ICA (Islet Cell Antibody) ELISA

For the qualitative determination of circulating IgG antibodies against pancreatic islet cell antigens

For Research Use Only. Not For Use In Diagnostic Procedures.

Catalog Number: 21-ICAHU-E01
Size: 96 wells
I. INTRODUCTION AND INTENDED USE

Insulin-dependent diabetes mellitus (IDDM) or Type I Diabetes is a debilitating chronic disease that impairs production and secretion of the key hormone insulin and alters blood sugar metabolism. Insulin is synthesized and secreted by pancreatic islet cells or Islets of Langerhans(1). The disruption of insulin synthesis is caused by immunological destruction of the islet cells by autoantibodies in IDDM patients(2-4). Such abnormalities (autoimmunity) may be genetically inherited and/or triggered by exposure to toxic chemicals, viral infections, and various forms of stress(5).

IDDM has a characteristic asymptomatic prediabetic phase that may last up to several years. During this period, the affected individuals exhibit the diminishing early-phase release of insulin in response to an intravenous/oral glucose challenge. In the majority of cases, these individuals carry circulating islet cell autoantibodies (ICA) and/or insulin autoantibodies (IAA). ICA can be detected as early as eight years prior to the clinical onset of IDDM(6) and thus may serve as an early indicator of the disease or predisposition to it. Individuals who are ICA-positive may show a progressive loss of the islet cell function as indicated by disruption of the early-phase insulin release. When this early phase insulin release completely stops, clinically overt IDDM develops(6).

Islet Cell Autoantibodies are present in 70% of patients with a recent onset of IDDM(13,14) compared with 0.1 - 0.5% of the control non-diabetic population(11,15). ICA are also detected in first degree relatives of IDDM patients. These individuals comprise the segment of human population who are at a high risk of developing IDDM. Several studies reported that the ICA-positive first degree relatives of IDDM patients subsequently developed diabetes(16-19). Other studies also suggested that the presence of serum ICA and IAA is an indicator of the enhanced likelihood to develop IDDM (3,6-12). Therefore, serological detection of ICA may be a powerful tool for early diagnosis of IDDM. The significance of these autoantibodies as markers of IDDM is also illustrated by their presence in nondiabetic individuals who ultimately develop IDDM. Riley, et al. recently reported that determination of ICA in Type 2 Diabetes patients could identify IDDM prior to the onset of clinical symptoms and predict the need for insulin therapy(20). Thus, those patients who are initially diagnosed with Type 2 Diabetes and carry serum ICA may deteriorate to insulin dependence.

An early detection of circulating ICA is important in order to identify the individuals in the general population, the siblings, and the families of IDDM patients, who are at a higher risk of developing this disease because of their genetic predisposition to diabetes. At an international workshop on ICA, the imminent need for an ELISA test for the determination of islet cell autoimmunity was emphasized(21).

Currently, serum ICA are determined by indirect immunofluorescence and histochemical methods employing frozen unfixed human/primate or rodent pancreatic sections as substrates. Despite various attempts to improve and modify this procedure since its original description in 1974 (22,23), the indirect immunofluorescence/histochemical technique suffers from inherent methodological problems. Standardization of the technique has proven to be very difficult. The reliability of this "frozen-section" technique is limited by factors such as the variation from one pancreas to another, the inevitable need for unfixed pancreatic tissue and infrequent availability of the suitable tissue.

This product uses a purified group of islet cell specific antigens in a microwell-ELISA procedure to detect the presence of serum ICA.

The ALPCO ICA EIA is a qualitative ELISA test for detection of circulating IgG antibodies against pancreatic islet cell antigens. This kit is for research use only. It is not for use in diagnostic procedures.

II. PRINCIPLE OF THE TEST

A purified mixture of pancreatic antigens is immobilized onto microwells. During an incubation period, antibodies in the serum sample are allowed to react at room temperature with antigen molecules on the microwells. After washing off excess/unbound serum materials, an enzyme (alkaline phosphatase)
labeled goat antibody, specific to human IgG, is added to the antigen-antibody complex. After another thorough washing, a substrate (PNPP) is added and the color generated is measured spectrophotometrically. The intensity of the color is directly proportional to the concentration of ICA in the sample. An ICA-positive control serves as an internal quality control and ensures valid results.

