

DNA/ENA AUTOIMMUNITY SCREENING PANEL

IVD For *In Vitro* Diagnostic Use

INTENDED USE

The ImmunoDOT DNA/ENA Autoimmunity Screening Panel is an enzyme immunoassay (EIA) test for screening and detection of autoantibodies against various specific nuclear antigens (DNA, SS-A, SS-B, RNP/Sm, and Sm) in serum, and is used as an aid in the diagnosis of systemic lupus erythematosus (SLE), mixed connective tissue disease (MCTD), and Sjögren's syndrome.

SUMMARY AND EXPLANATION¹

Identification of the lupus erythematosus (LE) cell in 1948 provided physicians with a relatively specific laboratory test to aid in the diagnosis of systemic lupus erythematosus (SLE). More recently, determining the presence or absence of particular autoantibodies influences the confidence with which a diagnosis is made. The ImmunoDOT DNA/ENA Panel detects antinuclear antibody for specific diagnostically significant nuclear antigens: ds-DNA, Sjögren's syndrome antigen A (SS-A/Ro), Sjögren's syndrome antigen B (SS-B/La), ribonucleoprotein (RNP), and Smith (Sm) antigen.

ASSAY PRINCIPLE

The ImmunoDOT DNA/ENA Autoimmunity Screening Panel utilizes an enzyme-linked immunoassay (EIA) dot technique for the detection of antibodies. The antigens are dispensed as discrete dots onto a solid membrane. After adding specimen to a reaction vessel, an assay strip is inserted, allowing patient antibodies reactive with the test antigen to bind to the strip's solid support membrane. In the second stage, the reaction is enhanced by removal of non-specifically bound materials. During the third stage, alkaline phosphatase-conjugated anti-human antibodies are allowed to react with bound patient antibodies. Finally, the strip is transferred to enzyme substrate reagent, which reacts with bound alkaline phosphatase to produce an easily seen, distinct dot.

REAGENTS

Assay Strip. positive human IgG control, double-stranded deoxyribonucleic acid (ds-DNA), ribonucleoprotein (RNP) and Smith antigens, Smith antigen, Sjögren's syndrome antigen A (SS-A/Ro), and Sjögren's syndrome antigen B (SS-B/La).

Diluent (#1). buffered diluent (pH 6.2-7.6), protein stabilizers with <0.1% NaN₃.

Enhancer (#2): sodium chloride with <0.1% NaN₃.

Conjugate (#3): alkaline phosphatase conjugated goat anti-human antibodies in buffered diluent (pH 6.2-8.5) with <0.1% NaN₃.

Developer (#4): 5-bromo-4-chloro-3-indolyl phosphate and p-nitro blue tetrazolium chloride in buffered diluent (pH 9.0-11.0), 0.8% N, N-Dimethylformamide, and <0.1% NaN₃.

Warnings and Precautions

For In-Vitro Diagnostic Use. ImmunoDOT DNA/ENA Autoimmunity Screening Panel reagents have been optimized for use as a system. Do not substitute other manufacturers' reagents or other ImmunoDOT Assay System reagents. Dilution or adulteration of these reagents may also affect the performance of the test. Do not use any kits beyond the stated expiration date. Analytic quality deionized or distilled water must be used as Clarifier. Close adherence to the test procedure will assure optimal performance. Do not shorten or lengthen stated incubation times since these may result in poor assay performance.

Some assay components contain sodium azide which may react with lead and copper plumbing to form highly explosive metal azides. On disposal, flush with a large volume of water to prevent azide build-up.

Warning - Potential Biohazardous Material. Human sera used in the preparation of controls were tested and found non-reactive for hepatitis B surface antigen and for antibodies to HIV-1, HIV-2, and hepatitis C virus. Because no test method can offer complete assurance that infectious

agents are absent, handle reagents and patient samples as if capable of transmitting infectious disease².

Storage

Store reagents and assay strips at 2-8°C. Reagents must be at room temperature (15-30°C) before use. Reagents must be used within one hour of placement in the heated workstation. Avoid contamination of reagents which may produce invalid results.

SPECIMEN COLLECTION AND HANDLING

The test requires approximately 10 µL of serum collected according to standard practices. Serum may be stored at 2-8°C for up to five days or frozen below -20 °C for extended periods.

