Performance Evaluation Report

< Strep A Rapid Test >

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Revision History

Revised chapter	Revised content	Revised reason	Revised date	Revisor
N/A	N/A	Newly released	2024/6/13	Chen Liang
Section 2.1; Section 2.2; Section 6.1; Summary of Performance Evaluation results	Add specification and REFs; Modify the content of intended use; Modify the state of the art; Modify the summary of performance evaluation results.	To bring the documentation into compliance with the requirements of the technical document assessment results from the first round, as provided by the Notified Body.	2025/3/19	Chen Liang
Summary of Performance Evaluation Results	Add evidence that there is no inter-ethnic differences in the detection of Strep A; Add the rationale for choosing these two brands as similar products; Modify the description of LOD.	To bring the documentation into compliance with the requirements of the technical document assessment results from the second round, as provided by the Notified Body.	2025/4/30	Chen Liang

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1. Purpose

The purpose of the Performance Evaluation is to demonstrate clinical evidence for Strep A Rapid Test. The Performance Evaluation consists of three IVD specific concepts: scientific validity, analytical performance, and clinical performance. The manufacturer should ensure that the performance evaluation is carried out throughout the life cycle of the product.

This plan will specify the characteristics and the performance of the Strep A Rapid Test and the process and criteria applied to generate the necessary clinical evidence.

This device is belonged to class C.

2. The Characteristics Of The Device

2.1 Product Name

Common name: Strep A Rapid Test

Trade Name: GenSure Strep A Rapid Test, or EuroGen Strep A Rapid Test

Specification		1T/Kit	2T/Kit	5T/Kit	10T/Kit	20T/Kit
REF	GenSure	P2019C01	P2019C02	P2019C05	P2019C10	P2019C20
	EuroGen	Y2019C01	Y2019C02	Y2019C05	Y2019C10	Y2019C20

2.2 Intended Use

The Strep A Rapid Test is a lateral flow immunoassay for the rapid, qualitative detection of Group A streptococcal (GAS, Strep A) antigen from throat swabs of individuals who suspected of Strep A infection. The test is used as an aid in the diagnosis of Strep A infection. It is a non-automated device intended for professional laboratory use and self-testing.

Children under 15 years old should be sampled and tested by adults.

2.2.1 What is detected or measured

Group A Streptococcal

2.2.2 The function of this device

Aid to diagnostic.

2.2.3 The specific information that is intended to be provided

Intended to be provided the information on infection with Group A Streptococcus.

2.2.4 Automated or not

Not automated;

2.2.5 Whether it is qualitative, semi-quantitative or quantitative

This product is an qualitative detection;

2.2.6 The type of specimen(s) required

Human throat swab;

2.2.7 Testing population

This test is use with throat swab samples for suspected patients.

Children under 15 years old should sampled and tested by adults.

2.3 Basic UDI-DI And EMDN Code

Basic UDI-DI: 697683823P201900F9

EMDN code: W0105090103

3. Relevant Documents

GSPR Checklist

Literature Search Plan

Post-Market Surveillance Plan

Post-Market Performance Follow-Up Plan

Performance Evaluation Procedure

Literature Research SOP

4. Responsibility And Resources

4.1 Personnel

Task	Personnel
Coordinator with overall responsibility	Wang Siyuan
Assess the validity of test results and data already available	Wang Siyuan
Specify performance claims which shall be further examined or confirmed	Zhang Shaodan
Prepare the evaluation report	Chen Liang

4.2 Resources

The samples used in the performance study is sourced from:

The Streptococcus hemolytic-β used in the analytical performance and stability studies was CMCC(B) 32210 from the China National Institutes for Food and Drug Control, cross-reactivity substance and interfering substances were

from the CDC, BNCC (BeNa Culture Collection) and the NIFDC (China National Institutes for Drug Control), and the negative samples were throat swab samples from healthy employees without Group A streptococcal.

The clinical performance and usability study samples were collected from UOC Laboratorio analisi e Biochimica Clinica - Diagnostica Molecolare Avanzata.

5. Methods Or Tools

The methods, including the appropriate statistical tools, used for the examination of the analytical, clinical performance and limitations of the kit and information provided by it are as follows:

- Routine test
- Clinical trial
- Four-fold table (statistical tool)

6. Performance Evaluation

6.1 The state of the art

6.1 The state of the art

The existing relevant standards, CS, guidance or best practices documents for performance evaluation are gathered as follows:

No.	Paper Number	Paper Title
1	EN ISO13485: 2016	Medical devices - Quality management systems - Requirements for regulatory purposes
2	EN ISO 15223-1: 2021	Medical devices - Symbols to be used with information to be supplied by the manufacturer - Part 1: General requirements
3	EN ISO 20417: 2021	Medical devices. Information to be supplied by the manufacturer
4	EN ISO 14971: 2019	Medical devices - Application of risk management to medical devices
5	ISO 18113-1: 2022	In vitro diagnostic medical devices - Information supplied by the manufacturer (labeling) - Part 1: Terms, definitions and general requirements
6	ISO 18113-2: 2022	In vitro diagnostic medical devices -Information supplied by the manufacturer (labelling)-Part 2: In vitro diagnostic reagents for professional use
7	ISO 18113-4: 2022	In vitro diagnostic medical devices - Information supplied by the manufacturer (labelling)- Part 4: In vitro diagnostic reagents for self-testing
8	EN 13612: 2002	Performance evaluation of in vitro diagnostic medical devices
9	EN ISO 23640: 2015	In vitro diagnostic medical devices - Evaluation of stability of in vitro diagnostic reagents

10	IEC 62366-1: 2015	Medical devices -Part 1: Application of usability engineering to medical devices
11	IEC/TR 62366-2: 2016	Medical devices -Part 2: Guidance on the application of usability engineering to medical devices
12	ISO 20916: 2019	In vitro diagnostic medical devices - Clinical performance studies using specimens from human subjects - Good study practice
13	CLSI EP17-A2	Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures
14	CLSI EP12-A3	Evaluation of Qualitative, Binary Output Examination Performance, 3rd Edition
15	CLSI EP05-A3	Evaluation of Precision of Quantitative Measurement Procedures
16	CLSI EP07-A3	Interference Testing in Clinical Chemistry
17	CLSI EP25-A2	Evaluation of Stability of In Vitro Medical Laboratory Test Reagents
18	CLSI EP24-A2	Assessment of the Diagnostic Accuracy of Laboratory Tests Using Receiver Operating Characteristic Curves
19	MDCG 2022-2	Guidance on general principles of clinical evidence for In Vitro Diagnostic medical devices (IVDs)

6.2 GSPR

6.2.1 Annex I Section 1-8

The IVDR stipulates in Annex I, Chapter 1 - General Requirements (see Table 1) that devices should achieve the performance required for their intended use and that they should maintain this required level of safety throughout their lifetime.

Table 1 IVDR - Annex I, Chapter 1,Section 1-8 of the IVDR

Section 1	Devices shall achieve the performance intended by their manufacturer and shall be designed and manufactured in such a way that, during normal conditions of use, they are suitable for their intended purpose.
Section 2	The requirement in this Annex to reduce risks as far as possible means the reduction of risks as far as possible without adversely affecting the benefit-risk ratio.
Section 3	Manufacturers shall establish, implement, document and maintain a risk anagement system. Risk management shall be understood as a continuous iterative process throughout the entire lifecycle of a device, requiring regular systematic updating. In carrying out risk management manufacturers shall: (a) establish and document a risk management plan for each device; (b) identify and analyse the known and foreseeable hazards associated with each device; (c) estimate and evaluate the risks associated with, and occurring during, the intended use and during

