

Revision Number	29.0	Document Number	I-66
Author/Reviewer	D. McWhinney	Authoriser	D Difallah
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REGIONAL IMMUNOLOGY USER MANUAL
February 2026

Additional Information & Cross References	
Replaces Document Number	I-66 v28.0
Change Management	
Related Documents	

**Please ensure that this is the most up to date version of the
Regional Immunology User Manual**

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Regional Immunology Service

Introduction

The Regional Immunology Service is based at the Immunology Day Centre and at the Kelvin Laboratory site, Royal Hospitals, Belfast Health & Social Care Trust.

Our full postal address is:

Clinical Service:

Regional Immunology Service
 Immunology Day Centre,
 Ward 34 Elliott Dynes Building
 The Royal Hospitals
 Belfast Health & Social Care Trust
 Grosvenor Road
 Belfast
 BT12 6BA

Laboratory Service:

Regional Immunology Service
 Kelvin Laboratories,
 The Royal Hospitals
 Belfast Health & Social Care Trust
 Grosvenor Road
 Belfast
 BT12 6BA

Clinical Service.

The clinical Immunology service receives referral in the areas of allergy, immune deficiency and autoimmune disease.

The clinical service provided at the Immunology Day Centre includes infusion clinics for immunoglobulin replacement therapy (IRT) and biological drugs and an IRT home therapy service (IVIg / SCiG / FSCiG).

Allergy challenge testing and allergen desensitisation is also undertaken.

More information about Outpatient Clinics is available on the service website below.

www.regionalimmunologyservicenorthernireland.com

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Laboratory Service.

Working hours: Monday to Friday from 09:00 to 17:00 (excluding public holidays).

Any **out of hours** requests should be directed to the Royal Hospitals' telephone switchboard (02890 240503) who will then contact the appropriate staff.

For routine results: Test results are available via the **Northern Ireland Electronic Care Record (NIECR)** and **encompass**.

Please avoid telephoning wherever possible. Non-urgent telephone calls create a significant workload and cause unnecessary delay in processing samples.

Regional Immunology Laboratory		
Kelvin Building, Royal Victoria Hospital, Grosvenor Road, Belfast, BT12 6BA		
Laboratory Contacts:		
Laboratory Enquiries / Advice		028 96151569 028 96151566
Clinical Lead	Lisa Devlin	028 96150088
Interim Discipline Manager	Mrs Denise Difallah	028 96151562
Operational Manager	Vacant	
Clinical Scientist	Dr Lynn Maxwell	028 96151563
Quality and Health and Safety Officer	Mrs Christine Taylor	028 96151563
Medical Contacts:		
Immunology Consultant	Dr Lisa Devlin	028 96150088
Immunology Consultant	Dr Tanya Coulter	028 96150088
Immunology Consultant	Dr Cathal Steele	028 96150088
Immunology Consultant	Dr Jayne McGucken	028 96150088
Immunology Specialty Registrars	Dr Nithya Rajendran Dr Hannah Stewart	028 96150088
Immunology secretaries		028 96150088
Out of Hours Contacts:		
Urgent Out of Hours	Contact RGH Switchboard who will notify the appropriate staff	028 90240503
Laboratory email address to request additional tests	immunologyaddons@belfasttrust.hscni.net	

All of the above staff can also be contacted via email using the address:
firstname.surname@belfasttrust.hscni.net

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Test repertoire

The Immunology laboratory is a UKAS accredited testing laboratory No. 8612

The test schedule listing accredited tests can be found on the UKAS website:
https://www.ukas.com/wp-content/uploads/schedule_uploads/00007/8612-Medical-Single.pdf

Assays not currently UKAS accredited include:

Cellular Immunology: Lymphocyte Activation markers and TCR $\alpha\beta$ $\gamma\delta$ cells.

Allergy: Mast Cell Tryptase on plasma/lithium heparin samples.

Haemolytic complement assay

Assays currently awaiting UKAS Extension to Scope accreditation:

Anti IgA tissue transglutaminase antibodies, Anti-MPO antibodies, Anti-PR3 antibodies and Anti-GBM antibodies.

We provide a comprehensive range of tests for the immunological investigation of patients. Our aim is to provide the highest quality of service with prompt delivery of accurate results, (backed up by specialist medical and scientific expertise). Where specific tests are not available locally, we will refer samples on to colleagues in other centres. Further information on the reference laboratories used can be obtained by contacting a Quality Lead.

The department is happy to assist in the interpretation of patient's test results. Interpretative comments will be added to reports where appropriate. Comments on how our service could be improved are always welcomed.

A list of tests offered is described in the following pages and includes type and volume of specimen and, if appropriate, any special requirements. There is a brief summary of the clinical application of each test which is intended to be helpful but is not intended to replace discussion of individual patients. The final section is a "Disease Index" which is intended to assist in the selection of the most appropriate investigations.

Turnaround Time

Average test turnaround times (TAT's) in days are quoted for the various tests. The turnaround times for tests referred to other centres are closely monitored and are available upon request.

Urgent Samples:

The laboratory must be telephoned to arrange all urgent samples before the specimen is collected and sent to the laboratory. Instructions will be given. It is NOT sufficient to mark the sample and/or request form "urgent". The requesting clinician is responsible for arranging transport of urgent samples to the laboratory.

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Consent for venepuncture and testing

All procedures carried out on a patient need the informed consent of the patient. For most routine laboratory procedures, consent can be inferred when the patient presents and willingly submits to the usual collecting procedure, for example venepuncture. It is assumed that when a sample is sent to the laboratory, the clinician responsible for the care of the patient has obtained the appropriate and valid consent for the test, storage and sharing of the patient's information with the relevant Health Care Professionals to generate the result so that the laboratory is not required to confirm or document consent. In emergency situations, it is assumed that when a sample is sent to the laboratory, the decision to bleed and complete the relevant testing has been taken by the clinical team in the best interest of the patient.

Transportation of Samples

There is a legal responsibility and a duty of care on anyone who dispatches clinical material (diagnostic specimens) to the Belfast Trust Laboratories, (by whatever means, including hospital van, courier, taxi, post, internal portering, or pneumatic chute).

Samples from within the Royal Hospitals can be sent by hospital porter or via the pneumatic tube system (except Category 3 samples).

Samples from other hospitals / GPs may be sent by the relevant dispatch systems.

The following documents are available from the laboratory on request:

- Transport of Specimens to the Laboratory
- Health & Safety Rules for Porters & Couriers
- Pneumatic Tube Transport of Clinical Specimens

Postal samples must be sent in accordance with the guidelines issued by the Post Office in respect of postal transmission of pathological specimens.

For advice contact the laboratory.

<https://belfasttrust.hscni.net/service/laboratory-services/laboratories-user-manual>

High risk samples

The laboratory must be informed of any known or potential hazards associated with samples sent.

Specimens of blood, serum and other body fluids from suspected or known carriers of Category 3 pathogens (hepatitis B or C, HIV, CJD, COVID-19) must be clearly marked with hazard stickers and enclosed in a sealed plastic bag. Request forms should also have a hazard sticker.

For some types of sample, and specific categories of hazard, a restricted range of services may be offered.

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Unsuitable Samples

If a sample is unsuitable for testing a report will be sent to the requestor giving the reason and requesting another sample. Samples unsuitable for testing include pleural effusion for any test, inappropriate presence or absence of anticoagulant, delayed cellular/ functional assay samples, haemolysed and/ or lipaemic samples and unlabelled samples/forms.

Requesting additional examinations

Patient serum samples are held by the laboratory for approximately 2 weeks. During this time the laboratory may be contacted for discussion on the appropriateness of additional testing. Additional tests must be confirmed in writing by request form or electronic equivalent. An email address is available for email requests:

ImmunologyAddons@belfasttrust.hscni.net

Frequency of requesting examinations

How often a test should be repeated, if at all, should be based on a number of criteria:

- The physiological properties
- Biological half-life
- Analytical aspects
- Treatment and monitoring requirements
- Established guidance

The Royal College of Pathologists have published advice on the minimum retesting intervals (MRI) in pathology:

<https://www.rcpath.org/resourceLibrary/g147-minimum-retesting-intervals-in-pathology.html>

Duplicate samples

For most tests, samples received within 7 days of a previous sample will not be tested. The following comment will be printed on the report:

'Test Name has not been tested on this sample as it has already been checked within the last 7 days. Please refer to Lab number (e.g.) 25B1300001 on 01/01/25'.

