510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY TEMPLATE

A. 510(k) Number:

k081276

B. Purpose for Submission:

To add urine as a specimen type to previously cleared ABX PENTRA Glucose HK CP (k052007) and ABX PENTRA Uric Acid CP (k060205) reagents and to add glucose and uric acid as constituents to previously cleared ABX PENTRA Urine Control L/H (k070146).

C. Measurand:

Urine Glucose and Urine Uric Acid

D. Type of Test:

Quantitative, colorimetric and enzymatic

E. Applicant:

Horiba ABX SAS

F. Proprietary and Established Names:

ABX PENTRA Glucose HK CP

ABX PENTRA Uric Acid CP

ABX Pentra Urine Control L/H

G. Regulatory Information:

1. Regulation section:

   21 CFR §862.1345 Glucose test system

   21 CFR §862.1775 Uric acid test system

   21 CFR §862.1660 Quality control material (assayed and unassayed)

2. Classification:

   Class II

   Class I, reserved

   Class I, reserved

3. Product code:

   CFR (glucose, hexokinase), KNK (uric acid, uricase), JJY (Multi-analyte controls, assayed)

4. Panel:

   Clinical Chemistry (75)

H. Intended Use:

1. Intended use(s):

   See Indication(s) for use

2. Indication(s) for use:

   ABX PENTRA Glucose HK CP reagent with associated calibrators and controls are intended for use on ABX PENTRA 400 for quantitative in vitro diagnostic determination of glucose in human serum, plasma and urine using glucose hexokinase method by colorimetry. Glucose measurements are used in the diagnosis and treatment of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycemia, and idiopathic hypoglycemia, and of pancreatic islet cell carcinoma.

   ABX PENTRA Uric Acid CP reagent with associated calibrators and controls are intended for use on ABX PENTRA 400 for quantitative in vitro diagnostic determination of uric acid in human serum, plasma and urine based on the enzymatic determination of uric acid using a chromogenic system in the presence of peroxidase and uricase (Trinder method). Measurements obtained by this device are used in the diagnosis and treatment of numerous renal and metabolic disorders, including renal failure, gout, leukemia, psoriasis, starvation or other wasting conditions, and of patients receiving cytotoxic drugs.

   ABX PENTRA Urine Control L/H is for use in quality control by monitoring accuracy and precision.

3. Special conditions for use statement(s):

   For prescription use.

4. Special instrument requirements:

   ABX PENTRA 400

I. Device Description:

The ABX PENTRA Glucose HK CP is an in vitro diagnostic assay for the quantitative determination of glucose in human serum, plasma and urine based on an enzymatic method using hexokinase coupled with glucose-6-phosphate dehydrogenase. Reagents are chemical solutions with additives.

The ABX PENTRA Uric Acid CP is an in vitro diagnostic assay for the quantitative determination of uric acid in human serum, plasma and urine based on the enzymatic determination of uric acid using a chromogenic system in the presence of peroxidase and uricase (Trinder method). Reagents are chemical solutions with additives.

The ABX PENTRA Urine Control L/H is a two-level (Low and High) quality control consisting of liquid solutions prepared from human urine with chemical additives and materials of biological origin added as required to obtain given component levels.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   Olympus Glucose Reagent

   Infinity Uric Acid Liquid Stable Reagent

   ABX PENTRA Urine Control L/H

2. Predicate K number(s):

   k944406, k971485, k070146 respectively

3. Comparison with predicate:

ABX Pentra Glucose HK CP:

	Predicate device (K944406):	**Device :**
Device Name	**Olympus Glucose Reagent**	**ABX Pentra Glucose HK CP**
Analyte	Glucose	Glucose
Method :	Colorimetric determination using	Colorimetric determination using