	reasonably foreseeable misuse; (d) eliminate or control the risks referred to in point (c) in accordance with the requirements of Section 4; (e) evaluate the impact of information from the production phase and, in particular, from the post-market surveillance system, on hazards and the frequency of occurrence thereof, on estimates of their associated risks, as well as on the overall risk, the benefit-risk ratio and risk acceptability; and (f) based on the evaluation of the impact of the information referred to in point (e) if necessary amend control measures in line with the requirements of Section.
Section 4	Risk control measures adopted by manufacturers for the design and manufacture of the devices shall conform to safety principles, taking account of the generally acknowledged state of the art. To reduce risks, the manufacturers shall manage risks so that the residual risk associated with each hazard as well as the overall residual risk is judged acceptable. In selecting the most appropriate solutions, manufacturers shall, in the following order of priority: eliminate or reduce risks as far as possible through safe design and manufacture; where appropriate, take adequate protection measures, including alarms if necessary, in relation to risks that cannot be eliminated; and provide information for safety (warnings/precautions/contra-indications) and, where appropriate, training to users. Manufacturers shall inform users of any residual risks.
Section 5	In eliminating or reducing risks related to use error, the manufacturer shall: reduce as far as possible the risks related to the ergonomic features of the device and the environment in which the device is intended to be used (design for patient safety), and (b) give consideration to the technical knowledge, experience, education, training and use environment, where applicable, and the medical and physical conditions of intended users (design for lay, professional, disabled or other users).
Section 6	The characteristics and performance of a device shall not be adversely affected to such a degree that the health or safety of the patient or the user and, where applicable, of other persons are compromised during the lifetime of the device, as indicated by the manufacturer, when the device is subjected to the stresses which can occur during normal conditions of use and has been properly

	maintained in accordance with the manufacturer's instructions.
Section 7	Devices shall be designed, manufactured and packaged in such a way that their characteristics and performance during their intended use are not adversely affected during transport and storage, for example, through fluctuations in temperature and humidity, taking into account the instructions and information provided by the manufacturer.
Section 8	All known and foreseeable risks, and any undesirable effects shall be minimised and be acceptable when weighed against the evaluated potential benefits to the patients and/or the user arising from the intended performance of the device during normal conditions of use.

Risk management and performance evaluation intersect here since the achieved performance must also be compatible with the potential benefits of the device. Article 5 Section i) stipulates that an assessment of the experience gained from its clinical use should be made, which must also be taken into account in the course of the iterative risk management process.

Please refer to the Risk Management Plan & Risk Management Report.

6.2.2 Annex I Section 9

Section 9 of Annex I, Chapter 2 of the IVDR-Requirements Regarding Performance, Design and Manufacture - describes the respective performance characteristics.

Table 2 IVDR - Annex I, Chapter II, Section 9 of the IVDR

9.1	Devices shall be designed and manufactured in such a way that they are suitable for the purposes referred to in point (2) of Article 2, as specified by the manufacturer, and suitable with regard to the performance they are intended to achieve, taking account of the generally acknowledged state of the art. They shall achieve the performances, as stated by the manufacturer and in particular, where applicable: (a) the analytical performance, such as, analytical sensitivity, analytical specificity, trueness (bias), precision (repeatability and reproducibility), accuracy (resulting from trueness and precision), limits of detection and quantitation, measuring range, linearity, cut-off, including determination of appropriate criteria for specimen collection and handling and control of known relevant endogenous and exogenous interference, cross-reactions; and (b) the clinical performance, such as diagnostic sensitivity, diagnostic specificity, positive predictive value, negative predictive value, likelihood ratio, expected values in normal and affected populations.
9.2	The performance characteristics of the device shall be maintained during the lifetime of the device as

	indicated.
9.3	Where the performance of devices depends on the use of calibrators and/or control materials, the metrological traceability of values assigned to calibrators and/or control materials shall be assured through suitable reference measurement procedures and/or suitable reference materials of a higher metrological order. Where available, metrological traceability of values assigned to calibrators and control materials shall be assured to certified reference materials or reference measurement procedures.
9.4	The characteristics and performances of the device shall be specifically checked in the event that they may be affected when the device is used for the intended use under normal conditions: for devices for self-testing, performances obtained by laypersons; (b) for devices for near-patient testing, performances obtained in relevant environments (for example, patient home, emergency units, ambulances).

6.2.3 Further requirements of Annex I that relate to performance

Even though the requirements relating to performance are mainly presented in Section 9 of Annex I “Requirements Regarding Performance, Design and Manufacture”, performance requirements are also outlined in other parts of Annex I (as shown for example in Table 3).

Table 3 IVDR - Annex I, Chapter 2, Sections 10.1, 19 and 20.4.1

10.1	Devices shall be designed and manufactured in such a way as to ensure that the characteristics and performance requirements referred to in Chapter I are fulfilled. Particular attention shall be paid to the possibility of impairment of analytical performance due to physical and/or chemical incompatibility betwethe materials used and the specimens, analyte or marker to be detected (such as biological tissues, cells, body fluids and micro-organisms), taking account of the intended purpose of the device.
19	Protection against the risks posed by devices intended for self-testing or near-patient testing
19.1	Devices intended for self-testing or near-patient testing shall be designed and manufactured in such a way that they perform appropriately for their intended purpose taking into account the skills and the means available to the intended user and the influence resulting from variation that can be reasonably anticipated in the intended user's technique and environment. The information and instructions provided by the manufacturer shall be easy for the intended user to understand and apply in order to

	correctly interpret the result provided by the device and to avoid misleading information. In the case of near-patient testing the information and the instructions provided by the manufacturer shall make clear the level of training, qualifications and/or experience required by the user.
19.2	Devices intended for self-testing or near-patient testing shall be designed and manufactured in such a way as to: ensure that the device can be used safely and accurately by the intended user at all stages of the procedure if necessary after appropriate training and/or information; and (b) reduce as far as possible the risk of error by the intended user in the handling of the device and, if applicable, the specimen, and also in the interpretation of the results.
19.3	Devices intended for self-testing and near-patient testing shall, where feasible, include a procedure by which the intended user: (a) can verify that, at the time of use, the device will perform as intended by the manufacturer; and (b) be warned if the device has failed to provide a valid result.
20.4.1	The instructions for use shall contain the following information:
w	analytical performance characteristics, such as analytical sensitivity, analytical specificity, trueness (bias), precision (repeatability and reproducibility), accuracy (resulting from trueness and precision), limits of detection and measurement range, (information needed for the control of known relevant interferences, cross-reactions and limitations of the method), measuring range, linearity and information about the use of available reference measurement procedures and materials by the user;
x	clinical performance characteristics as defined in Section 9.1 of this Annex;
z	where relevant, clinical performance characteristics, such as threshold value, diagnostic sensitivity and diagnostic specificity, positive and negative predictive value;

6.3 Scientific validity

The scientific validity is defined as the association of an analyte with a clinical condition or a physiological state. The analyte of this product is Group A Streptococcus, which is associated with symptom of upper respiratory infection such as tonsillitis, pharyngitis and scarlet fever.

According to MDCG 2022-2 Guidance on general principles of clinical evidence for In Vitro Diagnostic medical devices (IVDs). The association of tonsillitis, pharyngitis and scarlet fever and symptom of tonsillitis, pharyngitis and scarlet fever is well established. The scientific validity shall be demonstrated based on available information such as peer reviewed literature, textbooks, information on similar products and the generally acknowledged

state-of-the-art.

Stage l. Is the scientific validity of the analyte established?

(1) Perform systematic literature reviews:

- State of the art (SOTA) Search
- Competitor Search

(2) Describe the Background (Medical Condition, Diagnostic Options)

- Derived from the SOTA Search

(3) Include recommendations from professional societies /expert opinions

- Also derived from the SOTA Search

(4) Establish the competitive landscape

- Use data extracted from articles identifed in the Competitor Search to determinethe safety and performanee criteria and acceptanee measures.

Stage 2. Identification of scientific validity of the analyte.

Stage 3. Appraisal and analysis of scientific validity information.

6.4 Analytical performance

6.4.1 Specimen Type: verify the specimen type mentioned in the intended use is applicable.

6.4.2 The collection method of throat swab: based on the throat swab collection method of CDC.

- Open the sampling swab pouch and hold the swab. DO NOT touch the swab head.
- Preferably in front of a mirror, tilt your head backwards, opens your mouth as much as possible. For healthcare professionals, use a tongue depressor to flatten the tongue if possible. Place the swab head close to the throat. Touch the back of the throat, the area around the tonsils and any reddened or painful part (soft palate , uvula). NOTE: Rotating the swab several times so as to increases the amount of collected sample. Ask others to help you collect the sample if you feel resistance. If you are swabbing others, please wear a mask.
- Insert the swab into the sample extraction tube and plunge the swab up and down in the liquid for at least 10 times, taking care not to spill the liquid out of the tube. Then leave the swab in the tube for 1 minute. Remove the swab by holding it against the wall of the tube to squeeze out the liquid from the swab.

