QuikRead go® Strep A

A system for measurement of *Streptococcus pyogenes*
manufactured by
Orion Diagnostica Oy

Report from the evaluation SKUP/2015/106*

organised by SKUP at the request of

Orion Diagnostica Oy

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* This evaluation is not complete according to SKUP guidelines, since the part performed by the intended users was not included in the protocol

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The report was written by SKUP in 2014. For more details about SKUP, see attachment 1.
Main authors were Esther A. Jensen and Hanne Marie Holt, Denmark.

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Attachment 8 is included only in the copy to Orion Diagnostica Oy.

1. Summary

Background
Orion Diagnostica turned to SKUP for an evaluation of QuikRead go Strep A in 2013. The evaluation was performed at the Department of Clinical Microbiology, Odense University Hospital, Denmark.

The aim of the evaluation
- To describe the detection limit of the QuikRead go Strep A test and to investigate if the company's detection limit of 7×10^4 cfu/swab (colony forming units) is correct
- To describe the equivalence point (when 50% of the results are positive and 50% are negative) for the reference strain and five wild type strains and calculate the specificity
- To investigate if the detection limit, equivalence point and specificity of the evaluated instruments differ from instrument to instrument
- To investigate if the equivalence point and detection limit differ from lot to lot
- To investigate the agreement of results among evaluator(s)
- To investigate whether the equivalence point of the ATCC strain and the patient strains differ
- Selectivity: to investigate possible interference of the Strep A test with Strep C and G
- To evaluate the robustness of QuikRead go Strep A
- To evaluate the user-friendliness of QuikRead go Strep A in a hospital laboratory
- To determine the fraction of technical errors

Materials and methods
S. pyogenes ATCC strain 19615 and five wild type strains (from five patients) of *S. pyogenes*, and streptococci group C and G in different concentrations were used for determination of the equivalence point and the detection limit. In the evaluation a throat swab and 50 µL of sample is supposed to correspond to each other.

Results
The lowest positive result was $7{,}0\times10^4$ cfu/swab which correspond to the detection limit given by the manufacturer. The equivalence point, found as a geometric mean of six samples, was 4×10^4 cfu/swab. Specificity: 24 of 24 duplicate measurements analysed with two instruments from six streptococci strains were negative below the equivalence point 4×10^4 cfu/swab. Similar results were obtained when samples were analysed with three different instruments, by three evaluators or using two reagent lots. The equivalence point of the ATCC strain was $3{,}5\times10^4$cfu/swab and the equivalence point of the five wild type strains was between 2,2 and $8{,}8\times10^4$ cfu/swab. Selectivity: there was no interference on the results using haemolytic streptococci group C and G. Results were given in the display after one to three minutes. An additional experiment demonstrated that the three QuikRead go instruments could distinguish between two concentrations which differed only by a factor 1,6 ($4{,}4/2{,}8\times10^4$). It is not possible to distinguish such differences with the viable count technique. The positive and negative control materials all gave the expected results. The users were satisfied with the user manual. The operation facilities were assessed as satisfactory. The time factors and the quality control possibilities related to the QuikRead go instrument were assessed as satisfactory. The percentage of technical errors was <1,0%.

Conclusion
The following quality goals were fulfilled: The detection limit (7×10^4 cfu) given by the manufacturer was confirmed by the evaluation. The equivalence point (4×10^4 cfu/swab) of *S. pyogenes* (ATCC) and the five wild type strains did not differ. The results were similar when using different instruments, reagent lots and evaluators. There was no interference with haemolytic streptococci group C or group G.
In contrast to the viable count technique, QuikRead go instruments can distinguish between two concentrations which differ only by a factor 1,6 ($4{,}4/2{,}8\times10^4$). The positive and negative control materials all gave the expected results. The quality goal of the user-friendliness was fulfilled.The percentage of technical errors fulfilled the quality goal ≤2%.

Comments from the manufacturer
Orion Diagnostica has accepted the report without further comments.

2. Abbreviations and Acronyms

ATCC	American Type Culture Collection
C-NPU	Committee of Nomenclature, Properties and Units
Cfu	Colony forming units
DAK-E	Danish Quality Unit of General Practice
DANAK	Danish Accreditation and Metrology Fund
Detection limit	7×10^4 cfu/swab or higher according to the manufacturer
DS/EN ISO 15189:2008	4th Edition Danish and European standard for laboratories
EQA	External Quality Assessment
Equalis	External quality assurance in laboratory medicine in Sweden
Equivalence point	The equivalence point is the concentration at which 50% of the results are positive and 50% of the results are negative
GP	General Practitioner
NEQAS	National External Quality Assessment Service
NOH	Nordsjællands Hospital
Noklus	Norwegian Quality Improvement of Primary Care Laboratories
OUH	Odense University Hospital
SKUP	Scandinavian evaluation of laboratory equipment for primary health care
S.pyogenes	*Streptococcus pyogenes*
Strep A	*Streptococcus pyogenes* group A

3. Quality goals

Background
Group A haemolytic streptococcus (*Streptococcus pyogenes; S. pyogenes*) is the most frequent bacterial cause of infectious pharyngitis. Common signs and symptoms of the disease include sore throat, fever, tonsillar exudates and swollen cervical lymph nodes. However, making a diagnosis based solely on clinical findings is not possible. Scoring systems, e.g. the Centor Criteria [1], have been developed to help physicians to decide which patients need no testing, testing, or empiric antibiotic therapy. Available diagnostic tests include throat culture (which still is considered the diagnostic standard) and rapid antigen detection test. The result of a diagnostic test depends on the quality of the specimen sampling and the quality of the test.
The treatment of people with sore throat also varies from country to country [2-18].
Swab culture from the throat of a patient will not be used in this evaluation, which only consists of the evaluation in a clinical microbiology laboratory.

3.1. Analytical quality

No gold standard for the rapid testing of *S. pyogenes* exists.

Comparing different quality goals
There is no consensus on the evaluation procedures used for rapid Strep A tests or on details in the methods for culturing of *S. pyogenes*. However, the culture method used to detect *S. pyogenes* should be accredited and performed by standard methods, e.g. as described by Kellogg [2] or shown to be equivalent.

This evaluation in the clinical microbiology laboratory includes parameters with and without quality goals.

Evaluated parameters without quality goals in this evaluation

- Description of the equivalence point (the concentration at which 50% of the results are positive and 50% of the results are negative) of the Strep A test by analysing different concentrations of *S. pyogenes* using a type strain from American Type Culture Collection (ATCC) and five wild type strains (strains from patients, fresh or frozen isolates)
- Calculation of specificity, defined from equivalence point by measuring the ATCC and five wild type strains streptococci (true negative)/(false positive + true negative)

Description of the detection limit determined by using *S. pyogenes* ATCC 19615 and five wild strains of streptococci

Evaluated parameters with quality goals in this evaluation

- SKUP has not set a separate quality goal for the detection limit, however:
  The detection limit of the instrument should be equal to, or better than, the limit given by the manufacturer (7×10^4cfu/swab).
  The equivalence point of the instruments must not differ. The detection limit of the instruments must not differ. The equivalence point of the reagent lot numbers must not differ.
  The detection limit of the reagent lot numbers must not differ.

The detection limit and equivalence point of the reagent lot numbers should be similar, respectively.

The equivalence point of the ATCC strain and the patient strains should be similar.

- Inter-person/intra-person reading: all results from one sample should be in agreement when read by different persons or the same person.
- Is the test positive at the time specified by the manufacturer?
  Quality goal: Reading at the specified time should give the best agreement with culture of *S. pyogenes*
- Selectivity: interference with haemolytic streptococci group C and group G is investigated
  Quality goal: No interference

3.2. User-friendliness

The evaluation of user-friendliness was carried out by asking the evaluating persons (end-users) to fill in a questionnaire divided into four sub-areas, see section 5.5.

3.3. Technical errors

SKUP recommends that the percentage of "tests wasted" caused by technical errors should not exceed 2%.

3.4. Principles for the assessments

To qualify for an overall good assessment in a SKUP evaluation, the measuring system must show satisfactory analytical quality as well as satisfactory user-friendliness.

3.4.1. *Assessment of the analytical quality*

Detection limit

The manufacturer claims that the test detects bacteria in amounts corresponding to 7×10^4 cfu/swab or higher. For evaluation of the detection limit concentrations of *S. pyogenes* ATCC 19615 and five wild strains of streptococci (strains from patients, fresh or frozen isolates) are used. A sample of 50 µL is assumed to correspond to the bacterial concentration on a swab.

Specificity

Specificity is in the hospital evaluation defined as the fraction of negative results below the equivalence point for the six strains.

3.4.2. *Assessment of two lots*

The results are achieved with two reagent lots. Separate lot calculations are not performed. If distinct differences between the lots appear, this will be pointed out and discussed.

3.4.3. *Assessment of the user-friendliness*

The user-friendliness is assessed according to the answers and comments given in the questionnaire (see section 5.5.). For each question, the user must choose between three given

ratings, as for instance satisfactory, intermediate or unsatisfactory. The response from the users is reviewed and summarised. To achieve the overall rating ”satisfactory”, the tested equipment must reach the total rating of “satisfactory” in all four sub-areas of characteristics mentioned in section 5.5.

3.4.4. *Assessment of the technical errors*

The evaluating persons register the number of error codes and technical errors during the evaluation.

