



# ss-DNA Ab ELISA Kit

Catalog Number KA1117

96 assays

Version: 02

Intended for research use only

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## **Introduction**

### **Intended Use**

Enzyme Immunoassay for quantitative determination of IgG Autoantibodies to ssDNA in human serum or plasma

### **Background**

Autoimmune diseases are characterized by the occurrence of antibodies against own antigenic structures - so-called autoantibodies. Presence of autoantibodies to native Desoxyribonucleic acids (n-DNA, dsDNA, double-stranded DNA) is typical for the clinical picture of Systemic Lupus erythematoses (SLE). Antibodies against dsDNA belong to the group of Anti Nuclear Antibodies (ANA), which are directed against various structures of the nucleus of the cell. They appear in a variety of rheumatoid diseases. Besides the ANA antibodies another group of autoantibodies is of interest, which are directed against the so-called Extractable Nuclear Antigens (ENA). The ARA criteria of the American Rheumatism Association provide an extensive diagnostic scheme for the diagnosis of Systemic Lupus erythematoses (SLE). In case that at least 4 of the eleven ARA criteria are fulfilled, SLE is highly predictive [8]. Antibodies to dsDNA are found during the active phases of SLE, where the serum concentration exhibits positive correlation to the severity of the disease. An ongoing therapy may be monitored by the aid of autoantibody determination. Diagnostic sensitivity of the anti-dsDNA determination in cases of SLE is approximately 91 % combined with a diagnostic specificity of nearly 96 percent.

Antibodies against DNA can be differentiated into two groups:

1. antibodies, that bind only to native double-stranded DNA (dsDNA) and
2. antibodies recognizing single-stranded DNA (ssDNA) too.

Measurement of anti nuclear antibodies (ANA, or anti nuclear factor (ANF)) by indirect immunofluorescence test (IFT) is widely accepted as screening method in suspected SLE. Since in some stages of the diseases or during therapy IFT sometimes gives false results, a more specific test system is needed. Negative IFT for anti nuclear antibodies does not exclude the presence of anti-dsDNA antibodies, since the antigenic structures may be masked by other structures. Furthermore the ANA titers determined by IF test show only weak correlation to the severity of the disease.

Most antibodies against dsDNA are directed against the phosphate units of DNA. Thus, these autoantibodies also bind to DNA single strands. For quantitation of anti-dsDNA it has to be proven, that the antigen preparation exhibits no contamination with single stranded DNA.

Autoantibodies against single-stranded DNA are mainly directed against its basic compound, which in the native DNA is masked inside the helical structure. In serum of SLE patients antissDNA antibodies are found with a frequency of up to 87 percent during acute phases and 43 percent during inactive phases. SLE like diseases are caused by some drugs. For differential diagnosis of drug-induced LE the determination of anti-ssDNA is a valuable diagnostic tool. In drug- induced LE anti-ssDNA is elevated in more the 50 percent of alle cases. Furthermore elevated anti-ssDNA serum concentrations have been reported in Mononucleosis, Hepatitis and various forms of Leukemia.

Disease	dsDNA	ssDNA	Histone	SS-A	SS-B	Sm	RNP/Sm	Scl-79	Jo-1
Systemic lupus erythematosus (SLE)	>90	>90	30-50	10-30	30-50	10-30	10-30		
Drug-induced lupus (DIL)		30-50	50-90						
Sharp-syndrome/mixed connective tissue disease	10-30	10-30					>90		
Rheumatoid arthritis	10-30	30-50	30-50	10-30					
Sjogren's syndrome	10-30	10-30		>90	>90				
Scleroderma	10-30	10-30		10-30				>90	
Photosensitive dermatitis, dermatomyositis	10-30	10-30							50-90

### **Principle of the Assay**

Recombinant single-stranded DNA (ssDNA) is bound to microwells. Antibodies against the coated antigen, if present in diluted patient sample, bind to the respective antigen. Washing of the microwells removes unbound unspecific serum and plasma components. Horseradish peroxidase (HRP) conjugated anti-human antibodies immunologically detect the bound patient antibodies forming a conjugate/antibody/antigen complex. Washing of the microwells removes unbound conjugate. An enzyme substrate in the presence of bound conjugate hydrolyzes to form a blue colour. The addition of an acid stops the reaction forming a yellow end-product. The intensity of this yellow colour is measured photometrically at 450 nm. The amount of colour is directly proportional to the concentration of antibodies present in the original sample.

