

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION  
DECISION SUMMARY  
DEVICE ONLY TEMPLATE**

**A. 510(k) Number:**

k040811

**B. Purpose for Submission:**

New device

**C. Analyte:**

Single stranded DNA (ssDNA) antibodies

**D. Type of Test:**

Qualitative and semi-quantitative enzyme immunoassay

**E. Applicant:**

Sweden Diagnostics (Germany) GMBH (Pharmacia Diagnostics)

**F. Proprietary and Established Names:**

Varelisa® ssDNA Antibodies

**G. Regulatory Information:**

1. Regulation section:  
21 CFR 866.5100, Antinuclear Antibody Immunological Test System
2. Classification:  
Class II
3. Product Code:  
LRM, Anti-DNA Antibody (Enzyme-Labeled), Antigen, Control
4. Panel:  
Immunology 82

**H. Intended Use:**

1. Intended use(s):  
The Varelisa ssDNA Antibodies EIA kit is designed for the semiquantitative and qualitative determination of anti-single stranded DNA (ssDNA) autoantibodies in serum or plasma. In conjunction with the Varelisa dsDNA Antibodies kit, it assists in the diagnosis of systemic lupus erythematosus (SLE) and certain other rheumatic diseases. This test is not definitive in isolation but has to be seen as one parameter in a multi-criterion process.
2. Indication(s) for use:  
The Varelisa ssDNA Antibodies EIA kit is designed for the semiquantitative and qualitative determination of anti-single stranded DNA (ssDNA) autoantibodies in serum or plasma. In conjunction with the Varelisa dsDNA Antibodies kit, it assists in the diagnosis of systemic lupus erythematosus (SLE) and certain other rheumatic diseases. This test is not definitive in isolation but has to be seen as one parameter in a multi-criterion process.
3. Special condition for use statement(s):  
For prescription use only
4. Special instrument Requirements:  
Microplate reader capable of measuring OD at 450 nm

**I. Device Description:**

The assay components include microplate strips coated with synthetic ssDNA, 6 levels of calibrator: 0, 12.5, 25, 50, 100 and 200 U/mL, positive and negative control materials, wash buffer concentrate, sample diluent concentrate, anti-human IgG horseradish peroxidase conjugate, 3,3',5,5' tetramethylbenzidine (TMB) substrate, and 0.5 M H<sub>2</sub>SO<sub>4</sub> stop solution.

**J. Substantial Equivalence Information:**

1. Predicate device name(s):  
INOVA Quanta Lite ssDNA
2. Predicate K number(s):  
k954380
3. Comparison with predicate:

| Similarities          |  |   |
|-----------------------|--|---|
| Item                  | Device   | Predicate   |
| Indications for Use   | In conjunction with dsDNA antibodies kit it aids in the diagnosis of systemic lupus erythematosus (SLE) and certain other rheumatic diseases. The test is not definitive in isolation but has to be seen as one parameter in a multi-criterion diagnostic process. | Same  |
| Result interpretation | In conjunction with anti-dsDNA assay result  | Same  |
| Conjugate             | Anti-human IgG, HRP  | Same  |
| Substrate             | TMB  | Same  |
| Assay principle       | Indirect noncompetitive enzyme immunoassay   | Same  |
| Sample dilution       | 1:101  | Same  |
| Differences           |  |   |
| Item                  | Device   | Predicate   |
| Antigen               | Synthetic ssDNA  | Purified heat denatured calf thymus ssDNA   |
| Specimen matrix       | Serum and plasma   | Serum   |
| Calibrators           | Set of 6 prediluted calibrators: 0, 12.5, 25, 50, 100, and 200 U/mL  | None provided   |
| Controls              | Positive and negative controls   | High positive, low positive and negative controls   |
| Result interpretation | ss/ds $\leq 1$ = negative<br>ss/ds $> 1$ positive<br>AND<br>ssDNA $< 35$ = negative<br>ssDNA 35-55 = equivocal<br>ssDNA $> 55$ = positive  | ss/ds $\leq 0.5$ = negative<br>ss/ds $> 0.5$ positive<br>AND<br>ssDNA $< 68.6$ = negative<br>ssDNA 68.6-229 = moderate positive<br>ssDNA $> 229$ = positive |

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

None

**L. Test Principle:**

The wells of a microtiter plate are coated with synthetic ssDNA. Antibodies specific for ssDNA present in the patient samples bind to the antigen. In a second step, the enzyme labeled second antibody (conjugate) binds to the antigen-antibody complex which leads to the formation of an enzyme labeled conjugate-antibody-antigen complex. The enzyme labeled antigen-antibody complex converts the added substrate to form a colored solution. The rate of color formation from the chromogen is a function of the amount of conjugate complexed with the bound antibody and thus is proportional to the initial concentration of antibodies in the patient sample.

**M. Performance Characteristics (if/when applicable):**1. Analytical performance:a. Precision/Reproducibility:

The purpose of the precision study was to investigate variation within and between runs. The samples (low, medium, and high) were used in a standard 1:101 dilution and were analyzed in 5 runs, with 4 replicates per run. Calibrator and controls were analyzed in triplicates. One operator carried out the analyses within one day. The target values set for the studies were: within and between run variance should be <10%. The within run % CV ranged from 5.8 to 8.1% and between run ranged from 5.0 to 6.1 % thus meeting the target values.

b. Linearity/assay reportable range:Dilution linearity:

The reportable range for the assay is 1 – 200 U/mL. The purpose of the dilution linearity study was to demonstrate linearity of the assay over the measuring range. Beginning with a standard dilution of 1:101, 4 samples were further diluted 1:1, 2:3, 1:2, 1:4 then doubling dilutions through 1:64. Calibrators, controls and each dilution step were analyzed in duplicate. Specifications set for the study were: the observed/expected values should be within  $\pm 20\%$  for at least 3 successive dilution steps of each tested sample. Measured values ranged from 18.4 to >200 U/mL. Percent recovery for all four samples through the 1:8 dilution, ranged from 97 to 102%, thus meeting the specifications. For dilutions up to 1:32 recovery ranged from 64 to 85%.