3.5. SKUP´s quality goals in this evaluation

SKUP has not set a separate quality goal for the detection limit, however SKUP will assess the results from the evaluation of QuikRead go Strep A test against the following quality goals:

- The detection limit of the instrument should be equal to, or better than, the limit given by the manufacturer (7×10^4 cfu/swab)
- The detection limit, equivalence point and specificity of the evaluated instruments may not differ from instrument to instrument
- The equivalence point of the reagent lot numbers may not differ from lot to lot
- The detection limit of the reagent lot numbers may not differ from lot to lot
- The equivalence point of the ATCC strain and the patient strains may not differ
- Selectivity: no interference with haemolytic streptococci group C and group G
- Inter-person and intra-person reading: All results from one sample should be in agreement when read by different persons or the same person.
- The test should be positive at the time specified by the manufacturer
- User-friendliness, overall rating, rated as “satisfactory”
- Fraction of technical errors ≤2%

4. Materials and methods

4.1. Definition of what is measured

S. pyogenes can be detected by the ability of growth (swab culture from the throat) or by a specific antigen recognized in a rapid antigen detection test. The rapid antigen test for detection of *S. pyogenes* is described in the database of Committee of Nomenclature, Properties and Units (C-NPU) by the code [19]:

NPU 18729 Secr(Pharynx)—Streptococcus pyogenes(ag); arb.c.(proc.) = ?
i.e. an antigen detection test - the location from where the sample has been taken is specified to "pharynx".
The test evaluated in this report is called QuikRead go Strep A test or just Strep A test. The result reported from the test is either "negative" or "positive".

(The gold standard method, swab culture from the throat is:
NPU 12293 Secr(spec.)—Streptococcus pyogenes; arb.c.(proc.) = ?
The location from where the sample has been taken has to be specified – in this case swab culture from the throat).

4.2. QuikRead go instrument and the QuikRead go Strep A kit

QuikRead go Strep A (figure 1) is an immunoturbidimetric test based on micro particles coated with rabbit anti Strep A antibodies. Strep A antigen in the sample reacts with the micro particles. The turbidity of the solution change hereby. QuikRead measure the change in turbidity.

4.2.1 Analytical steps

To perform a test, a throat swab specimen is collected with QuikRead go sterile flocked swab. The swab is placed in a separate extraction tube. The extraction reagents 1 and 2 are added. The red colour of extraction reagent 2 changes to yellow/orange, indicating the beginning of the extraction. The swab is rotated in the solution for 30 seconds and then left in the solution for at least another 90 seconds, but no longer than 15 minutes. The swab and as much liquid as possible is moved to the prefilled cuvette. The swab is rotated vigorously and pressed against the inner wall of the cuvette to release all liquid before it is removed. The solution turns red again due to neutralisation.
The cuvette is closed tightly with a Strep A reagent cap without pressing the pink coloured inner part of the reagent cap down into the solution.
It is important not to touch the optical part of the cuvette. The solution is stable for at least four hours but was in this evaluation measured within 15 minutes.
If a test is positive, "positiv Strep A" is written on the display (in the Danish version).

Figure 1. QuikRead go instrument (left) and a box with QuikRead go Strep A reagents and control material (right)

For more technical data about the QuikRead go Strep A system, see table 1 and attachment 2. For information about the manufacturer Orion Diagnostic Oy and the suppliers in the Scandinavian countries, see attachment 3. For product information, see attachment 4.

Table 1. Technical data from the manufacturer

Technical data for the QuikRead go instrument	
Sample material	Throat swab sample
Sample volume	-
Measuring time	1-3 minutes to result, additional 3 minutes for preparation
Measuring results	Positive or negative
Storage capacity	100 patient results 100 control results
Electrical power supply	Power supply adapter, 12 W

4.3. The selected comparison method

A selected comparison method is a fully specified method which, in the absence of a reference method, serves as a common basis for the comparison of a field method.
The selected comparison method must be a recognised and well established hospital laboratory method. Good analytical quality must be documented by results from an external quality assessment (EQA) scheme, given that external quality control is offered for the component/method in mention.
The evaluation in the clinical microbiology laboratory is dealing with artificial specimens with different known concentrations of *S. pyogenes*, type strain ATCC 19615 and other streptococci. The concentration of streptococci in the specimens measured with the viable count method is a mean of four counts: two viable counts were made after the preparation of the solutions of 10^8 specimens and two counts were made just before the evaluation. The comparison specimens are further described in 4.3.1 and 4.3.2.

4.3.1. *Method for laboratory testing of the Strep A test and culturing of S. pyogenes*

The evaluation in the clinical microbiology laboratory is dealing with the detection limit, the sensitivity and the specificity of the Strep A test when the test is used on artificial specimens with different known concentrations of *S. pyogenes* and other streptococci.
For this evaluation the following strains are used: *S. pyogenes*, type strain ATCC 19615, five wild type strains of *S. pyogenes* from patients, one wild type strain of haemolytic strep group C and one wild type strain of haemolytic strep group G.
Cultures and handling of *S. pyogenes* and the other streptococci are done according to standard methods [2] (see attachment 5).

4.3.2. *Verification of the analytical quality of the comparison method*

4.3.2.1 Precision

The repeatability of the bacterial count was estimated from duplicate measurements of cultures after the preparation. The estimation was repeated after storage in refrigerator, just before the evaluation.

The method for bacterial culturing (including *S. pyogenes* and other streptococci) is accredited after Danish and European standard for laboratories DS/EN ISO 15189:2008 by Danish Accreditation and Metrology Fund (DANAK) [20].

4.3.2.2 The nominal examination trueness of the comparison method for culture of S. *pyogenes*

The trueness of the method for culturing and identification of *S. pyogenes* and other streptococci was verified with the EQA results for a time period of 12 months before and three months after the evaluation.

4.3.2.3 Internal quality control

The reference strain *S. pyogenes* ATCC 19615 was part of the evaluation.

4.3.2.4 External quality control

The Department of Clinical Microbiology participates in the NEQAS General Bacteriology program no. 3216, which is sent out twelve times yearly. The program covers culture and identification of bacteria (including *S. pyogenes*) and antibiotic sensitivity testing. For viable counts no EQA program exists.

4.4. Evaluation in a clinical microbiology laboratory

The goal of the evaluation is to investigate the analytical performance and the user-friendliness under standardised and optimal conditions in a clinical microbiology laboratory. The goals of the evaluation are described in 3.1 and 3.5.

4.4.1. *Planning of the evaluation*

QuikRead go Strep A is manufactured by Orion Diagnostica Oy in Finland and has been launched in many countries including Scandinavia.

Inquiry about an evaluation

Orion Diagnostica Oy applied for a SKUP evaluation of QuikRead go Strep A under standardised and optimal conditions in a hospital laboratory. SKUP in Denmark accepted to carry out this evaluation.

Protocol and contract

The protocol for the evaluation was approved in November 2013. Orion Diagnostica Oy and SKUP in Denmark signed the contract November 2013.

Preparations and training program

On the 17th of December 2013 Esther Jensen and Karin Eirheim Baur, who was a consultant for the General Practitioners, were trained by Anne Marie Ackermann, Orion Diagnostica, Finland and Britt Vinderslev, Orion Diagnostica, Denmark.

Esther Jensen, SKUP, taught the other participants the procedures for the evaluation.
The practical work with the evaluation was carried out in February 2014.

4.4.2. *Evaluation sites and persons involved*

The hospital evaluation took place at the Department of Clinical Microbiology, Odense University Hospital (OUH).
The participants in the evaluation are presented in table 2.

Table 2 Persons responsible for various parts of the evaluation

Name	Title	Organisation	Responsibility
Anne-Marie Ackermann	Product Manager	Orion Diagnostica Oy, Finland	Ordered the evaluation
Britt Vinderslev	Sales Manager	Orion Diagnostica A/S, Denmark	Ordered the evaluation
Esther Jensen	Physician, Speciality: clinical biochemistry	SKUP Department of Clinical Biochemistry, NOH	Practical work with the evaluation Author of the report
Karin Eirheim Baur	Biomedical laboratory scientist	Department of Clinical Biochemistry, NOH	Should have participated with practical work with the evaluation. Unable to attend evaluation
Elisa Knudsen	Biomedical laboratory scientist	Department of Clinical Microbiology, OUH	Practical work with the evaluation
Pia Steinecke	Biomedical laboratory scientist	Department of Clinical Microbiology, OUH	Practical work with the evaluation. Participated instead of Karin Eirheim Baur
Hanne Marie Holt	Physician Speciality: clinical microbiology	Department of Clinical Microbiology, OUH	Practical work with the evaluation Responsible for the comparison method

4.4.3. *The evaluation model*

An evaluation normally consists of two parts. In this evaluation only one part of the protocol; to investigate the analytical performance and the user-friendliness under standardised and optimal conditions by laboratory educated personnel in a hospital laboratory, was carried out.
Tests with false positive or false negative results, a high variation (intra- and inter-personal or between instruments) or procedures too difficult to perform can be sorted out at this point.

4.4.4. *The evaluation procedure in the hospital laboratory, standardised and optimal conditions Internal analytical quality control*

Positive and negative internal quality control samples from the test package of QuikRead go Strep A were measured before and after the evaluation. A positive and a negative sample of the test samples, table 3, were measured before and after the evaluation.

Material and preparation of bacterial dilutions
S. pyogenes ATCC strain 19615 and five wild type strains of *S. pyogenes* (from five patients), and one strain of streptococci group C and group G, respectively, were chosen from the routine production in the department and prepared as described in attachment 5. This preparation ended up with seven serial dilutions of eight strains of streptococci and seven blank samples, that are 63 specimens for testing with the QuikRead go Strep A test, see table 3. A swab from the Strep A test was tested with 50 µL from each of the 63 specimens and the result – positive or negative – was written in the form. The detection limit of the test was defined as the lowest bacterial count which gave a positive test.

