

Clinical Immunology **LABORATORY**

Service Manual 2026



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I PROFILE OF DEPARTMENT

I.1 Vision Statement

To be a group of professionals who provide excellent patient care through education and research, supported by a caring work environment.

I.2 Laboratory Development

We plan to develop the laboratory into one of choice for clinicians and clinical trialists managing Rheumatologic, Allergic and Immunologic disorders in Singapore and the region. We will offer the complete range of investigations that are performed accurately, reliably, and expeditiously at competitive costs. We plan to make the services of our Laboratory available to new, external clients and to expand the range of investigations we can offer, both by acquiring new equipment and, for the more difficult ones, by engaging the services of other laboratories which can perform them.

I.3 Scope

The Clinical Immunology Laboratory (subsequently referred to as CIL in this document) carries out tests that are vital for the management of patients with Rheumatologic, Allergic or Immunologic diseases.

I.4 Research and Development

Our laboratory is primarily meant for service work but does engage in limited volume of research. We constantly look into our in-house tests to improve them. We assist in the collection of sera, plasma and genomic DNA for studies. Clinical researchers also make use of the CIL as a central laboratory for analysing their study specimen samples.

I.5 Laboratory Relationships

We work very closely and constructively with the Department of Laboratory Medicine (DLM) in our hospital. We have links with the Immunology Laboratory of the Singapore General Hospital especially in terms of exchanging specimen for mutual corroboration. Certain tests that are neither available in our laboratory nor offered elsewhere in Singapore are sent to the Mayo Clinic Laboratory (Rochester, Minnesota) for analysis.

I.6 Personnel

Laboratory Director:	Dr Leong Khai Pang
Deputy Laboratory Director:	Dr Lim Xin Rong
Medical Technologists In-charge:	Ms Loh Chien Mei

I.7 Training, Education and Development

Training and education are essential for the maintenance and improvement of our services. Therefore, this program is emphasized in the CIL. New staffs undergo structured training in the different sections of our laboratory so that they gain competence in all the tests. Staffs are granted time to attend courses and talks.

I.8 Quality Assurance Programs

The quality of our results is under constant surveillance. Results that vary from the expected range with respect to patient population or laboratory norm will be scrutinized and repeated if necessary.

We subscribe to three external audit programs: the Royal College of Pathologists Australasia, the National External Quality Assurance Scheme (NEQAS) from UK and College of American Pathologists (CAP) Survey from the USA. Our laboratory has been accredited by the CAP since 2001.

2 SPECIMEN COLLECTION AND PREPARATION

Laboratory test results are dependent on the quality of the submitted specimen. It is important that all specimens and request forms be properly labelled with the patient's name, collection date, and the origin (source) of the specimen, when applicable. Also, they must be collected in the right manner, transported in the correct tubes and stored in the right conditions. These pre-analytic conditions are vital to the analysis work carried out in the laboratory.

If there is doubt or question about the type and method of specimen collection, please contact CIL by telephone (6357-8464) or email to ttsh.cil.enquiry@nhghealth.com.sg and we will be happy to assist.

2.1 Specimen Collection

Most laboratory tests are performed on serum, plasma or anti-coagulated whole blood. In general, tubes containing the specimens should be refrigerated until they are ready to be transported to the laboratory in the infectious disease biohazard bags. Please see our individual test directory section for other specific requirements.

2.1.1 Plasma

- Draw a sufficient amount of blood with the indicated anticoagulant to yield the necessary plasma volume. Gently mix the blood collection tube by inverting six to ten times immediately after collection.
- **EDTA-meta tubes are available from Clinical Immunology Laboratory, these are to be used only for Catecholamine, Fractionation, Free, Plasma.**
- Ideally, plasma should be separated from cells by centrifugation within 20-30 minutes.

2.1.2 Serum

- Draw a sufficient amount of blood to yield the necessary serum volume. Allow blood to clot at room temperature. Separate serum from clot by centrifugation within 20-30 minutes. Haemolysis should be avoided.
- Vigorous mixing, inadequate clotting time for the specimen and high centrifugation speed may cause haemolysis.

2.1.3 Whole Blood

- Draw a sufficient amount of blood with the indicated anticoagulant. Gently mix the blood collection tube by inverting six to ten times immediately after draw.

2.1.4 Stool

- Stool sample for calprotectin should be sent to the laboratory on the same day as specimen is collected.

2.1.5 CSF

- CSF sample for VDRL should be clear and free from particulate matter or blood.

2.1.6 Saliva

- Special collection kit for saliva is available from Clinical Immunology Laboratory for Cortisol, saliva testing.

2.2 Specimen Collection Instruction

When collecting specimens for transportation to CIL, please keep in mind:

- The specimen must be properly identified.

- The patient's name, hospital number or the unique identifier must be clearly written on the specimen container.
- The appropriate test requisition, complete with the patient's name or unique identifier must accompany the specimen.
- Unlabelled or mislabelled specimens will not be tested.

2.3 Specimen Collection Tubes

- These tubes are often used to collect specimen for processing in the CIL:

2.3.1 Lavender-Top Tube (EDTA)

- This tube contains the anticoagulant EDTA and is used for collecting whole blood.
- In CIL, HLA-B27 and HLA-B*57:01 testing requires whole blood collected with this tube.
- After filling the tube with blood, immediately invert it several times in order to prevent coagulation.