6.4.3 The analytical performance indicators

Items	Applicable	Explanation
Specimen type	Yes	Describe the different specimen types that can be analysed, including their stability.

Analytical sensitivity	Yes	Determine minimum concentration of the target marker that can be detected
Inclusivity	Yes	Investigate the detection ability of different influenza virus subtypes.
Trueness	No	No certified reference material or certified reference method is available.
Limits of detection	Yes	Determine limits of detection of the target marker that can be detected
Limits of quantitation	No	Not applicable for qualitative examination.
Repeatability	Yes	Determine the closeness of agreement between replicated results from the same sample under the same operating conditions.
Reproducibility and Within-laboratory Precision	Yes	Determine the closeness of agreement between the results of measurements when operating conditions are varied.
Cross Reactivity	Yes	Determine the product's ability to detect the analyte in the presence of cross-reactive substances.
Interfering Substance	Yes	Determine the product's ability to detect the analyte in the presence of interfering substances.
Metrological traceability	No	No certified reference material or certified reference method is available.
Measuring range	No	Not applicable for qualitative examination.
Cut-off	Yes	Quantity value used as a limit to identify samples that indicate the presence or the absence of a specific disease, condition or measurand.
Hook Effect	Yes	Determine the analyte concentration at which false negatives occur.
Accuracy	No	Not applicable. This product is a qualitative test, and the test results are not measured values.
Linearity	No	Not applicable for qualitative examination

6.5 Stability

Stability of a product is defined as “its ability to retain its properties and performance over a specified time interval when stored under specified conditions” in CLSI EP25 (current version).

According to CLSI EP25 (current version), the types of stability studies include shelf-life stability, in-use stability, transport stability as follows.

Items	Applicable	Explanation
Shelf-life stability	Yes	Determine period of time until the expiry date during which a product in its original packaging maintains its stability under the storage conditions specified by the manufacturer.
In-use stability	Yes	Determine the duration of time over which the performance of a product within its expiry date remains within specified limits after the card package is opened and the product is put into use under standard operation conditions.
Transport Stability study	Yes	Determine the duration of performance of the product within the expiry date when exposed to possible extreme transportation conditions.

6.6 Clinical performance

According to 2017/746, demonstration of the clinical performance of a device shall be based on one or a combination of the following sources: clinical performance studies, scientific peer-reviewed literature, and published experience gained by routine diagnostic testing. Clinical performance studies shall be performed unless due justification is provided for relying on other sources of clinical performance data.

The MDCG 2022-2, as well as ISO 20916: 2019, stipulates that clinical performance can be characterised by the demonstration and evaluation of applicable aspects of clinical performance for the device in question, such as: diagnostic sensitivity, diagnostic specificity, positive predictive value, negative predictive value and others.

The clinical performance indicators

Items	Applicable	Explanation
Diagnosis sensitivity	Yes	The ability of a device to identify the presence of a target marker associated with a particular disease or condition.
Diagnosis specificity	Yes	The ability of a device to recognise the absence of a target marker associated with a particular disease or condition.
Positive predictive value	Yes	The ability of a device to separate true positive results from false positive results for a given attribute in a given population.
Negative predictive value	Yes	The ability of a device to separate true negative results from false negative results for a given attribute in a given population.
Likelihood ratio	Yes	Likelihood of a given result arising in an individual with the target clinical condition or physiological state compared to the likelihood of the same result arising in an individual without that clinical condition or physiological state.
Expected values in normal and affected populations	Yes	Expected diagnosis sensitivity and specificity for calculating sample size in clinical performance studies.

Experience gained by routine diagnostic testing

Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis (2012 Update by the Infectious Diseases Society of America, https://academic.oup.com/cid/article/55/10/e86/321183#210208431) indicates that swabbing the throat and testing for GAS pharyngitis by rapid antigen detection test (RADT) and/or culture should be performed because the clinical features alone do not reliably discriminate between GAS and viral pharyngitis except when overt viral features. RADTs currently available are highly specific (approximately 95%) when compared with blood agar plate cultures. False-positive test results are highly unusual, and therefore therapeutic decisions can be made with confidence on the basis of a positive test result. Unfortunately, the sensitivity of most of these tests is 70%–90%, compared with blood agar plate culture.

Adverse events databass (held by either the manufacturer or Regulatory Authorities) (Adverse event report databases (e.g., MAUDE)

We proactively collect one adverse event report related to the safety and performance of the similar devices available on the British.

No.	Product Name	Date	Event Description
1	NADAL® Strep A Test	09.11.2023	Weak positive results that do not match clinical findings.

6.7 Usability evaluation

The usability of a medical device is defined as "the ability of the device to be used by the intended user population to achieve the intended use under specified use conditions" in relevant standards and guidelines. According to ISO 62366-1:2015 and other current best practices and standards, it focuses on the user interface, user training, error prevention, and feedback mechanisms.

Key indicators:

Items	Applicable	Explanation
User Interface Design	Yes	The device should have clear labeling and instructions for use.
User Training	Yes	Instructions should be easy to follow.
Error Analysis	Yes	Identification and handling of potential user errors.
Feedback Mechanisms	Yes	Provide clear results to users.
Task Completion	Yes	Ensure users can easily perform the test.
User Satisfaction	Yes	Satisfaction levels with the device's usability: gather feedback to improve user experience.
Accessibility	Yes	Ensure the test is usable by healthcare professionals and possibly by patients themselves.

These usability evaluations are crucial to ensure that the device is not only clinically effective but also user-friendly and safe to use in real-world settings. By conducting these evaluations, manufacturers can identify and address any potential usability issues before the device is released to the market, thereby improving patient outcomes and user satisfaction.

7. Evaluation Procedure

7.1 The List Of Laboratories

Project	Laboratories
Analytical Sensitivity	GenSure R&D Center laboratory A
Repeatability	GenSure R&D Center laboratory A
Reproducibility and Within-laboratory Precision	GenSure R&D Center laboratory A, B and C
Cross Reactivity	GenSure R&D Center laboratory A

Interfering Substance	GenSure R&D Center laboratory A
Hook Effect	GenSure R&D Center laboratory A
Specimen Type	GenSure R&D Center laboratory A
Clinical study	Clinical Study Lab: UOC Laboratorio analisi e Biochimica Clinica - Diagnostica Molecolare Avanzata and clinical Study Site: Azienda Ospedaliero-Universitaria Sant'Andrea.

7.2 Time table

Activity	Date
Plan Performance Evaluation	2020/4/7-2020/4/10
Conduct Performance Evaluation	2020/12/10-2024/4/16
Write Performance Evaluation Report	2024/6/3-2024/6/7

7.3 Performance study records

The records are kept in GenSure Biotech Inc..

7.4 Observations and unexpected outcomes

When an unexpected result occurs, a re-test is needed by another operator.

7.5 Performance evaluation update

We shall update the performance evaluation plan for performance issues derived from PMS activities.

We anticipate update the PEP/PER once every year.

The performance evaluation and relevant documentations shall be updated throughout the life cycle of the product obtained from implementation of the Company's Post-Market Performance Follow-Up Plan and the Post-Market Surveillance Plan.

7.6 Re-Evaluation

When the product performance cannot meet the requirements, analyze the reasons for failure, and carry out product redevelopment and performance evaluation.

Summary of Performance Evaluation Results

1. Scientific Validity

1.1 Identification of medical fields concerned/ relevant medical conditions

Group A Streptococcus (GAS) is an exquisitely human adapted pathogen, it can cause a broad spectrum of disease manifestations. Diseases caused by Streptococcus pyogenes can be roughly divided into superficial, sequelae and invasive. Pharyngitis, rheumatic heart disease, cellulitis and necrotizing fasciitis are the most common diseases associated with GAS among which pharyngitis, scarlet fever and impetigo are all superficial infectious disease.

