

6. A summary of the technological characteristics of the device compared to the predicate device, including chemical composition.

Both devices respond quantitatively to G6PD Activity.

The subject device has the same technological characteristics as the legally marketed predicate device. Specifically, the features, specifications, materials and mode of action are equivalent.

There are no significant differences in technology characteristics between the proposed device and the legally marketed predicate device. The proposed device has the same indications for use as the legally marketed predicate device.

The propose device has the same chemical composition and reaction mechanism as the legally marketed predicate device. There are no new reagents.

The proposed device uses a similar temperature, time and ratio of reagents to sample as the predicate device.

The proposed device uses fluorescence of NADPH to measure G6PD activity in the sample; the predicate device uses UV absorbance of NADPH to measure G6PD activity.

The proposed device is used as an element in a screening strategy that includes other tests and observations and requires confirmation testing and follow-up clinical assesment, as is the predicate device.

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

6. A summary of the technological characteristics of the device compared to the predicate device, continued

Comparison Table

Feature	Predicate Device Sigma Diagnostics	Proposed Device Astoria-Pacific Inc
Intended User	Clinical laboratory professionals	Clinical laboratory professionals
Intended Use	Quantitative determination of G6PD activity in blood (red blood cells)	Semi-quantitative determination of G6PD activity in blood (red blood cells)
Indications for use	Screening for decreased levels of G6PD activity	Screening for decreased levels of G6PD activity
Chemical Principle	NADP ⁺ Reduction to NADPH	NADP ⁺ Reduction to NADPH
Temperature	30° C or 37° C	37° C
Stability	8 hours	8 hours
Expected Value	4.6-13.5 U/g Hb	40-224 μM NADPH
Sensitivity	0.4 U/g Hb	2 μM NADPH
Detection Limit	1.0 U/g Hb	9 μM NADPH
Detection Method	UV absorbance of NADPH	fluorescence of NADPH
Wavelength	340 nm	λ excit. =350 nm λ emiss.=450 nm

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

7. Performance characteristics of the device, including:

Expected values
 Interfering substances
 Specific performance characteristics
 carryover
 specificity
 sensitivity
 within-run precision
 total precision
 correlation

EXPECTED VALUES

We have studied a normal population of neonates and these were the values:

Number of observations	17
Average Value observed	150 μ M NADPH
Sample Standard Deviation	54 μ M
Range of the data	40 - 224 μ M
95% Confidence interval	>42 μ M

We studied a G6PD deficient population, and these were the values:

Number of observations	10
Average Value observed	18 μ M NADPH
Sample Standard Deviation	12 μ M
Range of the data	4 - 40 μ M
95% Confidence interval	0 - 42 μ M

We also studied a population with intermediate G6PD activity. These were the values:

Number of observations	4
Average Value observed	49 μ M NADPH
Sample Standard Deviation	22 μ M
Range of the data	28 - 69 μ M
95% Confidence interval	5 - 93 μ M

510(K) SUMMARY

7. Performance characteristics of the device (continued)

These studies indicate:

1. Samples exhibiting activity less than about 40 μ M NADPH, the lowest observed value of the normal population range, are outside the normal range for G6PD activity and require follow-up and/or additional testing.
2. There is an overlap in the range for persons with intermediate G6PD activity and the normal population. When that occurs, those samples require follow-up and additional testing.

Each laboratory must determine its own range of normal, intermediate, and deficient levels of G6PD activity, based on its population and analytical variables.

The activity of normal samples varies widely, and the activity of all samples decreases with time under any conditions of storage. Samples showing sufficient activity can be classified as in the normal range. However, the G6PD 50 Hour Reagent Kit can not be used to classify a particular genotype.

Specimens producing abnormal or non-expected responses require confirmation/follow-up testing according to local, state and federal requirements.

Low activity may represent a deteriorated sample. If a sample has deteriorated, or was incorrectly collected, stored or handled, inaccurate results may be obtained.

510(K) SUMMARY

7. Performance characteristics of the device (continued)

INTERFERING SUBSTANCES

G6PD is inhibited by NADPH with a K_i of 0.02 mM, and by ATP with a K_i of 2 mM⁷. Sulfate at 5 mM in vitro causes a decrease of G6PD activity⁸.

G6PD is increased in cases of pernicious anemia, folic acid deficiency and sickle cell disease; it isn't affected by hairy cell leukemia or multiple sclerosis⁹. Copper strongly inhibits this enzyme¹⁰.

Neither smoking nor physical training have an effect on the level of enzyme activity¹⁰. In one study in the literature, the interindividual variability of G6PD was observed to be 32%, and the intraindividual variation was observed to be 33%.

Hemoglobin may minimally decrease G6PD activity by quenching fluorescence; in this procedure hemoglobin is removed from the reagent stream by dialysis. Bilirubin to 25 mg/dl and lipemia to 1000 mg/dl do not interfere with this test.

510(K) SUMMARY

7. Performance characteristics of the device. (continued)

SPECIFIC PERFORMANCE CHARACTERISTICS

Carryover from sample-to-sample is less than 2% and is corrected when a CARRYOVER cup is entered in the sample table.

Specificity for G6PD is achieved by using the specific substrate for the enzyme, glucose-6-phosphate. A small amount of NADPH may be produced by samples in the absence of the substrate.

Sensitivity. As little as 2 μM NADPH is discernable from no response. The response standards from 0 to 75 μM NADH gave a correlation coefficient $r > .999$ linearity.