	Predicate device (K944406):	Device :
Device Name	**Olympus Glucose Reagent**	**ABX Pentra Glucose HK CP**
	glucose hexokinase	glucose hexokinase
Specimen :	Serum, plasma, urine and CSF	Serum, Plasma and Urine
Component reagent matrices	Single-reagent bottles, ready to use.	Bi-reagent cassette, ready to use
Format	Liquid	Liquid
Accuracy and Precision	CV Total < 1.25%	CV Total < 4.82%
Measuring range	10 mg/dl – 800 mg/dl	3.9 mg/dl – 900 mg/dl and with automatic post-dilution 2700 mg/dl
Upper linearity limit	800 mg/dl	900 mg/dl
Calibration stability	30 days	21 days
Closed reagent stability	24 months at 2-8°C	36 months at 2-8°C
Open Reagent stability	on-board stability: 30 days	on-board stability (refrigerated area): 55 days

ABX Pentra Uric Acid CP:

	Predicate device (K971485):	Device :
Device Name	**Infinity Uric Acid Liquid Stable Reagent Set**	**ABX Pentra Uric Acid CP**
Analytes	Uric acid	Uric acid
Method :	Enzymatic determination using a chromogenic system in the presence of peroxidase and uricase	Enzymatic determination using a chromogenic system in the presence of peroxidase and uricase
Specimen :	Serum and urine	Serum, Plasma and Urine
Component reagent matrices	Single-reagent bottle, ready to use.	Bi-reagent cassette, ready to use.
Format	Liquid	Liquid
Linearity	0.5 mg/dL – 25.2 mg/dL (the user must do a manual 1:10 dilution and multiply the results)	5.20 mg/dL – 252 mg/dL (ABX Pentra 400 instrument automatically dilutes the urine 1:10 and performs the calculation.)
Accuracy and Precision	CV Total < 6.8%	CV Total < 4.36%
Measuring range	0.5 mg/dL – 25.2 mg/dL	5.20 mg/dL – 252 mg/dL and with automatic post-dilution 756 mg/dl

	Predicate device (K971485):	Device :
Device Name	**Infinity Uric Acid Liquid Stable Reagent Set**	**ABX Pentra Uric Acid CP**
Calibration stability	N/A	15 days
Closed reagent stability	Until the expiration date when stored refrigerated at 2-8°C	36 months at 2-8°C
Open Reagent stability	Until the expiration date when stored refrigerated at 2-8°C	on-board stability (refrigerated area): 41 days

ABX Pentra Urine Control L/H:

	Predicate device (K070146):	Device :
Device Name	**ABX Pentra Urine Control L/H**	**ABX Pentra Urine Control L/H**
Method :	Quality control by monitoring accuracy and precision for the quantitative methods as specified in the enclosed value sheet.	Same
Component reagent matrices	Vial (liquid) 2 levels : Low / High Human urine with added constituents of human and animal origin, chemicals, preservatives and stabilizers.	Same
Analytes	Amylase, Calcium, Creatinine, Phosphorus, Total Urinary Proteins, Urea / BUN	Amylase, Calcium, Creatinine, Phosphorus, Total Urinary Proteins, Urea / BUN, Glucose HK, Uric Acid
Format	Liquid, ready to use	Same
Theoretical values and confidence intervals	- The assigned values are determined by calculating the median value obtained from multiple determinations. - The assigned values for both Low and High controls are lot specific - The assigned values and precise confidence interval are indicated in the annex enclosed in the kit	Same Same Same

	Predicate device (K070146):	Device :
Device Name	**ABX Pentra Urine Control L/H**	**ABX Pentra Urine Control L/H**
Closed stability	2 years at 2-8°C	Same
Open stability	30 days at 2-8°C	Same

K. Standard/Guidance Document Referenced (if applicable):

CLSI EP05-A2, Evaluation of Precision Performance of Quantitative Measurement Methods, 08/01/2004

CLSI EP06-A, Evaluation of the Linearity of Quantitative Measurement Procedures: A statistical Approach, 01/01/2003

CLSI EP09-A2, Method Comparison and BiasEstimation Using Patient Samples, 09/01/2002

CLSI EP17-A, Protocol for Determination of Limits of Detection and Limits of Quantitation, 10/01/2004

CLSI EP21-A, Estimation of Total Analytical Error for Clinical Laboratory Methods, 04/01/2003

L. Test Principle:

1. ABX Pentra Glucose HK CP is an enzymatic method using hexokinase coupled with glucose-6-phosphate dehydrogenase.

2. ABX Pentra Uric Acid CP is an enzymatic test of uric acid using a chromogenic system in the presence of peroxidase and uricase (Trinder method).

