Diabetes is a chronic and progressive disease that impacts upon almost every aspect of life. It is caused by deficiency, inherit and/or acquired, in production of insulin by the pancreas (type 1), or resistance to the insulin produced (type 2).

As a major non-communicable disease, diabetes mellitus claims an average around 8% of total health budgets in developed countries. Type 2 diabetes, being more common, accounts for 90-95% of all diabetes cases worldwide.

Diabetes is indiscriminate and the risk of developing diabetes increases with age. Diabetes can result in premature death, ill health and disability, yet these can be prevented or delayed by high quality management and care.

Diabetes is called the ‘silent killer’, because it causes serious complications without symptoms, and can affect many of the major organs in the body.

Diabetes is one of the main causes of amputation of the low extremities, perinatal mortality, end stage renal disease, ischaemic heart disease and stroke, and it is the biggest cause of eye disease in working age adults.

**Diabetes Tests**
Details of family history, physical characteristics, symptoms, complications and laboratory analysis of blood and urine parameters are required for accurate diagnosis, treatment and management of diabetes. A profile for diabetes is dependent on the type of diabetes and may include the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Matrix</th>
<th>Patient Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>Plasma and urine</td>
<td>All types</td>
</tr>
<tr>
<td>Fructosamine</td>
<td>Plasma</td>
<td>Gestational, haemoglobinopathies</td>
</tr>
<tr>
<td>Glycated haemoglobin</td>
<td>Whole blood</td>
<td>Type 1 &amp; 2</td>
</tr>
<tr>
<td>Protein and microalbumin</td>
<td>Urine</td>
<td>Type 1 &amp; 2</td>
</tr>
<tr>
<td>Creatinine</td>
<td>Urine</td>
<td>Type 1 &amp; 2</td>
</tr>
<tr>
<td>Ketone</td>
<td>Urine and Blood</td>
<td>Type 1, gestational</td>
</tr>
<tr>
<td>NEFA</td>
<td>Serum</td>
<td>Type 1</td>
</tr>
</tbody>
</table>

Determination of HbA1c

The most widely used clinical test in monitoring diabetes is the measurement of whole blood level of glycated hemoglobin, also known as hemoglobin A1c. The concentration of HbA1c is usually measured as percent of total hemoglobin present. Hemoglobin formed in new red blood cells enters the circulation without any glucose attached.

However, red cells are freely permeable to glucose. This causes the glucose to attach irreversibly to hemoglobin during the life of the red cell at a rate dependent upon the prevailing blood glucose. The red cells, having a life cycle of 120 days, circulate in the blood before they are destroyed and their hemoglobin broken down.

Clinical Significance
The Diabetes Control and Complications Trial (DCCT) and many other clinical studies, have shown that long term monitoring and tight control of blood glucose level may reduce diabetes related complications.

As red blood cells have a lifespan of 120 days, HbA1c gives an indication of long-term control of a patient’s blood sugar level and compliances with their diet. For this reason, HbA1c should be measured every 4 months.

Microalbumin

Another clinical test used in the monitoring of diabetes is the measurement of microalbumin.

Kidney failure is one of the many effects of diabetes. Albumin is one of the major plasma proteins. Kidney filters waste products from blood through tiny capillaries in the glomerulus into urine, and retains proteins in the blood. Therefore albumin is usually present in very low concentrations in urine (< 20mg per day).

Damage to the capillaries results in kidney malfunction. As a result, waste products cannot be filtered and are retained in the blood while proteins are allowed to escape into urine. Kidney malfunction is progressive and starts with small amounts of albumin in urine (between 20 and 300mg per day). This is called microalbuminuria. Unfortunately it usually progresses to macroalbuminuria (> 300mg per day) before the patient gets any clinical symptoms.

Blood proteins, mainly albumin, bind water for circulation, and so regulate fluid levels and blood pressure. When the blood protein is too low, water escapes into the tissues, creating oedema. The lack of fluid causes blood pressure to fall and the body reacts by up-regulating the pressure. Hypertension and oedema are often the first clinical signs of renal failure, although the patient has already progress to stage 3 of the illness.