2.3.2 Light-Blue-Top Tube (Sodium Citrate)

- This tube contains sodium citrate as an anticoagulant and is used for collecting whole blood.
- In CIL, HLA-B27 and HLA-B*57:01 testing requires whole blood collected with this tube.
- Immediately after blood draw, invert the tube six to ten times in order to activate the anticoagulant.

2.3.3 Yellow-Top Tube - Serum Separator Tube (SST - Vacutainer®)

- This tube contains a clot activator and serum gel separator – used for various laboratory tests on sera.
- Invert the tube to activate the clotting; let stand for 20-30 minutes before centrifuging for 15 minutes. If frozen serum is required, pour off serum into plastic vial and freeze. Do not freeze VACUTAINER® tubes.

2.3.4 Red - Top Tube - Serum

- Silicone coated - used for various laboratory tests on sera.

2.4 Handling of Specimen

All specimens must be placed in properly labelled containers and transported in an infectious disease biohazard bag. Specimen may be hand-delivered to CIL.

2.4.1 Courier Services

Courier services are available for transporting specimens to CIL from many locations throughout Singapore. Special courier services will be established if appropriate

arrangements can be made. For more information, please contact us at the following numbers:

Telephone: 6357-8464 Facsimile: 6357-8463

Email: ttsh.cil.enquiry@nhghealth.com.sg

2.4.2 Turnaround time

This catalogue lists the days on which the tests are set up and the amount of time needed to analyse the test sample as an indicator of the turnaround times. Kindly note that repeated tests require additional time. If the published turnaround times cannot be met by the laboratory, a memo will be sent out stating when the result(s) will be available.

The results obtained through telephone (6357-8464) are provisional and may change after final quality assurance validation. Only the hard copy printed on letterhead paper issued by CIL should be regarded as **final**.

2.4.3 Repeat determinations

We will repeat tests without additional charge to the patient under the following circumstances:

- When we determine that our analytical system has failed quality control;
- If a specimen is lost because of a laboratory accident; or
- When the result does not correlate (in the doctor's opinion) with the patient's clinical picture. In such an instance, the doctor should explain the circumstances on the memo accompanying the new specimen.

Follow-up or confirmatory testing is not considered repeat determinations and the lab will charge the patient accordingly.

2.4.4 Storage of specimen

Original blood specimens and sera are kept at 4°C for a week, and analysed sera are kept at -70°C for 6 months. There might be occasions when it would be necessary to repeat or run additional tests on those samples in storage. To request this, please send an official requisition form with patient's particulars and the date of blood collected.

2.4.5 Unacceptable specimen

Some specimens cannot be analysed because of improper collection or degradation in transit. Other specimens may have prolonged turnaround times because of lack of necessary ancillary specimens or patient information.

You will be notified of rejected or problem specimens upon receipt. To avoid specimen rejection, please use the following checklist:

- Is the patient information boxes in the request form correctly, legibly and adequately filled up?
- Has the patient been properly prepared before blood draw? For example, the assays for Gastrin, serum level requires fasting blood.
- Is the specimen transported in the correct temperature?
- Is the specimen derived from the correct patient?
- Is the specimen kept in the right container (metal-free, separation gel, sterility, etc)?
- Has the correct specimen type (plasma, serum, whole blood etc) been collected?
- Is the specimen volume sufficient?
- Is the storage temperature (ambient, refrigerated, or frozen) appropriate?

2.4.6 Labelling errors

In the case of a major labelling error (e.g. no label, patient data on specimen container does not tally with request form), the laboratory will notify the doctor or the nurse in-charge and the specimen will be discarded and request rejected.

2.4.7 Specimen rejection policy

The quality and appropriateness of the specimen limit accuracy and clinical usefulness of all laboratory analyses. The techniques used for the collection and submission of the specimen can influence the outcome of testing results.

All specimens are subject to rejection if:

- Are of insufficient quantity or quality.
- Are of excessive age for the type of examination requested.
- Are received with either specimen container unlabelled or incomplete test request form or the specimen label not matching the test request form.
- Are leaking and can easily be replaced by recollection.
- Are of incorrect specimen type or condition

2.5 Laboratory Operating Hours

The Laboratory is open as follows:

Monday to Friday: 8.30 am – 5.30 pm
Saturdays, Sundays & Public Holidays: Closed

2.6 Request Forms

Request forms can be downloaded from [Laboratory Services - Tan Tock Seng Hospital, Singapore \(ttsh.com.sg\)](http://Laboratory Services - Tan Tock Seng Hospital, Singapore (ttsh.com.sg)) for your ease of use. Hardcopy can be supplied without charge. Please call us at 6357-8464 to arrange for delivery of forms.

3 ENQUIRIES, CONSULTATIONS AND CANCELLATIONS

3.1 Enquiries

The Medical Technologists of CIL provide technical information; handle general inquiries regarding types of available tests, service hours, and types of supplies available, specimen collection, unacceptable specimens, test results, payment and others.