1.2 Current Knowledge

The gold standard laboratory investigation of GAS pharyngitis is bacterial culture of a throat swab. However, effective management is hindered by the impracticality of throat culture because of the relatively long lag time between the collection of the specimen and final microbiological diagnosis. Rapid antigen detection tests have been used for four decades to help physicians diagnose GAS. Since their inception in the early 1980s, there have been several generations of RADTs that have used different methodologies, such as latex agglutination, followed by enzyme-linked immunosorbent assays (ELISAs), lateral flow and immunochromatographic assays, and optical immunoassays (OIAs). RADTs have been incorporated into the Infectious Diseases Society of America clinical practice guidelines due to low cost, rapid testing and rapid results, simple operation, especially easy to be operated by laypersons.

1.4 Racial diversityof the analyte

GAS and invasive group A Streptococcus (iGAS) infections are notifiable diseases in only a limited number of countries, therefore it is difficult to assess the overall level of circulation at this point. [7] GAS infections are widespread globally. The disease burden varies significantly across regions, with less developed countries bearing the highest burden. This is mainly due to better health conditions and medical resources in developed countries[8], rather than ethnic differences.

The Strep A Rapid Test produced by GenSure Biotech Inc. is a lateral flow immunoassay for the rapid, qualitative detection of Group A streptococcal (GAS, Strep A) antigen.

This antigen is identified as the Lancefield group A carbohydrate (GAC), a conserved antigen with no biological function. All GAS serotypes express the Lancefield GAC, comprising a polyrhamnose backbone with an immunodominant N-acetylglucosamine (GlcNAc) side chain, which is the basis of rapid diagnostic tests.[9] Therefore, the analyte does not vary across racial groups.

Lateral flow immunoassay test kits, based on the principle of specific antigen-antibody binding, do not influence test results across different racial samples when strict production quality standards are met. With evaluation based on the uniform objective indicator, the appearance of the test line, the criteria for result interpretation remain stable and are not modified according to races.

We reviewed the sensitivity and specificity reported in individual studies to explore the relationship between sensitivity/specificity and races (or regions).

Two RADTs (QuickVue and DIAQUICK) were evaluated in Swedish primary healthcare centers, achieving sensitivities of 92% and 72%, and specificities of 86% and 98%, respectively.[10] The average sensitivity and specificity of the two RADTs were 83% and 93%, respectively. Orient Gene Strep A was assessed in Turkey, demonstrated 85.2% sensitivity and 98% specificity.[11] A US study analyzing viral features in pediatric patients found that 63% exhibited viral features. The RADT sensitivity was 84%, with no significant difference between patients with and without viral features.[12] In Canada, a study on operator influence found that technologists achieved 81.4% sensitivity, while nurses achieved 76.3%, a non-significant 5.1% difference, with similar specificity at 97.7% and 96.6%.[13] The evaluated RADT in Greece showed 83.1% sensitivity and 93.3% specificity.[14]

Study	Locations	Sensitivity	Specificity	Remark
Una Ørvim Sølvik	Sweden	83% (QuickVue Dipstick 92% vs DIAQUICK 72%)	93% (QuickVue Dipstick 86% vs DIAQUICK 98%)	QuickVue Dipstick and DIAQUICK
Sibel Gumus	Turkey	85.2%	98%	Orient Gene
Daniel J. Shapiro	the US	84%	Undisclosed	RADT (unknown)
Carla Penney	Canada	79% (technologist 81.4% vs nurses 76.3%)	97% (technologist 97.7% vs nurses 96.6%)	RADT (unknown)
Helen C. Maltezou	Greece	83.1%	93.3%	RADT (unknown)

Overall, GAS RADT sensitivity ranged from 72% to 92%, and specificity from 86% to 98%. These studies were conducted across diverse locations, including Sweden, Turkey, the US, Canada, and Greece, reflecting the varied real-world applications of RADTs. In addition to the slight effect of operator experience on test performance, different RADTs used in these studies with different limits of detection (LOD) may also affect sensitivity and specificity. However, these factors are not directly related to races or regions.

A review shows that sensitivity of OIA RADTs ranged from 72.4% to 96.7%, specificity from 61.0% to 97.1%. The summary estimates of sensitivity and specificity for OIA tests were 86.2% and 93.7%, respectively. There were substantial variations in sensitivity across studies, but specificity was more stable; there was no statistical evidence of a trade-off between sensitivity and specificity. Heterogeneity in accuracy was not explained by study-level characteristics such as use of an enrichment broth before plating, mean age and clinical severity of participants, and GAS prevalence.[15]

This review does not reveal the relationship between the sensitivity and specificity of rapid detection of A group streptococcus antigens and races (or regions).

The Strep A Rapid Test produced by GenSure Biotech Inc., whose analytical performance was validated using Group A Streptococcus strains (CMCC (B) 32210) from the China National Institutes for Food and Drug Control and clinical performance was validated at the Azienda Ospedaliero-Universitaria Sant'Andrea in Italy, is suitable for detecting GAS antigens globally.

1.4 Scientific validity evaluation

According to MDCG 2022-2 Guidance on general principles of clinical evidence for In Vitro Diagnostic medical devices (IVDs), we plan to demonstrated the scientific validity of this product in the following ways:

- critical evaluation of equivalent product information;

- critical evaluation of relevant scientific literature currently available.

1.3.1 Demonstration of equivalence

Parameter	GenSure (or EuroGen) Strep A Rapid Test	QuickVue In-Line Strep A Test	BinaxNOW™ Strep A Card
Manufacturer	GenSure Biotech Inc.	Quidel Corporation	Abbott Diagnostics Scarborough, Inc.
Intended Use	The Strep A Rapid Test is a lateral flow immunoassay for the rapid, qualitative detection of Group A streptococcal (GAS, Strep A) antigen from throat swabs of individuals who suspected of Strep A infection. The test is used as an aid in the diagnosis of Strep A infection. It is a non-automated device intended for professional laboratory use and self-testing. Children under 15 years old should be sampled and tested by adults.	The QuickVue In-Line Strep A Test allows for the rapid detection of Group A Streptococcal antigen directly from patient throat swab specimens. The test is intended for use as an aid in the diagnosis of Group A Streptococcal infection. For use by healthcare professionals.	The BinaxNOW™ Strep A Card is a rapid immunochromatographic assay for the qualitative detection of Streptococcus pyogenes Group A antigen from throat swab specimens.
CE Certificate state	Under application (IVDR)	CE Marked (IVDD)	CE Marked (IVDD)
Testing populations	Individuals who suspected of Strep A infection	Patients who suspected of Strep A infection	Patients with signs and symptoms of pharyngitis
Intended user	Professional laboratory user and lay person	Healthcare professionals	Professional laboratory users
Analyte	Group A streptococcal (GAS, Strep A) antigen	Group A Streptococcal antigen	Streptococcus pyogenes Group A antigen
Technology	Lateral flow immunochromatographic membrane assay	Lateral-flow immunoassay	Immunochromatographic membrane assay
Specimen Type	Throat swab	Throat swab	Throat swab
Analytical Sensitivity	2.5×10^5 CFU/mL in extraction buffer (equivalent to 1.3×10^5 CFU/swab)	Not disclosed in the package insert.	1.8×10^5 CFU per test
Analytical Specificity	No cross reaction was observed for the following related pathogens, high prevalence disease agents and normal or pathogenic flora at 1×10^6 CFU/mL or 1×10^5 $TCID_{50}$/mL with the Strep A rapid test. Human adenovirus 1, Bordetella pertussis, Candida albicans, Enterococcus faecalis, Escherichia coli, Haemophilus influenzae, Haemophilus	Group C Streptococcus, Group G Streptococcus, S. aureus, N. subflava, H. influenza, C. albicans, N. meningitidis, N. gonorrhoea, B. catarrhalis, E. faecalis, S. pneumoniae, and S. mutans were tested in the QuickVue In-Line Strep A Test at levels exceeding 10^7/test and did not affect the	Bordetella pertussis, Candida albicans, Corynebacterium pseudodiptheriticum, Enterococcus faecalis, Escherichia coli, Haemophilus influenzae type b, Klebsiella pneumoniae, Moraxella catarrhalis, Neisseria subflava, Neisseria gonorrhoeae, Neisseria meningitidis, Pseudomonas

