



May 1, 2024

Biomerieux Inc.  
Chris Goodpaster  
Senior Regulatory Affairs Specialist  
595 Anglum Rd.  
Hazelwood, Missouri 63042

Re: K240279  
Trade/Device Name: VIDAS TBI (GFAP, UCH-L1)  
Regulation Number: 21 CFR 866.5830  
Regulation Name: Brain Trauma Assessment Test  
Regulatory Class: Class II  
Product Code: QAT  
Dated: January 31, 2024  
Received: February 1, 2024

Dear Chris Goodpaster:

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 (the 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. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database available at <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm> identifies combination product submissions. 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.

Additional information about changes that may require a new premarket notification are provided in the FDA guidance documents entitled "Deciding When to Submit a 510(k) for a Change to an Existing Device"

(<https://www.fda.gov/media/99812/download>) and "Deciding When to Submit a 510(k) for a Software Change to an Existing Device" (<https://www.fda.gov/media/99785/download>).

Your device is also subject to, among other requirements, the Quality System (QS) regulation (21 CFR Part 820), which includes, but is not limited to, 21 CFR 820.30, Design controls; 21 CFR 820.90, Nonconforming product; and 21 CFR 820.100, Corrective and preventive action. Please note that regardless of whether a change requires premarket review, the QS regulation requires device manufacturers to review and approve changes to device design and production (21 CFR 820.30 and 21 CFR 820.70) and document changes and approvals in the device master record (21 CFR 820.181).

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 Part 801 and Part 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR Part 803) for devices or postmarketing safety reporting (21 CFR Part 4, Subpart B) for combination products (see <https://www.fda.gov/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products>); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR Part 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR Parts 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to <https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems>.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (<https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance>) and CDRH Learn (<https://www.fda.gov/training-and-continuing-education/cdrh-learn>). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (<https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-dice>) for more information or contact DICE by email ([DICE@fda.hhs.gov](mailto:DICE@fda.hhs.gov)) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

 Ying Mao -S

Ying Mao, Ph.D.  
Branch Chief  
Division of Immunology and Hematology Devices  
OHT7: Office of In Vitro Diagnostics  
Office of Product Evaluation and Quality  
Center for Devices and Radiological Health

Enclosure

## Indications for Use

510(k) Number (if known)  
K240279

Device Name  
VIDAS® TBI (GFAP, UCH-L1)

### Indications for Use (Describe)

The VIDAS® TBI (GFAP, UCH-L1) test is composed of two automated assays - VIDAS® TBI (GFAP) and VIDAS® TBI (UCH-L1) - to be used on the VIDAS® 3 instrument for the quantitative measurement of Glial Fibrillary Acidic Protein (GFAP) and Ubiquitin C-terminal Hydrolase (UCH-L1) in human serum using the ELFA (Enzyme Linked Fluorescent Assay) technique. The results of both assays are required to obtain an overall qualitative test interpretation.

The overall qualitative VIDAS® TBI (GFAP, UCH-L1) test result is used, in conjunction with clinical information, to aid in the evaluation of patients (18 years of age or older), presenting within 12 hours of suspected mild traumatic brain injury (Glasgow Coma Scale score 13-15), to assist in determining the need for a Computed Tomography (CT) scan of the head. A negative interpretation of VIDAS® TBI (GFAP, UCH-L1) test is associated with the absence of acute intracranial lesions visualized on a head CT scan.

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.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

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## 510(k) SUMMARY

This 510(k) summary of safety and effectiveness information is being submitted in accordance with the requirement of Safe Medical Devices Act of 1990 and 21 CFR 807.92.

### VIDAS® TBI (GFAP, UCH-L1)

#### A. Submitter Information

Submitter's Name: bioMérieux Inc  
Address : 595 Anglum Rd., Hazelwood, MO 63042  
Contact Person: Chris Goodpaster  
Phone Number: 1 (314)-731-7303  
Fax Number: 1 (314)-731-8689  
Date of Preparation: 26 January 2024

#### B. Device Name

Trade Name: VIDAS® TBI (GFAP, UCH-L1)  
Common Name: VIDAS® TBI (GFAP, UCH-L1)  
Classification Name: Brain trauma assessment test (21 CFR 866.5830, Product Code QAT) - Class 2 in vitro Diagnostic device