Clinical Significance
Ideally, patients should be detected in stage 1 and 2, as treatment in those stages will significantly reduce the number of patients continuing through all stages and developing renal failure. This shows that microalbumin tests should be used as a routine screening annually.
C- Reactive Protein

CRP is a member of the class of acute-phase reactants as its levels rise dramatically during inflammatory processes occurring in the body. During an inflammatory response, CRP levels can be rapidly elevated by up to 1000-fold. CRP activates the classical complement pathways, initiating a range of processes including phagocytosis and lysis of invading cells.

Elevated CRP levels (>6 mg/l) occurs in rheumatic disease and other inflammatory conditions. Variation within normal range (0-6 mg/l) can be used for risk assessment of cardiovascular disease and for detection of renal allograft rejection.

Full range CRP assays are particularly important for early detection of bacterial infections in newborns, where initial values can be very low and rise rapidly with the onset of infection. CRP levels can be affected with various factors and should always be compared to previous values.

Clinical Significance

Approximately half of all heart attacks occur in persons with low cardiac risk based on current methods of risk estimation. This shows that there is a need for additional risk indicators of cardiovascular disease.

There is a strong correlation between inflammatory markers and cardiac risk, with a link between inflammation and the development of atherosclerosis. CRP has an established association with cardiovascular disease thus making it an emerging risk factor.

Besides that, CRP also has applications across the spectrum of cardiovascular disease. In the primary prevention of coronary disease, individuals with normal LDL-cholesterol levels may have elevated CRP levels. These two tests appear to select for different high risk groups. Individuals with elevated levels of both LDL-cholesterol and CRP are at higher risk still.

CRP plays a role in secondary prevention where slightly elevated levels may be an indication of cardiac events in patients with previous myocardial infarction, angina and stroke.

In addition, CRP also helps in early detection of neonatal bacterial infection and renal allograft rejection.

CRP is also an established method of detection and monitoring of patients with acute inflammatory diseases.

Text excerpted from:
1. An Update on Diabetes (Including HbA1c and microalbumin); Jak Jervell, M.D. PhD., Axis Shield, Aug 2000
2. Diabetes; Randox Laboratories Ltd, March 2007
3. CRP; Randox Laboratories Ltd, Dec 2007
**Randox Internal Quality Controls** [Product of UK]

<table>
<thead>
<tr>
<th><strong>Randox C-Reactive Protein (CRP) Controls</strong></th>
<th><strong>Randox C-Reactive Protein (CRP) Calibrators</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Description</strong></td>
<td><strong>Cat. No.</strong></td>
</tr>
<tr>
<td>CRP Liquid Control Level 2</td>
<td>CP2480</td>
</tr>
<tr>
<td>CRP Liquid Control Level 3</td>
<td>CP2481</td>
</tr>
<tr>
<td>CRP High Sensitivity Control Level 1</td>
<td>CP2476</td>
</tr>
<tr>
<td>CRP High Sensitivity Control Level 2</td>
<td>CP2477</td>
</tr>
</tbody>
</table>

**Randox Microalbumin Urine Control & Calibrator** [Product of UK]

Features:
- Liquid, ready to use
- 100% human product with no animal additives
- Compatible for use on most clinical analyzers
- Target values and ranges quoted
- Stable to expiry date at +2 - 8°C

**Ordering information:**
Cat# MA1361 **Microalbumin Control Level 1 & 2** (Packing: 6 x 1 ml)
Cat# MA1567 **Microalbumin Calibrator Series** (Packing 6 x 2 ml)

---

(Randox International Quality Assessment Scheme)
**The World’s Largest EQA Programme from UK**

**RQ9129**
**GLYCATED HAEMOGLOBIN (HbA1c) Programme**
Kit size: 12 x 0.25ml
Frequency: Monthly reporting (12 samples per year)
Importance of Control in Handling

Nycocard® HbA1c  [Product of Axis-Shield, Norway]

1. Why is it important to run internal quality control for Nycocard® HbA1c?
   - Internal quality control is important and should be used **daily** as it assures accurate and reliable patient test results. Each laboratory should ensure that the control values are within the acceptable ranges before the patient samples are analysed.
   - Internal control values that exceed the acceptable range may indicate a faulty system or incorrect sample handling method.