PROCEDURE

Materials Provided

ImmunoDOT DNA/ENA Assay Strips	Reaction Vessels
Diluent (#1)	Package Insert
Enhancer (#2)	
Conjugate (#3)	
Developer (#4)	

Materials Required But Not Provided

GenBio Workstation
Specimen collection apparatus (e.g., finger sticking device, venipuncture equipment)
Timer
Analytic quality distilled or deionized water to be used as Clarifier
Pipets
Absorbent toweling to blot dry assay strip
Positive control serum

Set-Up

1. Turn on Workstation and adjust to proper temperature if necessary. Refer to Workstation Instructions.
2. Remove 4 Reaction Vessels (per test) from the product box and insert into appropriate slots in Workstation. For the large Workstation, add water up to the fill line of the Clarifier vessel provided. For the small Workstation, use an appropriate container and sufficient water to cover all reactive windows of the assay strip.
3. Place 2 mL Diluent (#1) in Reaction Vessel #1; 2 mL Enhancer (#2) in Reaction Vessel #2; 2 mL Conjugate (#3) in Reaction Vessel #3; and 2 mL Developer (#4) in Reaction Vessel #4.
4. Wait ten minutes before beginning "Assay Procedure". During this time, specimen(s) may be added (step #5), Assay Strips labeled (step #6), and inserted into the Strip Holder (step #7).
5. Add patient specimen (approximately 10 µL serum) to Reaction Vessel #1.
6. Appropriately label the Assay Strips.
7. If the large Workstation is used, insert the label end of the Assay Strip into the Strip Holder, one per groove, taking care not to touch the assay windows.

Assay Procedure

1. Prewet Assay Strip by immersing in Clarifier for 30 - 60 seconds.
2. Using several (5 - 10) quick up and down motions with the Assay Strip, mix reagent and specimen thoroughly in Reaction Vessel #1. Let stand for 15 minutes.
3. Remove Assay Strip from Reaction Vessel and swish in the Clarifier. Use a swift back and forth motion for 5 - 10 seconds allowing for optimal washing of the Assay Strip's membrane windows.
4. Place Assay Strip into Reaction Vessel #2. Mix thoroughly with several (5 - 10) quick up and down motions. Let stand for 5 minutes.
5. Remove Assay Strip from Reaction Vessel #2 and swish in Clarifier as described (step #3).

6. Place Assay Strip into Reaction Vessel #3. Mix thoroughly with several (5 - 10) quick up and down motions. Let stand for 15 minutes.
7. Remove Assay Strip from Reaction Vessel #3 and swish in Clarifier as described (step #3). DO NOT remove the Assay Strip from the Clarifier.
8. Allow the Assay Strip to stand in the Clarifier for 5 minutes.
9. Remove Assay Strip from Clarifier and place into Reaction Vessel #4. Mix thoroughly with several (5 - 10) quick up and down motions. Let stand for 5 minutes.
10. Remove Assay Strip from Reaction Vessel #4 and swish in Clarifier as described (step #3).
11. Blot and allow Assay Strip to dry. It is imperative that tests of borderline specimens be interpreted after the Assay Strip has been allowed to dry.

insert. (Contact Technical Services for additional guidance if an alternate heat source is used.)

INTERPRETATION

Each window of the assay strip is interpreted independently. Reactions fall into three categories:

Nonreactive	Negative reaction
Weakly reactive	The dot is not easily seen and is interpreted as negative.
Reactive	Positive reaction ("dot")

Weakly reactive samples are sometimes seen and are negative reactions. Weak reactions may either indicate low level autoantibodies or nonspecific cross-reacting antibodies which are found in normal subjects. In either case, weakly reactive autoantibody (i.e., lower titer) may be reported and should be interpreted with caution since a significant number of normal specimens will have similar reactions.

LIMITATIONS

Negative assay strips should not be used as the sole criteria to rule out all autoimmune disease. No single screening test contains all possible nuclear antigens. Diagnosis of autoimmune disorders requires integration of clinical and epidemiological information as well as laboratory data.