#### C. Predicate Device Name

Trade Name: BANYAN BTI™, Banyan, DEN170045

#### D. Device Description

The VIDAS® TBI (GFAP, UCH-L1) test is composed of two automated assays – VIDAS® TBI (GFAP) and VIDAS® TBI (UCH-L1) – to be used on the VIDAS® 3 instrument. Similar to other VIDAS assays, VIDAS TBI (GFAP) and VIDAS TBI (UCH-L1) test kits (specific to each biomarker) contain the solid phase receptacles (SPRs®), the reagent strips, Product Calibrator S1 and Product Control C1. These test kits will also contain the master lot entry (MLE) data i.e., a barcode printed on the outer label of the packaging, as well as the reference number of the package insert to download from the bioMérieux website.

Whether it be for the GFAP or UCH-L1 quantification, the test combines a three-step enzyme immunoassay sandwich method with a final fluorescent detection step, also known as enzyme-linked fluorescent assay (ELFA):

- The Solid Phase Receptacle (SPR) serves as the solid phase as well as the pipetting device. The inner surface of the SPR is coated with antibodies against the substance of interest i.e., anti-GFAP or anti-UCH-L1 antibodies. The reagent strip consists of 10 wells covered with a labeled foil seal. Well 1 is designated for the sample. Eight of the wells contain sample diluent, wash buffer, conjugate, and tracer. The last well contains the fluorescent substrate.

All of the assay steps are performed automatically by the instrument.

The intensity of the fluorescence is proportional to the concentration of the analyte the sample. At the end of the assay, the biomarker concentration is automatically calculated by the instrument in relation to the calibration curve and stored in the Master Lot Entry (MLE) data.

VIDAS TBI (GFAP) and VIDAS TBI (UCH-L1) results are reported separately: the VIDAS 3 reports the calculated concentration and the qualitative interpretation for each. The final result i.e., the patient's status in relation to suspected mild traumatic brain injury, must be interpreted by the user according to the decision tree presented in the package insert.

#### **E. Intended Use**

The VIDAS TBI (GFAP, UCH-L1) test is composed of two automated assays - VIDAS TBI (GFAP) and VIDAS TBI (UCH-L1) - to be used on the VIDAS 3 instrument for the quantitative measurement of Glial Fibrillary Acidic Protein (GFAP) and Ubiquitin C-terminal Hydrolase (UCH-L1) in human serum using the ELFA (Enzyme Linked Fluorescent Assay) technique. The results of both assays are required to obtain an overall qualitative test interpretation.

The overall qualitative VIDAS TBI (GFAP, UCH-L1) test result is used, in conjunction with clinical information, to aid in the evaluation of patients (18 years of age or older), presenting within 12 hours of suspected mild traumatic brain injury (Glasgow Coma Scale score 13-15), to assist in determining the need for a Computed Tomography (CT) scan of the head. A negative interpretation of VIDAS TBI (GFAP, UCH-L1) test is associated with the absence of acute intracranial lesions visualized on a head CT scan.

#### **F. Technological Characteristics Summary**

A general comparison of the similarities and differences of the assays with the predicate is presented in table 1 below.