	parainfluenzae, Human herpesvirus 1, Klebsiella pneumoniae, Moraxella catarrhalis, Mumps Virus, Human rhinovirus 16, Pseudomonas aeruginosa, Neisseria meningitidis, Yersinia enterocolitica, Streptococcus oralis, Streptococcus pneumoniae, Streptococcus agalactiae, Streptococcus zooepidemicus, Streptococcus bovis, Streptococcus dysgalactiae, Arcanobacterium haemolyticum, Corynebacterium diphtheriae, Neisseria gonorrhoeae, Serratia marcescens, Streptococcus salivarius, Streptococcus sanguis.	expected test results.	aeruginosa, Serratia marcescens, Staphylococcus aureus and epidermidis, Streptococcus agalactiae, pneumoniae, Group C, Group F, Group G, mitis, mutans, and parasanguis were tested in the BinaxNOW Strep A Card at levels exceeding 10^7 organisms per test and did not cross react.
Interfering Substances	The Strep A rapid test shows no significant interference from regular substances which may exist in clinical specimens listed below. Listerine Antiseptic, 20% v/v; Listerine Cool Mint, 20% v/v; Coffee, 20% v/v; Bilirubin, 200 mg/L; Mucin, 1 mg/mL; Menthol, 1.5 mg/mL; Benzocaine, 1.5 mg/mL; Phenol, 15% v/v; Aspirin, 20 mg/mL; Salbutamol, 0.083 mg/mL; Amantadine Hydrochloride, 500 ng/mL; Ascorbic Acid, 5% by weight; Beclometasone Dipropionate, 500 ng/mL; Budesonide, 0.64 nmol/L; Chlorphenamine Maleate, 5 mg/mL; Dexamethasone, 10 mg/mL; Dextromethorphan Hydrobromide , 10 mg/mL; Mometasone Furoate, 500 ng/mL; Oseltamivir Phosphate, 5 mg/mL; Pseudoephedrine Hydrochloride, 20 mg/mL; Zanamivir sesquihydrate, 300 ng/mL; Biotin, 2.4 mg/mL; Hemoglobin, 25 g/L; Paracetamol, 10 mg/mL.	Not disclosed in the package insert.	The BinaxNOW Strep A Card was found to perform as expected with both positive and negative samples in the presence of 2 commercially available sore throat medications. Overall agreement was 100%.
Clinical Sensitivity	83.18% (95%CI: 74.97%~89.09%) vs PCR	90.06% (84.36%~94.21%) vs culture	92.31% (79.13%~98.38%) vs culture

QuickVue In-Line Strep A Test and BinaxNOWTM Strep A Card are both CE mark under IVDD, the evidences could be found in the IFUs (IFU-QuickVue In-Line Strep A Test and IFU-BinaxNOW™ Strep A Card). Additionally, QuickVue In-Line Strep A Test has been approved by FDA in 1994 and BinaxNOWTM Strep A Card has been approved by NMPA in 2013.

New Search | Back To Search Results

Device Classification Name	Antisera, All Groups, Streptococcus Spp.
510(k) Number	K934484
Device Name	QUICKVUE IN-LINE ONE-STEP STREP A TEST
Applicant	QUIDEL CORP. 10165 MCKELLAR COURT SAN DIEGO, CA 92121
Applicant Contact	Robin Weiner
Correspondent	QUIDEL CORP. 10165 MCKELLAR COURT SAN DIEGO, CA 92121
Correspondent Contact	Robin Weiner
Regulation Number	866.3740
Classification Product Code	GTZ
Date Received	09/14/1993
Decision Date	07/18/1994
Decision	Substantially Equivalent (SESE)
Regulation Medical Specialty	Microbiology
510k Review Panel	Microbiology
Type	Traditional
Reviewed by Third Party	No
Combination Product	No

New Search | Back To Search Results

Device Classification Name	Antisera, All Groups, Streptococcus Spp.
510(k) Number	K954257
Device Name	QUICKVUE IN-LINE ONE STEP STREP A TEST (MODIFICATION)
Applicant	QUIDEL CORP. 10165 MCKELLAR COURT SAN DIEGO, CA 92121
Applicant Contact	Robin Weiner
Correspondent	QUIDEL CORP. 10165 MCKELLAR COURT SAN DIEGO, CA 92121
Correspondent Contact	Robin Weiner
Regulation Number	866.3740
Classification Product Code	GTZ
Date Received	07/27/1995
Decision Date	10/20/1995
Decision	Substantially Equivalent (SESE)
Regulation Medical Specialty	Microbiology
510k Review Panel	Microbiology
Type	Traditional
Reviewed by Third Party	No
Combination Product	No

境进口医疗器械（注册历史数据） —— "国食药监械(进)字2011第3400963号" 基本信息

注册证编号	国食药监械(进)字2011第3400963号
注册人名称	BinaxNOW Strep A Card
注册人住所	10 Southgate Road, Scarborough, ME 04074
生产地址	10 Southgate Road, Scarborough, ME 04074
代理人名称	英艾科尔(中国)医疗器械有限公司
代理人住所	上海市张江高科技园区金科路3728号4号楼221室
产品名称	A群链球菌抗原检测试剂盒(胶体金法)
管理类别	第三类
型号规格	25人份/盒
结构及组成/主要组成成分	检测卡:包被有鼠抑制化的兔抗A群链球菌多克隆抗体、兔抗羊IgG多克隆抗体、胶体金标记的鼠抑制化的兔抗A群链球菌多克隆抗体、胶体金标记的羊IgG多克隆抗体,抽提液1,抽提液2,阳性对照拭子。
适用范围/预期用途	该产品用于定性检测咽拭子标本中的A群化脓性链球菌抗原。
产品储存条件及有效期	
附件	注册产品标准、产品技术要求、说明书
其他内容	
备注	/
审批部门	国家食品药品监督管理总局
批准日期	2013-02-07

境进口医疗器械（注册） —— "国械注进20143405795" 基本信息

注册证编号	国械注进20143405795
注册人名称	雅培诊断（英国）斯卡博股份有限公司Abbott Diagnostics Scarborough, Inc.
注册人住所	10 Southgate Road Scarborough, Maine 04074, United States
生产地址	10 Southgate Road Scarborough, Maine 04074, United States
代理人名称	雅培医疗诊断产品有限公司
代理人住所	中国（上海）自由贸易试验区哥伦比亚路391号1幢2楼办公区域A区225室
产品名称	A群链球菌抗原检测试剂盒（胶体金法） BinaxNOW Strep A Card
管理类别	第三类
型号规格	25人份/盒
结构及组成/主要组成成分	检测卡、抽提液1、抽提液2、阳性对照拭子。（具体内容详见产品说明书）
适用范围/预期用途	本产品用于体外定性检测咽拭子标本中的A群化脓性链球菌抗原。
产品储存条件及有效期	2－30℃保存，有效期为24个月。
附件	产品技术要求、说明书
其他内容	/
备注	2023年10月10日前最正说明书内容，2023年9月8日核发的中华人民共和国医疗器械注册证(体外诊断试剂)、说明书予以废止。
审批部门	国家药品监督管理局
批准日期	2023-10-10

Quidel Corporation and Abbott Diagnostics Scarborough, Inc. are both prominent multinational corporations specializing in in vitro diagnostic reagents, whose products are highly regarded in major markets such as Europe, the United States, and China.

Regrettably, neither company has disclosed specific information regarding their market share of the Strep A test.

According to the full-year 2024 financial results reported by Quidel Corporation (https://www.businesswire.com/news/home/20250212064272/en/QuidelOrtho-Reports-Fourth-Quarter-and-Full-Year-2024-Financial-Results), total revenue was $2.8 billion, including $1.6 billion in North America, $336 million in EMEA, $325 million in China, and $502 million in other regions. Of this total, respiratory revenue accounted for $504 million.

Abbott Diagnostics Scarborough, Inc. did not release its 2024 financial statements independently. However, according to the full-year 2024 results published by its parent company, Abbott Laboratories (https://www.sec.gov/Archives/edgar/data/1800/000162828025002092/abt-2024q4xexhibitx991.htm), rapid diagnostics sales amounted to $849 million, comprising $554 million in the U.S. and $295 million internationally.

As per BioSpace

(https://www.biospace.com/press-releases/in-vitro-diagnostics-market-size-to-attain-usd-132-18-bn-by-2034), the global in vitro diagnostics market revenue reached $102 billion in 2024. Within this market, reagents accounted for $67 billion, and infectious diseases represented $54 billion in terms of application.