2. Is it recommended to analyse both levels included in the Nycocard® HbA1c Control kit?
   - Yes. It is recommended to analyse both control levels. Analysis of both controls will confirm reliable results for a wider HbA1c range than analysis of a single control.

3. The Nycocard® HbA1c Control result is too high. What are the possible reasons?
   - Sample and Reagent (R1) is incubated more than 3 minutes
   - Reaction mixture applied too slowly on the Test Device
   - Air bubble is formed when the reaction mixture or Washing Solution (R2) is applied on the Test Device
   - Washing Solution (R2) is applied before the reaction mixture has soaked completely into the membrane
   - Test result is measured before Washing Solution (R2) has soaked completely into the membrane
   - Incorrect reading of test result with Nycocard® Reader
   - Incorrect storage of the HbA1c Control

4. The Nycocard® HbA1c Control result is too low. What is the possible reason?
   - The Nycocard® HbA1c kit has been exposed to high temperature
   - The Reagent (R1) is not equilibrated to room temperature
   - The Test Device is cold when used
   - The samples and Reagent are incubated less than 2 minutes
   - White spots are formed on the Test Device membrane surface
   - The Nycocard® HbA1c Control is not stored as recommended, not equilibrated to room temperature or not mixed well enough before analysis

---

### Product Description

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Catalogue No.</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nycocard® HbA1c Control (Level I and II)</td>
<td>1113022</td>
<td>2 x 0.4 ml</td>
</tr>
</tbody>
</table>

"Similar information can be obtained from [http://www.axis-shield-poc.com/](http://www.axis-shield-poc.com/)"
For 35 years - An Essential Tool in External Quality Assessment (EQA) and Quality Improvement Through Accurate Diagnostic Testing

❖ Microalbumin
One challenge each
Microalbumin (quantitative)
Creatinine

❖ Urinalysis Dipstick
One challenge each.
Bilirubin          pH
Blood/Hemoglobin    Protein
Nitrite             Specific Protein
Glucose            Microalbumin (dipstick only)
Ketones             Leukocytes Esterase
Urobilinogen

❖ Urine Sediment Identification
Two challenges consisting of color photographs

❖ Urinalysis Module
(Includes Urinalysis Dipstick and Urine Sediment Identification)

Ordering Information:

Cat# 539 Microalbumin
Cat# 531 Urinalysis Dipstick
Cat#532 Urine Sediment Identification
Cat# 530 Urinalysis Module
Multirule QC uses a combination of decision criteria, or control rules, to decide whether an analytical run is in-control or out-of-control.

The Westgard multirule QC employs a multiple QC procedure to judge the acceptability of an analytical run.

This is in contrast to a single-rule procedure which is associated with a normal Levey Jennings Chart that uses an acceptable range of +/- 2SD or +/- 3SD.

Westgard rules are normally used with 2 or 4 control measurements per run. This means that they are appropriate for use when two different control levels are measured 1 or 2 times per material.

For tests which require three control materials, such as coagulation and immunoassays, other Westgard rules are used.

**Westgard Rules**

The following are the Westgard Rules used for two different control levels which are measured 1 or 2 times per level.

$1_{3s}$ refers to a control rule that is commonly used with a Levey-Jennings chart when the control limits are set as the mean plus 3s and the mean minus 3s. When a single control measurement exceeds the mean plus 3s or the mean minus 3s control limit, the run will be rejected.
1$_{2S}$ is the control rule that is commonly used with a Levey-Jennings chart when the control limits are set as the mean plus/minus 2$s$. This rule is used as a warning rule to trigger careful inspection of the control data by the following rejection rule.

2$_{2S}$ is a control rule which is used to reject 2 consecutive control measurements when they exceed plus or minus 2$s$ of the mean.

R$_{4S}$ is used to reject when 1 control group measurement exceeds the mean plus or minus 2$s$.