**Table 1: VIDAS TBI (GFAP, UCH-L1) Comparison with Predicate**

Item	VIDAS TBI (GFAP, UCH-L1)	Predicate Device: Banyan BTI™ DEN170045
<b>Intended Use</b>	<p>The VIDAS® TBI (GFAP, UCH-L1) test is composed of two automated assays - VIDAS® TBI (GFAP) and VIDAS® TBI (UCH-L1) - to be used on the VIDAS® 3 instrument for the quantitative measurement of Glial Fibrillary Acidic Protein (GFAP) and Ubiquitin C-terminal Hydrolase (UCH-L1) in human serum using the ELFA (Enzyme Linked Fluorescent Assay) technique. The results of both assays are required to obtain an overall qualitative test interpretation.</p> <p>The overall qualitative VIDAS® TBI (GFAP, UCH-L1) test result is used, in conjunction with clinical information, to aid in the evaluation of patients (18 years of age or older), presenting within 12 hours of suspected mild traumatic brain injury (Glasgow Coma Scale score 13-15), to assist in determining the need for a Computed Tomography (CT) scan of the head. A negative interpretation of VIDAS® TBI (GFAP, UCH-L1) test is associated with the absence of acute intracranial lesions visualized on a head CT scan.</p>	<p>The Banyan BTI™ is an in vitro diagnostic chemiluminescent enzyme-linked immunosorbent assay (ELISA). The assay provides a semi-quantitative measurement of the concentrations of ubiquitin C-terminal hydrolase-L1 (UCH-L1) and glial fibrillary acidic protein (GFAP) in human serum and is used with the Synergy 2 Multi-mode Reader.</p> <p>The assay results obtained from serum collected within 12 hours of suspected head injury are used, along with other available clinical information, to aid in the evaluation of patients 18 years of age and older with suspected traumatic brain injury (Glasgow Coma Scale score 13-15).</p> <p>A negative assay result is associated with the absence of acute intracranial lesions visualized on a head CT Computed Tomography) scan. The Banyan BTI™ is for prescription use only.</p>
<b>Specimen</b>	Serum	Serum
<b>Analyte</b>	Ubiquitin C-terminal Hydrolase (UCH-L1) and Glial Fibrillary Acidic Protein (GFAP)	Ubiquitin C-terminal Hydrolase (UCH-L1) and Glial Fibrillary Acidic Protein (GFAP)
<b>Automated</b>	Yes	No
<b>Assay Technique</b>	Labeled antibody sandwich method (three immunological steps) with a final fluorescent detection step, also known as enzyme-linked fluorescent assay (ELFA).	Chemiluminescent enzyme-linked immunosorbent assay (ELISA)

**G. Nonclinical Testing**

A summary of the performance results is presented below.

**Sample stability**

The following storage conditions are tested and confirmed on serum samples:

- +18°C to +25°C for 3 hours after centrifugation or at +2°C to +8°C for 43 hours
- -19°C to -31°C for 5 months, with one freeze/thaw cycle
- -60°C or colder for 5 months, with one freeze/thaw cycle

### **Calibration Frequency**

The 56-day calibration frequency was verified for VIDAS TBI (GFAP, UCH-L1).

### **Tubes Type**

Two studies were performed to evaluate the suitability of specific collection tube types with the VIDAS TBI (GFAP, UCH-L1) assay.

The first study was performed with a minimum of 30 samples collected both in serum tubes with separator gel (SST) and in serum tubes (CAT). A second study was performed with a minimum of 40 samples collected both in serum tubes with separator gel (SST) and in rapid serum tubes.

The following types of tubes were validated with the VIDAS TBI (GFAP, UCH-L1) assay:

- Plastic tube with coagulation activator
- Plastic tube with rapid coagulation activator
- Plastic tubes with or without separation gel

### **Metrological traceability, product Calibrator S1 and product Control C1**

The metrological traceability of the VIDAS TBI (GFAP, UCH-L1) assay was established by standardizing the assay against internal reference calibrators as, for the GFAP and UCH-L1 analytes, there is no certified reference material (CRM), primary calibrators, reference measurement procedures (RMPs) or harmonization protocol available, and as such no traceability to the International System of Units (SI).

The metrological traceability was established in accordance with the ISO 17511:2020 standard.

The internal reference calibrators were assigned using the BANYAN BTI assay. The concentrations for the VIDAS TBI (GFAP, UCH-L1) assay were therefore assigned to agree with the BANYAN BTI assay.

### **Analytical Measuring Interval**

The VIDAS TBI (GFAP, UCH-L1) analytical measuring intervals are defined as follows:

- 10.0 – 320.0 pg/mL for VIDAS TBI (GFAP)
- 80.0 – 2560.0 pg/mL for VIDAS TBI (UCH-L1)

### **Linearity**

The study was performed as recommended by CLSI EP06-Ed2 "Evaluation of Linearity of Quantitative Measurement Procedures". The study was conducted on the VIDAS 3 instrument.

Linearity of VIDAS TBI (GFAP) was demonstrated on the range 6.7 – 354.5 pg/mL.  
Linearity of VIDAS TBI (UCH-L1) was demonstrated on the range 58.9 – 2769.1 pg/mL.

**Detection Limits**

The study was performed as recommended by CLSI EP17-A2 “Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures”.