Exceptions to this rule are:

TEST	MRI
Vasculitis screen (ANCA)	1 day
GBM Antibody	1 day
Anti CCP Antibody	90 days (3 months)
Anti IgA tTG Antibody	42 days (6 weeks)
Connective Tissue Disease screen	90 days (3 months)
ENA specificities (with a positive history)	1 year
Liver disease antibodies	180 days (6 months)
Gastric parietal cell antibodies	180 days (6 months)
Intrinsic Factor antibodies	180 days (6 months)

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Immunology request forms

Supplies Information The immunology request form has a light brown strip along the top, middle and bottom.

Request forms can be obtained by contacting BSO PaLS via the customer helpline 028 9536 1301. Product code WPH000012

The request form contains 3 sections, which refer to separate sections of the laboratory: Autoimmune serology, Allergy and Cellular immunology. Tests may be requested by ticking the appropriate box or writing the test required in the space provided. **Separate blood samples and request forms are needed for tests performed in separate sections of the laboratory.**

Please note, Immunochemistry tests are no longer performed by Immunology and should be sent to the Clinical Chemistry laboratory. Refer to the laboratory sections in this handbook for further details of their individual sample requirements.

encompass:

encompass is a Health and Social Care (HSC) wide initiative that will introduce a digital integrated care record to Northern Ireland.

<https://encompassni.hscni.net/>

Lab tests ordered via encompass will include all the essential criteria required.

Belfast Trust users:

<https://bhsct.sharepoint.com/sites/pm/SitePages/Instructions-for-sending-samples-to-the-lab-post-Encompass-go-live.aspx>

The importance of supplying the correct legible information cannot be over-stressed since specimens cannot be accepted for analysis where the identifying information on either the specimen or request form (if applicable) is inconsistent or inadequate.

Missing or illegible information on a sample request form raises a patient safety concern e.g. the wrong test may be carried out (and the right one not carried out); a critically important result may not be communicated in a timely manner because the source is not identifiable; or results may not be readily available to look up because the patient is not uniquely identifiable. If the location/source and consultant is not identified, laboratory staff cannot telephone critical results. Some tests are time-specific and if the date and time of sampling are not stated on the request form, the accuracy of such results cannot be assured.

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The responsibility for requesting and following up on a laboratory test lies with a trained and authorised practitioner. Furthermore, it is the responsibility of the requester to ensure that samples are correctly labelled, and request forms are completed to agreed standards.

Minimum Acceptance Criteria (MAC 2.0)

The following standards for safe patient and sample identification ensure that the correct result will be available to guide management.

Requests which fail to fulfil MAC 2.0 will be rejected.

If the collection process is not completed on EPIC, the laboratory will not receive an electronic request as a result the request will not meet MAC 2.0 and therefore will not be processed.

MINIMUM ACCEPTANCE CRITERIA	
SAMPLE	REQUEST FORM
<ul style="list-style-type: none"> • H&C number ¹ • Patient Official First Name • Surname • Date of Birth (dd/mm/yyyy) • Name / signature of staff member taking the sample ⁴ 	<ul style="list-style-type: none"> • H&C number ¹ • Patient Official First Name • Surname • Sex • Date of Birth (dd/mm/yyyy) • Date & Time of Sample Collection • Full Name of GP and GP Cypher code² • GP Practice Name and Practice code • Test Requested • Specimen type and Anatomical Site ³ <p><i>(where relevant)</i></p> <ul style="list-style-type: none"> • Name / signature of staff member taking the sample ⁴
Footnote	
<ol style="list-style-type: none"> 1. The H&C Number must be used unless the patient is not registered with a GP in NI / is registered but does not yet have their H&C number (in which case, it must clearly state "No H&C number available" on the request form) or In an emergency situation when the identity of the patient is UNKNOWN (in which case, use the local hospital emergency numbering system) 2. Only cyphers for salaried GP's /Partners issued and managed by BSO FPS are acceptable. Locally derived Cyphers for locums, trainee's etc., are not acceptable and will result in sample being rejected under MAC 2.0 3. Mandatory for Microbiology and Virology only 4. Mandatory for Blood Transfusion only 	

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- If the location/source and requesting practitioner is not specified, laboratory staff cannot telephone critical results.
- Some tests are time-specific and if the date and time of sampling are not stated on the request form, the accuracy of such results cannot be assured.

NOTE: It is recommended that all categories listed as desirable are completed to ensure a more comprehensive service.

- Clinical information should be provided on the request form for all requests but is essential for specific IgE & ANCA requests. For vaccine studies, it is essential to state on the request form whether the sample is pre or post vaccination.

All specimens from known or suspected carriers of Category III pathogens, e.g. Hepatitis B, Hepatitis C, HIV, CJD or COVID-19 MUST be clearly marked with hazard labels on the request form and the specimen tube.

Samples with inadequate identifying information will be rejected.

Referral Tests

Specialised tests which are not available in the Belfast Trust may be sent to selected referral laboratories for analysis by arrangement. The referral centre names are provided with the laboratory reports. Further details are available upon request.

Data Protection

The legal requirement for the Trust and its staff to treat personal information confidentially and hold it securely is set out in the UK General Data Protection Regulation (UK GDPR) and the UK Data Protection Act 2018.

The Belfast Health & Social Care Trust has the following document in place and it is available via the BHSC Intranet site or from the laboratory on request:

Policy code BHSC/PPI (06): Policy on the Data Protection and Protection of Personal Information

Comments/Complaints

The Regional Immunology Service adheres to the Belfast Trust 'Policy and procedure for the management of complaints and compliments'. A copy is available from the laboratory upon request. Comments or compliments should be directed to the Immunology Laboratory Services Manager, Mrs Denise Difallah by post, email or telephone.

Tel: 02896 151562 or RGH ext 51562 denise.difallah@belfasttrust.hscni.net

Service Agreement

Each request accepted by the Regional Immunology Laboratory for examination(s) shall be deemed to be an agreement by the user for the Belfast Health & Social Care Laboratory services, or other accredited laboratories as may be used to perform testing outside repertoire, to carry out the necessary testing and reporting function. It

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also implies an acceptance of the conditions of preparation and transport as outlined in this manual.














Please Note: Tests and specimen types listed below are for guidance only. For tests not listed below, or specimen types not listed within a particular test please contact the laboratory to discuss clinical requirements.

Measurement Uncertainty















The uncertainty of measurement for each test listed in the repertoire table below can be obtained on request from the Quality Officer. See contact details at the start of this manual.

For a compendium of Immunology tests available please see pages 11-19
















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Immunology tests listed in alphabetical order (Where Anti- is at the start of a test name the second part of the name is used for alphabetical listing).				
TEST	SAMPLE REQUIREMENTS		LAB CODE	NOTES
Anti-Acetylcholine receptor antibody	Clotted		ACHO	Clinical information: Myasthenia Gravis
Adalimumab antibodies	Clotted		ADAP	
Anti-Adrenal antibody	Clotted		ADAR	Referral test
Allergic alveolitis screen (includes <i>Aspergillus fumigatus</i> , <i>Micropolyspora faeni</i> , budgerigar mix)	Clotted		EAAS	Hypersensitivity pneumonitis screen
Alternative complement pathway (part of total haemolytic complement screen)	Clotted		HCOM	AP/AH100, AP/AH50
AMPA glutamate receptor antibodies	Clotted		AMRA	Tests include: AMPA1, AMPA2, GABAb5
AMPA glutamate receptor antibodies (CSF)	CSF	Plain universal	AMRC	Tests include: AMPA1, AMPA2, GABAb5
Anaesthetic reactions	Clotted		ANXI	
ANCA Anti-neutrophil cytoplasmic antibody. Anti MPO/Anti-PR3 Vasculitis/Vasculitic screen	Clotted		MPOP	
<i>Aspergillus fumigatus</i> IgG	Clotted		ASPF	
Anti-Basal Ganglia antibody	Clotted		BGA	
Anti-Beta 2 Glycoprotein antibodies	Clotted		ACAB	IgG/IgM Cardiolipin antibodies IgG/IgM β 2-glycoprotein 1 antibodies
Anti-nuclear antibodies	Clotted		CTD	See Connective tissue disease screen
Anti-nuclear antibodies by IIF (Immunofluorescence)	Clotted		HEPI	Includes homogenous, speckled, nucleolar, perinuclear antibodies and anti-centromere antibody patterns

