III. WARNINGS AND PRECAUTIONS

All reagents provided with the kit are for research use only.

1. Potentially Biohazardous Material
The matrix of the Calibrators and Controls is human serum. The human serum used has been found to be non-reactive to HBsAg, anti-HIV 1/2, and anti-HCV when tested with FDA licensed reagents. Because there is no test method that can offer complete assurance that HIV, Hepatitis B virus, Hepatitis C, or other infectious agents are absent, these reagents should be handled as if potentially infectious.

2. Sodium Azide
Some reagents contain sodium azide as a preservative. Sodium azide may react with lead, copper, or brass in plumbing to form explosive metal azides. When disposing of these materials, always flush with large volumes of water to prevent azide buildup.

3. Stop Solution
Stop Solution consists of 1 N NaOH. This is a strong base and should be handled with caution. It can cause burns and should be handled with gloves. Wear eye protection and appropriate protective clothing. Avoid inhalation. Dilute spills with water before absorbing with paper towels.

Precautions
1. Do not freeze test reagents, store all kit components at 2-8°C at all times.
2. Positive and Negative Controls must be run each time the test is performed.
3. Use only clear serum as test samples. The test sample should not have gross turbidity, hemolysis, or microbial contamination.
4. All samples should be analyzed in duplicate.
5. Do not mix reagents from different lots.
6. Do not use expired reagents.
7. Do not allow reagents to stand at room temperature for extended periods of time.
8. Do not expose substrate solution to light.
9. Careful pipetting technique is necessary for reproducible and accurate results.

IV. REAGENTS AND MATERIALS

Materials Supplied:

1. **PLA ICA** = ICA- Microwell Strips (with the holder)  
   12 strips
2. **CONJ ENZ 5X** = ICA- IgG Enzyme Conjugate (concentrate)  
   2 x 1.0 ml
3. **DIL SPE 5X** = Sample Diluent (concentrate)  
   1 x 25.0 ml
4. **CONJ ENZ DIL** = Conjugate Diluent  
   1 x 10.0 ml
5. **CTRL REF ICA** = Reference Control  
   1 x 1.5 ml
6. **CTRL + ICA** = Positive Control (human serum)  
   1 x 1.5 ml
7. **CTRL – ICA** = Negative Control (human serum)  
   1 x 1.5 ml
8. **SUBS PNPP** = Substrate Solution (PNPP)  
   1 x 15.0 ml
9. **BUF WASH 25X** = Wash Buffer (concentrate)  
   1 x 20.0 ml
10. **SOLN STP** = Stop Solution (1 N NaOH)  
    1 x 6.0 ml
V. ADDITIONAL MATERIALS REQUIRED BUT NOT SUPPLIED

1. Distilled or deionized water.
2. Absorbent paper towels to blot dry the test strips after washing and parafilm/plastic wraps to cover strips during incubations.
3. Suitable sized glass tubes for serum dilution.
4. Micropipet with disposable tips to deliver 10 µl, 50 µl, and 100 µl.
5. A microtiter plate washer or a squeeze bottle for washing.
6. 5 ml pipettes for conjugate diluent delivery.
7. A 500 ml graduate cylinder.
8. Microtiter plate reader with 405 nm absorbance capability.

VI. SAMPLE COLLECTION

Collect 5-10 ml of blood by venipuncture into a clot (red top) tube. Serum separators may be used. Separate serum by centrifugation.

Serum samples may be stored at 2-8°C. Excessive hemolysis and the presence of large clots or microbial growth in the test sample may interfere with the performance of the test. Freeze the serum sample at -20°C if it cannot be analyzed within 24 hours.