Table 3 Evaluation of samples in various dilutions in the clinical microbiology laboratory

Strain	**Concentration of bacteria (cfu/mL)**						
S. pyogenes ATCC 19615	$2{,}2\times10^{2}$	$2{,}2\times10^{3}$	$2{,}2\times10^{4}$	$2{,}2\times10^{5}$	$2{,}2\times10^{6}$	$2{,}2\times10^{7}$	$2{,}2\times10^{8}$
S. pyogenes-1	$5{,}6\times10^{2}$	$5{,}6\times10^{3}$	$5{,}6\times10^{4}$	$5{,}6\times10^{5}$	$5{,}6\times10^{6}$	$5{,}6\times10^{7}$	$5{,}6\times10^{8}$
S. pyogenes-2	$1{,}5\times10^{2}$	$1{,}5\times10^{3}$	$1{,}5\times10^{4}$	$1{,}5\times10^{5}$	$1{,}5\times10^{6}$	$1{,}5\times10^{7}$	$1{,}5\times10^{8}$
S. pyogenes-3	$1{,}4\times10^{2}$	$1{,}4\times10^{3}$	$1{,}4\times10^{4}$	$1{,}4\times10^{5}$	$1{,}4\times10^{6}$	$1{,}4\times10^{7}$	$1{,}4\times10^{8}$
S. pyogenes-4	$1{,}9\times10^{2}$	$1{,}9\times10^{3}$	$1{,}9\times10^{4}$	$1{,}9\times10^{5}$	$1{,}9\times10^{6}$	$1{,}9\times10^{7}$	$1{,}9\times10^{8}$
S. pyogenes-5	$2{,}7\times10^{2}$	$2{,}7\times10^{3}$	$2{,}7\times10^{4}$	$2{,}7\times10^{5}$	$2{,}7\times10^{6}$	$2{,}7\times10^{7}$	$2{,}7\times10^{8}$
Strep gr. C	$2{,}5\times10^{2}$	$2{,}5\times10^{3}$	$2{,}5\times10^{4}$	$2{,}5\times10^{5}$	$2{,}5\times10^{6}$	$2{,}5\times10^{7}$	$2{,}5\times10^{8}$
Strep gr. G	$3{,}5\times10^{2}$	$3{,}5\times10^{3}$	$3{,}5\times10^{4}$	$3{,}5\times10^{5}$	$3{,}5\times10^{6}$	$3{,}5\times10^{7}$	$3{,}5\times10^{8}$
Blank (PBS)	0	0	0	0	0	0	0

Cfu: colony forming units

Handling of samples and measurements
Two samples of 50 µL were taken from each dilution (table 3) in random order by a biomedical laboratory scientist. All samples were blinded for the two evaluators.
The evaluators treated the samples as a throat swab specimen, as the procedure described in 4.2.1. All samples (table 3) were measured in duplicate with QuikRead go Strep A test. The evaluators each used two reagent lot numbers of tests randomly and each of the evaluators measured all the samples. Each dilution was analysed twice in total.

Analysing on the comparison method
Two viable counts of the 10^{8} dilution were made just after the preparation of the test-specimens the day before testing and two counts were made 18 hours later, just before the evaluation, to assure that the bacterial count of strep A, strep C and strep G in the samples did not change during the stay in the refrigerator.

Recording of results
All results were registered consecutively on a registration form prepared by SKUP. All errors were reported. All results were signed by the person performing the practical work.

Data processing
The data was checked for unexpected results.

Additional experiments
In order to determine the detection limit and the equivalence point using an alternative method, the stem solutions from the ATCC 19615 strain and patient 1, were used to prepare dilutions between 10^5cfu/mL and 10^6cfu/mL.

Evaluation of user-friendliness
The evaluators of QuikRead go Strep A evaluated the user-friendliness after the practical work by means of the user-friendliness questionnaire worked out by SKUP.

5. Results and discussion

5.1. Number of samples

In total 166 measurements were made with QuikRead go Strep A test.

5.1.1. *Excluded and missing results*

None

5.1.2. *Failed measurements*

No. 55, instrument 3831, Patient B4, *S-Pyogenes-1* concentration 10^4: Reagent error. A new sample was produced.

Seven cuvettes had to be placed twice or more in the holder due to the messages 'check the reagent' 'check the cap' or 'etiquette of the reagent not read'.

Conclusion

QuikRead go Strep A had one technical error and fulfils the quality goal of a maximum of 2% waste due to technical errors.

5.2. Analytical quality of the selected comparison method

5.2.1. *Internal quality control*

Strain 19615 of *S. pyogenes* from ATCC 19615 was used as a reference strain in the evaluation.

5.2.2. *The precision of the specimens for the laboratory evaluation*

Two viable counts of the 10^8 dilution were made just after the preparation of the test-specimens the day before testing and two counts were made 18 hours later, just before the evaluation, to assure that the bacterial count did not change during the stay in the refrigerator, see attachment 7. The concentration of streptococci in the test-specimens is the mean of four viable counts. The variation of the viable counts was acceptable.

5.2.3. *The nominal examination trueness of the comparison method for culture of S. pyogenes*

In the NEQAS General Bacteriology program no. 3216, the evaluating microbiology laboratory showed satisfactory results during a time period of 12 months before and three months after the evaluation. The accumulated results as they appeared at the end of 2013 (i.e. cumulative results for the past 12 months) and the report of April 2014, results for the past 6 months, can be seen in attachment 6.

5.3. Analytical quality of QuikRead go Strep A in a hospital laboratory

5.3.1. *External quality assessment*

No samples from NEQAS were received during the evaluation period.

5.3.2. *Internal quality control*

In the beginning and end of the evaluation the positive and the negative control was run with all the QuikRead go A instruments. A genuine positive sample and a genuine negative sample were also run.
The negative control material as well as the genuine negative sample gave negative results with three instruments, and the positive control material and the genuine positive sample gave positive results.

Discussion internal quality control

Positive and negative controls should be tested with each new reagent lot and with each new operator and as otherwise required by the standard quality control procedures of the laboratory. If controls do not perform as expected, the test results cannot be used. The negative internal control material in the test kit contains Strep group C and the positive contain Strep group A in high concentrations.
The chosen strains ATCC 19615, Strep group C and G and the buffer PBS in the evaluation also act as control materials. All results expected to be negative were negative. The positive control from the test kit was positive, so was ATCC 19615 in high concentrations, see table 4.

5.3.3. *Comparison of the 1st and 2nd measurements*

The 1st and the 2nd measurements were identical for all duplicate measurements on QuikRead go instrument even if the two measurements were performed with two instruments (see attachment 8).

5.3.4. *The equivalence point of QuikRead go Strep A*

The equivalence point is the concentration at which 50% of the results are positive and 50% of the results are negative.
To achieve a measure for the equivalence point of the QuikRead go Strep A procedure under standardised and optimal measuring conditions in a hospital laboratory, 50 µL of *S. pyogenes;* ATCC and five wild type strains, bacteria cultures in various dilutions (table 3) was analysed in duplicate. The duplicate measurements were analysed within 15 minutes from preparation by two evaluators. Two instruments and two lots of test kits were used. The duplicate results always originate from two different instruments. Raw data is shown in attachment 8.

Table 4 QuikRead go Strep A results in the clinical microbiology laboratory

Strain	**Concentration of bacteria (cfu/mL)**						
S. pyogenes ATCC 19615	$2{,}2\times10^{2}$	$2{,}2\times10^{3}$	$2{,}2\times10^{4}$	$2{,}2\times10^{5}$	$2{,}2\times10^{6}$	$2{,}2\times10^{7}$	$2{,}2\times10^{8}$
S. pyogenes-1	$5{,}6\times10^{2}$	$5{,}6\times10^{3}$	$5{,}6\times10^{4}$	$5{,}6\times10^{5}$	$5{,}6\times10^{6}$	$5{,}6\times10^{7}$	$5{,}6\times10^{8}$
S. pyogenes-2	$1{,}5\times10^{2}$	$1{,}5\times10^{3}$	$1{,}5\times10^{4}$	$1{,}5\times10^{5}$	$1{,}5\times10^{6}$	$1{,}5\times10^{7}$	$1{,}5\times10^{8}$
S. pyogenes-3	$1{,}4\times10^{2}$	$1{,}4\times10^{3}$	$1{,}4\times10^{4}$	$1{,}4\times10^{5}$	$1{,}4\times10^{6}$	$1{,}4\times10^{7}$	$1{,}4\times10^{8}$
S. pyogenes-4	$1{,}9\times10^{2}$	$1{,}9\times10^{3}$	$1{,}9\times10^{4}$	$1{,}9\times10^{5}$	$1{,}9\times10^{6}$	$1{,}9\times10^{7}$	$1{,}9\times10^{8}$
S. pyogenes-5	$2{,}7\times10^{2}$	$2{,}7\times10^{3}$	$2{,}7\times10^{4}$	$2{,}7\times10^{5}$	$2{,}7\times10^{6}$	$2{,}7\times10^{7}$	$2{,}7\times10^{8}$
Strep gr. C	$2{,}5\times10^{2}$	$2{,}5\times10^{3}$	$2{,}5\times10^{4}$	$2{,}5\times10^{5}$	$2{,}5\times10^{6}$	$2{,}5\times10^{7}$	$2{,}5\times10^{8}$
Strep gr. G	$3{,}5\times10^{2}$	$3{,}5\times10^{3}$	$3{,}5\times10^{4}$	$3{,}5\times10^{5}$	$3{,}5\times10^{6}$	$3{,}5\times10^{7}$	$3{,}5\times10^{8}$
Blank (PBS)	0	0	0	0	0	0	0

Numbers on shaded background: QuikRead go Strep A positive results. White background: QuikRead go Strep A negative results.

Table 4 shows that the QuikRead go Strep A test is negative for all samples with the concentration $5{,}6\times10^{5}$cfu/mL and below and positive for all samples with the concentration $1{,}4\times10^{6}$cfu/mL and above.
The PBS-buffer samples and the samples of Strep C and G were all negative.

Arithmetic mean bacterial concentration of the sample results with the highest negative test result was $2{,}6\times10^{5}$ (range $1{,}4\times10^{5} - 5{,}6\times10^{5}$) cfu/mL and arithmetic mean of the sample results with the lowest positive result was $2{,}6\times10^{6}$ (range $1{,}4\times10^{6} - 5{,}6\times10^{6}$) cfu/mL.

Geometric mean has been used for calculations in the previous Strep A reports, attachment 11. Geometric mean is more correct for calculation for the equivalence point (the arithmetic mean concentration would be within the confidence interval of the positive mean concentration).
The geometric mean for the six strains is 714207 ~ $7{,}1\times10^{5}$ cfu/mL.