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				By request and also added to ANCA requests with an indication of P-ANCA to check for the presence of ANA
Aquaporin IV antibodies	Clotted		NMO	Aquaporin 4 antibody Neuromyelitis optica antibodies
Aquaporin IV antibodies CSF	CSF	Plain universal	AQCS	Neuromyelitis optica antibodies Aquaporin 4 antibody
Beta interferon neutralizing antibody (BINF)	Clotted		INBA	
BTK protein expression	EDTA		BTK	Protein deficiency in XLA Patient AND Control samples required
Budgerigar mix IgG (proteins, feathers, droppings) (Avian precipitins)	Clotted		BUD	
C1 esterase inhibitor functional	Clotted		C1NF	First line testing
C1 esterase inhibitor functional (including C1 esterase inhibitor quantitative)	Clotted		C1F	**URGENT REFERRAL** By request only Only for patients with a previously low C1NF result
Anti-C1Q Antibody	Clotted		C1QA	
Anti-C1Q Level	Clotted		C1Q	
C2 Complement	Clotted		COM2	
C3 Nephritic factor	Clotted		CNEF	Only referred if C3 levels are low
Anti-Cardiac Muscle antibody	Clotted		CRDM	
Anti-Cardiolipin antibody	Clotted		ACAB	IgG/IgM Cardiolipin antibodies IgG/IgM β 2-glycoprotein 1 antibodies
Anti-CASPR2 antibody	Clotted		CASP	
Anti-CASPR2 antibody CSF	CSF	Plain universal	CASC	
Anti-CCP antibody	Clotted		CCPA	Cyclic Citrullinated peptide














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CD40/CD40 ligand	EDTA Lithium heparin			Maintain at room temperature Control sample required
CGD protein analysis	EDTA		CGD	Includes gp91 and gp47 Patient AND Control samples required
Classical complement pathway (part of total haemolytic complement screen)	Clotted		HCOM	CH100, CH50
Coeliac screen (IgA tissue transglutaminase)	Clotted		TGA	
Coeliac IgG screen	Clotted		CDG	IgG anti-Endomysial antibodies
Connective Tissue Disease Screen (including requests for dsDNA and ENA (extractable nuclear antigen) antibodies)	Clotted		CTD	DNA, U1RNP (RNP70, A, C), SM, SS-A/Ro 52/60, SS-B/La, Centromere B, Scl-70, Jo-1, Fibrillarin, RNA Pol III, Rib-P, PM-Scl, PCNA, Mi-2.
Crithidia antibody	Clotted		CRI	By request or Reflex test added to positive dsDNA samples if no previous positive CRI results in patient's history
CTLA4	EDTA			
Cytotoxic assay	EDTA		CAI	Granule release and Perforin Patient AND Control samples required
Diabetes autoantibodies	Clotted		IA2	See IA2 panel
Diphtheria toxoid antibody	Clotted		DIPA	
dsDNA antibody	Clotted		Code CTD	Reflex test from equivocal/positive CTD screen
Anti-DPPX antibodies	Clotted		DPPX	
ENA or Extractable nuclear antigens	Clotted		Code CTD	Reflex test from equivocal/positive CTD screen
Anti-Endomysial antibodies IgA	Clotted		ENDO	Automatically added when transglutaminase is ≥ 4 EliA U/ml















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Anti-Endomysial antibodies IgG	Clotted		CDG	See Coeliac IgG screen
Epithelia mix	Clotted		EX1	
Etanercept antibodies	Clotted		ETA	
Extended B cell panel	EDTA		BEXT	Maintain at room temperature
Extended T cell panel/ Naïve T cell panel	EDTA			Maintain at room temperature
Extended Nut panel	Clotted		NUTS	Peanut, Hazelnut, Brazil, Almond, Cashew, Pistachio, Walnut, Pecan, Pine, Macadamia Nut, Ara h 2 Peanut, Ana o3 cashew nut.
Factor H	Clotted		CFH	
Factor I	Clotted		CFI	
GABA-A antibodies CSF	CSF	Plain universal	GABC	
GABA-b antibodies	Clotted		AMRA	See AMPA glutamate receptor antibodies
Anti-GAD antibody	Clotted		GAD	Glutamic acid decarboxylase
Anti-GAD antibody CSF	CSF	Plain universal	GAD	Glutamic acid decarboxylase
Anti-Ganglionic acetylcholine receptor antibody	Clotted		ACHG	
Anti-Gastric Parietal cell antibody	Clotted		GPC	
Anti-GBM antibody (Glomerular basement membrane)	Clotted		GBMA	Goodpasture's syndrome
Anti-Gliadin antibody	Clotted		GLI	
Anti-Glycine antibody	Clotted		GLYA	
Anti-Glycine antibody CSF	CSF	Plain universal	GCR	
Anti-Glycolipid antibodies	Clotted		GGM	GM1, GM2, GD1a, GD1b, GQ1b














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Anti-Granulocyte antibody	Clotted or EDTA		AGA	Anti-neutrophil antibody Further testing may be requested requiring an EDTA sample
Haemolytic complement screen	Clotted		HCOM	Classical complement Alternative complement Mannose binding lectin
Haemophilus influenza antibodies	Clotted		HIB	
HEP-2 antibodies	Clotted		HEPI	Anti-nuclear antibodies by IIF (Immunofluorescence)
Anti-Histone antibody	Clotted		HIST	
HLA-DR	EDTA		LAS5	Maintain at room temperature Reflex test
HMGCoA receptor antibodies	Clotted		HMG	
IA2 antibody panel	Clotted		IA2	Panel contains: Anti-GAD antibodies (GADD), IA-2 antibodies (IA2D) Zinc transporter 8 antibodies (ZNT8)
Anti-IgA antibodies	Clotted		AIGA	Only request for the investigation of blood transfusion reaction with specific IgA deficiency
IgD Immunoglobulin D	Clotted		IGD	Measurement of IgD is indicated in the investigation of hereditary periodic fever syndromes
IgLON5 antibodies	Clotted		LON5	
IgLON5 antibodies (CSF)	CSF	Plain universal	LONC	
Infliximab antibodies	Clotted		IFXS	
Inhaled allergens	Clotted		INHS	House dust mite (D1), epithelial mix (EX1), grass pollen mix (GX1)













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Innate signalling studies	EDTA Lithium heparin Clotted		ISS	Formerly Type 1 cytokine 10ml LiHep (patient & control) 2-5ml EDTA (patient & control) 2-5ml clotted (patient & control)
Anti-Intrinsic factor antibody	Clotted		IFA	Clinical information – Pernicious anaemia
Anti-LGI1 antibody	Clotted		LGI1	
Anti-LGI1 antibody CSF	CSF	Plain universal	LGIC	
Liver autoantibody screen	Clotted		AA3	Anti-Mitochondrial (MITO), Anti-Smooth muscle (SMA), Anti- Liver Kidney Microsomal (LKM) Relevant clinical indications e.g. Chronic active hepatitis (CAH), Primary biliary cirrhosis (PBS), Liver antibodies
Liver blot	Clotted		LIVB	See Anti-soluble liver antigen
LKM (Liver kidney microsomal) antibody	Clotted		AA3	See Liver autoantibody screen
LRBA	EDTA		LRBA	
Lymphocyte phenotyping	EDTA		LAS1	Maintain at room temperature
Lymphocyte proliferation	Lithium heparin		LSPR	Maintain at room temperature Control sample required
Anti-MAG antibody	Clotted		MAG	Myelin associated glycoprotein
Mannose Binding Lectin	Clotted		MBL	Part of Haemolytic complement screen. Individual test by prior arrangement only
Memory B Cell panel	EDTA		BEXT	
Meningococcal C antibody	Clotted		MCA1	Serotype C only
Meningococcal serotype antibodies	Clotted		MENG	Serotypes A, B, C, Y, W


