The claimed Limit of Blank (LoB), Limit of Detection (LoD) and Limit of Quantitation (LoQ) for the VIDAS TBI (GFAP, UCH-L1) assay on the VIDAS 3 instrument were:

**Table 2: VIDAS TBI (GFAP, UCH-L1) Detection Limits**

	VIDAS TBI (GFAP)	VIDAS TBI (UCH-L1)
Limit of Blank (LoB)	4.4 pg/mL	41.8 pg/mL
Limit of Detection (LoD)	5.4 pg/mL	48.1 pg/mL
Limit of Quantitation (LoQ)	5.4 pg/mL	48.1 pg/mL

The accuracy goal associated to LoQ is defined as 15% total within-lot precision, which is satisfactory for the intended clinical use.

**Hook Effect**

For VIDAS TBI (GFAP), no hook effect was found up to 200,000.0 pg/mL.

For VIDAS TBI (UCH-L1), no hook effect was found up to 400,000.0 pg/mL.

**Precision**

The study was performed as recommended by CLSI EP05-A3 “Evaluation of Precision of Quantitative Measurement Methods”. The precision estimates are as follows:

**Table 3: VIDAS TBI (GFAP, UCH-L1) Precision**

VIDAS TBI (GFAP, UCH-L1)	Sample	N	Mean [pg/mL]	Repeatability Within-run precision		Within-lot within-instrument		Within-Laboratory Precision Between-lot within-instrument	
				Standard Deviation [pg/mL]	CV (%)*	Standard Deviation [pg/mL]	CV (%)*	Standard Deviation [pg/mL]	CV (%)*
GFAP	Sample 1	75	15.63	0.93	5.9	0.93	5.9	1.11	7.1
	Sample 2	75	31.03	1.16	3.7	1.17	3.8	1.95	6.3
	Sample 3	75	75.29	4.69	6.2	4.69	6.2	6.58	8.7
	Sample 4	75	199.54	5.93	3.0	6.42	3.2	12.28	6.2
	Sample 5	75	282.23	8.23	2.9	8.56	3.0	18.22	6.5
UCH-L1	Sample 6	75	141.30	6.58	4.7	7.85	5.6	7.93	5.6
	Sample 7	75	274.52	10.72	3.9	11.03	4.0	11.55	4.2
	Sample 8	75	388.91	14.54	3.7	14.54	3.7	16.47	4.2
	Sample 9	75	837.10	30.20	3.6	30.20	3.6	34.54	4.1
	Sample 10	75	2253.47	104.87	4.7	104.87	4.7	135.80	6.0

\*CV (%): Coefficient of Variation (%)

### **Interference**

The study was performed as recommended by CLSI EP07-Ed3 "Interference Testing in Clinical Chemistry".

#### **Study of drugs and other potentially interfering substances**

No significant interference was detected up to the maximum concentrations indicated below:

**Table 4: Drugs Concentrations Found Not to Interfere**

<b>Tested drug</b>	<b>VIDAS TBI (GFAP, UCH-L1) Concentration</b>
Acetaminophen (Paracetamol)	15.6 mg/dL
Acetylsalicylic acid (Aspirin)	3.0 mg/dL
Benzoylcegonine tetrahydrate	37.5 ng/mL
Cardene	0.047 mg/dL
Coumadin (Warfarin)	7.5 mg/dL
EDDP*	125 ng/mL
Ethanol	600.1 mg/dL
Ibuprofen	21.9 mg/dL
Lopressor (Metoprolol + tartrate salt)	18.7 µmol/L
Methadone hydrochloride	0.318 mg/dL
d-Methamphetamine	125 ng/mL
Methaqualone Solution	37.5 ng/mL
Metoclopramide	0.225 mg/dL
Morphine monohydrate	0.78 mg/dL
Ondansetron hydrochloride dihydrate	0.96 mg/dL
Oxazepam	0.435 mg/dL
Phencyclidine hydrochloride	3.1 ng/mL
Plavix	4.5 mg/dL
Propoxyphene	0.321 mg/dL
Secobarbital	1.59 mg/dL