Telephone: 6357-8464 Facsimile: 6357-8463
Email: ttsh.cil.enquiry@nhghealth.com.sg

3.2 Clinical Consultation

We welcome clinical discussions on the interpretation of tests conducted in the CIL. Requests for interpretation of test results and consultations should be directed to the laboratory consultant:

Dr. Leong Khai Pang Mobile no: 8126-3240
Dr. Lim Xin Rong Mobile no: 9826-8649

3.3 Reports

Paper reports will be sent to the requesting location when requested. **Encrypted soft copies may be sent to requesting locations upon request.**

3.4 Test Result Call-Backs

Results will be faxed or emailed to a client when requested.

3.5 Test Cancellation

Physicians occasionally decide that certain tests are not needed after the specimen drawn from the patient has been dispatched. We honour such cancellations at no charge provided the tests have not been set up. Once the analysis has commenced, such requests cannot be accepted. A memorandum containing the patient's particulars, test(s) to be cancelled and doctor's signature must be sent to CIL within 24 hours after verbal cancellation. **Requests to Mayo Clinic Laboratories may incur a handling fee if cancellation notification comes after specimen have been processed.**

3.6 Corporate Clients

The Finance Department will issue a monthly billing invoice for tests performed in the Laboratory to private medical practitioners, contractual clients and private institutions allied to TTSH.

3.7 Internal Clients

Doctors practicing in Tan Tock Seng Hospital utilize a different system for test ordering and obtaining patient reports.

4 LIST OF TESTS PERFORMED IN CIL

This is a list of tests currently performed in the CIL.

Electronic version can be found on TTSH website: [Laboratory Services - Tan Tock Seng Hospital, Singapore \(ttsh.com.sg\)](http://Laboratory Services - Tan Tock Seng Hospital, Singapore (ttsh.com.sg))

4.1 Connective Tissue Disease and APS Markers

4.1.1 Anti-Nuclear Antibody (ANA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Normal <80 Titre
If positive, results are titred up to 1/640 dilution and patterns indicated.
Turnaround Time: 1-4 days
Day(s) Test Set Up: Monday through Friday, Morning

4.1.2 Anti-double stranded DNA Antibody (dsDNA)

Specimen Required: Serum (Yellow or Red top)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal < 200 IU/mL,
Equivocal 200-300 IU/mL
Positive >300 IU/mL
Turnaround Time: 1-4 days
Day(s) Test Set Up: Monday through Friday, Morning

4.1.3 Anti-Ro60 (SSA) Antibody (SSA or Ro60)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Friday, Morning

4.1.4 Anti-La (SSB) Antibody (SSB or La)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)

Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Friday, Morning

4.1.5 Anti-Smith Antibody (Sm)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Friday, Morning

4.1.6 Anti-Ribonucleoprotein Antibody (nRNP)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Friday, Morning

4.1.7 Anti-Scl-70 Antibody (Scl-70)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Friday, Morning

4.1.8 Anti-Jo-I Antibody (Jo-I)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Friday, Morning

4.1.9 Anti-Cardiolipin IgG Antibody (ACA-IgG)

Specimen Required: Serum (Yellow or Red top)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: <15 GPL Units – Negative
 ≥15 – <20 GPL Units – Indeterminate
 ≥20 GPL Units – Positive
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday, Morning

4.1.10 Anti-Cardiolipin IgM Antibody (ACA-IgM)

Specimen Required: Serum (Yellow or Red top)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: <12.5 MPL Units – Negative
 ≥12.5 – <20 MPL Units – Indeterminate
 ≥20 MPL Units – Positive
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday, Morning

4.1.11 Anti-β₂-Glycoprotein-I (Anti-β₂GPI) IgG

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: <4 U/mL – Negative
 5-8 U/mL – Equivocal
 >8 U/mL – Positive
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday, Morning

4.1.12 Myositis Panel (18 Antigens)

Specimen Required: Serum (Yellow or Red top)
Transport condition: Refrigerated (2-8°C if <48 hours)
 Frozen (if >48 hours)
Method: Immunoblotting Assay
Reference: For All Negative: ≤10 units
 Individual results for 17 Antigens: Mi-2α, Mi-2β, TIF1γ, MDA5, NXP2, SAE1, Ku, Ro-52, PM-Scl100, PM-Scl75, Jo-1, SRP, PL-7, PL-12, EJ, OJ, cN1A, and HMGCR*
 (*refer to ELISA method)
Turnaround Time: 1-4 days

Day(s) Test Set Up: Monday Morning and Thursday Afternoon

4.1.13 Systemic Sclerosis Panel (13 Antigens)

Specimen Required: Serum (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Immunoblotting Assay
Reference: For All Negative: ≤10 units
 Individual results for 13 Antigens: Scl-70, CENP A, CENP B, RPII, RPI55, Fibrillarin, NOR90, Th/To, PM-Scl100, PM-Scl75, Ku, PDGFR, Ro-52
Turnaround Time: 1-7 days
Day(s) Test Set Up: Monday, Afternoon

4.1.14 *Anti-HMGCR Antibody (ELISA)

Specimen Required: Serum (Yellow or Red top)
Transport condition: Refrigerated (2-8°C if <48 hours)
 Frozen (if >48 hours)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 Units
Turnaround Time: 1-4 days
Day(s) Test Set Up: Monday and Thursday, Afternoon