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<i>Micropolyspora faeni</i>	Clotted		FAEN	
Anti-Mitochondrial antibody	Clotted		AA3	See Liver autoantibody screen
Anti-MOG antibody	Clotted		MOG	Myelin oligodendrocyte glycoprotein
Anti-MOG antibody CSF	CSF	Plain universal	MOGC	Myelin oligodendrocyte glycoprotein
Molecular IRAK analysis	EDTA		IRAK	
MUSK (Muscle specific kinase) antibody	Clotted		MUSI	
Myositis antibody panel	Clotted		MYOE	Includes Ro52, OJ, EJ, PL-7, PL-12, SRP, Jo-1, PM-Sc175, Pm-Sc1100, Ku, SAE1, NXP2, MDA5, TIF1g, Mi-2b, Mi-2a antibodies
Neuronal antibody screen (Anti-Hu, Anti-Ri, Anti-Yo)	Clotted		NABS	Currently not tested in house – send as referral NAB2
Neuronal antibodies – referral test	Clotted		NAB2	Used for NABS samples for further testing in Headington, Oxford Anti-Hu, Ri, Yo, Ma1, Ma2, TR, CV2/CRMP5, amphiphysin antibodies
Neuronal antibodies CSF	CSF	Plain universal	NABC	
Neutrophil integrins	EDTA		INTI	CD11a, CD11b, CD11c, CD15, CD18 Maintain at room temperature Control sample required
Neutrophil respiratory oxidative burst	EDTA		NROB	Maintain at room temperature Control sample required
NMDA receptor antibodies	Clotted		NMDA	<i>N</i> -methyl-D-aspartate receptor
NMDA receptor antibodies CSF	CSF	Plain universal	FNMC	<i>N</i> -methyl-D-aspartate receptor
NMO antibodies	Clotted		NMO	Neuromyelitis optica antibodies Aquaporin 4 antibody
NMO antibodies CSF	CSF	Plain universal	AQCS	Neuromyelitis optica antibodies Aquaporin 4 antibody
Normal muscle antibody	Clotted		NMA	

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Orexin CSF	CSF	Plain universal	OREX	
Paraneoplastic antibodies (Anti-Hu, Anti-Ri, Anti-Yo)	Clotted		NABS	Currently not tested in house – send as referral NAB2 In house screen- referred to Oxford if possible positive. If any subtype specified e.g. Anti-CV etc. sample referred i.e. Code as NAB2
Paraneoplastic antibodies – Referral test	Clotted		NAB2	Used for NABS samples for further testing in Headington, Oxford Anti-Hu, Ri, Yo, Ma1, Ma2, TR, CV2/CRMP5, amphiphysin antibodies
Paraneoplastic antibodies CSF	CSF	Plain universal	NABC	
Paranodal antibodies	Clotted		PARA	Neurofascin, Contactin, and Caspr1 Proforma required.
Periodic fever	EDTA		PFI	
Anti-Phospholipase A2 receptor	Clotted		PA2A	
Anti-phospholipid antibodies	Clotted		ACAB	IgG/IgM Cardiolipin antibodies IgG/IgM β2-glycoprotein 1 antibodies
Pigeon mix IgG (proteins, feathers, droppings)	Clotted		PIG	
Anti-Pituitary antibodies	N/A	N/A	PITA	Test no longer available – code and PID – LIMS results with automatic comment “Assay no longer available.”
Pneumococcal serotype specific antibody	Clotted		PSSA	
Anti-recoverin antibodies / Anti-retinal antibodies	Clotted		RAB	
Anti-RNA Polymerase antibody	Clotted		RPAB	
Anti-Salivary gland antibody	Clotted		SALI	
Scleroderma Immunoblot	Clotted		SCIB	Includes: Ro52, PDGFR, KU, Pm-ScI75, PM-ScI100, Th/To, NOR90, U3RNP, RNAP III 155, RNAP III 11, CENP B, CENP A, ScI-70

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Serum Amyloid A	Clotted		AMYA	
Serum Mast Cell Tryptase	Clotted Lithium/EDTA heparin accepted		TRYP	Lithium heparin and EDTA samples also accepted
Anti-Skeletal muscle antibody	Clotted		NMA	
Anti-Skin antibodies – Basement membrane/desmosome	Clotted		SKIN	Currently not tested in house – sent as referral (SKNR) Clinical indications – Pemphigoid/pemphigus
Anti-Skin antibodies – Basement membrane/desmosome	Clotted		SKNR	Referral test Clinical indications – Pemphigoid/pemphigus
SLAM associated protein	EDTA		SAP	Protein deficiency in XLP Signalling lymphocytic activation molecule Patient AND Control samples required
Anti-Smooth Muscle antibody	Clotted		AA3	See Liver autoantibody screen
Soluble CD25 (IL-2)	Clotted		SC25	Sample must be sent to referral centre within 4 days of venepuncture.
Anti-soluble liver antigen	Clotted		LIVB	Includes Anti-M2, M2-3E, LKM-1, LC1, SLA, gp210, Sp100, PML and Ro52 (LBLT) blot
Specific IgE	Clotted			
Anti-Steroid cell antibodies	Clotted		OT	Ovary and Testes antibodies
TCR a/b, TCR g/d	EDTA		ABGD	Maintain at room temperature Reflex test
Anti-Tetanus toxoid antibody	Clotted		TOXI	
Thymic Emigrants	EDTA		THEM	
IgA Tissue Transglutaminase	Clotted		TGA	See Coeliac screen
Total Serum IgE	Clotted		IGE	
Anti-Tysabri antibody	Clotted		TYS	

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Anti-voltage-gated calcium channel antibody	Clotted		VGCC	
Anti-voltage gated potassium channel antibody	Clotted		VGKC	Default screening is by Anti-Caspr2 and Anti-Lgi1 antibodies
Wiskott Aldrich Syndrome Protein	EDTA		WASP	Protein deficiency in Wiskott Aldrich Patient AND Control samples required

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AUTOIMMUNE SEROLOGY



Sample requirements: One yellow topped gel sample tube required (4.0ml). Separate blood samples and request forms are needed for tests performed in separate sections of the laboratory. Please provide clinical details on the request form.

For specific disease associations please see antibody list below. All results should be interpreted in the context of the patient's clinical history. If clinical advice regarding interpretation of results is required, please use the contact details listed above.

CONNECTIVE TISSUE DISEASE

Connective Tissue Disease screen (CTD)

CTD Screen is intended for the in vitro qualitative measurement of antinuclear IgG Antibodies (ANA) in human serum and plasma as an aid in the clinical diagnosis of systemic lupus erythematosus (SLE), mixed connective tissue disease (MCTD), Sjögren's syndrome, scleroderma and polymyositis/dermatomyositis.

ANA may also occur in a number of other conditions including juvenile chronic arthritis, fibrosing alveolitis, autoimmune hepatitis, viral infections particularly EBV and CMV and in drug reactions.

CTD Screen includes U1RNP (RNP70, A, C), SS-A/Ro (60kDa, 52kDa), SS-B/La, centromere B, Scl-70, Jo-1, Fibrillarin, RNA Pol III, Rib-P, PM-Scl, PCNA, Mi-2 proteins, Sm proteins and native purified DNA.

TAT for CTD screen: 5 days

Results reported as negative/equivocal/positive.

If CTD screen is negative, connective tissue disease is unlikely.

If CTD screen is positive or equivocal, follow on testing for anti-dsDNA and anti-ENA antibodies will be undertaken.

Anti ds DNA antibody

Anti dsDNA is intended for the in vitro quantitative measurement of IgG antibodies directed to dsDNA in human serum and plasma as an aid in the clinical diagnosis of systemic lupus erythematosus (SLE).

For the diagnosis of SLE, dsDNA antibodies are considered to be a highly specific marker representing one of the diagnostic criteria for SLE (ACR criteria). More than 90% of sera from patients with active SLE contain dsDNA antibodies. Additionally, the determination of dsDNA antibodies is a tool to monitor the clinical course of a defined SLE patient, because a clear-cut relationship exists between anti-dsDNA titre and disease activity, in particular renal involvement.

Reference *EliA™ dsDNA 250-5500-023 UK Issued Oct 2020*

Our present anti dsDNA profile includes two assays for dsDNA. Positive samples are also tested for anti dsDNA antibody by crithidia; see below.