Based on the aforementioned data and information, we have reason to believe that QuickVue In-Line Strep A Test and BinaxNOW™ Strep A Card possess significant market potential.

1.3.2 Scientific literature evaluation

A total of 77 scientific documents were retrieved, and Among them, 47 literature were excluded based on the inclusion criteria, and the remaining 30 were found in full text and continued to be reviewed. Among them, 7 were irrelevant or less relevant to the subject, and the remaining 23 literature were included in the scientific validity data. Systematic review of cross sectional studies with consistently applied reference standard and blinding is considered the best quality literature with 6 literature, including PubMed Papers 2/3/4/7/8/11. These literature introduce the development history of Rapid antigen detection testing (RADT), the sensitivity and specificity of RADTs, and the benefits of using RADTs for antibiotic-prescribing. The first generation of RADTs typically used latex agglutination in the 1980s, the second-generation RADTs are based on enzymeimmunoassay techniques, the high-sensitivity optical immunoassay became available in 1994, and RADTs that use chemiluminescent DNA probes and rapid-cycle real-time PCR methods have become available more recently. Overall, the sensitivity and specificity of RADTs are about 86% and 96% respectively. However, different studies have different conclusions on whether the sensitivity and specificity of RADTs in adults are superior to those in children. Undoubtedly, RADTs may help to reduce antibiotic-prescribing rates.

The Strep A Rapid Test is a lateral flow immunoassay for the rapid, qualitative detection of Group A streptococcal (GAS, Strep A) antigen from throat swabs. Clinical guidelines recognize the importance of rapid antigen detection tests in the diagnosis of Group A Streptococcal pharyngitis.

The CDC recommends using rapid antigen detection tests (RADTs) to diagnose group A streptococcal pharyngitis, but advises confirming negative RADT results with a throat culture in symptomatic children aged 3 years or older. IDSA recommends using rapid antigen detection tests to diagnose group A streptococcal pharyngitis, with a positive result being diagnostic and a negative result in children requiring a backup culture. Therefore, Strep A Rapid Test is recommended by the guidelines to detect Group A streptococcal infection in the clinic.

In terms of clinical performance of the Strep A Rapid Test, it demonstrates a clinical sensitivity of 83.18% (95%CI: 74.97%~89.09%) and a clinical specificity of 95.71% (95%CI: 90.97%~98.02%). When compared to commercially

available similar products, the clinical specificity is comparable, while the clinical sensitivity is slightly lower. However, according to the literature (Ha-Nui Kim, Jeeyong Kim, Woong Sik Jang, ect), the sensitivity of RADTs using PCR as a reference is lower than when using culture method as the reference. And according to the literature search results, the clinical sensitivity of RADTs compared with culture ranges from 64% to 100%, with most values falling within the range of 85% to 95%; and the clinical specificity ranges from 83% to 98%, with most values being greater than 95%. Therefore, the clinical performance of the Strep A Rapid Test is acceptable.

In addition, several studies have indicated that the use of RADTs can effectively curb the misuse of antibiotics.

In short, the Strep A Rapid Test is the state of the art and employing the Strep A Rapid Test holds the potential to confer significant benefits on humanity.

Please refer to *Scientific Validity Report* for more detail.

2. Analytical Performance

2.1 Analytical Sensitivity (Limit of Detection (LoD))

Cultured and counted streptococcus pyogenes (7.5×10^8 CFU/mL) was continuously diluted with the negative clinical matrix pool and then tested with the 3 different lots of products in triplicate. 7.5×10^5 CFU/mL was previously determined as the estimate LoD. Then streptococcus pyogenes with a concentration of 7.5×10^5 CFU/mL was further diluted with the negative clinical matrix pool tested 5 times a day for 4 days with 3 lot of products. The concentration of 2.5×10^5 CFU/mL is set as the LoD. Finally, 1 lot of products was tested for 5 times a day for 4 days to confirm the positive detection rate shall be $\geqslant$95% for this concentration.

The LoD of Strep A rapid test is 2.5×10^5 CFU/mL in extraction buffer (equivalent to 1.3×10^5 CFU/swab).

2.2 Repeatability

Negative sample N1, weak positive sample P5, moderate positive sample P3, and high negative sample H were tested 3 times in parallel every time (both a.m. and p.m. of the day) at the same site with 3 different lots in 20 days by the same operator. The test results of positive samples are all positive, while the test results of negative samples are all negative, and the T-line intensity of the same sample is the same.

The Strep A rapid test showed good repeatability Results obtained from different batches.

2.3 Reproducibility and Within-laboratory Precision

Negative sample N1, weak positive sample P5, moderate positive sample P3, and high negative sample H were tested 5 times in parallel every day with the 1 lot at 3 different sites for 5 days by 3 different operators. The test

results of positive samples are all positive, while the test results of negative samples are all negative, and the T-line intensity of the same sample is the same.

The Strep A rapid test showed good reproducibility and within-laboratory precision on results by different operators on different sites and on different testing days.

2.4 Cross Reactivity

Cross-reactive microorganisms were diluted by negative clinical matrix pool and moderate positive sample respectively, then tested in triplicates with 3 different lots. The test results are positive in the presence of *S. pyogenes* and the test results are negative in the absence of *S. pyogenes.*

No cross reaction was observed for the following related pathogens, high prevalence disease agents and normal or pathogenic flora at 1×10^6 CFU/mL or 1×10^5 TCID50/mL with the Strep A rapid test

Human adenovirus 1	Moraxella catarrhalis	*Streptococcus zooepidemicus*
Bordetella pertussis	Mumps Virus	*Streptococcus bovis*
Candida albicans	Human rhinovirus 16	*Streptococcus dysgalactiae*
Enterococcus faecalis	*Pseudomonas aeruginosa*	*Arcanobacterium haemolyticum*
Escherichia coli	*Neisseria meningitidis*	*Corynebacterium diphtheriae*
Haemophilus influenzae	*Yersinia enterocolitica*	*Neisseria gonorrhoeae*
Haemophilus parainfluenzae	*Streptococcus oralis*	*Serratia marcescens*
Human herpesvirus 1	*Streptococcus pneumoniae*	*Streptococcus salivarius*
Klebsiella pneumoniae	*Streptococcus agalactiae*	*Streptococcus sanguis*

2.5 Interference

Interfering substances were diluted by negative clinical matrix pool and moderate positive sample respectively, then tested in triplicates with 3 different lots. The test results are positive in the presence of *S. pyogenes* and the test results are negative in the absence of *S. pyogenes.*

The Strep A rapid test shows no significant interference from regular substances which may exist in clinical specimens listed below.

Interfering Substances	**Concentration**	**Interfering Substances**	**Concentration**
Listerine Antiseptic	20% v/v	Beclometasone Dipropionate	500 ng/mL
Listerine Cool Mint	20% v/v	Budesonide	0.64 nmol/L
Coffee	20% v/v	Chlorphenamine Maleate	5 mg/mL
Bilirubin	200 mg/L	Dexamethasone	10 mg/mL
Mucin	1 mg/mL	Dextromethorphan Hydrobromide	10 mg/mL
Menthol	1.5 mg/mL	Mometasone Furoate	500 ng/mL
Benzocaine	1.5 mg/mL	Oseltamivir Phosphate	5 mg/mL
Phenol	15% v/v	Pseudoephedrine Hydrochloride	20 mg/mL

Aspirin	20 mg/mL	Zanamivir sesquihydrate	300 ng/ml
Salbutamol	0.083 mg/mL	Biotin	2.4 mg/ml
Amantadine Hydrochloride	500 ng/mL	Hemoglobin	25 g/L
Ascorbic Acid	5% by weight	Paracetamol	10 mg/mL

2. 6 Hook Effect

Streptococcus pyogenes was continuously diluted with the negative clinical matrix pool and then tested 5 times with 3 different lots. The intensity of the T line decreases with the decrease of virus concentration ($\geqslant 2.5 \times 10^5$ CFU/mL).

There is no hook effect when the concentration of group A streptococci is 7.5×10^8 CFU/mL or below.

2.7 Specimen Type

Negative clinical throat swabs and simulated weak/moderate/strong positive throat swabs prepared by negative swabs and different concentrations of *Streptococcus pyogenes* were stored under different conditions.