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

ABX PENTRA Glucose HK CP

Within Run Precision:
Within run precision was determined by testing 2 controls (Level 1 and Level 2) and 3 specimens of low, medium and high concentrations 20 times in a single run for each sample.

Sample	N	Mean mg/dL	SD	CV%
Level 1	20	29.0	0.36	1.25
Level 2	20	288.0	1.20	0.42
Sample 1	20	18.8	0.48	2.56
Sample 2	20	179.7	1.31	0.73
Sample 3	20	533.7	4.04	0.76

Total Precision

In accordance with CLSI document EP05-A, 5 human urine specimens and 2 controls (Level 1 and Level 2) were tested in duplicate for 20 days, twice per day (n=80).

Sample	N	Mean mg/dL	Total SD	Total CV%
Level 1	80	29.4	1.05	3.57
Level 2	80	291.1	2.16	0.74
Sample 1	80	14.6	0.70	4.82
Sample 2	80	104.5	1.27	1.21
Sample 3	80	175	5.18	2.96
Sample 4	80	496.2	13.60	2.74
Sample 5	80	828.7	13.17	1.59

ABX PENTRA Uric Acid CP

Within Run Precision:

Within run precision was determined by testing 2 controls (Level 1 and Level 2) and 3 specimens of low, medium and high concentrations were tested 20 times in a single run for each sample.

Sample	N	Mean mg/dL	SD	CV%
Level 1	20	11.96	0.29	2.45
Level 2	20	8.13	0.24	3.01
Sample 1	20	8.16	0.27	3.26
Sample 2	20	25.53	0.56	2.19
Sample 3	20	61.52	0.48	0.78

Total Precision

In accordance with CLSI document EP05-A, 5 human urine specimens and 2 controls (Level 1 and Level 2) were tested in duplicate for 20 days, two series per day (n=80).

Sample	N	Mean mg/dL	Total SD	Total CV%
Level 1	80	12.17	0.50	4.13
Level 2	80	8.91	0.39	4.36
Sample 1	80	26.29	0.75	2.84
Sample 2	80	63.94	1.54	2.41

b. Linearity/assay reportable range:

ABX PENTRA Glucose HK CP

Without Post-dilution

Linearity determination was based upon CLSI EP6-A using aqueous glucose standards. The concentrations of the standards covered the measuring range with the lowest standard at 3.92 and the highest standard at 1017.2 mg/dL. Each level was measured 4 times. Following the CLSI document, first, second and third order regressions were calculated. It was determined that the third order regression represented the best fit. Based on these studies, the sponsor has demonstrated linearity for the ABX Pentra Glucose HK CP from 3.9 -900 mg/dL. The sponsor is claiming a measuring range of 3.9 mg/dL - 900 mg/dL.

With Post-dilution

The Pentra 400 performs automatic dilutions (1/3) on urine glucose samples if the value is > 900 mg/dL up to a limit of 2700 mg/dL. A study was performed comparing manual dilutions to the Pentra 400 automated dilutions using human urine samples spiked with glucose. Samples ranged from 1177.66 mg/dL to 2629.54 mg/dL. Manual and automated dilution factors were the same and each sample was run in duplicate. Bias between the two methods was calculated and was acceptable.

ABX PENTRA Uric Acid CP

Without Post-dilution

Linearity determination was based upon CLSI EP6-A using 11 uric acid solutions. The concentrations of the solutions were prepared based on the dilution of the highest concentration solution with a solution near the low limit

of detection. The concentrations of the standards ranged from 5.19 to 283.37 mg/dL. Each level was measured 4 times. Following the CLSI document, first, second and third order regressions were calculated. It was determined that the second order regression represented the best fit. Based on these studies, the sponsor is claiming a measuring range for the ABX Pentra Uric Acid CP from 5.2-252 mg/dL.