4$_{1S}$ is used to reject when 4 consecutive control measurements exceed the mean plus or minus 1$s$.

10$_X$ is used to reject when 10 consecutive control measurements fall on one side of the mean.
In our last issue of QA Highlights, we announced the launch of RIQASNET and some features of this web-based system were explained. Now let us see how easily RIQAS participants can submit results using RIQASNET...

**Entering Results**

- After a successful login to RIQASNET, the participants need to select **Data Entry**, then **Enter Results**
- Next, select the laboratory reference number that you would like to enter results for
- A list of samples and their final date of submission will appear
- After selecting the required cycle and sample number, a list of parameter will appear on the screen.
- Participants can now key in their results
- Finally, click on **Submit** box and the results will be sent to RIQAS

Please do not hesitate to contact ALL EIGHTS (your local distributor for RIQAS Programmes) at tel. no. (03) 5633 4988 for more information on RIQSNET
WHY DO YOU NEED QUALITY CONTROL IN AUTOIMMUNE TESTING?

Autoimmune disorders are diseases caused by the body producing an inappropriate immune response against its own tissues. Sometimes the immune system will cease to recognize one or more of the body’s normal constituents as “self” and will create autoantibodies—antibodies that attack its own cells, tissues, and/or organs. This causes inflammation and damage and it leads to autoimmune disorders.

Examples of autoimmune diseases include systemic lupus erythematosus, Sjogren syndrome, Hashimoto thyroiditis, rheumatoid arthritis, juvenile (type 1) diabetes, polymyositis, scleroderma, Addison disease, vitiligo, pernicious anemia, glomerulonephritis, and pulmonary fibrosis.

Results of serologic tests for autoantibodies, including tests for autonuclear antibodies (ANA) and antibodies to specific nuclear antigens such as double-stranded DNA (dsDNA), play an important role in the diagnosis of systemic rheumatic diseases.

One of the major laboratory screening tests for the detection of autoimmune disease is ANA. The testing methodology for ANA is available in both the indirect fluorescent (IFA) and ELISA assay formats.

The IFA, which uses HEp-2 cells, has become the standard methodology in performing ANA tests. In recent years, most relevant literature regarding autoimmune diseases and ANA testing is based on results obtained with HEp-2 cells.

IFA method increases the sensitivity of results due to expression of the relevant nuclear antigens in the human tumor. Using HEp-2 cells as a substrate has also virtually eliminated false-negative ANA results. Despite this experience in the identification of pattern of fluorescence in samples is in need to minimize the misinterpretation of results.

The use of EIA in ANA testing has become increasing popular among laboratories. EIA uses nuclear antigens from cell preparations or mixtures of purified or recombinant antigens which are absorbed to microtiter plates.

Two types of EIA-ANA methods are available for use in clinical laboratories: assays that test for ANA of broad specificity, so called generic ANA tests, and antigen-specific assays that detect ANA and react with single autoantigen, eg, dsDNA or Ro (SS-A).
Why do you need Quality Control in Autoimmune Testing?

Since EIA-ANA are newer than IFA, most clinicians are less familiar with results of this test. It is important in this context to provide clinician about test specificity (the range of ANA detected) test sensitivity (lowest concentration or titer of ANA detected), the relationship of levels of reactivity expressed in units appropriate to the assays to IFA-ANA titers or the concentration of specific autoantibodies, and the frequencies of weakly positive results found in healthy individuals and in patients without systemic rheumatic diseases.

The levels of screening EIA-ANA results that are used as cutoffs to indicate further testing should be defined in different practice settings, eg, patients seen in primary care settings vs patients referred for specialty evaluation. Thus if EIA-ANA is to be used, the consensus document should address the performance of EIA-ANA assays by both methods. Having said that, IFA is still widely used as the Gold standard method for ANA.

Whether it is IFA or EIA, the use of quality control materials is equally important to ensure the accuracy and reliability of test results. Clinical laboratories will continue to be involved in competency assessments and performance of proficiency specimens to ensure their competency in ANA testing. Each laboratory sets their own internal standardization within the laboratory. Well controlled analytical methods are of great value to clinicians as it is needed to deliver accurate and precise test results.