EXPECTED RESULTS

It has been found that among the major systemic rheumatic disorders, each exhibits a rather distinct and unique profile of ANA's characteristic of the particular disorder^{3,4} (Table 1).

PERFORMANCE CHARACTERISTICS

ImmunoDOT DNA/ENA Autoimmunity Screening Panel measures five nuclear autoantibodies: Sjögren's syndrome antigen A (SS-A/Ro), Sjögren's syndrome antigen B (SS-B/La), a combination of RNP and Sm antigen, and Sm antigen and ds-DNA. *Crithidia lucilliae* immunofluorescence was used as the standard ds-DNA test method. For the latter four, autoantibodies to extractable nuclear antigens (ENAs), comparison against gel diffusion was made to assess test sensitivity. A commercial EIA system was used to resolve differences between the two assay methods. To establish test specificity, sera from normal subjects and gel negative samples were evaluated.

Reading the Assay Strip

Positive	A dot with an EASILY SEEN , distinct border is visible in the center of the window. The outer perimeter of the window must be white to pale gray.
Negative	If no dot is seen or a dot is difficult to see, interpret it as negative.

Quality Control

The top membrane window of the Assay Strip is a positive reagent control and must be positive for further interpretation. The reagent control assures that reagents are active and that the test has been performed properly. If the reagent control is negative, the test must be repeated. The intensity of the positive control dot must not be used as a calibrator. Positive reactions in the other antigen windows of the strip may be either darker or lighter than the positive control depending on the antibody titer.

GenBio quality assures that each kit lot performs as described. In addition, positive control serum (Product No. 3918), moderately positive for DNA, SS-A, SS-B, RNP, and Sm is available separately. The performance of each kit lot may be confirmed upon receipt by testing the positive control sera and obtaining positive results.

The assay's reagent temperature is between 42-48°C. Due to heat transfer loss, the Workstation temperature is set higher. The appropriate Workstation temperature setting is listed in the Workstation's package

Table 1

	<u>dsDNA</u>	<u>Sm Antigen</u>	<u>Histones</u>	<u>SS-A</u>	<u>SS-B</u>	<u>RNP</u>	<u>Sci-70</u>	<u>Nucleolar</u>	<u>Centromere</u>
Systemic Lupus Erythematosus (SLE)	↑50-60%	30%	60%	30-40%	15%	30-40%	—	—	—
Mixed Connective Tissue Disease (MCTD)	—	—	—	—	—	↑90-100%	—	—	—
Drug-Induced SLE	—	—	95%	—	—	—	—	—	—
Diffuse Scleroderma	—	—	—	+/-	+/-	+/-	10-20%	↑40-50%	—
CREST Syndrome	—	—	—	—	—	—	—	—	↑80-90%
Sjogren's Syndrome	—	—	—	↑70%	↑60%	+/-	—	—	—

KEY: (↑) High Titers (%) Frequency of Occurrence (+/-) Occasionally Found at Low Titer (-) Usually Not Found

Sensitivity

Table 2 presents the comparative data between conventional assay positive (ENA) specimens and the ImmunoDOT assay result. As described in the INTERPRETATION section, weakly reactive samples are interpreted as negative, although they may be reported as weakly reactive. Weak reactions occurred less frequently in positive samples than in normal specimens.

Table 2: ImmunoDOT Reactions in Positive Samples

<u>Immunoantibody</u>	<u>Nonreactive</u>	<u>Weakly Reactive</u>	<u>Reactive</u>
SS-A (Ro)	6	2	47
SS-B (La)	2	3	17
RNP/Sm	0	1	34
Sm	2	0	18
ds-DNA	1	3*	27

*There was insufficient serum to retest one weakly reactive DNA positive sample. The specimen is included as a false negative ImmunoDOT in final tabulation

Samples tested and represented in the RNP/Sm autoantibody row of Table 2 are gel diffusion RNP positive. In the ImmunoDOT assay, immunoreactive RNP requires the presence of the Sm component of the complex and is therefore measured as a complex reaction. The converse, immunoreactive Sm antigen without RNP, can be measured and these results are shown in the table.

Each discrepant sample (nonreactive and weakly reactive) was resolved using a third method, a commercial enzyme immunoassay (EIA). The EIA result of each nonreactive and weakly reactive sample in Table 2 is detailed in Table 3.