With Post-Dilution

The Pentra 400 performs automatic dilutions (1/3) on urine uric acid samples if the value is > 252 mg/dL up to a limit of 756 mg/dL. A study was performed comparing manual dilutions to the Pentra 400 automated dilutions using human urine samples spiked with uric acid. Samples ranged from 253.97 mg/dL to 712.96 mg/dL. Manual and automated dilution factors were the same and each sample was run in duplicate. Bias between the two methods was calculated and was acceptable.

c. *Traceability, Stability, Expected values (controls, calibrators, or methods):*

Traceability: **ABX PENTRA Urine Control L/H**

The values of the ABX PENTRA Controls are assigned from the ABX PENTRA calibrator, reagents and analyzers following a standardized protocol. A minimum of 6 ABX PENTRA 400 analyzers are used.

Target values for each level of control are the median of the combined results from the 6 analyzers (n=150). The percentage of deviation between the lowest device mean and the highest device mean must be less than 10%. The coefficients of variation (CV) are calculated and ranked by value for each analyzer. The confidence range generally applied is +/-3 times the standard deviation around the highest CV. Once the target value and confidence interval have been determined, the control is run on 1 ABX Pentra 400 for confirmation.

Stability

ABX PENTRA Glucose HK CP
Reagent Shelf-life: Real time stability of the reagent stored at 2-8°C has been evaluated on 3 different lots. Results support a real time stability of at least 36 months.
Reagent Stability On Board: Reagent stability on-board has been evaluated by testing accuracy and linearity periodically. Results support a real time on-board (refrigerated area) reagent stability after opening of 55 days.

ABX PENTRA Uric Acid CP

Reagent Shelf-life: Real time stability of the reagent stored at 2-8°C has been evaluated on 3 different lots. Results support a real time stability of at least 36 months.
Reagent Stability On Board: Reagent stability on-board has been evaluated by testing accuracy and linearity periodically. Results support a real time on-board (refrigerated area) reagent stability after opening of 41 days.

ABX PENTRA Urine Control L/H
Control Shelf-life : The stability of the products have been evaluated using 2 lots. Results support a real time stability of 2 years in unopened vials stored at 2-8°C.
Reagent Stability After Opening : Control stability has been tested by doing recovery studies over time. Results have determined a stability of 30 days in vials stored at 2-8°C, tightly closed when not in-use.

d. Detection limit:

ABX PENTRA Glucose HK CP
Physiological water (0.9% NaCl) was assayed 60 times on 2 different Pentra 400 for glucose. Limit of Blank (LoB) was determined in accordance with CLSI Guideline EP17-A "Protocols for Determination of Limits of Detection and Limits of Quantitation ; Approved Guideline". The LoB is 1.95 mg/dL. Limit of Detection (LoD) was derived from assaying 4 samples with concentrations between LoB and LoB x 4, 20 times. The LoD is 2.9 mg/dL. Limit of Quantitation (LoQ) was determined by assaying a range of low concentration samples 12 times. The LoQ was defined as the first concentration sample where the CV% was lower than 15% and the relative bias within +/-10%. The LoQ is 3.3 mg/dL.

ABX PENTRA Uric Acid CP
Physiological water (0.9% NaCl) was assayed 90 times on 3 different Pentra 400 for uric acid. Limit of Blank (LoB) was determined in accordance with CLSI Guideline EP17-A "Protocols for Determination of Limits of Detection and Limits of Quantitation ; Approved Guideline". The LoB is 2.33 mg/dL. Limit of Detection (LoD) was derived from assaying 4 samples with concentrations between LoB and LoB x 4, 20 times. The LoD is 3.49 mg/dL. Limit of Quantitation (LoQ) was determined by assaying a range of low concentration samples 12 times. The LoQ was defined as the first concentration sample where the CV% was lower than 15% and the relative bias was within +/-10%. The LoQ is 5.15 mg/dL. The claimed LoQ for uric acid is 5.2 mg/dl

e. Analytical specificity:

Endogenous interference was determined in according to the following protocol: Interfering substances in solution were added to pooled human

urine at two different glucose or uric acid concentrations (normal and high). Each sample was then serially diluted with the same neat base urine to adjust the glucose or uric acid concentrations. The sponsor determined that greater than 10% deviation from the target glucose or uric acid values constituted interference.