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TAT for dsDNA: 8 days

Anti dsDNA antibody: Results reported in IU/mL, 0-9 negative, 10-15 equivocal, >15 positive.

Extractable Nuclear Antigen Screen (ENA antibodies)

ENA screen contains SS-A/Ro (60kDa, 52kDa), SS-B/La, U1RNP (RNP70, A, C), Sm, Scl-70, Jo-1 and Centromere B antigens.

TAT for ENA screen: 8 days

Results reported as negative/equivocal/positive.

If ENA screen is positive or equivocal follow up testing for Anti ENA specificities will be undertaken.

Extractable Nuclear Antigen (ENA) specificities:

TAT: 14 days

Anti SS-A/Ro antibody

Detection of SS-A/Ro antibodies is of interest and significance for the clinical diagnosis of SLE (prevalence 40–50%) and Sjögren's syndrome (prevalence 60–75% for primary Sjögren's syndrome).

Reference *EliA™ Ro 250-5503-022 / UK Issued Oct 2020*

Anti Ro antibodies are also found in patients with subacute cutaneous lupus erythematosus (particularly photosensitivity), neonatal lupus, congenital complete heart block in babies born to SLE mothers (rare) and SLE with interstitial pneumonitis.

Anti-Ro (SS-A) contains Anti Ro60kDa and Anti Ro52kDa.

Results reported in EliA U/mL, 0-6 negative, 7-10 equivocal, >10 positive.

Anti SS-B/La antibody

SS-B/La antibodies are the serological hallmark of Sjögren's syndrome, but a small proportion of patients remain anti-SS-B/La negative. Reported in 6–15% of sera from SLE patients, SS-B/La antibodies are associated with a lower prevalence of dsDNA antibodies and renal disease in these patients.

Although a strong association of neonatal lupus erythematosus (NLE) with anti-SS-A/Ro was recognized first, the majority of mothers with babies with NLE are now known to have serum SS-B/La antibodies as well.

Reference *EliA™ La 250-5504-022 / UK Issued Oct 2020*

Results reported in EliA U/mL, 0-6 negative, 7-10 equivocal, >10 positive.

Anti U1RNP antibody

Antibodies to U1RNP (ribonucleoprotein) occur in patients with SLE and mixed connective tissue disease (MCTD).

Anti U1RNP contains RNP70, A, C.

Results reported in EliA U/mL, 0-4 negative, 5-10 equivocal, >10 positive.

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Anti Sm antibody

Sm antibodies, and particularly those against the SmD component, offer a highly specific, but comparatively insensitive, clinical marker for SLE. Indeed, their presence constitutes one of the revised ACR criteria for diagnosis, even though their overall prevalence ranges from 20% to 30% in SLE.

Anti Sm contains SmD^P-S.

Reference *EliA™ SmDP-S 250-5672-021 / UK Issued Feb 2021*

Results reported in EliA U/mL, 0-6 negative, 7-10 equivocal, >10 positive.

Anti Scl-70 antibody

Antibodies against Scl-70 (topoisomerase-1) are characteristic and specific for scleroderma/systemic sclerosis (particularly the diffuse form; frequency up to 70%).

Reference *EliA™ Scl-70^S 250-5637-022 / UK Issued Oct 2020*

Results reported in EliA U/mL, 0-6 negative, 7-10 equivocal, >10 positive.

Anti Jo-1 antibody

Anti Jo-1 antibodies (histidyl tRNA synthetase antibodies) are found in 20-40% of patients with aggressive polymyositis usually in association with interstitial lung disease and arthralgia. Antibodies to other tRNA synthetases are also associated with variant myositis syndromes.

Results reported in EliA U/mL, 0-6 negative, 7-10 equivocal, >10 positive.

Anti centromere antibody

These antibodies are found in patients with the limited cutaneous form of systemic sclerosis and in the CREST variant (**C**alcinosis, **R**aynaud's, **O**esophageal immotility, **S**clerodactyly, **T**elangiectasia). Also found in up to 12% of patients with primary biliary cirrhosis, over half of such patients have clinical signs of scleroderma.

Results reported in EliA U/mL, 0-6 negative, 7-10 equivocal, >10 positive.

Reference ranges provided by Phadia AB, Sweden.

Anti dsDNA antibody by crithidia. This assay is performed on samples which are dsDNA antibody positive by the EliA method (≥ 16 IU/ml). The assay has very high specificity but poor sensitivity for SLE.

Anti dsDNA antibody (Crithidia): Results reported as positive or negative.

TAT: 14 days.

Anti nuclear antibody by Hep-2 indirect immunofluorescence (IIF)

A number of clinically relevant autoantibodies can be detected using human epithelial (HEp2) cells as antigen. In the Regional Immunology Laboratory, HEp-2 cells are only used for the detection of the following ANA patterns:

Homogenous, speckled, nucleolar, perinuclear and centromere.

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Results for these antibodies are reported as negative or a positive titre. Please note this titre is an estimation of fluorescence intensity.

TAT: 14 days

For IIF tests, please note some additional patterns may be seen which have not been requested. In these instances, further tests may be reflexed by the laboratory if appropriate.

Anti histone antibody

Anti histone antibodies are found in 18-50% of patients with SLE and in 95% of patients with drug induced SLE. *This assay is performed by the Supreregional Protein Reference Laboratory, Sheffield.*

Results reported as units / ml, positive >5 U/ml.



Anti phospholipid antibodies

One yellow topped gel sample tube required (4.0ml).

Anti-cardiolipin antibodies and anti-β2 glycoprotein 1 antibodies are used, in conjunction with clinical findings, to diagnosis of Anti-phospholipid Syndrome (APS). They form part of a spectrum of anti-phospholipid antibodies. They may also be found in patients with a variety of diseases, such as infections, malignancies and autoimmune diseases.

Anti-phospholipid syndrome (APS) may be primary or secondary to systemic lupus erythematosus (SLE) or other connective tissue diseases.

The diagnosis of anti-phospholipid syndrome is based on the presence of clinical AND laboratory criteria. The major clinical features of APS are thromboses (arterial or venous) and recurrent spontaneous abortion and fetal loss. Thrombocytopenia and skin rash (livedo reticularis) may also be present. The laboratory features of APS include persistently positive anti-phospholipid antibodies (anti-cardiolipin antibodies and/or anti β2 glycoprotein 1 antibodies) and/or lupus anticoagulant. Anti-phospholipid antibodies should be present on 2 or more occasions, at moderate to high levels (>40 U/ml) at least 12 weeks apart.

A sample should also be sent to Haematology for coagulation (Lupus anticoagulant) studies.

Anti IgG and IgM cardiolipin antibody

Reported as U/ml: <20 Negative, ≥20 Positive.

TAT: 5 days.

Anti IgG and IgM β2 glycoprotein 1 antibody

Reported as U/ml: <20 Negative, ≥20 Positive.

TAT: 5 days

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Reference ranges provided by Inova Diagnostics, Inc.

Antibodies in patients with myositis / dermatomyositis.

The Myositis panel (extended) includes antibodies to Ro52, OJ, EJ, PL-12, PL-7, SRP, Jo-1, PM/ScI-75, PM-ScI-100, KU, SAE, NXP2, MDA5, TIF1, Mi-2a & Mi-2b. *This assay is performed by the Rapid Response Laboratory, Royal Free Hospital, London.*

Results for these antibodies are reported as positive or negative.

Antibodies in patients with systemic sclerosis

Anti-RNA polymerase antibodies. *This assay is performed by the Rapid Response Laboratory, Royal Free Hospital, London.*

Results for these antibodies are reported as positive or negative.

Scleroderma immunoblot

The scleroderma immunoblot includes antibodies to Ro52, PDGFR, KU, Pm-ScI75, PM-ScI100, Th/To, NOR90, U3RNP, RNAP III 155, RNAP III 11, CENP B, CENP A, ScI-70

This assay is performed by the Rapid Response Laboratory, Royal Free Hospital, London.

Results for these antibodies are reported as positive or negative.

RHEUMATIC DISEASE

One yellow topped gel sample tube required (4.0ml).