## General Information

### Materials Supplied

List of component

Component	Amount
Divisible microplate: Consisting of 12 modules of 8 wells each. Ready to use.	96 (8x12) wells
Calibrators A-F (0, 12.5, 25, 50, 100, 200 U/ml), containing ssDNA antibodies in a serum/buffer matrix (PBS, BSA, detergent, NaN <sub>3</sub> 0.09%), yellow. Ready to use.	1.5 ml x 6
Control positive and (1) negative (2), containing ssDNA antibodies in a serum/buffer matrix (PBS, BSA, detergent, NaN <sub>3</sub> 0.09%, yellow. Ready to use.	1.5 ml x 2
Sample buffer P, containing PBS, BSA, detergent, preservative NaN <sub>3</sub> 0.09%, yellow, 5x conc.	20 ml
Enzyme Conjugate, containing anti-human IgG antibodies, HRP labelled; PBS, BSA, detergent, preservative ProClin 300 0.05%, light red. Ready to use.	15 ml
TMB Substrate; containing 3,3',5,5'-Tetramethylbenzidin, colorless. Ready to use.	15 ml
Stop solution (contains acid). Ready to use.	15 ml
Wash solution, containing Tris, detergent, preservative NaN <sub>3</sub> 0.09%; 50 x conc.	20 ml

### Storage Instruction

- ✓ Store the kit at 2-8°C.
- ✓ Do not expose reagents to heat, sun or strong light during storage and usage.
- ✓ Store microplate sealed and desiccated in the clip bag provided.
- ✓ Unopened reagents are stable until expiration of the kit. See labels for individual batch.
- ✓ Diluted Wash Solution and Sample Buffer are stable for at least 30 days when stored at 2-8°C. We recommend consumption on the same day.

### Materials Required but Not Supplied

- ✓ Microplate reader capable of endpoint measurements at 450 nm; optional: reference filter at 620 nm.
- ✓ Data reduction software
- ✓ Multi-Channel Dispenser or repeatable pipet for 100 µl
- ✓ Vortex mixer
- ✓ Pipets for 10 µl, 100 µl and 1000 µl
- ✓ Laboratory timing device
- ✓ Distilled or deionized water
- ✓ Measuring cylinder for 1000 and 100 ml
- ✓ Plastic container for storage of the wash solution

## **Precautions for Use**

### ✓ Warning and Precautions

- All reagents of this kit are intended for research use only.
- Components containing human serum were tested and found negative for HBsAg, HCV, HIV1 and HIV2 by FDA approved methods. No test can guarantee the absence of HBsAg, HCV, HIV1 or HIV2, and so all human serum based reagents in this kit must be handled as though capable of transmitting infection.
- Bovine serum albumin (BSA) used in components has been tested for BSE and found negative.
- Avoid contact with the substrate TMB (3,3',5,5'-Tetramethyl-benzidine).
- Stop Solution contains acid, classification is non-hazardous. Avoid contact with skin.
- Controls, calibrator, sample buffer and wash solution contain sodium azide (NaN<sub>3</sub>) 0.09% as preservative. This concentration is classified as non-hazardous.
- Enzyme conjugate contains ProClin 300 0.05% as preservative. This concentration is classified as non-hazardous.
- During handling of all reagents, controls and serum samples observe the existing regulations for laboratory safety regulations and good laboratory practice:  
First aid measures: In case of skin contact, immediately wash thoroughly with water and soap.  
Remove contaminated clothing and shoes and wash before reuse. If system fluid comes into contact with skin, wash thoroughly with water. After contact with the eyes carefully rinse the opened eye with running water for at least 10 minutes. Get medical attention if necessary.
- Personal precautions, protective equipment and emergency procedures:  
Observe laboratory safety regulations. Avoid contact with skin and eyes. Do not swallow. Do not pipette by mouth. Do not eat, drink, smoke or apply makeup in areas where specimens or kit reagents are handled. When spilled, absorb with an inert material and put the spilled material in an appropriate waste disposal.
- Exposure controls/personal protection: Wear protective gloves of nitrile rubber or natural latex. Wear protective glasses. Used according to intended use no dangerous reactions known.
- Conditions to avoid: Since substrate solution is light-sensitive. Store in the dark.
- For disposal of laboratory waste the national or regional legislation has to be observed.
- Observe the guidelines for performing quality control in medical laboratories by assaying control sera.

### ✓ Warning and Precautions

- This EILSA assay is suitable for use on open automated ELISA processors. Each assay has to be validated on the respective automated system.
- Do not use kit components beyond their expiration dates.
- Do not interchange kit components from different lots and products.
- All materials must be at room temperature (20-28°C) prior to use.
- Prepare all reagents and samples. Once started, perform the test without interruption.

- Double determinations may be done. By this means pipetting errors may become obvious.
- Perform the assay steps only in the order indicated.
- Always use fresh sample dilutions.
- Pipette all reagents and samples into the bottom of the wells.
- To avoid carryover or contamination, change the pipette tip between samples and different kit controls.
- Wash microwells thoroughly and remove the last droplets of wash solution.
- All incubation steps must be accurately timed.
- Do not re-use microplate wells.

## Assay Protocol

### Reagent Preparation

✓ Wash Solution

Dilute the contents of one vial of the buffered wash solution concentrate (50x) with distilled or deionized water to a final volume of 1000 ml prior to use.