4.2 Arthritis Markers

4.2.1 Rheumatoid Factor (RF) IgM

Specimen Required: Serum (Yellow or Red top)
Method: Turbidimetry, Optilite™
Reference: Normal <10 IU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday

4.2.2 Anti-CCP (Cyclic Citrullinated Peptide)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 Units
Turnaround Time: 1-4 days
Day(s) Test Set Up: Monday and Thursday, Afternoon

4.3 Syphilis Markers

4.3.1 Rapid Plasma Reagin (RPR)

Specimen Required: Serum preferred (Yellow or Red top) or plasma
Method: Card Particle Agglutination Test
Reference: Non-reactive
If reactive, results are titred up to extinction
Turnaround Time: 1-3 days
Day(s) Test Set Up: Monday through Friday, Afternoon

4.3.2 Syphilis IgG Antibody

Specimen Required: Serum (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: <16 RU/mL - Negative
≥16 to <22 RU/mL - Borderline
≥22 RU/mL - Positive
Turnaround Time: 1-4 days
Day(s) Test Set Up: Tuesday and Friday, Afternoon

4.3.3 TPPA (*Treponema pallidum* Particle Agglutination)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Particle agglutination
Reference: <1:80 Titre
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday, Afternoon

4.3.4 VDRL – CSF

Specimen Required: CSF, Clear – free from particulate matter and blood
Method: Flocculation
Reference: Non-reactive
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday, Morning

4.4 Organ Specific Autoimmunity

4.4.1 Anti-Thyroglobulin Antibody (ATG)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <100 IU/ml
Turnaround Time: 1-7 days
Day(s) Test Set Up: Wednesday, Morning

4.4.2 Anti-Thyroid Peroxidase Antibody (TPO)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Fluoroenzymeimmunoassay (FEIA) using ImmunoCap P250 system
Reference: <25 IU/mL – Normal
≥25 – 35 IU/mL – Equivocal
>35 IU/mL – Positive
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.4.3 Anti-TSH Receptor Antibody (TRAB)

Specimen Required: Serum (Yellow or Red top)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <1.0 IU/L
Turnaround Time: 1-7 days
Day(s) Test Set Up: Wednesday, Morning

4.4.4 Anti-Smooth Muscle Antibody (SMA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Negative
If positive, results are titred up to 1/80 dilution.
Turnaround Time: 1-5 days
Day(s) Test Set Up: Tuesday and Friday, Morning

4.4.5 Anti-Mitochondrial Antibody (AMA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Negative (Reported as Positive or Negative)
Turnaround Time: 1-5 days
Day(s) Test Set Up: Tuesday and Friday, Morning

4.4.6 Anti-Liver, Kidney Microsomal Antibody (LKM)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Negative (Reported as Positive or Negative)
Turnaround Time: 1-5 days
Day(s) Test Set Up: Tuesday and Friday, Morning

4.4.7 Anti-Islet Cell Antibody (ICA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Negative (Reported as Positive or Negative)
Turnaround Time: 1-5 days
Day(s) Test Set Up: Tuesday and Thursday, Afternoon

4.4.8 Glutamic Acid Decarboxylase Autoantibody (GAD)

Specimen Required: Serum (Yellow or Red top)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <5 U/mL
Turnaround Time: 1-14 days
Day(s) Test Set Up: Alternate Monday, Morning

4.4.9 Anti-Insulin antibodies

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/ml

Turnaround Time: 1-14 days
Day(s) Test Set Up: Alternate Monday Afternoon

4.4.10 Anti-IA-2

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/ml
Turnaround Time: 1-14 days
Day(s) Test Set Up: Alternate Monday Afternoon, results available on Tuesday

4.4.11 Anti-Zinc Transporter 8

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/ml
Turnaround Time: 1-14 days
Day(s) Test Set Up: Alternate Monday Afternoon, results available on Tuesday

4.4.12 Anti-Parietal Cell Antibody (PCA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Fluoroenzymeimmunoassay (FEIA) using ImmunoCap P250 system
Reference: Normal <10 U/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.4.13 Anti-Intrinsic Factor Antibody (AIF)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Fluoroenzymeimmunoassay (FEIA) using ImmunoCap P250 system
Reference: Normal <10 U/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.4.14 Anti-Skeletal Muscle Antibody (SKM)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Negative (Reported as Positive or Negative)
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday and Friday, Morning

4.4.15 Anti-Glomerular Basement Membrane Antibody (GBM)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 U/mL
Turnaround Time: 1-5 days
Day(s) Test Set Up: Tuesday and Friday, Afternoon

4.4.16 Anti-Endomysial Antibody, IgA (EMA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Indirect Immunofluorescence
Reference: Negative (Reported as Positive or Negative)
Turnaround Time: 1-7 days
Day(s) Test Set Up: Tuesday and Friday, Morning

4.4.17 Anti-Tissue Transglutaminase Antibody, IgA (TTGA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <20 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.4.18 Anti-Tissue Transglutaminase Antibody, IgG (TTGG)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <10 U/mL
Turnaround Time: 1-7 days