Anti cyclic citrullinated peptide antibody (CCP)

Anti-cyclic citrullinated peptide (CCP) antibodies are present in early rheumatoid arthritis (RA) and appear to be a marker of more erosive disease. The sensitivity of anti-CCP is similar to that of RF but the test is more specific for RA.

Results reported in U/mL: Negative <5.3, Positive ≥ 5.3. TAT: 5 days

Reference ranges provided by Inova Diagnostics, Inc.

GASTROINTESTINAL DISEASE

One yellow topped gel sample tube required (4.0ml).

Coeliac disease antibody screen

Requests for coeliac disease antibodies are screened for IgA anti tissue transglutaminase antibody (IgA tTG). Samples with results that are ≥ 4.0 U/mL are further tested for IgA anti endomysial antibody.

While highly specific for Coeliac Disease, the TTGA will be negative in individuals with selective IgA deficiency (sIgAD) (IgA <0.05g/L), or if gluten has been avoided pre-test (normal quantities of gluten should be consumed for 6 weeks before testing). The laboratory will automatically test for IgG endomysial antibodies if the TTGA assay produces an undetectable result.

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Parallel measurement of immunoglobulins (separate sample to Biochemistry) is recommended to exclude sIgAD. If sIgAD is detected please send a separate request for IgG endomysial antibody (if not already tested).

Anti tissue transglutaminase antibodies (TGA)

Tissue transglutaminase is the antigenic target for anti endomysial antibody, and these IgA class antibodies are tested in combination with anti endomysial antibodies bringing the sensitivity for coeliac disease to nearly 100%.

Treatment with a gluten free diet leads to gradual disappearance of these antibodies. They can also be used to monitor dietary compliance. Approx 10% of coeliac patients are only positive for either endomysial or transglutaminase antibodies.

Results reported as U/mL, <7 negative, 7-10 equivocal, >10 positive.

TAT: 10 days.

Reference ranges provided by Thermofisher, EliA Celikey IgA directions for use.

The analytical measuring range (AMR) of Ttg IgA is 0.2 to \geq 128 EliA U/ml.

Anti endomysial antibodies (EMA)

These IgA class antibodies are very specific (90-100%) for coeliac disease (CD) and dermatitis herpetiformis (DH). Treatment with a gluten free diet leads to gradual disappearance of these antibodies. They can also be used to monitor dietary compliance. IgG class anti endomysial antibodies may be detected in IgA deficient patients with coeliac disease.

Results reported as positive or negative. TAT: 14 days.

Interpretation of coeliac antibody results: IgA tissue transglutaminase (TTG) is a useful screening test for coeliac disease, whereas IgA endomysial antibodies (EMA) are more disease specific and will automatically be performed when the IgA TTG level is >4.0 . Both tests may become negative in patients with coeliac disease on a gluten free diet. Duodenal biopsy remains the gold standard test for diagnosis.

Anti gastric parietal cell (GPC) antibodies

Anti GPC antibodies are present in 95% of patients with pernicious anaemia in the early stages and in patients with atrophic gastritis (type A). They are also associated with other organ specific autoimmune diseases especially autoimmune thyroid disease. Also found in the normal population (the incidence rising with increasing age). Anti-intrinsic factor antibody is a better confirmatory test for pernicious anaemia.

Results reported as negative or positive. TAT: 14 days.

Please note some additional patterns may be seen which have not been requested. In these instances, further tests may be reflexed by the laboratory if appropriate.

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Anti intrinsic factor antibodies (IFA)

Anti IFA antibodies are highly specific for pernicious anaemia and are found in up to 75% of patients. Highly specific if found in combination with gastric parietal cell antibody. Anti-intrinsic factor antibody may be detected before anaemia develops.

Results reported in units, negative ≤ 20 , equivocal 20.1-24.9, positive ≥ 25

Reference range provided by Inova Diagnostics.

TAT: 14 days



AUTOIMMUNE LIVER DISEASE

One yellow topped gel sample tube required (4.0ml)

Antinuclear antibody

Please request ANA as a separate test and provide clinical details on the request form.

Liver associated antibodies (the following three autoantibodies are detected as part of the liver associated autoantibody screen):

Anti smooth muscle antibody

These antibodies can occur in high titres in patients with autoimmune hepatitis. Low titre antibodies may be detected after infection.

Results reported as titre, positive >40 . TAT: 14 days.

Anti mitochondrial antibody

Anti mitochondrial antibodies are detected at high titre in 95% of patients with primary biliary cirrhosis. They can also be found in patients (usually lower titres) with chronic active hepatitis, autoimmune thyroiditis and Sjogren's syndrome.

Results reported as a titre, positive >40 . TAT: 14 days.

Anti liver kidney antibodies (LKM)

Anti LKM-1 antibodies are associated in patients with type 2a and 2b autoimmune hepatitis. This is the most common form of autoimmune hepatitis in childhood and has a particularly poor prognosis and can be associated with hepatitis C infection. Anti LKM-2 antibody is associated with drug induced hepatitis and LKM-3 antibody is associated with hepatitis D infection.

Results reported as titre, positive >40 . TAT: 14 days.

Please note some additional patterns may be seen which have not been requested. In these instances, further tests may be reflexed by the laboratory if appropriate.

Anti M2, anti LKM, anti Liver cytosol-1 (LC-1) and soluble liver antigen (SLA) antibodies (Liver antibodies line blot)

These antibodies are found in patients with primary biliary cirrhosis and autoimmune hepatitis 1 and 2. Antibodies in the panel include Anti-SLA, M2, LKM, LC1, Ro-52,

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GP210, PML, SP 100 & M2-3E. *This assay is performed by the Immunology Laboratory, King's College Hospital, London.*

Results for these types of antibody are reported as positive or negative.

ENDOCRINE DISEASE

One yellow topped gel sample tube required (4.0ml).

Anti adrenal antibodies

These antibodies are detected in 60-70% of patients with idiopathic Addison's disease. *This assay is performed by the Supraregional Protein Reference Laboratory, Sheffield.*

Results reported as negative or positive.

Part of endocrine antibody panel- reported with ovary/testes antibodies.

Diabetic antibodies

This panel includes Anti IA-2, ZNT8 & GAD antibodies. If the diagnosis being queried is type 1 diabetes, then the presence of 1 or more of the diabetes autoantibodies is highly supportive. *This assay is performed by the Immunology Laboratory, King's College Hospital, London.*

Results reported in U/mL.

Reference range provided by Kings: IA-2 <7.5, ZNT8 <15 & GAD <5.0

Anti glutamic acid decarboxylase (GAD) antibodies.

These antibodies are found in >60% of patients with the stiff man syndrome (high titre) and also in patients with type 1 diabetes mellitus. *This assay is performed by The Immunology Department, Churchill Hospital, Oxford.*

Results reported as U/ml, normal range 0-5 U/ml.

Anti ovary/testes antibodies

A number of antibodies react with various cell types within the ovary and testes. Antibodies found in patients with Type 1 autoimmune polyendocrinopathy syndrome and premature gonadal and ovarian failure. *This assay is performed by the Supraregional Protein Reference Laboratory, Sheffield.*

Results reported as negative or positive.

Part of endocrine antibody panel- reported with adrenal antibodies.

NEUROLOGICAL DISEASE

One yellow topped gel sample tube required (4.0ml).

Anti acetyl choline receptor antibody (AChR) and .

These antibodies are a highly sensitive and specific marker for generalised myasthenia gravis (80-90% sensitivity); up to 90% of generalised MG cases are AChR positive for AChR antibodies whilst in pure ocular MG up to 50% of patients are positive.

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Anti muscle specific kinase antibody (MuSK).

These antibodies are found in up to 50% of patients with generalised myasthenia gravis who are negative for anti AChR antibody.

AChR and MUSK antibodies are performed by IIF as a first line screen in a combined assay. Results are reported as positive/ negative.

If AChR antibodies are positive by IIF, reflex testing for AChR by radioimmunoassay (RIA) is performed (results are reported as a quantitative value).

This assay is performed by The Immunology Department, Churchill Hospital, Oxford.

First line IIF results are reported as positive or negative

AChR RIA results reported as antibody concentration:

Negative <5 x10⁻¹⁰mol/L

Low Positive 5 -10 x10⁻¹⁰mol/L,

Positive >10 x10⁻¹⁰mol/L

TAT: 21 days.