VII. REAGENT PREPARATION AND STORAGE

1. Enzyme Conjugate:
   Accurately transfer 5 ml of the Conjugate Diluent into one bottle containing the Enzyme Conjugate (concentrate). Close the bottle and mix thoroughly by inversion. Store the diluted conjugate at 2-8°C when not in use. Record the date of dilution on the label. **This reagent expires 30 days after dilution.** Two bottles containing the conjugate concentrate are provided. Each bottle contains enough conjugate for 6 strips. Dilute as needed.

2. Sample Diluent Buffer:
   Transfer the entire contents (25 ml) into 100 ml of distilled/deionized water in a suitable container. Mix thoroughly; label the container as Sample Diluent, and store at 2-8°C. The diluted reagent is stable until the expiry shown on the vial.

3. Wash Solution:
   Transfer the entire contents into 480 ml of distilled/deionized water in a 500 ml container. Mix thoroughly; label the container as wash, and store at 2-8°C. The diluted reagent is stable until the expiry shown on the vial.

4. Serum Sample Preparation:
   Accurately pipet 10 µl (0.010 ml) of serum sample into 1.0 ml of the Working Sample Diluent in an already labeled glass tube. Mix thoroughly.

VIII. ASSAY PROCEDURE

The test kit contains 12 microwell strips coated with purified islet cell antigens. The number of microwell strips used in each assay depends upon the number of serum samples to be tested. If 12 microwell strips are used, a total of 45 sample sera can be tested in duplicate with this kit.

**IMPORTANT NOTE:** Bring all the reagents, including serum samples, to room temperature (25°C) before starting the assay. Incubation temperatures varying by greater than ± 1°C can affect the results.
1. Assemble the number of microwell strips needed for the test in the holder provided. The microwell strip must be snapped in place firmly or it may fall out and break.

2. Familiarize yourself with the indexing system of wells, e.g., wells A1, B1, C1, D1, etc.

3. Dispense 100 µl of Negative Control into microwells C1 and D1.

4. Dispense 100 µl of Positive Control into microwells E1 and F1.

5. Dispense 100 µl of Reference Control into microwells G1 and H1.

6. Add 100 µl of diluted sample serum (see #4, Section VII, Reagent Preparation) to microwells A2 and B2. For more samples, use additional strips and add other diluted samples to microwells in duplicate. There should be 100 µl of solution in each microwell to be assayed except A1 and B1 which are empty at this point and will be used later.

7. Any strips not used should be properly stored with desiccant in the ziplock bag provided for the next run. Any wells not used on the strip should be properly covered and saved for the next run.

8. Cover the plate with a parafilm/plastic wrap (to prevent contamination) and leave for 1 hour at room temperature (25° ± 1°C).

9. After incubation, discard the solution into sink by quick decantation and blot the plate dry by tapping gently onto a paper towel. If an automatic plate washer is being used, wash each well 3 times with 300 µl (0.3 ml) of the Wash Solution. If a squeeze bottle is used, fill the wells with the Wash Solution carefully and decant the buffer from the microwells. Repeat the procedure two more times and blot the plate dry with a paper towel.

10. Add 100 µl of ICA-IgG Enzyme Conjugate reagent (see #1, Section VII, Reagent Preparation) to all microwells except wells A1 and B1.

11. Cover the plate with a parafilm/plastic wrap and let it stand at room temperature (25°±1°C) for one hour.

12. After incubation, repeat the washing step (step #9) and blot the microwells dry.

13. Add 0.1 ml (100 µl) of Substrate Solution to all microwells including wells A1 and B1. Be sure to dispense the substrate reagent at a rapid steady pace without any interruption.

14. Cover the plate and leave it in the dark for 30 minutes at room temperature (25° ± 1°C).

15. After 30 minutes promptly add 50 µl of the Stop Solution into each well at a rapid steady pace without any interruption.

16. Set up microplate reader to read the absorbance at 405 nm according to manufacturing instructions, and blank the plate reader with well A1 or B1.

17. Calculate the data according to Section IX.

IX. CALCULATION OF DATA

Record the spectrophotometric readings [optical density (OD) in absorbance units] as shown in the ICA Sample Data. This example is only for illustration.