✓ Sample buffer P

Prior to use dilute the contents (20 ml) of one vial of sample buffer 5x concentrate with distilled or deionized water to a final volume of 100 ml.

### Sample Preparation

✓ Specimen Collection, Storage and Handling

1. Collect whole blood specimens using acceptable medical techniques to avoid hemolysis.
2. Allow blood to clot and separate the serum by centrifugation.
3. Test serum should be clear and non-hemolyzed. Contamination by hemolysis or lipemia is best avoided, but does not interfere with this assay.
4. Specimens may be refrigerated at 2-8°C for up to five days or stored at -20°C up to six months.
5. Avoid repetitive freezing and thawing of serum samples. This may result in variable loss of autoantibody activity.
6. Testing of heat-inactivated sera is not recommended.

✓ Preparation of Samples

Dilute samples 1:100 with sample buffer before assay. Put 990 µl of prediluted sample buffer in a polystyrene tube and add 10 µl of sample. Mix well. *Note: Calibrators/Controls are ready to use and need not be diluted.*

### Assay Procedure

Prepare enough micorplate modules for all calibrators.controls and samples.

1. Pipette 100 µl of calibrators, controls and prediluted samples into the wells.
2. Incubate for 30 minutes at room temperature (20-28°C).
3. Discard the contents of the microwells and wash 3 times with 300 µl of wash solution.
4. Dispense 100 µl of enzyme conjugate into each well.
5. Incubate for 15 minutes at room temperature.
6. Discard the contents of the microwells and wash 3 times with 300 µl of wash solution.
7. Dispense 100 µl of TMB substrate solution into each well.



8. Incubate for 15 minutes at room temperature.
9. Add 100  $\mu$ l of stop solution to each well of the modules
10. incubate for 5 minutes at room temperature.
11. Read the optical density at 450 nm (reference 600-690 nm) and calculate the results. The developed color is stable for at least 30 minutes. Read optical densities during this time.

## Data Analysis

### Calculation of Results

✓ Calculation of results

For quantitative results plot the optical density of each calibrator versus the calibrator concentration to create a calibration curve. The concentration of samples may then be estimated from the calibration curve by interpolation.

Using data reduction software a 4-Parameter-Fit with lin-log coordinates for optical density and concentration is the data reduction method of choice.

### Performance Characteristics

✓ Calibration

This assay system is calibrated in relative arbitrary units, since no international reference preparation is available for this assay.

✓ Measuring range

The calculation range of this ELISA assay is 0-200 U/ml.

✓ Expected values

In a normal range study with samples from healthy blood donors the following ranges have been established with this ELISA assay: Cut-off 20 U/ml.

✓ Interpretation of results

Negative: < 20 U/ml

Positive: ≥ 20 U/ml

✓ Limit of detection

Functional sensitivity was determined to be: 1 U/ml.

✓ Interfering substances

No interference has been observed with haemolytic (up to 1000 mg/dl) or lipemic (up to 3 g/dl triglycerides) sera or bilirubin (up to 40 mg/dl) containing sera or plasma. Nor have any interfering effects been observed with the use of anticoagulants (Citrate, EDTA, Heparine). However for practical reasons it is recommended that grossly hemolyzed or lipemic samples should be avoided.

✓ Linearity

Samples containing high levels of specific antibody were serially diluted in sample buffer to demonstrate the dynamic range of the assay and the upper/lower end of linearity. Activity for each dilution was calculated from the calibration curve using a 4-Parameter-Fit with lin-log coordinates.

Sample	Dilution	Observed U/ml	Expected U/ml	O/E [%]
1	1:100	189.2	189.2	100
	1:200	90.3	94.6	95
	1:400	50.1	47.3	105
	1:800	21.9	28.7	92
2	1:100	163.2	163.2	100
	1:200	77.9	81.6	95
	1:400	39.2	40.8	96
	1:800	21.1	20.4	103

✓ Reproducibility

Intra-assay precision: Coefficient of variation (CV) was calculated for each of three samples from the results of 24 determinations in a single run. Results for precision-within-assay are shown in the table below.

Inter-assay precision: Coefficient of variation (CV) was calculated for each of three samples from the results of 6 determinations in 5 different runs. Results for run-to-run precision are shown in the table below.

Intra-Assay		
Sample	Mean U/ml	CV%
1	16.0	5.6
2	65.0	4.2
3	135.0	6.4

Inter-Assay		
Sample	Mean U/ml	CV%
1	15.0	6.3
2	63.0	4.4
3	132.0	6.8

## Resources

### References

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**Plate Layout**

	1		3	4	5	6	7	8	9	10	11	12
A	Standard A	Sample 1										
B	Standard B	Sample 2										
C	Standard C	Sample 3										
D	Standard D											
E	Standard E											
F	Standard F											
G	Control +											
H	Control -											