Day(s) Test Set Up: Thursday, Morning

4.4.19 Anti-Deamidated Gliadin Peptides Antibody, IgA (GLPA)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <25 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.4.20 Anti-Deamidated Gliadin Peptides Antibody, IgG (GLPG)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: Normal <25 RU/mL
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.4.21 Anti-Phospholipase A2 Receptor (PLA2R)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)
Method: Enzyme Linked Immunosorbent Assay (ELISA)
Reference: <14 RU/mL – Negative
≥14 to <20 RU/mL – Borderline
≥20 RU/mL – Positive
Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.5 Vasculitis Markers

4.5.1 Anti-Neutrophil Cytoplasmic Antibody (ANCA)

Specimen Required: Serum (Yellow or Red top)
Method: Indirect Immunofluorescence
Reference: Negative
If positive for C-ANCA, P-ANCA or Atypical ANCA, Anti-Myeloperoxidase Antibody (MPO) & Anti-Proteinase 3 (PR3) antibody will be added on automatically at no charge.

Anti-MPO & Anti-PR3 will be quantitated by enzyme-linked immunosorbent assay (ELISA).

NOTE: Not all specimens positive for P-ANCA are positive for Anti-MPO and not all specimens positive for C-ANCA are positive for Anti-PR3 antibody.

Turnaround Time: 1-5 days
Day(s) Test Set Up: Tuesday and Friday, Morning

4.5.2 Anti-Myeloperoxidase Antibody (MPO)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)

Method: Enzyme Linked Immunosorbent Assay (ELISA)

Reference: Normal <20 RU/ml

Turnaround Time: 1-4 days

Day(s) Test Set Up: Monday Morning & Thursday Afternoon

4.5.3 Anti-Proteinase 3 Antibody (PR3)

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA, Heparin or Citrate tube)

Method: Enzyme Linked Immunosorbent Assay (ELISA)

Reference: Normal <20 RU/ml

Turnaround Time: 1-4 days

Day(s) Test Set Up: Monday Morning & Thursday Afternoon

4.6 Genotyping

4.6.1 Human Leucocyte Antigen B27 (HLA B27)

Specimen Required: 3 ml Sodium Citrated blood (Light Blue-Top)

Method: Real-time PCR using gene specific primer pair

Reference: Negative (Reported as Positive or Negative)

Turnaround Time: 1-7 days

Day(s) Test Set Up: Monday, Morning

4.6.2 Human Leucocyte Antigen B*57:01 (HLA-B*57:01)

Specimen Required: 3 ml Sodium Citrated blood (Light Blue-Top)

Method: Real-time PCR using gene specific primer pair

Reference: Negative (Reported as Positive or Negative)

Turnaround Time: 1-7 days
Day(s) Test Set Up: Thursday, Morning

4.7 Allergy Tests

4.7.1 Total IgE, Serum

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)

Method: Fluoroenzymeimmunoassay (FEIA) using ImmunoCap P250 system

Reference: Normal <113 kU/L (Adult and children age > 10 years old)

Children Age (up to)	Reference Range (kU/L) (Geometric Mean + 2SD)
6 weeks	<4.0
3 mths	<7.2
6 mths	<12.8
9 mths	<17.4
12 mths	<22.8
2 years	<40.3
3 years	<56
4 years	<70
5 years	<84
6 years	<98
7 years	<110
8 years	<124
9 years	<136
10 years	<148

Turnaround Time: 1-7 days
Day(s) Test Set Up: Wednesday, Morning

4.7.2 Tryptase, Serum

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube). **NOTE:** Samples should preferably be taken between 15 minutes and 3 hours after the suspected event causing mast cell activation.

Method: Fluoroenzymeimmunoassay (FEIA) using ImmunoCap P250 system

Reference: Normal < 11.4 µg/L (for children >4 years and adults)

Turnaround Time: I-7 days
Day(s) Test Set Up: Wednesday, Morning

4.7.3 Specific IgE Testing

Allergens available:

Drugs	<ul style="list-style-type: none"> ▪ Penicilloyl G ▪ Amoxicilloyl ▪ Clorhexidine 	<ul style="list-style-type: none"> ▪ Penicilloyl V ▪ Ampicilloyl
Environmental/ Occupational	<ul style="list-style-type: none"> ▪ <i>D. pteronyssinus</i> (House dust mite) ▪ <i>Blomia tropicalis</i> (House dust mite) ▪ Dog Dander ▪ <i>Aspergillus fumigatus</i> 	<ul style="list-style-type: none"> ▪ <i>D. farinae</i> (House dust mite) ▪ Cockroach ▪ Cat dander ▪ Oil Palm, Tree Pollen ▪ Latex
Insect Venom	<ul style="list-style-type: none"> ▪ Honey Bee ▪ Yellow Jacket (Common Wasp) ▪ White-faced Hornet 	<ul style="list-style-type: none"> ▪ Paper Wasp ▪ Yellow Hornet
Storage Mites	<ul style="list-style-type: none"> ▪ <i>Acarus siro</i> d70 ▪ <i>L. destructor</i> d71 	<ul style="list-style-type: none"> ▪ <i>T. putrescentiae</i> d72 ▪ <i>G. domesticus</i> d73
Components	<ul style="list-style-type: none"> ▪ rAra h1 (peanut) ▪ rAra h2 (peanut) ▪ rAra h8 (peanut) ▪ rAra h9 (peanut) ▪ rCor a14 (Hazelnut) ▪ rAna o3 (Cashew nut) 	<ul style="list-style-type: none"> ▪ Ovomuroid ▪ Ovalbumin ▪ rTri a19 Omega-5 Gliadin ▪ Casein (Milk) ▪ rJug r1 Walnut ▪ rSes i1 Sesame seed
Food	<ul style="list-style-type: none"> ▪ Crab ▪ Cod Fish ▪ Milk ▪ Wheat ▪ Soy Bean ▪ Chick pea ▪ Beef ▪ Rice ▪ Pine Nut ▪ Barley ▪ Egg Yolk ▪ Egg White ▪ Egg ▪ Coconut ▪ Gluten ▪ Baker's yeast (<i>S. cerevisiae</i>) 	<ul style="list-style-type: none"> ▪ Shrimp ▪ Chicken ▪ Cheese, Cheddar ▪ Peanut ▪ Sesame ▪ Pea ▪ Macadamia Nut ▪ Corn, Maize ▪ Oat ▪ Rye ▪ Clam ▪ Scallop ▪ Lobster ▪ Squid ▪ Potato

- Tree Nuts (Almond, Cashew, Pecan, Brazil, Pistachio, Hazel, Walnut)
-

Grass and Mold	▪ Bermuda grass	▪ Candida albicans
	▪ Timothy grass	▪ Penicillium chrysogenum

Note: CIL is able to perform tests for allergens not listed here as long as they are available from the manufacturer or have the option of sending out to Mayo Clinic Laboratories. Please call 6357-8464 to discuss the availability and price of allergen.

The ordering and interpretation of specific IgE tests should be made with careful clinical correlation. They are useful for confirming the allergen specificity in patients with clinically documented allergic disease. They may be less effective when used for screening.

Specimen Required:	Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)	
Method:	Fluoroenzymeimmunoassay (FEIA) using ImmunoCap P250 System	
Reference:	<u>Class</u>	<u>Interpretation</u>
	0	Negative
	1	Equivocal
	2	Positive
	3	Positive
	4	Strong Positive
	5	Strong Positive
	6	Strong Positive
	NOTE: Results will also be reported in kU/L	
Turnaround Time:	1-7 days	
Day(s) Test Set Up:	Wednesday, Morning	

4.8 Others

4.8.1 Stool Calprotectin

Specimen Required:	Morning Stool preferred. Please send to laboratory within the same day of collection.
Method:	Enzyme Linked Immunosorbent Assay (ELISA)
Reference:	<50 ug/g – Negative 50 to 120 ug/g – Borderline >120 ug/g – Positive
Turnaround Time:	1-5 days
Day(s) Test Set Up:	Tuesday and Friday, Afternoon

4.8.2 IgG Subclasses

Specimen Required:	Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)
Method:	Turbidimetry on Optilite™
Reference Values:	IgG1: 3824 – 9286 mg/L IgG2: 2418 – 7003 mg/L IgG3: 218.2 – 1760.6 mg/L IgG4: 39.2 – 864.0 mg/L
Turn Around Time (TAT):	1-7 days
Day(s) Setup:	Tuesday

4.8.3 IgG4

Specimen Required:	Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)
Method:	Turbidimetry on Optilite™
Reference Values:	39.2 – 864.0 mg/L
Turn Around Time (TAT):	1-7 days
Day(s) Setup:	Tuesday

4.8.4 Kappa/ Lambda Free Light Chains, Serum

Specimen Required:	Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)
Method:	Tubidimetry on Optilite™
Reference Values:	Free Kappa: 3.30 – 19.40 mg/L Free Lambda: 5.71– 26.30 mg/L Kappa/Lambda ratio: 0.26 – 1.65
Turn Around Time (TAT):	1-7 days
Day(s) Setup:	Friday

4.8.5 Caeruloplasmin

Specimen Required:	Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)
Method:	Tubidimetry on Optilite™
Reference Values:	0.2 – 0.6 g/L
Turn Around Time (TAT):	1-7 days
Day(s) Setup:	Friday

4.8.6 B2-microglobulin

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)
 Method: Tubidimetry on Optilite™
 Reference Values: 0.8 – 2.34mg/L
 Turn Around Time (TAT): 1-7 days
 Day(s) Setup: Friday

4.8.7 Cystatin-C with Estimated GFR

Specimen Required: Serum preferred (Yellow or Red top) or plasma (EDTA or Heparin tube)
 Method: Tubidimetry on Optilite™
 Reference Values: Cystatin-C: 0.8 – 2.34mg/L
 eGFR: >60
 Turn Around Time (TAT): 1-7 days
 Day(s) Setup: Friday

5 REFERRED TEST (Non-exhaustive list)

CIL is the reference lab for tests sent to Mayo Clinic Laboratories in TTSH and NHG. There are two shipments to Mayo Clinic Laboratory every Monday and Wednesday. More information can be found on Mayo Clinic Laboratories website: <http://www.mayocliniclabs.com>. Reports will be dispatched to the requesting doctors as soon as CIL receives the results. Please call CIL at 6357-8464 for clarifications.