\*2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine

**Table 5: Other Substances Found Not to Interfere**

Tested substance	VIDAS TBI (GFAP) Concentration	VIDAS TBI (UCH-L1) Concentration
Bilirubin (conjugated)	0.4 g/L (475 µmol/L)	0.4 g/L (475 µmol/L)
Bilirubin (unconjugated)	0.4 g/L (684 µmol/L)	0.4 g/L (684 µmol/L)
Biotin	3.84 µg/mL	3.51 µg/mL
Hemoglobin	10 g/L (620 µmol/L)	0.6 g/L (37.2 µmol/L)*
Human Albumin	60 g/L	60 g/L
Human Anti Mouse Antibodies (HAMA)	2000 ng/mL	2000 ng/mL
Lipids	30 g/L	30 g/L
Rheumatoid factor	802 IU/mL	175 IU/mL**
Total proteins	120 g/L	120 g/L

\* For VIDAS TBI (UCH-L1), no interference was observed for hemoglobin up to the concentration of 0.6 g/L. Above this concentration, the interference leads to an increase of the VIDAS TBI (UCH-L1) results.

\*\* For VIDAS TBI (UCH-L1), no interference was observed for rheumatoid factors up to the concentration of 175 IU/mL. Above this concentration, the interference leads to an increase of the VIDAS TBI (UCH-L1) results.

Cross-reactivity of structurally related molecules:

**Table 6: Cross-reactivity Results of VIDAS TBI (GFAP)**

Tested substance	VIDAS TBI (GFAP) Tested concentration (ng/mL)	Cross-reactivity (%)
Desmin	127	No interference observed up to the concentration tested.
Internexin	77	
Keratin type II	10	
Neurofilament light	0.068	
Neurofilament medium	8.6	
Neurofilament heavy	77	
Peripherin	5	
Vimentin	354	

**Table 7: Cross-reactivity Results of VIDAS TBI (UCH-L1)**

Tested substance	VIDAS TBI (UCH-L1) Tested concentration (ng/mL)	Cross-reactivity (%)
UCH-L3	354	No interference observed up to the concentration tested.

## H. Clinical Testing

### **Reference interval**

The study was performed as recommended by CLSI EP28-A3 “Defining, Establishing, and Verifying Reference Intervals in the Clinical Laboratory; Approved Guideline – Third Edition”.

Reference intervals were determined using two cohorts of apparently healthy US adult ( $\geq$  18 years) subjects (N=513). Testing was conducted at three sites (one internal European site, and two external US sites) using the VIDAS 3 instrument. The reference intervals were defined by the central 95% distribution of GFAP and UCH-L1 concentration, i.e by the 2.5<sup>th</sup> and 97.5<sup>th</sup> percentiles. 91.0% of the reference value subjects had a negative overall assay interpretation for VIDAS<sup>®</sup> TBI (GFAP, UCH-L1). Among the 513 apparently healthy subjects included in this study, 43 individuals had a positive assay interpretation (8.4%) and 470 (91.6%) had a negative assay interpretation.

The overall reference interval for apparently healthy subjects was  $<10$  to 31.63 for GFAP and  $<80$  to 249.70 for UCH-L1.

### **Diagnostic Accuracy**

The study was performed using the ALERT cohort and was performed as recommended by CLSI EP12-A2 guideline ‘User Protocol for Evaluation of Qualitative Test Performance; Approved guideline – Second edition’. The clinical performance study was conducted on the VIDAS 3 instrument.

The diagnostic accuracy performance characteristics obtained for the VIDAS TBI (GFAP, UCH-L1) assay at the cut-off values were the following:

- The diagnostic sensitivity observed was 96.7%
- The diagnostic specificity observed was 41.2%
- The positive likelihood ratio was 1.6
- The negative likelihood ratio was 0.1
- The positive predictive value observed was 9.9%
- The negative predictive value observed was 99.5%

The clinical performance of the VIDAS TBI (GFAP, UCH-L1) assay demonstrates that the assay is safe and effective to yield results correlated with the presence of GFAP and UCH-L1 for patients with mild traumatic brain injury as per product intended purpose, using human serum samples.

## I. Conclusion

The results from the non-clinical and clinical studies submitted in this premarket notification demonstrate that the VIDAS TBI (GFAP, UCH-L1) assay is substantially equivalent to the predicate device and meets special controls requirements of 21 CFR 866.5830.