Table 3: Discrepant Sample Resolution

<u>Immunoantibody</u>	<u>EIA Negative</u>	<u>EIA Positive</u>
SS-A (Ro)	6	2
SS-B (La)	4	1
RNP/Sm	0	1
Sm	2	0
ds-DNA	3	0

ImmunoDOT results in presumptive normal sera, nonreactive in the rapid plasma reagin (RPR), are presented in Table 4.

Table 4: ImmunoDOT Reactions in Normal Samples

<u>Immunoantibody</u>	<u>Nonreactive</u>	<u>Weakly Reactive</u>	<u>Reactive</u>
SS-A (Ro)	27	9	1
SS-B (La)	36	1	0
RNP/Sm	18	19	0
Sm	35	2	0
ds-DNA	42	11	0

Autoantibody specificity was further defined with gel diffusion-negative specimens. These data are exhibited in Table 5.

Table 5: ImmunoDOT Reactions in Gel Negative Samples

<u>Immunoantibody</u>	<u>Nonreactive</u>	<u>Weakly Reactive</u>	<u>Reactive</u>
SS-A (Ro)	39	11	1
SS-B (La)	48	3	0
RNP/Sm	38	12	1
Sm	39	12	0

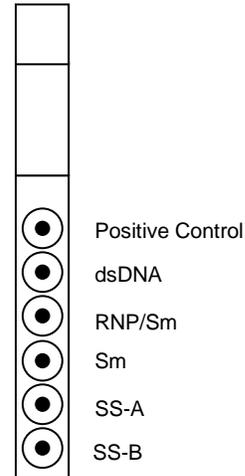
The comparative sensitivity against alternate assays and specificity using normal samples for each assay are presented in Table 6.

Table 6: Assay Performance Characteristics

<u>Immunoantibody</u>	<u>Sensitivity</u>	<u>Specificity</u>
SS-A (Ro)	96% (47/49)	98% (86/88)
SS-B (La)	94% (17/18)	>99% (88/88)
RNP/Sm	97% (34/35)	99% (87/88)
Sm	>99% (18/18)	>99% (88/88)
ds-DNA	96% (27/28)	>99% (53/53)

Bibliography

1. Harley, JB and KK Gaither. Systemic Lupus Erythematosus-Autoantibodies. *Rheumatic Disease Clinics of North America* 14(1):43 (1988)
2. Centers for Disease Control/National Institutes of Health Manual *Biosafety in Microbiological and Biomedical Laboratories* (1983)
3. Nakamura, RM and EM Tan. Autoantibodies to nonhistone nuclear antigens and their clinical significance. *Human Pathology* 14(5): 392 (1983)
4. Tan, EM. Antinuclear Antibodies in Diagnosis and Management. *Hospital Practice* 18(1): 79 (1983)



QUICK REFERENCE PROCEDURE

ImmunoDOT DNA/ENA

Set-Up

- Make sure Workstation is at temperature.
- Place reaction Vessels into slots in Workstation and add water to the Clarifier Vessel.
- Place 2 mL Diluent (1) in Vessel #1; 2 mL Enhancer (2) in Vessel #2; 2 mL Conjugate (3) in Vessel #3; and 2 mL Developer (4) in Vessel #4.
- Wait 10 minutes

Procedure

- Add 10 μ L serum to Vessel #1.
- **Prewet** assay strip in Clarifier for 30 - 60 seconds.
- Place strip in Vessel #1, mix, **let stand 15 min.**
- Remove strip, place in Clarifier, swish 5-10 sec.
- Place strip in Vessel #2, mix, **let stand 5 min.**
- Remove strip, place in Clarifier, swish 5-10 sec.
- Place strip in Vessel #3, mix, **let stand 15 min.**
- Remove strip, place in Clarifier, **let stand 5 min.**
- Place strip in Vessel #4, mix, **let stand 5 min.**
- Remove strip, place in Clarifier, swish, blot, dry, and read.

To place an order for ImmunoDOT products, contact your local distributor or call GenBio directly for the distributor nearest you and for additional product information.

For assistance, please call toll-free 800-288-4368.



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