Calculation of equivalence point in the unit cfu
The geometric equivalence point is the concentration at which 50% of the results are positive and 50% of the results are negative. The equivalence point of the six strep A samples in table 4 is $7{,}1\times10^{5}$ cfu/mL.

$$714207 \text{ cfu/mL} = \frac{714207\times50\ \mu\text{L}}{1000\ \mu\text{L}} = 35710 \text{ cfu/swab} \sim 4\times10^{4} \text{ cfu/swab}$$

Discussion
There was no quality goal for the cfu of the equivalence point. The manufacturer has no description of the equivalence point. The equivalence point is per definition higher than the detection limit because the equivalence point is where 50% of the results are positive and 50% of the results are negative. The manufacturer claims the detection limit is 7×10^{4} cfu per throat swab.

In the evaluation a throat swab and 50 µL is supposed to correspond to each other. In the evaluation the equivalence point, found as a geometric mean of six samples, was even lower (4×10^4 cfu/swab).

5.3.5. *Accordance of equivalence point of S. pyogenes ATCC strain and wild type strains*
The geometric equivalence point of the ATCC strain was $3,5\times10^4$ cfu/swab and the geometric equivalence point of the five wild type strains was between 2,2 and $8,8\times10^4$ cfu.

Discussion
It was a goal that the equivalence point of *S. pyogenes* (ATCC) and the five wild type strains should not differ. Due to the uncertainty of the counting of the stem solutions and the uncertainty of the dilutions, $2,2\times10^4$ cfu/swab and $8,8\times10^4$ cfu/swab is not considered different from $3,5\times10^4$ cfu.

Conclusion
The goal was fulfilled.

5.3.6. *The detection limit of QuikRead go Strep A*
The detection limit is equal to 7×10^4 cfu per throat swab according to the manufacturer.

Calculation of bacterial number of negative and positive samples
From each sample 50 µL was tested on QuikRead go Strep A. The bacterial count giving a negative test ranged between 7000 and 28000 cfu/swab:

$$\frac{1,4\times10^5 \text{ cfu}\times 50\ \mu\text{L}}{1000\ \mu\text{L}} = 7000 \text{ cfu/swab} \quad \text{and} \quad \frac{5,6\times10^5 \text{ cfu}\times 50\ \mu\text{L}}{1000\ \mu\text{L}} = 28000 \text{ cfu/swab}$$

The bacterial count in the positive test ranged between 70000 and 280000 cfu/swab.

Discussion
It was a quality goal of the evaluation that the detection limit of the instruments in the evaluation should be equal to or better than the detection limit given by the manufacturer. In the kit insert the manufacturer claims that the detection limit of the test is 7×10^4 cfu per throat swab. In the evaluation a throat swab and 50 µL of the dilutions is supposed to correspond to each other. In the evaluation the lowest positive result was $7,0\times10^4$ cfu/swab which correspond to the detection limit given by the manufacturer.

Conclusion
The detection limit of the instrument is equal to the limit given by the manufacturer. The quality goal was fulfilled.

5.3.7. *Specificity*
Specificity is defined as the fraction of negative results below the equivalence point in proportion to the results with culture of *S. pyogenes.* The percentages should be close to 100%; however, no quality goal was set for percentage.

It is seen in table 4 that 24 of 24 duplicate results, i.e. 100%, from six streptococci strains were negative below the equivalence point.

5.3.8. *Selectivity*

It was a quality goal for the QuikRead go Strep A test to show no interference with other streptococci. Haemolytic streptococci group C and group G was analysed blinded in concentrations between $2{,}5\times10^{2}$ and $3{,}5\times10^{8}$cfu/mL, see table 4 and attachment 8.

Conclusion

There were no interferences with haemolytic streptococci group C and group G. The quality goal was fulfilled.

5.3.9. *Agreement of instruments*

The instruments agreement for samples analysed with QuikRead go (two instruments) was 100%, see table 4 and attachment 8.

Discussion

The first and the second measurement of a sample were performed using two instruments. It was a goal in the evaluation that all results with the QuikRead go Strep A should be in agreement when identical samples were analysed with two instruments.

Conclusion

The inter-instrument agreement goal was fulfilled.

5.3.10. *Reading agreement of QuikRead go Strep A kit with different lot number*

The reading agreement for samples analysed with two instruments and two kits with different lot numbers were 100%, see table 4 and attachment 8.

Discussion

The first and the second measurement of a sample were performed using two instruments and most often two reagent lots. It was a goal in the evaluation that all results with different lots were in agreement when identical samples were analysed.

Conclusion

The goal for the lot result was fulfilled.

5.3.11. *Accordance of results among evaluators*

Inter-person reading agreement: The fraction of all results with the evaluated system, which is in agreement in a repeated test read by two evaluators.

The inter-person agreement for samples analysed with QuikRead go (two instruments and two reagent lots) was 100%, see table 4 and attachment 8.

Discussion

The first and the second measurements of a sample were performed by two evaluators. It was a goal that the results with the QuikRead go Strep A, when analysed/read by different persons, were in agreement, which they were.

Conclusion
The agreement of results among evaluators was fulfilled.

5.3.12. *Accordance of results for each evaluator*
Intra-person reading agreement: The fraction of all results with the evaluated system, which is in agreement in a repeated test read by the same evaluator. The intra-person agreement was 100%, the results originate from the additional experiment, see 5.3.14.

Discussion
The numbers of samples analysed twice by the same evaluator are few, since the inter-person agreement was prioritised. Intra-person agreement is more relevant when the analysis is performed with a test strip and not an instrument.

Conclusion
The agreement of results for an evaluator was fulfilled.

5.3.13. *Is the test positive at the time specified by the manufacturer?*
Negative results were given in the display within 3 minutes. The positive results were given in the display after about 1 minute, depending on the Strep A concentrations.

Discussion
It is a goal for all strep A tests that they are positive at the time specified by the manufacturer. The goal is more relevant for test strips with visual reading.
The reading time after extraction for QuikRead go Strep A test is 1 to 3 minutes according to the manufacturer.

Conclusion
The goal for reading time was fulfilled.

5.3.14. *Additional experiments*
It is seen in table 4 that the QuikRead go Strep A test is negative for all samples in the concentration range of 10^5cfu/mL and positive for all samples in the concentration range of 10^6cfu/mL.
In order to determine the detection limit and the equivalence point more precise, the stem solutions from the ATCC 19615 strain and patient 1, were used to prepare dilutions between 10^5 cfu/mL and 10^6cfu/mL as described in table 5.
Each dilution with the ATCC 19615 strain was produced in a total amount of 200 µL, the percent of 10^6 varied from 10 to 90% in the dilutions. The 50% dilution was measured both negative and positive with the one instrument using one lot of reagents. The dilutions with fewer bacteria were all negative and the dilutions with higher number of bacteria were positive. This was repeated using the two other instruments and the same lot of reagents for the concentrations (40 and 60% of 10^6) around the equivalence point.
Dilutions of 40 and 60% of 10^6 were also produced for one of the wild strains of *S. pyogenes.* The dilutions were measured on the three instruments using the same lot of reagents. The results were similar to the results with the ATCC 19615 strain. No further measurements were performed using dilutions of 10^5 cfu/mL and 10^6 cfu/mL.

When using various stem solutions the calculated concentration for positive or negative results can vary, attachment 9. Two persons did the measurements using three instruments. The measurements performed by one person using one dilution gave the same results.

Table 5. Additional experiment, dilutions of concentration $\times 10^5$ and $\times 10^6$

	µL	**µL**	**Cfu/swab**		**Instrument**	
Strain	**2,2×10^{5}cfu/mL**	**2,2×10^{6}cfu/mL**	**×10^4**	**A11006 P00985 Result**	**A12016 P04309 Result**	**A12015 P03831 Result**
S. pyogenes ATCC 19615	180	20	1,4	Negative		
S. pyogenes ATCC 19615	160	40	1,7	Negative		
S. pyogenes ATCC 19615	140	60	2,2	Negative		
S. pyogenes ATCC 19615	120	80	2,8	Negative	Negative	Negative
S. pyogenes ATCC 19615	100	100	3,5	Negative		
S. pyogenes ATCC 19615	100	100	3,5	Positive		
S. pyogenes ATCC 19615	80	120	4,4	Positive	Positive	Positive
S. pyogenes ATCC 19615	60	140	5,5	Positive		
S. pyogenes ATCC 19615	40	160	6,9	Positive		
S. pyogenes ATCC 19615	20	180	8,7	Positive		
Strain	**5,6×10^{5}cfu/mL**	**5,6×10^{6}cfu/mL**	**Cfu/swab ×10^4**	**0985 Result**	**4309 Result**	**3831 Result**
S. pyogenes-1	120	80	7	Negative	Negative	Negative
S. pyogenes-1	80	120	11	Positive	Positive	Positive

The fourth column cfu/swab is calculated as geometric mean.

Discussion

In the reference material the mix of 120 µL 10^5 solution and 80 µL of the solution 10^6 (40% 10^6 ~2,8×10^4 cfu/swab) was negative and 60% 10^6 (4,4×10^4 cfu/swab) was positive. At the mix of 100 µL 10^5 and 100 µL 10^6 of *S. pyogenes* ATCC 19615 (50% 10^6) the results were both positive and negative. At the concentration 5,0×10^5 cfu/mL (3,5×10^4 cfu/swab) results were both positive and negative ~ equivalence point or grey zone area, see illustration in attachment 12.

Three instruments, one reagent lot and two persons achieved exactly the same results when analysing a sample of 50 µL from the same bacteria bouillon.

The experiment was repeated for patient 1. The 40% 10^6 (7×10^4 cfu/swab) was negative and the 60% 10^6 (11×10^4 cfu/swab) was positive. Again three instruments, one reagent lot and two persons achieved exactly the same results when analysing 50 µL from the same bacteria bouillon. The concentrations of the reference strain and patient 1 was not known during the experiment. It is a coincidence that the 40% 10^6 was negative and the 60% 10^6 was positive for both samples.