5.1 Angiotensin Converting Enzyme

Specimen Required: Serum- yellow top (preferred)
 Reject Conditions: Gross haemolysis/ Gross icteric/ Gross lipemic
 Minimum Volume: 1ml
 Turn Around Time (TAT): 7-14 working days

5.2 CI Esterase Inhibitor (Antigen)

Specimen required: Serum- red top (preferred)
 Patient Preparation: Fasting preferred but not required
 Collection Instructions: Immediately after specimen collection, place in wet ice. Centrifuge and aliquot serum into plastic vial
Freeze within 30 minutes
 Minimum volume: 1ml
 Transport Condition: Send Frozen in plastic vial
 Reject Conditions: Gross lipemic
 Turn Around Time (TAT): 7-14 working days

5.3 CI Esterase Inhibitor (Functional)

Specimen Required: Serum- red top (preferred)
 Patient Preparation: Fasting preferred but not required
 Collection Instructions: Immediately after specimen collection, place in wet ice. Centrifuge and aliquot serum into plastic vial
 Freeze within 30 minutes
 Minimum volume: 1ml
 Transport Condition: Send Frozen in plastic vial
 Turn Around Time (TAT): 7-14 working days

5.4 Complement, Total, Serum

Specimen Required:	Serum- red top only
Patient Preparation:	Fasting preferred
Collection Instructions:	Immediately after specimen collection, place in wet ice. Centrifuge and aliquot serum into plastic vial. Freeze within 30 minutes.
Minimum volume:	1ml
Transport Condition:	Send Frozen in plastic vial
Turn Around Time (TAT):	7-14 working days

5.5 Interleukin-6, Serum

Specimen Required:	Serum- yellow top (preferred)
Transport Condition:	Send refrigerated (preferred)
Reject Conditions:	Gross haemolysis/ Gross lipemic/ Gross icteric
Minimum volume:	1ml
Turn Around Time (TAT):	7-14 working days

5.6 Complement C1q, Serum

Specimen Required:	Serum- Red top (preferred)
Patient preparation:	Fasting for 12 hours
Transport Condition:	Send refrigerated (preferred)
Reject Conditions:	Gross lipemic
Minimum Volume:	1ml
Turn Around Time (TAT):	7-14 working days

5.6 I,3-Beta-D-Glucan, Fungitell, Serum

Specimen Required:	Serum- yellow top only
Collection Instructions:	Send entire specimen in original collection tube. Do not aliquot or open tube
Minimum volume:	1ml
Transport Condition:	Send refrigerated (preferred), original tube.
Reject Conditions:	Gross lipemic
Turn Around Time (TAT):	7-14 working days

5.7 Gastrin, Serum

Specimen Required:	Serum- yellow top (preferred)
Patient Preparation:	<ol style="list-style-type: none"> 1. Fasting (8 hours) required 2. For 12 hours before specimen collection, do not take multivitamins or dietary supplements containing biotin (vitamin B7), which is commonly found in hair, skin, and nail supplements and multivitamins. 3. If medically feasible, proton pump inhibitor (omeprazole, lansoprazole, dexlansoprazole, esomeprazole, pantoprazole, and rabeprazole) therapy should be discontinued 1 week before measurement of serum gastrin levels.

4. Drugs that interfere with gastrointestinal motility (eg, opioids) should be discontinued for at least 2 weeks before serum gastrin testing.

Collection Instructions: Centrifuge at refrigerated temperature within 2 hours of collection and immediately aliquot serum into plastic vial.

Minimum volume: 1ml

Transport Condition: Send Frozen in plastic vial

Reject Conditions: Gross haemolysis

Turn Around Time (TAT): 7-14 working days

5.8 1,25-Dihydroxyvitamin D, Serum (Calcitriol)

Specimen Required: Serum- red top (preferred)

Patient Preparation: Fasting (4 hours) preferred

Transport Condition: Send refrigerated (preferred)

Minimum volume: 1.5ml

Reject Conditions: Gross haemolysis

Turn Around Time (TAT): 7-14 working days

5.9 Erythropoietin, Serum

Specimen Required: Serum- yellow top (preferred)

Collection Instructions: Morning collection, 7:30 a.m.-12 p.m. is preferred due to diurnal variation

Transport Condition: Send refrigerated (preferred)

Minimum volume: 1ml

Reject Conditions: Gross haemolysis

Turn Around Time (TAT): 7-14 working days

5.10 Brucella Antibody Screen IgM & IgG; potential reflex to Brucella total antibody agglutination testing, Serum

Specimen Required: Serum- yellow top (preferred)

Transport Condition: Send refrigerated (preferred)

Minimum volume: 1ml

Reject Conditions: Gross haemolysis/ Gross lipemic/ Heat-inactivated specimen

Turn Around Time (TAT): 7-14 working days

5.11 Lyme Disease

Specimen Required: Serum- yellow top (preferred)

Transport Condition: Send refrigerated (preferred)

Minimum volume: 1ml

Reject Conditions: Gross haemolysis/ Gross lipemic/ Gross Icteric

Turn Around Time (TAT): 7-14 working days

5.12 Histoplasma Antigen, Random Urine

Specimen Required: Random urine, no preservative

Collection Instructions: Morning collection, 7:30 a.m.-12 p.m. is preferred due to diurnal variation

Transport Condition: Send refrigerated (preferred)

Minimum volume: 2.5ml

Reject Conditions: Gross haemolysis/ Turbid coloured

Turn Around Time (TAT): 7-14 working days

5.13 Metanephrine, Fractionated, Free, Plasma

Specimen Required: Plasma - EDTA

Patient Preparation: Use of an Epi-pen within the last 7 days may produce inaccurate results.