Freshly collected swab samples should be tested as soon as possible. For laypersons, it is recommended to perform the test immediately after sampling. For professionals, if the sample cannot be processed immediately, it should be stored immediately in a clean and strictly sealed plastic tube. It can be stored at room temperature (15-25℃) for 8 hours, stored at 2-8℃ for 72 hours, stored at -20℃ for 6 months, and can be frozen and thawed at -20℃ for a total of 2 times. The throat swab is extracted in a buffer, and the extract can be stored at room temperature for 8 hours.

Please refer to *Analytical Performance Evaluation Report* for more detail.

3. Stability

3.1 Transportation Stability

Transport simulation were conducted twice: in the cold winter, one lot of products packed in cartons will be entrusted to a freight company for the first transportation, and in the hot summer, another lot will be entrusted to the freight company for the second transportation.The two transportation routes are the same, both from Shanghai to Heilongjiang, then to Urumqi, and finally back to Shanghai. Airplane transportation is used between cities, while truck transportation is used between airports and warehouses, and the entire process may also involve manual or mechanical handling. 4800 T of one lot were transported for the first time; and 1200 T of another lot were transported for the second time. After each transportation, the product were stored at room temperature in the warehouse for 24 hours, and then carry out testing. Shanghai is located at latitude 31.41 and longitude 121.49, Harbin is located at latitude 45.55 and longitude 126.96, and Urumqi is located at latitude 43.36 and longitude

88.31. According web of Weather Atlas, the mean lowest temperature in Shanghai, Harbin and Urumqi during winter are 2.1℃, -24℃ and -17℃ respectively, and the mean highest temperatures in shanghai, Harbin and Urumqi during summer are 32℃, 28℃ and 30℃ respectively. Considering the airtightness, the temperature of the truck carriages may exceed 40℃ in summer. It is inevitable that the temperature would briefly deviate from the upper or lower limit of the storage temperature required for the product during transportation, however the test results after two shipments both met the acceptance criteria.

The Strep A Rapid Test is considered to be able to transport to all over the world, as the product will not be affected by the transportation environment.

Please refer to *Transportation Stability Study Report* for more detail.

3.2 In-use Stability

The open stability study were conducted after the first transportation simulation (after stored at room temperature in the warehouse for 24 hours). Open the packaging box, tear the aluminum foil bag, take out the cassette. These opened products were stored stored at 5±3℃ & 20%±5% RH, 5±3℃ & 80%±5% RH, 35±3℃ & 20%±5% RH, and 35±3℃ & 80%±5% RH respectively, and tested at 0min, 15min, 30min, 45min, 60min, and 90min since placement. The product could meet the acceptable criteria within 90 minutes of opening, however some test results were different from the initial results.

It is suggested that once the sealed bag is opened, the test cassette should be used within 60 minutes under 5-35℃&20%-80%RH.

Please refer to *In-use Stability Study Report* for more detail.

3.3 Real-time Stability

3 different lots were involved in the study, including: 1 lot that had already undergone transportation before real-time stability began; another lot was transported after 6 months of the study and then returned to this study; the last lot was not transported throughout the entire process. These products of each lot were randomly stored at 4±3℃ and 30±3℃ out of direct sunlight, and tested at the 1st, 3th, 6th, 9th, 12th, 15th, 18th, 20th, 22nd, 24th, 26th, and 27th months respectively. The completed 27-month test results of the 3 different lots met the acceptable criteria.

It has been validated that the product performance can remain stable and effective within 27 months. Therefore, the declared validity period of Strep A Rapid Test in the IFU is for 24 months.

Please refer to *Real-time Stability Study Report* for more detail.

4. Clinical Performance

4.1 A comparison of Regulatory Approval of Clinical Performance Study Protocol

Current medical device regulations in both the European Union (EU) and China require clinical performance study plan and report.

The EU has additional requirements contained in the IVDR 2017/746 Annex XIII section 2.3.2.

Although this article aims to demonstrate the justification that where any of the elements referred to in the second paragraph are not deemed appropriate for inclusion in the CPSP due to the specific study design chosen, such as use of left-over samples versus interventional clinical performance studies.

The company provides a table outlining the specific requirements of IVDR requirements, and explains that the clinical performance study plan provided by the company meets the requirements of IVDR's clinical performance research plan.

Table 1.The Checklist of EU IVDR Requirements

Description	NA	A	Justification
a. the single identification number of the clinical performance study, as referred to in Article 66(1);	☐	☒	Ref. 7376
b. identification of the sponsor, including the name, address of the registered place of business and contact details of the sponsor and,if applicable,the name,address of the registered place of business and contact details of its contact person or legal representative pursuant to Article 58(4) established in the Union;	☐	☒	The Abstract of the clinical performance study plan show the identification of the sponsor, including the name, address of the registered place of business and contact details of the sponsor and, if applicable, the name, address of the registered place of business and name of PI.
c. information on the investigator or investigators, namely principal, coordinating or other investigator;qualifications;contact details,and investigation site or sites, such as number,qualification, contact details and, in the case of devices for self-testing, the location and number of lay persons involved;	☐	☒	The Abstract of the clinical performance study plan show information on the investigator or investigators, namely principal,coordinating or other investigator;qualifications;contact details,and investigation site or sites and in the case of devices for self-testing, the location and number of lay persons involved.
d. the starting date and scheduled duration for the clinical performance study;	☐	☒	Study Period: September 2023 – April 2024
e. identification and description of the device, its intended purpose, the analyte or analytes or marker or markers,the metrological traceability and the manufacturer;	☐	☒	The overall synopsis of the clinical performance study plan show the identification and description of the device.
f. information about the type of specimens under investigation;	☐	☒	The Study enrollment procedure of the clinical performance study plan show information about the type of specimens under investigation.

g. overall synopsis of the clinical performance study, its design type, such as observational, interventional,together with the objectives and hypotheses of the study,reference to the current state of the art in diagnosis and/or medicine；	☐	☒	The 4.6 Type of specimens under investigation in Description of the candidate test of the clinical performance study plan show its design type,The specimen in conjunction with the study is throat swab. The section 2.2 Objectives of the clinical performance study plan and report show the objectives of the study,reference to the current state of the art in diagnosis and/or medicine.
h. a description of the expected risks and benefits of the device and of the clinical performance study in the context of the state of the art in clinical practice, and with the exception of studies using left-over samples, the medical procedures involved and patient management;	☐	☒	The section 8 of the clinical performance study plan show the anticipated risks and expected benefits.
i. the instructions for use of the device or test protocol, the necessary training and experience of the user, the appropriate calibration procedures and means of control,the indication of any other devices, medical devices, medicinal product or other articles to be included or excluded and the specifications on any comparator or comparative method used as reference；	☐	☒	The investigators received IFUs of the evaluated kit and the comparator kit and were required to receive relevant training and pass the evaluation according to 5.1.1 Professionalss of the clinical performance study plan.
j. description of and justification for the design of the clinical performance study, its scientific robustness and validity, including the statistical design, and details of measures to be taken to minimise bias, such as randomisation, and management of potential confounding factors;	☐	☒	Scientific robustness and validity is described in section 5.1.3 of the clinical performance plan, and bias control measures is described in section 5.5.4 of the clinical performance report.
k. the analytical performance in accordance with point (a) of Section 9.1 of Chapter I of Annex I with justification for any omission;	☒	☐	Not applicable. The company has established a GSPR Checklist in accordance with the requirements of Appendix I of IVDR. We have completed the analysis performance study based on the GSPR checklist.
l. parameters of clinical performance in accordance with point (b) of Section 9.1 of Annex I to be determined, with justification for any omission; and with the exception of studies using left-over samples the specified clinical outcomes/endpoints (primary/secondary) used with a justification and the potential implications for individual health and/or public health management decisions;	☐	☒	Parameters of clinical performance, clinical endpoints and benefit-risk analysis are described in section 6, 4 and 8 of the clinical performance plan.
m.information on the performance study population: specifications of the subjects, selection criteria, size of performance study population, representativity of target population and, if applicable, information on vulnerable subjects involved, such as children, pregnant women, immuno-compromised or elderly subjects;	☐	☒	The inclusion criteria and exclusion criteria in Clinical Performance describe the specifications of the subjects, selection criteria. The Sample Size Requirement describe the samples size calculation and assumption describe a, size of Performance study population, representativeness of target population.