When using other stem solutions (10^8cfu/mL) the equivalence point also varied, data not shown. It was clear that the uncertainty originated from the uncertainty of the counting or diluting of the stem solutions, because the duplicate results from QuikRead go Strep A, with three instruments and one reagent lot number, were similar for each sample.

Conclusion
The additional experiment demonstrated that the three QuikRead go instruments could distinguish between two concentrations which differed only by a factor 1,6 ($4{,}4/2{,}8\times10^4$) when samples were analysed from the same bacteria bouillon. It is not possible to distinguish such differences with the viable count technique.
QuikRead go Strep A have a very narrow grey zone in which the sample results can be both positive and negative compared to previous evaluations, attachment 11. The concentration at which the Strep A test is positive was between $2{,}8\times10^4$ and $4{,}4\times10^4$ cfu/swap for the reference strain *S. pyogenes* ATCC 19615. The uncertainty of the viable count procedure and the uncertainty of the dilutions exceed this interval. The true equivalence point is therefore not possible to establish with this method.

5.4. Analytical quality of QuikRead go Strep A in primary health care

In this evaluation Orion Diagnostica did not want the primary health care part to be executed; therefore this report includes only the first part of the evaluation: a testing performed by experienced laboratory personnel.
The user evaluation testing the performance of the Strep A test by the intended users in general practice is not included.

5.5. Evaluation of user-friendliness

5.5.1. *Questionnaire to the evaluators*

The most important response regarding user-friendliness comes from the users themselves. The end-users often emphasize other aspects than those pointed out by more extensively trained laboratory personnel.

At the end of the evaluation period, each user fills in a questionnaire about the user-friendliness of the instrument. The questionnaire is divided into four sub-areas:

Table A) Rating of the information in the manual / insert / quick guide
Table B) Rating of operation facilities. Is the system easy to handle?
Table C) Rating of time factors for the preparation and the measurement
Table D) Rating of performing internal and external quality control

The end-users fill in table A and B. SKUP fills in table C and D, and in addition topics marked with grey colour in table A and B.

In the tables the first column shows what is up for consideration. The second column in table A and B shows the rating by the individual users at the evaluation sites. The last three columns show the rating options. The overall ratings from all the evaluating sites are marked in coloured and bold text. The last row in each table summarises the total rating in the table. The total rating is an overall assessment by SKUP of the described property, and not necessarily the arithmetic mean of the rating in the rows. Consequently, a single poor rating can justify an overall poor rating, if this property seriously influences on the user-friendliness of the system.

Unsatisfactory and intermediate ratings will be marked with an asterisk and explained below the tables.

Comment
In this evaluation, the user-friendliness was assessed at the clinical microbiology department of the OUH laboratory. The rating is made by one physician and two biomedical laboratory scientists from the microbiological department and one physician from the biochemical department at NOH. The rating order is; physician, microbiology, two biomedical laboratory scientists, microbiology, and physician, biochemistry.

Table A. Rating of the information in the manual / kit insert / quick guide

Topic	Rating	Assessment	Assessment	Assessment
General impression	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Table of contents	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Preparations / Pre-analytic procedure	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Specimen collection	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Measurement procedure	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Reading of result	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Description of the sources of error	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Help for troubleshooting	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Readability / Clarity of presentation	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Keyword index		**Satisfactory**	Intermediate	Unsatisfactory
Measurement principle		**Satisfactory**	Intermediate	Unsatisfactory
Available insert in Danish, Norwegian, Swedish		**Satisfactory**	Intermediate	Unsatisfactory
Total rating by SKUP		**Satisfactory**		

Positive comments: The kit insert is short and easily readable and usable. It is good that detection limit is specified in cfu.

Negative comments: The kit insert is huge, the size could be smaller.

Table B. Rating of operation facilities

Topic	Rating	Assessment	Assessment	Assessment
To prepare the test / instrument	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
To prepare the sample	**I, I, I, S**	**Satisfactory**	**Intermediate**[1]	Unsatisfactory
Application of specimen	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Specimen volume	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Number of procedure step	**S, I, I, S**	**Satisfactory**	**Intermediate**[2]	Unsatisfactory
Instrument / test design	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Reading of the test result	**S, S, S, S**	**Easy**	Intermediate	Difficult
Sources of errors	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Cleaning / Maintenance	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Hygiene, when using the test	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Size and weight of package	**S, S, S, S**	**Satisfactory**	Intermediate	Unsatisfactory
Storage conditions for tests, unopened package		**+15 to +30°C**	+2 to +8°C	–20°C
Storage conditions for tests, opened package		**+15 to +30°C**	+2 to +8°C	–20°C
Environmental aspects: waste handling		No precautions	Sorted waste	**Special precautions**[3]
Intended users		**Health care personnel**	Laboratory experience	Biomedical laboratory scientists
Total rating by SKUP		**Satisfactory**		

[1]Strep A reagent cap was difficult to place correct. The colour of bottle 1 and 2 did not correspond to the colour of the reagents. The colours could correspond to the colour of the reagents (red reagent ~ red bottle, white reagent ~white bottle).The positive control bottle was sometimes dripping.
[2]Several steps compared to other tests (glucose etc.).
[3]Viable bacteria always have to be handled with special precautions.

Positive comment: Very easy to read.

Table C. Rating of time factors (filled in by SKUP)

Topic	Assessment	Assessment	Assessment
Required training time	**<2 hours**	2 to 8 hours	>8 hours
Durations of preparations / Pre-analytical time	**<6 min.**	6 to 10 min.	>10 min
Duration of analysis	**<10 min.**	10 to 20 min.	>20 min
Stability of test, unopened package	**>5 months**	3 to 5 months	<3 months
Stability of test, opened package	**>30 days**	14 to30 days	<14 days
Stability of quality control material, unopened	**>5 months**	3 to 5 months	<3 months
Stability of quality control material, opened	**>6 days or disposable**	2 to 6 days	≤1 day
Total rating by SKUP	**Satisfactory**		

Table D. Rating of quality control (filled in by SKUP)

Topic	Assessment	Assessment	Assessment
Reading of the internal quality control	**Satisfactory**	Intermediate	Unsatisfactory
Usefulness of the internal quality control	**Satisfactory**	Intermediate	Unsatisfactory
External quality control	**Satisfactory**	Intermediate	Unsatisfactory
Total rating by SKUP	**Satisfactory**		

5.5.2. *Assessment of the user-friendliness*

Assessment of the information in the manual (table A)

The information in the manual was assessed as satisfactory. Both the manual and the short manual were easily read and usable. Specifically it was mentioned that it was good that the detection limit was specified in cfu.

Assessment of the operation facilities (table B)

The operation facilities were assessed as satisfactory.

None of the evaluators were familiar with the instrument. It was agreed that the number of steps for analysing with QuikRead go were about the same as used in other Strep A test methods.

Assessment of time factors (table C)
The time factors were assessed as satisfactory. It was assessed as an advantage that the cuvettes with the sample can be stored at room temperature and analysed up to four hours later.

Assessment of quality control possibilities (table D)
The quality control possibilities were assessed as satisfactory. Internal and external control materials can be used.

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Attachment 1 The organisation of SKUP

Scandinavian evaluation of laboratory equipment for primary health care, SKUP, is a co-operative commitment of Noklus[1] in Norway, DAK-E[2] in Denmark, and Equalis[3] in Sweden. SKUP was established in 1997 at the initiative of laboratory medicine professionals in the three countries. SKUP is led by a Scandinavian *steering committee* and the secretariat is located at Noklus in Bergen, Norway.

The purpose of SKUP is to improve the quality of near patient testing in Scandinavia by providing objective and supplier-independent information on analytical quality and user-friendliness of laboratory equipment. This information is generated by organising SKUP *evaluations*.

SKUP offers manufacturers and suppliers evaluations of equipment for primary health care and also of devices for self-monitoring. Provided the equipment is not launched onto the Scandinavian market, it is possible to have a confidential pre-marketing evaluation. The company requesting the evaluation pays the actual testing costs and receives in return an impartial evaluation.

There are *general guidelines* for all SKUP evaluations and for each evaluation a specific *SKUP protocol* is worked out in co-operation with the manufacturer or their representatives. SKUP signs *contracts* with the requesting company and the evaluating laboratories. A *complete evaluation* requires one part performed by experienced laboratory personnel as well as one part performed by the intended users.

Each evaluation is presented in a *SKUP report* to which a unique *report code* is assigned.The code is composed of the acronym SKUP, the year and a serial number.A report code, followed by an asterisk (*), indicates a special evaluation, not complete according to the guidelines, e.g. the part performed by the intended users was not included in the protocol. If suppliers use the SKUP name in marketing, they have to refer to www.skup.nuand to the report code in question. For this purpose the company can use a logotype available from SKUP containing the report code.

SKUP reports are published at www.skup.nu.

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[1] Noklus (Norwegian Quality Improvement of Primary Care Laboratories)is an organisation founded by Kvalitetsforbedringsfond III (Quality Improvement Fund III), which is established by The Norwegian Medical Association and the Norwegian Government. Noklus is professionally linked to “Seksjon for Allmennmedisin” (Section for General Practice) at the University of Bergen, Norway.

[2] SKUP in Denmark is placed in Nordsjællands Hospital. SKUP in Denmark reports to DAK-E (Danish Quality Unit of General Practice), an organisation that is supported by KIF (Foundation for Quality and Informatics) and Faglig udvalg (Professional Committee), which both are supported by DR (The Danish Regions) and PLO (The Organisation of General Practitioners in Denmark).

[3] Equalis AB (External quality assurance in laboratory medicine in Sweden) is a limited company in Uppsala, Sweden, owned by “Sveriges Kommuner och Landsting” (Swedish Association of Local Authorities and Regions), “Svenska Läkaresällskapet” (Swedish Society of Medicine) and IBL (Swedish Institute of Biomedical Laboratory Science).