Transport Condition: Centrifuge and aliquot plasma into a plastic vial within 2 hours of collection. Send refrigerated.

Minimum volume: 1ml

Turn Around Time (TAT): 7-14 working days

5.14 Catecholamine, Fractionation, Free, Plasma

Specimen Required: Plasma EDTA Meta

Collection Instructions: Draw blood in tubes containing EDTA -sodium metabisulfite solution

Note: If the collection instructions are not followed, falsely elevated test results are highly likely.

1. Drawing from an indwelling intravenous (IV) line/catheter/butterfly is required.

2. Calm the patient by giving complete instructions and reassurance regarding the procedure.

3. Insert an indwelling IV catheter. Flush with 3 mL of sodium chloride (NaCl) using positive pressure.

4. Have the patient rest for 30 minutes in the supine position in

- a quiet room.
5. At the end of the 30 minutes, withdraw and discard a minimum of 3 mL of blood to remove the saline out of the catheter.
 6. If provocative sampling (eg, standing specimen) is required, perform provocative manoeuvre immediately after obtaining supine specimen. Obtain standing specimen immediately.
 7. For each specimen, draw 10 mL of blood into the chilled 10 mL catecholamine tube containing EDTA-sodium metabisulfite solution. A 6 mL pink top EDTA-metabisulfite tube is an acceptable substitute.
 8. Specimens must remain at refrigerated temperature during processing and transport.
 9. Separate plasma in a refrigerated centrifuge within 30 minutes of collection.
 10. Freeze specimen immediately.

Transport Condition: Send Frozen
 Minimum Volume: 2ml
 Reject Conditions: Gross haemolysis
 Turn Around Time (TAT): 7-14 working days

5.15 Cortisol, Saliva

Specimen Required: Saliva
 Patient Preparation:

1. Do not brush teeth before collecting specimen.
2. Do not eat or drink for 15 minutes prior to specimen collection.

 Collection Instruction: Require specific saliva collection kit, available from CIL. Follow instructions on collection kit.
 Transport Condition: Refrigerated (preferred)
 Minimum volume: 1ml
 Turn Around Time (TAT): 7-14 working days

5.16 Renin (Plasma Renin Activity)

Specimen Required: Plasma - EDTA
 Patient Preparation: The plasma renin activity cannot be interpreted if the patient is being treated with spironolactone (Aldactone). Spironolactone should be discontinued for 4 to 6 weeks before testing.
 Collection Instruction:

1. Draw blood in a chilled syringe from a patient in a seated position; place specimen in a chilled, lavender-top (EDTA) tube; and mix.

2. Alternatively, draw blood directly in a chilled, EDTA tube.
3. Immediately place EDTA tube into an ice-water bath until thoroughly cooled.
4. Refrigerate specimen during centrifugation and immediately transfer plasma to plastic vial. (If a refrigerated centrifuge is unavailable, chill the centrifuge carriers. Centrifuge specimen for less than or equal to 5 minutes, then promptly transfer plasma.)
5. Immediately freeze plasma.

Transport Condition: Send Frozen in plastic vial
 Minimum volume: 1.5ml
 Rejection Condition: Gross haemolysis
 Turn Around Time (TAT): 7-14 working days

5.17 Aldosterone

Specimen Required: Serum – yellow top (preferred)
 Patient Preparation: Spironolactone (Aldactone) should be discontinued for 4 to 6 weeks before testing. The plasma renin activity cannot be interpreted if the patient is being treated with spironolactone.
 Collection Instructions: The recommended collection time is 8 a.m., after the patient is active for approximately 2 hours. Try to collect the specimen as close to that time as possible and no later than 10 a.m. See last page for instructions from Mayo Clinic Laboratory.
 Transport Condition: Send refrigerated (preferred)
 Minimum volume: 1.5ml
 Turn Around Time (TAT): 7-14 working days

5.18 Streptococcus pneumoniae 23 serotypes

Specimen Required: Serum – yellow top (preferred)
 Transport Condition: Refrigerated (preferred)
 Minimum volume: 1ml
 Rejection Conditions: Gross haemolysis/ Gross lipemic/ Gross Icteric
 Turn Around Time (TAT): 10-21 working days

5.19 Tetanus Toxoid, IgG

Specimen Required: Serum – yellow top (preferred)
 Transport Condition: Refrigerated (preferred)
 Minimum volume: 1ml

Rejection Conditions:	Gross haemolysis/ Gross lipemic/ Gross Icteric
Turn Around Time (TAT):	10 - 21 working days