Recovery:

The purpose of this study was to demonstrate that the assay detects added amounts of ssDNA specific IgG antibodies. Two positive samples were used in a 1:101 dilution. The sample dilutions were spiked with 1:10 volume of calibrators S1 – S6. The spiked samples, calibrators and controls were analyzed in duplicate. The specifications for this study were: the percent recovery (observed/expected x 100) should be within  $\pm 20\%$  of the expected

values. Recoveries ranged from 89.6 to 104.4% and met the study specifications.

c. *Traceability (controls, calibrators, or method):*

There is no recognized reference material for ssDNA antibodies. Results are reported in arbitrary units.

d. *Detection limit:*

The analytical sensitivity study was performed to verify the detection limit and to prove the ability of the assay to differentiate between the background and the first calibrator point. The sample diluent was diluted according to the directions for use and measured 56 times on one plate. Calibrators and controls were analyzed in 4 replicates. For curve control below calibrator point S2, 2 dilutions of Calibrator S2 were performed (1:2, 1:4) and also run in 4 replicates. The value for the analytical sensitivity (detection limit) was calculated as the mean of the optical densities (OD) of the Sample Diluent plus 3 times the standard deviation (SD), expressed in U/mL. The specifications for the study were: the mean plus 3 SD of the OD of the sample diluent should be lower than the Calibrator S2; the detection limit should be equal or below 1 U/mL; and the discrimination value should be  $>2.0$ . The mean plus 3SD of the sample diluent was 0.013 U/mL (lower than Calibrator S2 and lower than 1.0 U/mL. The discrimination value was above 2 U/mL and diluted Calibrator S2 could be discriminated from the background. Thus specifications for the study were met.

e. *Analytical specificity:*

The purpose of the study was to investigate whether high concentrations of potentially interfering substances in serum including bilirubin (F and C), hemoglobin, chyle, and rheumatoid factor (RF) adversely affect results of the assay. Three serum samples were diluted 1:101 in sample diluent and spiked with different amounts of interfering substances or their respective blank solutions and analyzed in triplicate. The calibrators and controls were run in duplicate. The specification to be met for this study was: the deviation of the values of the sample spiked with the interfering substance should be less than  $\pm 20\%$  of the value of the sample spiked with a buffer blank. The spiking of high concentrations of the potentially interfering substances showed no significant influence on the test results (deviations ranged from -15.8 to 16.2%). The specifications for this study were met.

f. *Assay cut-off:*

A study was performed to establish and confirm the defined cut-off by measuring 432 apparently healthy blood donor samples, equally distributed by gender and age. Specifications for the study were: 95% of the normal population should be negative. Therefore the 95<sup>th</sup> percentile should lie below the lower limit of the equivocal range. The cut-offs were set as  $<35$  U/mL is negative, 35-55 U/mL is

equivocal and  $>55$  is considered positive. The 95 percentile was 36.7 U/mL, at the lower end of the equivocal range. The results were independent of gender and age.

2. Comparison studies:

a. *Method comparison with predicate device:*

The comparison was made by testing 120 sera (ssDNA antibody positive and negative). Analyses and calculations were performed according to assay procedures. Correlations and Four Field Analysis were performed. The comparison showed an overall agreement of 99.2% (119/120) (95% CI 97.6% to 100.8%). Positive and negative agreements were 100% (39/39) and 98.8% (80/81) (95% CI 96.4% to 101.2%) respectively. Comparison for the 40 positive sera was done by interpreting the ssDNA/dsDNA ratio. There was one discordant result (new device positive, predicate device negative).

b. *Matrix comparison:*

The predicate device uses serum only. The new device recommends use of both serum and plasma. A study was performed to demonstrate that the new assay gives the same results for serum, heparin plasma, citrate plasma and EDTA plasma collected from the same specimen. Eight ssDNA antibody negative samples, each available as serum, heparin plasma, citrate plasma and EDTA plasma variant; 8 ssDNA antibody spiked positive sera and 2 ssDNA antibody positive samples, each available as serum, heparin plasma, citrate plasma and EDTA plasma variant were assayed. The 8 ssDNA antibody negative samples were run in duplicate together with calibrators and controls. Then they were spiked with the 8 different ssDNA antibody positive sera. All positive sample preparations were run in four replicates together with calibrators and controls. The specifications are: percent deviation between serum and plasma results for positive samples should not be higher than  $\pm 20\%$  and negative samples should be negative as serum or plasma. The data showed no difference greater than  $\pm 20\%$  (deviations ranged from -19.8 to 5.7%) in the evaluation of a positive sample when testing serum, heparin, citrate or EDTA plasma and no negative sample changed from negative to positive. Thus the specifications were met.

3. Clinical studies:

a. *Clinical sensitivity:*

Not provided

b. *Clinical specificity:*

Not provided

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

4. Clinical cut-off:

See assay cut-off.

5. Expected values/Reference range:

According to the literature about 6.7% of the apparently healthy population may have anti-ssDNA antibodies. This proportion increases in the elderly population (up to 17.2%; mean age 81 years) with prevalence for females (Giardina et al. 1997; Manoussakis et al. 1987).

**N. Conclusion:**

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