Attachment 2 Facts about the measurement system

This form are filled in by Orion Diagnostica and SKUP

Table 1. Basic facts

Name of the measurement system:	QuikRead go instrument
Dimensions and weight:	Width: 200 mm Depth: 270 mm Height: 140 mm Weight: 1,7 kg
Components of the measurement system:	
Measurand:	*Streptococcus pyogenes Group A*
Sample material:	Throat samples
Sample volume:	-
Measuring principle:	Immunoturbidimetric
Traceability:	*Streptococcus pyogenes Strain ATCC 19615*
Calibration:	-
Measuring results:	Negative or positive (positive ~$7x10^4$ cfu/swab)
Linearity:	-
Measurement duration:	Less than 7 minutes (measure time: 1- 3 minutes)
Operating conditions:	+2°C to +25°C
Electrical power supply:	Power supply adapter, 12 W
Recommended regular maintenance:	Every two years
Package contents:	QuikRead go instrument, power supply adapter, manual
Necessary equipment not included in the package:	Reagents, timer, holder for tubes

Table 2. Post analytical traceability

Is input of patient identification possible?	Yes
Is input of operator identification possible?	Yes
Can the instrument be connected to a bar-code reader?	Yes
Can the instrument be connected to a printer?	Yes
What can be printed?	Result, Patient ID, Operator ID, Time, QuikRead go instrument serial no., Reagent lot, Buffer lot, expire date-
Can the instrument be connected to a PC?	Yes
Can the instrument communicate with LIS (Laboratory Information System)? If yes, is the communication bidirectional?	Yes Yes (driver demanded)
Storage capacity and what is stored in the instrument?	100 patient sample results plus 100 control results
Is it possible to trace/search for measurement results?	Yes

Table 3. Facts about the QuikRead go Strep A reagents

	Storage 2-8 ºC	**Storage 18-25 ºC**
Reagent caps, extraction reagents and controls; stability in unopened sealed vial:	More than 12 months	More than 12 months
Reagent caps, extraction reagents and controls;stability in opened vial:	12 months	12 months
Prefilled cuvettes; stability in unopened foil pouch:	Until expiry date	Until expiry date
Prefilled cuvettes; stability after opening foil pouch:	6 months	3 months
Stability of opened prefilled cuvette:	2 hours	2 hours
Package contents:	50 tests, positive and negative controls, package insert	

Table 4. Quality control

Electronic self-check:	Yes, during start up
Recommended control materials and volume:	Positive and negative control (part of test kit)
Stability in unopened sealed vial:	More than 12 months
Stability in opened vial:	12 months
Package contents:	Reference value sheet and instruction for use Negative control 1 x 1 mL Positive control 1 x 1 mL

Attachment 3 Information about manufacturer, retailers and marketing

Marketing information

Manufacturer:	Orion Diagnostica Oy P.O.Box 83 Koivu-Mankkaan tie 6 B Fl-02101 Espoo Finland Tel. +358 10 4261 Fax: +358 10 426 2794
Retailer in Denmark:	**Orion Diagnostica** Møllevej 9 A 2990 Nivå Danmark e-mail: orion@oriondiagnostica.com www.oriondiagnostica.dk
Retailers in Norway:	**Orion Diagnostica** Postboks 4366 Nydalen 0402 Oslo Norge e-post:firmapost@oriondiagnostica.no www.oriondiagnostica.no
Retailers in Sweden:	**Orion Diagnostica** Djupdalsvägen 7 Box 520 192 05 Sollentuna Sverige info@oriondiagnostica.com www.oriondiagnostica.se
In which countries is the system marketed:	**Globally X**
Date for start of marketing the system in Scandinavia:	**November 2010**
Date for CE-marking:	**CE-marking before released into the market**
In which Scandinavian languages is the manual available:	**All**

Attachment 4 Product information, QuikRead go

QuikRead go instrument serial numbers

Instrument	Serial number	Used by
QuikRead go	A11006P00985	OUH
QuikRead go	A12015P03831	OUH
QuikRead go	A12016P04309	OUH

QuikRead go Strep A kit

QuikRead go Strep A	number	Kit lot	Expiry date
Lot for test kit (figure 1 right)		HH98	2014-12-02
Strep A Reagent Caps (Rabbit)	2 x 25	HG06	
Buffer in prefilled cuvettes	2 x 25 x 0,8 mL	HG70	
Extraction Reagent 1	1 x 6 mL	1537948	
Extraction Reagent 2	1 x 6 mL	1537952	
Extraction tubes	50		
Positive control	1 x 1 mL	1537830	
Negative control	1 x 1 mL	1537831	
QuikRead go Strep A swabs	50	1499642	
Instructions for use	1		

The kit should be stored at 2-25ºC

QuikRead go Strep A kit

QuikRead go Strep A Kit	number	Kit lot	Expiry date
Lot		HC43	2014-05-31
Strep A Reagent Caps (Rabbit)	2 x 25	HB58	
Buffer in prefilled cuvettes	2 x 25 x 0,8 mL	HB90	
Extraction Reagent 1	1 x 6 mL	1501030	
Extraction Reagent 2	1 x 6 mL	1501024	
Extraction tubes	50		
Positive control	1 x 1 mL	1501296	
Negative control	1 x 1 mL	1501293	
QuikRead go Strep A swabs	50	1499642	
Instructions for use	1		

The kit should be stored at 2-25ºC

Attachment 5 The method for preparation of samples and culture of streptococci, clinical microbiology laboratory

Culture method and materials
The included strains are cultured and typed according to standard methods or methods shown to be equivalent [2, 21]:
Pure cultures of streptococci are stored in a freezer at -80°C and plated on blood agar plates 5% (Statens Serum Institute no. 677) and grown at 35°C in a 5% CO_2 atmosphere for 18 hours. Phosphate buffered saline (PBS), 10 µM Phosphate 0,15 M NaCl (Statens Serum Institute no. 90148) is used as a diluent. Identification of the isolates is made by a latex agglutination test for the identification of Lancefields streptococcal groups A, B, C, D, F and G (Streptococcal grouping kit, Oxoid) and with MALDI-TOF mass spectrometry (VITEK® MS, BioMérieux and MaldiBiotyper, Bruker).

The culture method is accredited and documented by results from internal and external controls of culture media and control specimens

Preparation of specimens with different bacterial concentrations
Samples with the different concentrations of *S. pyogenes* (10^2 - 10^8, Table 3) and the different concentrations of group C and G streptococci are made by means of serial dilutions, and all preparations are made as follows:

1. **Day 1**: Add one colony of the strain to 5 mL broth and incubate for 18 h in 36°C.
2. **Day 2**: Make a tenfold dilution in phosphate buffered saline (PBS). Mark 8 tubes for each strain and add 4,5 mL of PBS to each tube.
3. Take 0,5 mL of the overnight cultured broth and add to the tube 1. Mix thoroughly. Transfer 0,5 mL from tube 1 to tube 2. Mix thoroughly. Transfer 0,5 mL from tube 2 to tube 3. Continue to transfer and mix through tube 8. Discard 0,5 mL from tube 8.
4. Make a viable count. Take 0,1 mL from each tube and inoculate on a blood agarplate. Make duplicates from each tube.
5. Incubate all the inoculated blood agar plates for 18 h in 36°C for the first bacterial count.
6. Keep all the diluted samples and both tubes in the refrigerator overnight.
7. **Day 3**: Make a new viable count next morning to assure that the bacterial count has not dropped significantly. Take 0,1 mL from each tube and inoculate on a blood agarplate. Make duplicates from each tube.
8. Incubate all the inoculated blood agar plates for 18 h in 36°C for the second bacterial count.
9. Take out the cultures of *S. pyogenes*and group C and G streptococci (first bacterial count); choose the plate with approximately 30-50 colonies. Depending on how many colonies you have, you can calculate the number of cfu in the first tube.

   You now have seven tubes with seven different concentrations of bacteria (10^2–10^8) from each streptococcal strain
10. **Testing of the different concentrations with the Strep A test procedure.**

    Take 50 µL of the suspension and add to a clean tube marked with a code, so that the actual concentration is blinded for the laboratory technician. Put in a swab included in the rapid test for Strep A. Perform the rapid testaccording to the method described by the manufacturer.

    Continue performing tests from all dilutions according to the described method of the rapid test.
11. Note the results in the form.
12. **Day 4:**Take out the cultures of *S. pyogenes*and group C and G streptococci (second bacterial count); choose the plate with approximately 30-50 colonies. Depending on how many colonies you have, you can calculate the number of cfu in the first tube.

Attachment 6 Raw data EQA, comparison culture

2013: Cumulative score information, last 12 distributions

UK National External Quality Assessment Service for Microbiology

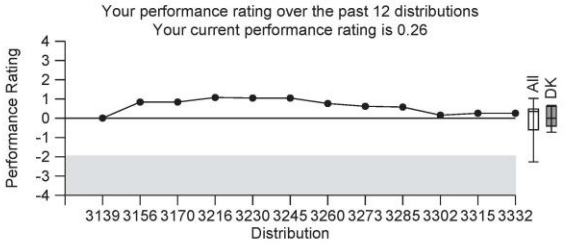
UKNEQAS for General bacteriology	Laboratory : [redacted]
Distribution : **3332**	Page 1 of 4
Dispatch Date : 25-Nov-2013	

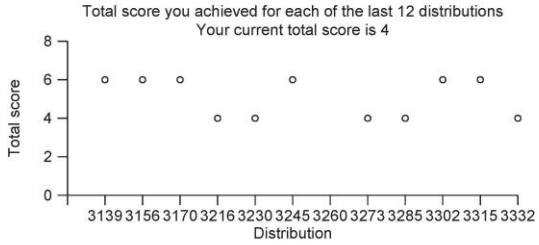
Intended Result		Your Report	Your Score
Specimen 1749	*Ralstonia mannitolilytica*	*Ralstonia mannitolilytica*	Not scored
Specimen 1750	*Neisseria gonorrhoeae*	*Neisseria gonorrhoeae*	2
Specimen 1751	Negative result (or commensals only)	Negative result (or commensals only)	2

Cumulative score information
Total number of specimens sent to you for **UK NEQAS for General bacteriology** over the last 6 distributions is 18
Specimen numbers 1532 1533 1534 1582 1583 1615 1617 1660 1661 1662 1695 1696 1697 1750 1751 have been analysed and scored.
Number of reports returned and scored 15
Number of specimens reported as not examined (not scored) 0
Number of specimens received too late for analysis (not scored) 0
Number of specimens for which no report was received (not scored) 3
Your cumulative score for these specimens was 24 out of a possible total of 24
The mean score calculated from the reports returned by **Denmark** laboratories was 23.67 with a standard error of 1.28.