1. Calculate the average OD reading from the duplicates of the Reference Control, Negative Control, Positive Control, and samples.

\[
\text{Average OD: Reference (R}_{\text{AVE}}), \text{Negative (N}_{\text{AVE}}), \text{Positive (P}_{\text{AVE}}), \text{Samples (S}_{\text{AVE}})
\]

2. Divide the average OD of the Samples and the Positive and Negative Controls by the (R_{\text{AVE}}) value. This yields a Ratio Value for each.
Interpretation:
ICA Ratio Value          Result
<0.95                     Negative
>1.05                     Positive
0.95-1.05                  Indeterminate (Borderline)

Samples with Ratio Values <0.95 show a low level of ICA antibodies, Ratio Values > 1.05 show a high level of ICA antibodies. Samples with Ratio Values between 0.95 and 1.05 are considered indeterminate. It is recommended to assay indeterminate samples again or to run them in parallel with new samples taken at a later date.

ICA SAMPLE DATA
Section A: Control Results

<table>
<thead>
<tr>
<th>Data</th>
<th>OD</th>
<th>Ave. OD</th>
<th>Ratio Value</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>Controls</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Control</td>
<td>1.072</td>
<td>RAVE = 1.082</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.092</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Negative Control</td>
<td>0.290</td>
<td>NAVE = 0.297</td>
<td>0.27</td>
<td>Negative</td>
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<tr>
<td></td>
<td>0.303</td>
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</tr>
<tr>
<td>Positive Control</td>
<td>1.413</td>
<td>PAVE = 1.409</td>
<td>1.30</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>1.406</td>
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</table>

Note: For a valid test, the Ratio Value of the NAVE should be <0.95 and the Ratio Value of the PAVE should be >1.05. Repeat the test if the results are not valid.

Section B: Sample Results

<table>
<thead>
<tr>
<th>Data</th>
<th>OD</th>
<th>Ave. OD</th>
<th>Ratio Value</th>
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</thead>
<tbody>
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<td>Sample</td>
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</tr>
<tr>
<td>Reference Control</td>
<td>1.072</td>
<td>RAVE = 1.082</td>
<td>1.00</td>
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<tr>
<td>1</td>
<td>1.444</td>
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<td>2</td>
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<td></td>
<td>0.534</td>
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<td>3</td>
<td>1.036</td>
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<tr>
<td></td>
<td>1.051</td>
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</tbody>
</table>

X. QUALITY CONTROL
Positive and Negative Controls must be run along with unknown samples each time in order for results to be valid. The Negative Control should show a Ratio Value that is < 0.95 and the Positive Control should show a Ratio Value that is >1.05.

XI. PERFORMANCE CHARACTERISTICS
The specificity of the kit’s antigen coated microwell strips was established by Western blot analysis that used confirmed positive samples for IgG to IsletCell Antigens. Samples with thyroid autoantibodies and rheumatoid factors read negative on this ICA ELISA.
XII. SIGNIFICANCE
This research tool detects the presence of ICA antibodies in sera. Results obtained by using this procedure must not be used for the diagnosis of IDDM.
Save the weak positive and borderline samples (within 5% of the Reference Control OD) and store at -20°C. Fresh samples from these individuals should be tested again every six months together with the previous serum samples.

XIII. LIMITATIONS AND SOURCES OF ERROR
1. Although a higher ICA titer will produce a higher OD reading, the test is designed for the qualitative determination of ICA only.
2. Poor test reproducibility may result from:
   a. Inconsistent delivery of reagents;
   b. Improper storage of reagents;
   c. Improper dilution of reagents;
   d. Incomplete washing of microwells;
   e. Substrate reagent old or exposed to light;
   f. Unstable/defective spectrophotometer;
   g. Error in following the assay procedure.

XIV. LITERATURE
with duration and type of diabetes, coexistent autoimmune disease and HLA type. *Diabetes*, **26**:13 8-147.