Exogeneous interference from pH was tested for glucose at levels of 3.3, 7.2 and 10.4.

ABX PENTRA Glucose HK CP

The conclusions were:

Hemoglobin up to 500 mg/dL-5g/L (290 micmol/L) does not interfere with glucose determination on the ABX Pentra 400.

Total Bilirubin up to 29.3mg/dL (500 micmol/L) does not interfere with glucose determination on the ABX Pentra 400.

Ascorbic Acid up to 6.2 mg/dL (350 micmol/L) does not interfere with glucose determination on the ABX Pentra 400.

Specific Gravity in the range of 1.005 to 1.035: there is no interference with glucose determination on the ABX Pentra 400.

pH between 3.3-10.4 does not interfere with glucose determination on the ABX Pentra 400.

ABX PENTRA Uric Acid CP

The conclusions were:

Hemoglobin up to 500 mg/dL-5g/L (290 micmol/L) does not interfere with uric acid determination on the ABX Pentra 400.

Direct Bilirubin up to 33.7 mg/dL (500 micmol/L) does not interfere with uric acid determination on the ABX Pentra 400.

Ascorbic Acid up to 6.2 mg/dL (350 micmol/L) does not interfere with uric acid determination on the ABX Pentra 400.

Specific Gravity in the range of 1.005 to 1.035: there is no interference with uric acid determination on the ABX Pentra 400.

A list of drugs and other preanalytical variables known to affect these glucose and uric acid methods are described by Young (1, 2) and referenced in the sponsor's labeling.

References:

1- Young DS. Effects of Preanalytical Variables on Clinical Laboratory Tests, 2nd Edition. Washington, DC, AACC Press 1997; 3:120-132.

2- Young DS. Effects of Drugs on Clinical Laboratory Tests, 4th Edition. Washington, DC, AACC Press 1995; 3:143-163.

f. Assay cut-off:

Not applicable

2. Comparison studies:

   a. Method comparison with predicate device:

   ABX PENTRA Glucose HK CP

   A method comparison was performed between the ABX Pentra 400 and the predicate device on 105 human urine samples (80 native, 25 spiked). The samples ranged from 5.22 mg/dL to 898.92 mg/dL and were run in duplicate on the candidate and predicate devices. Analysis of point to point comparisons between the predicate and candidate devices gave the following regression equation: $y=0.96 + 0.84$, $r^2 = 0.9970$.

   ABX PENTRA Uric Acid CP

   A method comparison was performed between the ABX Pentra 400 and the predicate device on 113 human urine samples (76 native, 37 spiked) across the measuring range (5.3-248.8 mg/dL). Analysis of point to point comparisons between the predicate and candidate devices gave the following regression equation: $y=1.01 + 0.99$, $r^2 = 0.9949$.

   b. Matrix comparison:

   Not applicable.

3. Clinical studies:

   a. Clinical Sensitivity:

   Not applicable.

   b. Clinical specificity:

   Not applicable.

   c. Other clinical supportive data (when a. and b. are not applicable):

4. Clinical cut-off:

   Not applicable

5. Expected values/Reference range:

   The sponsor references peer reviewed publications for expected values:

ABX Pentra 400 Urine Glucose [1, 2]:
< 15 mg/dL (< 0.84 mmol/L)
< 0.5 g/24 hrs. (< 2.8 mmol/24 hrs)

ABX Pentra 400 Urine Uric Acid[1]
250-750 mg/24 hrs. (1,480-4,430 miccmol/24 hrs.)

[1]Roberts W.L., McMillin G.A., Burtis C.A., Bruns D.E., Reference Information for the Clinical Laboratory, TIETZ Textbook of Clinical Chemistry and Molecular Diagnostics. 4ème Ed., Burtis C.A.,Ashwood E.R., Bruns D.E., (Elsevier Saunders eds., St Louis, USA), 2006, 2270-2271.

[2]Thomas L. ed. Clinical Laboratory Diagnostics. 1st ed. Frankfurt: TH-Books Verlagsgesellschaft, 1998; 192-202.

N. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

O. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.