Anti Glycolipid antibodies (GM1, GM2, GD1a, GQ1b).

These antibodies are associated with a number of peripheral neuropathies. Anti GM1/GM2 antibodies are associated with Guillain Barré syndrome (GBS), chronic demyelinating polyneuropathy and multifocal motor neuropathy. Anti GQ1b antibodies are associated with Miller Fisher variant of GBS. Anti GD1a antibodies are associated with Acute Motor Axonal Neuropathy (AMAN) variant of GBS.

This assay is performed by The Neurological Sciences, Southern General Hospital, Glasgow.

Results reported as titre, Negative result is a titre of <1/500.

Anti muscle specific kinase antibody (MuSK).

These antibodies are found in approx 40% of patients with generalised myasthenia gravis who are negative for anti AChR antibody. *This assay is performed by The Immunology Department, Churchill Hospital, Oxford.*

Results are reported as positive or negative.

Anti paraneoplastic antibodies (neuronal nuclear and purkinje cell).

These antibodies are associated with paraneoplastic disorders with accompanying carcinomas. They include anti Yo (PCA), anti Hu (ANNA-1) and anti Ri (ANNA-2) antibodies. Further testing can include Western blot to Yo, Hu, Ri, Ma 2, CV2/CRMP5, amphiphysin, Zic-4, Sox-1, Tr, Titin and Recoverin antibodies.

This assay is performed by The Immunology Department, Churchill Hospital, Oxford.

Results are reported as positive or negative.

Anti NMDA (N-methyl D-aspartate) receptor antibody.

Associated with limbic encephalitis, SLE, ataxia, epilepsy partialis continua and prominent psychiatric symptoms such as behavioural and cognitive problems and seizures.

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This assay is performed by The Immunology Department, Churchill Hospital, Oxford.
Results are reported as positive or negative.

Muscle antibodies:

Anti striated (skeletal) muscle antibody and Anti Cardiac Muscle antibody

Striated: These antibodies are present in some patients with myasthenia gravis and almost all (80 – 100%) patients with thymomatous myasthenia gravis. They can also occur in patients with hepatitis, acute viral infections and polymyositis.

Cardiac: Cardiac muscle antibodies are described in patients with Dressler's syndrome after myocardial infarction, cardiomyopathy, myocarditis and in patients who have undergone cardiac surgery or have had rheumatic fever.

These assays are performed by the Supraregional Protein Reference Laboratory, Sheffield.

Results reported as positive or negative.

Anti voltage gated calcium channel antibody (VGCC).

These antibodies are found in patients with the Lambert-Eaton myasthenic syndrome (LEMS). *This assay is performed by The Immunology Department, Churchill Hospital, Oxford.* **Results reported in pmol/L, positive >45pM.**

Anti voltage gated potassium channel antibody (anti VGKC ab)/ Anti-Caspr2 antibody and Anti-Lgi1 antibody.

These antibodies are associated with acquired neuromyotonia.

Please note requests for VGKC antibodies will be tested for Anti-Caspr2 and Anti-Lgi1 antibodies. This is the default screening pathway set by the referral centre.

<https://www.ouh.nhs.uk/immunology/diagnostic-tests/tests-catalogue/potassium-channel-antibodies.aspx>

These assays are performed by The Immunology Department, Churchill Hospital, Oxford.

Results reported as positive or negative.

Anti Aquaporin 4 antibody

Antibodies found in 80% of patients with neuromyelitis optica (NMO) or Devic's disease and approx 50% of patients with longitudinally extensive transverse myelitis.

This assay is performed by The Immunology Department, Churchill Hospital, Oxford.

Results are reported as positive or negative.

Anti basal ganglia antibody (ABGA)

These antibodies have been associated with Sydenham's chorea, tic disorders and encephalitis lethargic like syndrome, all associated with streptococcal infections. *This assay is performed by The Neuroimmunology and CSF laboratory, Institute of Neurology, Queens Square, London.*

Results are reported as positive or negative.

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Beta interferon neutralizing antibodies.

This assay is performed by The Neuroimmunology and CSF laboratory, Institute of Neurology, Queens Square, London.

Results are reported as positive or negative.

Pemphigoid and Pemphigus Antibodies. Skin Antibodies.

Diagnosis of autoimmune bullous skin diseases (pemphigus and pemphigoid).

This assay is performed by the Supraregional Protein Reference Laboratory, Sheffield.

Results are reported as weak positive, positive or negative.

RENAL DISEASE ASSOCIATED ANTIBODIES



One yellow topped gel sample tube required (4.0ml).

Routine ANCA testing comprises of MPO-ANCA and PR3-ANCA only.

New positive for MPO-ANCA and/or PR3-ANCA samples will be automatically reflexed for indirect immunofluorescence. If indirect immunofluorescence is required on a sample which is negative for MPO-ANCA and/or PR3-ANCA or required clinically please contact the laboratory.

Reference ranges provided by Thermofisher.

Anti Myeloperoxidase antibody (MPO) TAT 2 days

Myeloperoxidase is the target antigen for the majority of P-ANCA and is associated with microscopic polyangiitis and Churg Strauss syndrome, but can also be found in some patients with GPA.

Results reported in IU/mL.

Reference range: Negative <3.5, equivocal 3.5 – 5.0, positive >5.0 IU/mL

MPO: The reportable range of the assay is 0.2 to ≥ 134 IU/mL.

Anti Proteinase-3 antibody (PR3) TAT 2 days

Proteinase 3 (PR3) is the major target antigen for C-ANCA. The detection of anti PR3-ANCA has a high predictive value for Granulomatosis with polyangiitis .

Results reported in IU/mL.

Reference range: Negative <2.0. equivocal 2.0 – 3.0, positive >3.0 IU/mL

PR3: The reportable range of the assay is 0.6 to ≥ 177 IU/mL

Anti neutrophil cytoplasmic antibodies (ANCA) TAT 2 days

Indicated in the investigation of ANCA associated vasculitis. Main patterns recognised, are cytoplasmic (C-ANCA) and perinuclear (P-ANCA).

C-ANCA with specificity for proteinase-3 (PR-3) has a high predictive value for active generalized Granulomatosis with polyangiitis (GPA) and can also be found in patients with microscopic polyangiitis (MPA).

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P-ANCA with anti-myeloperoxidase (MPO-ANCA) specificity is predictive for patients with active MPA and Churg Strauss syndrome (CSS), some patients with GPA also have this antibody. P-ANCA with specificities other than MPO-ANCA occur in some patients with inflammatory bowel disease, sclerosing cholangitis, rheumatoid arthritis, systemic lupus erythematosus, chronic active hepatitis and other autoimmune diseases. In such patients, ANCA levels are often low and of uncertain significance.

The presence of p-ANCA staining can be masked by ANA staining. If anti-nuclear antibody is detected during ANCA testing we cannot comment on the presence of p-ANCA.

The ANCA assay will only be performed on patients with clinical features associated with ANCA associated vasculitis (GPA, MPA, CSS).

Results reported as a titre, positive titre ≥ 20 .

Anti glomerular basement membrane antibodies (GBM)

These antibodies are found in patients with Goodpasture's syndrome (>90% sensitivity).

Results reported in CU (chemiluminescent units).

Reference range Negative <7.0, equivocal 7.0 – 10.0, positive >10.0 EliA U/ml.

Reference ranges provided by Thermofisher.

GBM: The reportable range of the assay is 1.5 to 680 EliA U/ml.

The laboratory will endeavour to contact the requesting doctor upon the detection of a new positive GBM or ANCA with associated positive MPO/PR3 result providing that the requesting source has been specified.

Urgent MPO-ANCA & PR3-ANCA/GBM requests may be tested on the same day of sample arriving at laboratory if during normal working hours. All tests must be booked with the laboratory. The laboratory may not be able to process unbooked samples due to time and staffing constraints.

Samples must be in the lab by 2pm on the day of testing.

Please contact the laboratory prior to sending.

C3 nephritic factor (C3 Nef)

These antibodies, to the alternative pathway C3 convertase, are found in patients with membrano-proliferative glomerulonephritis (type II) and partial lipodystrophy. *These assays are performed by the Supraregional Protein Reference Laboratory, Sheffield.*

Results reported as detected or not detected.