Performance rating
Your performance rating for **UK NEQAS for General bacteriology** (i.e. the number of standard errors by which your cumulative score lies above or below the mean for **Denmark** laboratories) is 0.26.

A performance rating of more than 1.96 standard errors below the mean indicates possible poor performance.
Performance ratings may change if other participants' results are amended.
No score penalty is incurred for non return of reports. However non return of results may be used as a measure of poor performance.





Turn around time: The time taken to report your results was 21 day(s). This information is provided for your own use and does not form part of your performance assessment.

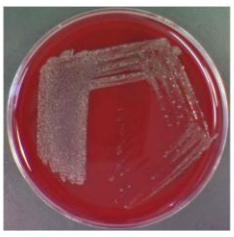
Report format
In the histograms on pages 2, 3 and 4, a maximum of 10 instruments/methods are displayed; this includes the most commonly used methods and the method(s) used in your laboratory indicated by an arrow(s). The figures in the histograms and those in the overall results tables may differ:
(1) due to participants using more than one instrument/method resulting in higher numbers of data sets in the histograms, or,
(2) due to exclusion of kits displayed in the histograms resulting in apparently lower numbers of data sets in the histograms.
The method category described as 'other' contains a miscellaneous assortment of method responses that were not well defined.

Acknowledgments
We thank colleagues in the following Public Health England (PHE) - Microbiology Services: Respiratory and Vaccine Preventable Bacteria Reference unit (RVPBRU), Sexually Transmitted Bacteria Reference Unit (STBRU) Colindale for the supply of strains and provision of confirmatory testing.

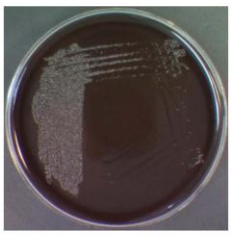
Enquiries
For repeat specimens please order using the web form or e-mail **organiser@ukneqasmicro.org.uk** stating your laboratory identification number, the distribution name and number, and specimen numbers. For any technical enquiries related to this distribution, please contact Christine Walton using the email address above. In-house test results are available should you experience a technical failure and wish to discuss the results. To access intended results and additional images with information on media and incubation conditions associated with this distribution, log onto our secure website and click on the DIST button.
Report authorised by: Christine Walton, Scheme Organiser

Images of results obtained in the UK NEQAS laboratory

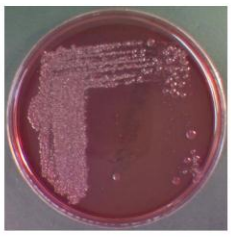
No. 1749 *Ralstonia mannitolilytica*



No. 1750 *Neisseria gonorrhoeae*



No. 1751 No pathogens



Operated by Public Health England
MS Specialist Microbiology Services
133-155 Waterloo Road
Wellington House
London SE1 8UG

UK NEQAS for Microbiology
PO Box 63003
London NW9 1GH

Published at 17:21:31 on Monday 23 December 2013

Attachment 6

2014: Cumulative score information, last six distributions

UK National External Quality Assessment Service for Microbiology

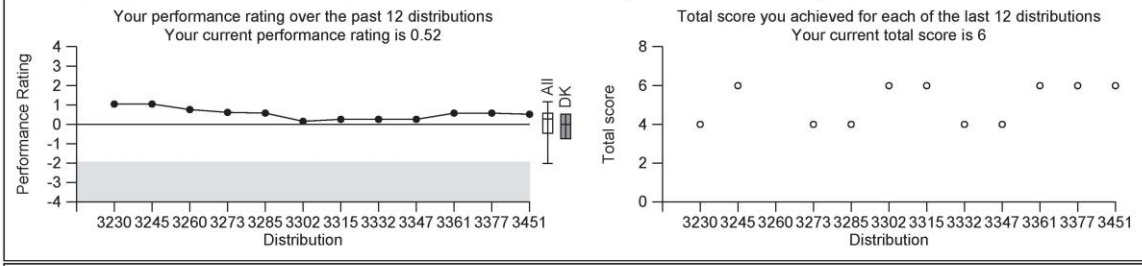
UKNEQAS for General bacteriology	Laboratory : [redacted]
Distribution : **3451**	Page 1 of 4
Dispatch Date : 14-Apr-2014	

Intended Result		Your Report	Your Score
Specimen 1966	*Bacteroides fragilis* group	*Bacteroides fragilis* group	2
Specimen 1967	*Pasteurella multocida*	*Pasteurella multocida*	2
Specimen 1968	*Salmonella* Braenderup	*Salmonella* sp.	2

Cumulative score information
Total number of specimens sent to you for **UK NEQAS for General bacteriology** over the last 6 distributions is 18
Specimen numbers 1695 1696 1697 1750 1751 1794 1795 1838 1839 1840 1883 1884 1885 1966 1967 1968 have been analysed and scored.
Number of reports returned and scored 16
Number of specimens reported as not examined (not scored) 0
Number of specimens received too late for analysis (not scored) 0
Number of specimens for which no report was received (not scored) 0
Your cumulative score for these specimens was 32 out of a possible total of 32
The mean score calculated from the reports returned by **Denmark** laboratories was 31.17 with a standard error of 1.59.

Performance rating
Your performance rating for **UK NEQAS for General bacteriology** (i.e. the number of standard errors by which your cumulative score lies above or below the mean for **Denmark** laboratories) is 0.52.

A performance rating of more than 1.96 standard errors below the mean indicates possible poor performance.
Performance ratings may change if other participants' results are amended.
No score penalty is incurred for non return of reports. However non return of results may be used as a measure of poor performance.



Turn around time: The time taken to report your results was 18 day(s). This information is provided for your own use and does not form part of your performance assessment.

Report format
In the histograms on pages 2, 3 and 4, a maximum of 10 instruments/methods are displayed; this includes the most commonly used methods and the method(s) used in your laboratory indicated by an arrow(s). The figures in the histograms and those in the overall results tables may differ:
(1) due to participants using more than one instrument/method resulting in higher numbers of data sets in the histograms, or,
(2) due to exclusion of kits displayed in the histograms resulting in apparently lower numbers of data sets in the histograms.
The method category described as 'other' contains a miscellaneous assortment of method responses that were not well defined.

Acknowledgments
We thank colleagues in the following Public Health England (PHE) - Microbiology Services: The Antimicrobial Resistance and Healthcare Associated Infections Reference Unit (AMRHAI) and Gastrointestinal Bacterial Reference Unit (GBRU)Colindale and Anaerobe Reference Unit at Cardiff for the supply of strains and provision of confirmatory testing.

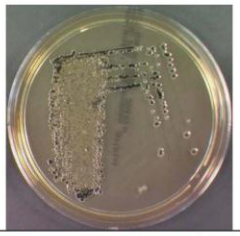
Enquiries
For repeat specimens please order using the web form or e-mail **organiser@ukneqasmicro.org.uk** stating your laboratory identification number, the distribution name and number, and specimen numbers. For any technical enquiries related to this distribution, please contact Christine Walton using the email address above. In-house test results are available should you experience a technical failure and wish to discuss the results. To access intended results and additional images with information on media and incubation conditions associated with this distribution, log onto our secure website and click on the DIST button.
Report authorised by: Christine Walton, Scheme Organiser

Images of results obtained in the UK NEQAS laboratory

No. 1966 *Bacteroides fragilis* group

No. 1967 *Pasteurella multocida*

No. 1968 *Salmonella* Braenderup



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UK NEQAS for Microbiology
PO Box 63003
London NW9 1GH

Published at 18:24:19 on Wednesday 28 May 2014

Attachment 7 Raw data comparison culture

Sample: strain	Duplicate count before and after evaluation 10^6 cfu/0,1 mL				Mean concentration 10^6 cfu/0,1 mL	Mean concentration cfu/mL
A: *S pyogenes* ATCC 19615	29	29	*15*	*15*	22	$2,2 \times 10^8$
B: Haem.strep. gr. A Pt-1	67	57	*56*	*45*	56	$5,6 \times 10^8$
C: Haem.strep. gr. A Pt-2	10	21	*11*	*18*	15	$1,5 \times 10^8$
D: Haem.strep. gr. A Pt-3	9	13	*15*	*17*	14	$1,4 \times 10^8$
E: Haem.strep. gr. A Pt-4	21	22	*14*	*17*	19	$1,9 \times 10^8$
F: Haem.strep. gr. A Pt-5	28	29	*22*	*27*	27	$2,7 \times 10^8$
G: Haem.strep. gr. C	28	30	*20*	*20*	25	$2,5 \times 10^8$
H: Haem.strep. gr. G	41	35	*35*	*30*	35	$3,5 \times 10^8$

The duplicate count after preparation of the samples before the evaluation is given in column 2 and 3. The duplicate count after storage in refrigerator 18 hours, and just before the evaluation is given in column 4 and 5.
The mean count of the duplicates in 0,1 mL before the evaluation was 29,3. The mean count after the evaluation was 23,3. The average of the four measurements (column 2-5) are used for calculation of the concentration (column 7).

Attachment 8 Raw data QuikRead go Strep A, standardised and optimal conditions

Raw data from the QuikRead go measurements are shown only in the report to Orion Diagnostica Oy.