Precision. Within-run and total precision were evaluated for this method. Samples with three levels of activity were assayed in duplicate, in 2 runs per day over 5 days to estimate the within-run and total precision. The data is summarized below:

	WITHIN-RUN PRECISION (SWR)		
	G6PD Deficient	Intermediate	G6PD Normal
Average	7.80 μM	43.0 μM	158 μM
S.D	0.25 μM	1.9 μM	7.34.9 μM
C.V.	3.2 %	4.4 %	3.1 %

	TOTAL PRECISION (ST)		
	G6PD Deficient	Intermediate	G6PD Normal
Average	7.80 μM	43.0 μM	158 μM
S.D	0.42 μM	2.6 μM	13.7 μM
C.V.	5.4 %	6.0 %	8.7 %

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

510(K) SUMMARY

7. Performance characteristics of the device (continued)

Correlation. The performance of the G6PD 50-Hour Reagent Kit and a competitive device were evaluated by analyzing samples known to be normal (16), intermediate (4), and G6PD deficient (10). Based upon the evaluation of these 30 samples, a comparison of the performance is presented below:

	False Positives	False Negatives
API G6PD 50 Hour Kit	0 of 20	0 of 10
Competitive Device	0 of 20	0 of 10

END**510(K) SUMMARY**

This 510(k) summary is submitted in accordance with the requirements of 21 CFR § 807.92, as revised April 1, 1998.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration
2098 Gaither Road
Rockville MD 20850

MAY 11 1999

Mr. Raymond L. Pavitt
President
Astoria-Pacific, Inc.
14600 S. E. 82nd Drive
Post Office Box 830
Clackamas, Oregon 97015-0830

Re: K990957
Trade Name: Astoria-Pacific SPOTCHECK G6PD 50 Hour Reagent Kit
Regulatory Class: II
Product Code: JBL
Dated: March 18, 1999
Received: March 22, 1999

Dear Mr. Pavitt:

We have reviewed your Section 510(k) notification of intent to market the device referenced above and we 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). 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.

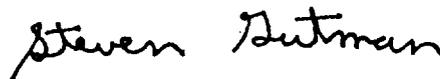
If your device is classified (see above) into either class II (Special Controls) or class III (Premarket Approval), it may be subject to such additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 895. A substantially equivalent determination assumes compliance with the Current Good Manufacturing Practice requirements, as set forth in the Quality System Regulation (QS) for Medical Devices: General regulation (21 CFR Part 820) and that, through periodic QS inspections, the Food and Drug Administration (FDA) will verify such assumptions. Failure to comply with the GMP regulation may result in regulatory action. In addition, FDA may publish further announcements concerning your device in the Federal Register. Please note: this response to your premarket notification submission does not affect any obligation you might have under sections 531 through 542 of the Act for devices under the Electronic Product Radiation Control provisions, or other Federal laws or regulations.

Under the Clinical Laboratory Improvement Amendments of 1988 (CLIA-88), this device may require a CLIA complexity categorization. To determine if it does, you should contact the Centers for Disease Control and Prevention (CDC) at (770) 488-7655.

This letter will allow you to begin marketing your device as described in your 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801 and additionally 809.10 for in vitro diagnostic devices), please contact the Office of Compliance at (301) 594-4588. Additionally, for questions on the promotion and advertising of your device, please contact the Office of Compliance at (301) 594-4639. Also, please note the regulation entitled, "Misbranding by reference to premarket notification"(21 CFR 807.97). Other general information on your responsibilities under the Act may be obtained from the Division of Small Manufacturers Assistance at its toll-free number (800) 638-2041 or (301) 443-6597, or at its internet address "<http://www.fda.gov/cdrh/dsma/dsmamain.html>".

Sincerely yours,

A handwritten signature in black ink that reads "Steven Gutman". The signature is written in a cursive style with a large initial 'S'.

Steven I. Gutman, M.D, M.B.A.
Director
Division of Clinical
Laboratory Devices
Office of Device Evaluation
Center for Devices and
Radiological Health

Enclosure

510(k) Number (if known): K990957

Device Name: Spotcheck G6PD
Kit, 50 hour.

Indications For Use:

Astoria-Pacific, Inc

G6PD 50-Hour Reagent Kit

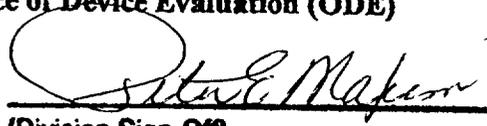
INDICATIONS FOR USE

Intended Use

The Astoria-Pacific SPOTCHECK G6PD 50 Hour Reagent Kit is intended for the semi-quantitative determination of glucose-6-phosphate dehydrogenase activity in erythrocytes using the Astoria-Pacific SPOTCHECK Analyzer. Measurements of glucose-6-phosphate dehydrogenase activity are used primarily in the diagnosis and treatment of nonspherocytic congenital hemolytic anemia or drug-induced hemolytic anemia associated with a G6PD deficiency. It is for in vitro diagnostic use primarily as an aid in screening for decreased levels of G6PD enzyme activity. This device is for use by trained, qualified laboratory personnel.

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of Device Evaluation (ODE)



(Division Sign-Off)
Division of Clinical Laboratory Devices
510(k) Number K990957

Prescription Use
(Per 21 CFR 801.109)

OR

Over-The-Counter Use

(Optional Format 1-2-96)