n. information on use of data out of left over specimens banks, genetic or tissue banks, patient or disease registries etc.with description of reliability and representativity and statistical analysis approach; assurance of relevant method for determining the true clinical status of patient specimens;	☒	☐	Not applicable. The samples used in this clinical performance study were fresh throat swab samples from recruited subjects.
o. monitoring plan	☐	☒	The monitoring plan is described in section 7.8 of the clinical performance plan.
p. data management	☐	☒	Applicable
q. decision algorithms;	☐	☒	The 7.2 Statistical analysis of the clinical performance study plan and report show description of and justification for the design of the clinical performance study,including the statistical design.
r. policy regarding any amendments, including those in accordance with Article 71, to or deviations from the CPSP, with a clear prohibition of use of waivers from the CPSP;	☒	☐	Until now, the templates in the EUDAMED database have not been enabled. Article 71 Material modifications to performance studies cannot be implemented.
s. accountability regarding the device, in particular control of access to the device, follow-up in relation to the device used in the clinical performance study and the return of unused, expired or malfunctioning devices;	☐	☒	Section 12 of clinical performance study plan show that the PI is responsible for is responsible for keeping the devices and destroying unused device at the end of the study.
t. statement of compliance with the recognised ethical principles for medical research involving humans and the principles of good clinical practice in the field of clinical performance studies as well as with the applicable regulatory requirements;	☐	☒	Annex 4 Investigator declaration of clinical performance study plan show the statement of compliance with the recognised ethical principles for medical research involving humans and the principles of good clinical practice in the field of clinical performance studies as well as with the applicable regulatory requirements.
u. description of the informed consent process, including a copy of the patient information sheet and consent forms;	☐	☒	Annex 5 Informed Consent Form for Data Processing of clinical performance study plan show the description of the informed consent process.
v. procedures for safety recording and reporting, including definitions of recordable and reportable events,and procedures and timelines for reporting;	☐	☒	The Adverse events and device deficiency of performance evaluation plan and report show the procedures for safety recording and reporting, including definitions of recordable and reportable events. The timelines for reporting is no later than 3 calendar days from the day the site personnel became aware of the event or as per the investigative site's local requirements.
w. criteria and procedures for suspension or early termination of the clinical performance study;	☐	☒	The accountability of IVD medical devices under investigation of the clinical performance study plan and report show the criteria and procedures for suspension or early termination of the clinical

			performance study.
x. criteria and procedures for follow up of subjects following completion of a performance study, procedures for follow up of subjects in the case of suspension or early termination, procedures for follow up of subjects who have withdrawn their consent and procedures for subjects lost to follow up;	☒	☐	Not applicable. Only with the written consent of the subjects, their throat swabs can be collected for clinical performance studies, and this process will not exceed half an hour, so follow-up is not necessary.
y. procedures for communication of test results outside the study, including communication of test results to the performance study subjects;	☒	☐	Not applicable. This clinical performance study is observational and the test results are not used as a clinical diagnostic basis, so the subjects do not need to know the results of professional testing.
z. policy as regards the establishment of the clinical performance study report and publication of results in accordance with the legal requirements and the ethical principles referred to in IVDR Section 2.2;	☐	☐	Section 9 Report and Publication of clinical performance study plan show the policy as regards the establishment of the clinical performance study report and publication of results.
aa. list of the technical and functional features of the device indicating those that are covered by the performance study;	☐	☒	The company has listed the Analytical Performance of the device. Information To Be Supplied By The Manufacturer Performance Evaluation Report The results of this clinical evaluation show that the product is highly correlated with the results of the comparison kit, proving that this product is equivalent to the results of the comparison reagent determination of clinical samples and its applicability in clinical determination.
ab. bibliography.	☐	☒	Section 13 eference of clinical performance study plan and report show the bibliography.

4.2 Clinical performance study

In total 248 participants,sample from 1 participant was excluded due to invalid PCR result， the remaining 247 participants met the inclusion criteria mentioned in the clinical protocol and filled out the informed consent and privacy terms. Of these, 107 participants tested positive for Streptococcus pyogenes.

Characteristics of the subjects involved:Individuals at the study site were more often female (57.9%) and more symptomatic (54.7%), most frequent with headache (29.6%), strep throat (23.9%),body aches (14.2%). Duration of symptoms were 1~7 days in 217 subjects (87.9%), and more than 7 days in 30 subjects (12.1%).

Test characteristics of the candidate test compared to the RT- PCR

Candidate Test	RT- PCR results		Total
	(+) Positive	(-) Negative	
(+) Positive	89	6	95

(-) Negative	18	134	151
Total coincidence rate (accuracy)	107	140	247

Calculation and analysis of the clinical sensitivity, clinical specificity, total coincidence rate and their 95% Confidence Interval as below:

Clinical sensitivity = (89/107) × 100% = 83.18% (95%CI:74.97%~89.09%)

Clinical specificity = (134/140) × 100% = 95.71% (95%CI:90.97%~98.02%)

Positive predictive value = 89/(89+6) × 100% = 93.68% (95%CI:90.97%~98.02%)

Negative predictive value = 134/(135+18)× 100% = 88.16% (95%CI:86.90%~97.07%)

Total coincidence rate = [(89+134)/247] × 100% =90.28% (95%CI:85.95%~93.38%)

False Positive Rate = 6/(6+134)× 100% = 4.28%

False Negative Rate = 18/(18+89)× 100% =16.82%

Positive Likelihood Ratio = Sensitivity/(1-Specificity) = 19.40

Negative Likelihood Ratio = (1- Sensitivity)/Specificity = 0.18

Conclusively, the Strep A Rapid Test exhibited commendable diagnostic sensitivity, diagnostic specificity, and accuracy when applied to anterior throat swabs from suspected Strep A cases. Its performance, as demonstrated in this evaluation, underscores its efficacy as a rapid diagnostic tool for facilitating the early detection of Strep A infections, thereby aiding in timely clinical management and public health interventions.

Please refer to *Annex D Clinical Study Report* for more detail.

5. Usability evaluation

The summative usability test was performed at Azienda Ospedaliero-Universitaria Sant'Andrea. The tests took place at the test lab or other rooms. We choose a regular office or neutral room condition as test environment because this is closest to the most common application environment for self-testing. The interviews and moderations were given by a test engineer sitting opposite to the Test User.

The usability study involved a total of 117 participants, spanning a wide range of ages from 8 to 87 years old, and representing diverse educational backgrounds. All participants have no prior experience in medical-related fields, indicating that the absolute majority of participants were laypersons. This diversity ensured a comprehensive evaluation of the instructional clarity and ease of use of the GenSure Strep A Rapid Test. In addition to assessing the feasibility of operational procedures, we also placed particular emphasis on evaluating the readability of the

instructions. This was done to ensure that users of varying ages and educational levels could accurately comprehend the key points of the testing process. The design of these steps aimed to simulate real-world usage conditions, thereby facilitating a more robust evaluation of the product's performance in practical applications. Evaluation was conducted across four key aspects: 1) the consistency between participants' self-test results and those of professionals, 2) the accuracy of result interpretation, 3) the completion rate of the operational procedures according to the instructions, and 4) the overall understanding of the instructions.

The overall results are as follows:

1. The consistency rate between participants' self-test results and those of professionals reached 94.44% for positive results and 97.53% for negative results, with an overall consistency rate of 96.58%. These results align with expectations.

2. The accuracy of result interpretation reached 99.15%, meeting expectations.

3. Participants demonstrated a completion rate of over 95% for correctly following the operational procedures in Scenario 1, Scenario2 , Scenario 3 and Scenario 4 according to the instructions, as anticipated. While there were some errors in operations ("Falls"), but did not affect the test results.

4. Following the test, the average correctness rate of the post-test questionnaire designed to assess understanding of the instructions exceeded 95%, as expected. More than 95% of the participants selected the instructions for use is easy to understand, and agreed that the operation process and result interpretation are simple for them to perform. But It's still noteworthy that prompts regarding interpretation waiting times should ideally be displayed on the test cassette and product packaging to minimize operational errors and potential result unreliability due to incorrect waiting times.

Please refer to *Annex E Usability Evaluation Report* for more detail.