Text excerpted from Guidelines for Clinical Use of the Antinuclear Antibody Test and Tests for Specific Autoantibodies to Nuclear Antigens; Arthur Kavanaugh, MD; Russell Tomar, MD; John Reveille, MD; et al. Arch Pathol Lab Med-Vol 124, Jan 2000

Quality Control from Immuno Concepts...

[Product of USA]

Immuno Concepts has always realized that correct pattern recognition is critical for accurate reporting of ANA results. This is why a variety of optional controls are offered to assist with pattern recognition. These controls are ready-to-use and packaged in dropper vials for ease of use.

ORDERING INFORMATION:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>ANA Homogenous Control</td>
<td>5.0 ml</td>
</tr>
<tr>
<td>2022</td>
<td>ANA Speckled Control</td>
<td>2 x 1.0 ml</td>
</tr>
<tr>
<td>2023</td>
<td>ANA Nucleolar Control</td>
<td>2 x 1.0 ml</td>
</tr>
<tr>
<td>2025</td>
<td>ANA Centromere Control</td>
<td>2 x 1.0 ml</td>
</tr>
<tr>
<td>2026</td>
<td>ANA Titratable Control (not packaged in dropper vial)</td>
<td>1.0 ml</td>
</tr>
<tr>
<td>2027</td>
<td>ANA Mitochondrial Control</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>2028</td>
<td>ANA Cytoskeletal Control</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>2029</td>
<td>ANA Golgi Control</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>2031</td>
<td>ANA Negative Control</td>
<td>5.0 ml</td>
</tr>
<tr>
<td>2032</td>
<td>ANA Control Set (Homogenous, Speckled, Nucleolar, Centromere, Negative)</td>
<td></td>
</tr>
<tr>
<td>2033</td>
<td>ANA Sm Control</td>
<td>0.5 ml</td>
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<tr>
<td>2035</td>
<td>ANA SS-A Control</td>
<td>0.5 ml</td>
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<tr>
<td>2037</td>
<td>ANA PCNA Control</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>2039</td>
<td>ANA Nuclear Matrix Control</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>2041</td>
<td>ANA Sci-70 Control</td>
<td>0.5 ml</td>
</tr>
</tbody>
</table>
The AESQC quality controls are obtained from pools of human sera available with different autoantibodies that allow a multi parametric control in autoimmune disease diagnosis. These controls were developed to help lab managers ensure that analytical error stays within acceptable limits.

The AESQC are ready to use and should be handled in the sample way as patient samples. It can be used to monitor the performance of ELISA and FARR assays.

**AESQC Pool 1** Cat.No: AESQCP1
(Size: 2x 500μl)
SS-A 60 kDa, SS-A 52 kDa, SS-B, Sm, Sm / RNP, Ribo, CEN-P-B, Jo-1, Scl-70, AMA

**AESQC Pool 2** Cat No: AESQCP2
(Size: 2x 500μl)
aCL IgG, aPL IgG, β2GP1 IgG and IgM, DNA (ELISA & FARR)

**AESQC Pool 3** Cat No: AESQCP3
(Size: 2x 500μl)
aCL IgM, aPL IgM, β2GP1 IgG and IgM, DNA (ELISA & FARR)

**AESQC Pool 4** Cat.No: AESQCP4
(Size: 2x 500μl)
TPO, TG, Glia IgA and IgG, tTG IgA, MPO, PR3, GBM

**AESQC Pool 5** Cat No: AESQCP5
(Size: 2x 500μl)
hRF IgM isotype, CCP IgG isotype, LCP IgG isotype (Linear citrullinated peptides)

**AESQC Pool Mix** Cat No: AESQCPM
- 1x 500μl AESQC Pool 1
- 1x 500μl AESQC Pool 2
- 1x 500μl AESQC Pool 3
- 1x 500μl AESQC Pool 4
- 1x 500μl AESQC Pool 5