Attachment 9 "SKUP-info". Summary for primary health care

SKUP-info

QuikRead go fra Orion Diagnostica Oy
Sammendrag af en hospitalsafprøvning i regi av SKUP

Konklusion QuikRead go Strep A opfyldte følgende kvalitetsmål:

- Detektionsgrænsen (7×10^4 cfu) opgivet af producenten blev bekræftet af afprøvningen
- Omslagspunktet (4×10^4 cfu/podepind) var det samme for en *S. pyogenes* reference stamme og fem vildtype stammer fra patienter
- Forskellige personer, instrumenter eller reagenslot påvirkede ikke resultaterne
- Resultaterne påvirkes ikke af hæmolytiske streptokokker gr. C eller G
- QuikRead go instrumenterne kunne skelne mellem to Strep A koncentrationer, som kun afviger med en faktor 1,6 fra hinanden. (Usikkerheden på bakterietælling og fremstilling af bakterieboulioner er større)
- De positive og negative kontrolmaterialer gav de forventede resultater
- Positive resultater klar efter 1 minut, negative efter 3 minutter
- Kvalitets målene for brugervenlighed blev opfyldt
- Mindre end 1% tekniske fejl

QuikRead go instrumentet fra Orion Diagnostica kan analysere forskellige komponenter. Denne Strep A afprøvning er foretaget på klinisk mikrobiologisk afdeling i Odense af to bioanalytikere og to overlæger. Afprøvningen blev udført på *S. pyogenes* ATCC stamme 19615 og fem vildtype stammer (fra fem patienter) af *S. pyogenes*, og streptokokker gr. C og G i forskellige koncentrationer.

Resultater
Det laveste positive resultat var $7{,}0\times10^4$ cfu/vatpind. Det svarer til detektionsgrænsen opgivet af Orion Diagnostica. Omslagspunktet mellem negativ og positive resultater blev beregnet til 4×10^4 cfu/vatpind. Specificitet: 24 af 24 dobbelbestemmelser analyseret med to instrumenter fra seks streptokokstammer var negative under omslagspunktet 4×10^4 cfu/vatpind. Lignende resultater blev opnået, når prøverne blev analyseret med tre forskellige instrumenter, af tre personer og ved hjælp af to reagenslot.
Selektivitet: hæmolytiske streptokokker gruppe C og G påvirker ikke resultaterne. Resultaterne kunne ses på skærmen efter en til tre minutter. Et tillægsforsøg viste, at tre QuikRead go instrumenter kunne skelne mellem to koncentrationer, som kun adskilte sig med en faktor 1,6 De positive og negative kontrolmaterialer gav de forventede resultater. Procentdelen af tekniske fejl var <1,0%.

Brugervenlighed
Manual, tidsfaktorer, kontrolmuligheder og betjening af instrumentet blev vurderet som tilfredsstillende af brugerne.

Yderligere information
Oplysninger om pris fås ved at kontakte Orion Diagnostica, Danmark. Hele rapporten fra afprøvningen af QuikRead go Strep A, SKUP/2015/106*, findes på www.skup.nu og www.SKUP.dk, hvor den er farvekodet efter kvalitetsmålene fra rapporten, da der ikke findes danske kvalitetsmål for Strep A analysen i almen praksis.

Attachment 10 List of previous SKUP evaluations

Summaries and complete reports from the evaluations are found at www.skup.nu. In addition, SKUP reports are published at www.skup.dk, where they are rated according to the national Danish quality demands for near patient instruments used in primary health care. Some SKUP summaries are translated into Italian by Centre for Metrological Traceability in Laboratory Medicine (CIRME), and published athttp://users.unimi.it/cirme. SKUP as an organisation has no responsibility for publications of SKUP results on these two websites.

The 30 latest SKUP evaluations

Evaluation no.	Component	Instrument/testkit	Producer
SKUP/2015/106*	Strep A	QuikRead go Strep A	Orion Diagnostica Oy
SKUP/2014/101	HbA1c	InnovaStar HbA1c	DiaSys Diagnostic Systems GmbH
SKUP/2014/104	PT (INR)	ProTime InRhythm	ITC International Technidyne Corporation
SKUP/2014/105	Glucose	Accu-Chek Aviva	Roche Diagnostics
SKUP/2014/103	PT (INR)	*Confidential*	
SKUP/2014/105	Glucose	Accu-Chek Aviva	Roche Diagnostics
SKUP/2013/87	Glucose[1]	Wellion Calla Light	Med Trust Handelsges.m.b.H.
SKUP/2013/100	Glucose[1]	Mylife Unio	Bionime Corporation
SKUP/2013/97	NT-proBNP	Cobas h 232 POC system	Roche Diagnostics GmbH
SKUP/2013/92	CRP	Eurolyser smart 700/340	Eurolyser Diagnostica GmbH
SKUP/2013/99*	Glucose	Accu-Chek Mobile	Roche Diagnostics
SKUP/2013/98*	Glucose	Accu-Chek Aviva	Roche Diagnostics
SKUP/2013/85	Glucose, β-Ketone	Nova StatStrip	Nova Biomedical Corporation, USA
SKUP/2013/96	Hemoglobin	DiaSpect Hemoglobin T	DiaSpect Medical GmbH
SKUP/2013/68	Allergens	ImmunoCap Rapid	Phadia AB MarknadsbolagSverige
SKUP/2012/95	Glucose[1]	Mendor Discreet	Mendor Oy
SKUP/2012/94	Glucose[1]	Contour XT	Bayer Healthcare
SKUP/2012/91	HbA1c	Quo-Test A1c	Quoient Diagnostics Ltd
SKUP/2011/93*	Glucose	Accu-Chek Performa	Roche Diagnostics
SKUP/2011/90	CRP	*i*-Chroma	BodiTech Med. Inc.
SKUP/2011/84*	PT-INR	Simple Simon PT and MixxoCap	Zafena AB
SKUP/2011/86	Glucose[1]	OneTouch Verio	LifeScan, Johnson & Johnson
SKUP/2011/77	CRP	*Confidential*	
SKUP/2011/70*	CRP	smartCRP system	EurolyserDiagnostica GmbH
SKUP/2010/83*	Glucose	*Confidential*	
SKUP/2010/78	HbA1c	In2it	Bio-Rad
SKUP/2010/80	PT (INR)	INRatio2	Alere Inc.
SKUP/2010/89*	Glucose	FreeStyle Lite	Abbott Laboratories
SKUP/2010/88*	HbA1c	*Confidential*	
SKUP/2010/82*	Glucose, protein, blood, leukocytes, nitrite	Medi-Test URYXXON Stick 10 urine test strip and URYXXON Relax urine analyser	Macherey-Nagel GmBH& Co. KG
SKUP/2010/81*	Glucose	mylife PURA	Bionime Corporation
SKUP/2010/67	Allergens	*Confidential*	

*A report code followed by an asterisk indicates that the evaluation is not complete according to SKUP guidelines, since the part performed by the intended users was not included in the protocol, or the evaluation is a follow-up of a previous evaluation, or the evaluation is a special request from the supplier.

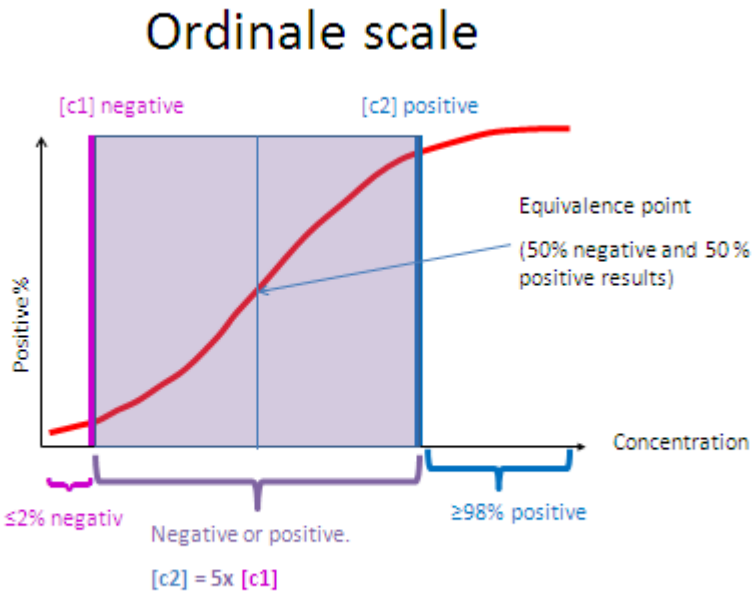
[1] Including a user-evaluation among diabetes patients

Attachment 11 List of previous SKUP evaluations of Rapid Strep A test

Evaluation no.	Component	Instrument/test kit	Producer
SKUP/2015/106*	Strep A	QuikRead go Strep A	Orion Diagnostica Oy
SKUP/2008/69*	Strep A	Diaquick Strep A test	Dialab GmbH
SKUP/2007/62*	Strep A	QuikRead	Orion Diagnostica Oy
SKUP/2006/53*	Strep A	*Confidential*	
SKUP/2005/52*	Strep A	Clearview Exact Strep A Dipstick	Applied Biotech, Inc.
SKUP/2005/42*	Strep A	Twister Quick-Check Strep A	ACON laboratories, Inc.
SKUP/2004/36*	Strep A	Dtec Strep A testcard	UltiMed
SKUP/2004/32*	Strep A	QuickVue In-Line Strep A test	Quidel Corporation
SKUP/2003/28*	Strep A	QuickVue In-Line Strep A test	Quidel Corporation
SKUP/2003/27*	Strep A	QuickVue Dipstick Strep A test	Quidel Corporation
SKUP/2003/24*	Strep A	OSOM Strep A test	GenZyme, General Diag.

*The report code followed by an asterisk indicates that the evaluation is not complete according to SKUP guidelines, since the part performed by the intended users was not included in the protocol.

Attachment 12 Ordinal scale theory



The detection limit (lowest positive concentration) has to be lower than the equivalence point, where 50% is positive and 50% is negative.
For test strips there normally is a 'grey zone area/borderline concentration' at which the 'true results' can be both positive and negative. The higher concentration, the higher percentage of positive results. The positive concentration limit is normally at least 5× the negative concentration limit.