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OTHER AUTOANTIBODIES

Anti C1q antibodies

Antibodies to C1q may be associated with renal disease activity in patients with SLE. High levels are found in patients with hypocomplementaemic urticarial vasculitis syndrome (HUVS). *These assays are performed by the Supraregional Protein Reference Laboratory, Sheffield.*

Results reported as ELISA U/ml, positive value >15 U/ml.

Anti-IgA antibodies

These antibodies may occur in patients with selective IgA deficiency. They can cause blood product transfusion reactions. *This assay is performed by the NHS Blood and Transplant Centre, Barnsley.*

Results reported as negative or positive with titre.

Granulocyte Immunology

Anti Granulocyte Antibodies for the investigation of Autoimmune neutropenia, neonatal alloimmune neutropenia and drug induced antibody mediated neutropenia. *These assays are performed by NHS Blood and Transplant Histocompatibility & Immunogenetics service, Bristol.*

For more information please see form

<https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/14481/frm100131-hi-request-form-3e-granulocyte-immunology.pdf>

Infliximab and Adalimumab therapeutic drug monitoring

Sample requirements: One 4mL yellow topped gel sample tube is sufficient for drug and antibody level measurements.

To aid interpretation of results, it is desirable that the following information is included on the request form:

- Infusion dosing interval
- Number of infusions to date
- Reason for request, i.e., poor response
- Primary diagnosis

This assay is performed by the Blood Sciences Department, Royal Devon & Exeter Hospital.

Therapeutic ranges

<https://www.exeterlaboratory.com/test/anti-tnf-drug-and-antibody-testing-at-exeter-clinical-laboratory/>

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Other autoantibodies may be available on request: Please contact the laboratory.

IMMUNOCHEMISTRY



Sample requirements: One 4mL yellow topped gel sample tube is sufficient for all immunochemistry measurements, unless otherwise stated below.

IgD

Measurement of IgD is indicated in the investigation of hereditary periodic fever syndromes.

These assays are performed by the Supraregional Protein Reference Laboratory, Sheffield. Results reported as mg/L, normal range 13-132 mg/L.

IgE

See allergy section

Functional (specific) antibodies

Antibodies to pneumococcal specific antigens (PSSA) are available from *Clinical Immunology Laboratory Cambridge University Hospital*.

Antibodies to tetanus IgG, meningococcal C, haemophilus and diphtheria are available from *The Meningococcal Reference Unit, Manchester*.

[Meningococcal reference unit \(MRU\): user manual - GOV.UK \(www.gov.uk\)](#)

[Tetanus-IgG-Antibody-Determination.pdf](#)

[Haemophilus-influenzae-type-b-IgG-Antibody-Determination.pdf](#)

[Microsoft Word - Diphtheria IgG Antibody Determination](#)

Functional antibody tests are of limited value and are used mainly in the investigation of primary immune deficiency. For advice, please contact immunology medical staff.

**Results are reported as: Tetanus IgG: IU/mL, PSSA: ug/ml, MCA: rSBA titre, HIB: ug/ml, DIP: IU/ml
TAT: 35 days.**

Classical (CH50), Alternative (AH50) and Mannose Binding Lectin (MBL) pathway, Haemolytic Complement Functional Assays.

Sample requirements: One yellow topped gel sample tube required (4.0ml). Samples must be received by the laboratory within 24 hours of venepuncture. Samples received >24 hours will be rejected.

Screening tests for complement pathway deficiencies in patients with clinical history suggesting high probability of such deficiencies. The clinical symptoms (including type

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of infectious organisms concerned in repeated infections) give a strong indication of likely deficiencies.

Values within the normal range indicate that the pathway components are present. Please note that a true deficient MBL pathway, i.e. an activity of <10%, may be found in a normal population at a frequency of 20-30%

Normal range:

Classical pathway $\geq 69\%$

Alternative pathway $\geq 30\%$

Mannose binding lectin pathway $\geq 10\%$

C1 esterase inhibitor (functional)

Sample requirements: One yellow topped gel sample tube required (4.0ml).

Samples must ideally be received in the laboratory within 24 hours of venepuncture. Samples that arrive in the laboratory within 24 to 48 hours after venepuncture may be tested, but low results must be interpreted with caution.

Samples received >48 hours will be rejected.

In type I hereditary angioedema (HAE) (85% of patients), low levels of C1 esterase inhibitor (C1INH) are found by both the quantitative and functional assays. In type II HAE (15% of patients) normal or raised levels of functionally inactive C1INH are detected. Consequently, the functional C1INH assay is essential for this diagnosis. Both types of HAE are associated with low or absent C4 levels during an attack.

Reduced levels of C1INH (quantitative and functional) and C1q are found in the rarer acquired form of C1INH deficiency. This condition generally occurs secondary to underlying disease, most frequently lymphoproliferative disorders.

C1INH functional will be tested on all samples. C1INH quantitative (see below) will only be tested on samples with a C1INH functional result that is below the normal range.

Normal range: C1INH (functional) 70 -130%

Reference range supplied by Technochrom®

TAT: functional – 14 days

C1 esterase inhibitor (quantitative)

Quantitative C1 inhibitor is no longer measured routinely. If the functional C1 inhibitor level is found to be low, quantitative C1 inhibitor will be measured automatically.

This assay is performed by the Molecular Immunology Service, Cardiff.

Normal range 0.2-0.47 g/L

Minimum retest interval: 1 year

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ALLERGY



Sample requirements: One 4.0mL yellow topped gel sample tube is sufficient for all allergy testing, unless otherwise stated below.

Total IgE

Total serum IgE is usually elevated in patients with atopic disease. However, levels do not correlate with severity of disease and a raised IgE does not necessarily indicate the presence of allergic disease. Other conditions where serum IgE levels are raised include: parasitic diseases, some rare immunodeficiencies, atopic eczema, eosinophilia, bronchopulmonary aspergillosis and in some lymphoid malignancies.

Age | Normal range (KU/L)

Newborn – 3 Months	<5
3 months – 1 year	<11
1 year – 5 years	<29
5 years – 10 years	<52
10 years – 15 years	<63
15 years - Adult	<75
Adult *	<81

* Adult values are not stabilized until 15-20 years of age

Reference ranges established by the PRU, Sheffield.

<https://www.pru-sheffield.org.uk/TestItem.asp?id=480>

(Reference ranges were established using a population with demographics similar to Northern Ireland population).

TAT: 5 days.

Allergen specific IgE

Allergen specific IgE testing is of value where skin testing is difficult to perform, or contraindicated, i.e.

- in very young children.
- in patients with severe/extensive eczema or dermatographism.
- in patients taking anti-histamines which cannot be stopped.
- in patients in whom there is a significant risk of an anaphylactic reaction, the use of allergen specific IgE testing must be carefully considered and is not a substitute for careful clinical assessment.

High levels of specific IgE against a wide range of inhalant and food allergens are frequently found in patients with atopic eczema. The clinical significance of such sensitisation is often unclear.

Over 100 specific allergens are available for testing, however “screening” for allergy using allergen specific IgE is not usually helpful.

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If requesting allergen specific IgE testing, please provide as much clinical information as possible, and which specific allergens are required.

The detection of allergen specific IgE in serum is not diagnostic of clinical allergy, nor does the failure to detect allergen specific IgE exclude the diagnosis. Specific IgE concentrations (Ku/L) do not correlate with clinical severity of allergic reactions.

Reference range: 0 – 0.35 kUA/l

Reference ranges provided by Phadia AB, Sweden.

TAT: 5 days.

Booklets are available on House Dust Mite Allergy and Peanut Allergy. Copies may be obtained from the Immunology Secretaries in the Immunology Day Centre. Phone 02896 150088

Extrinsic allergic alveolitis screen.

May be used in the investigation of patients with respiratory conditions in whom hypersensitivity reactions to inhaled organic material is suspected. These conditions are often associated with occupational exposure, for example, farmers' lung (thermophilic fungi) and bird fanciers' lung (pigeons, caged birds).

Assays, which may be requested individually or as a screen include:

IgG antibodies to aspergillus fumigatus. Results in mg antigen/litre, normal range <40.

IgG antibodies to micropolyspora faeni. Results in mg antigen/litre, normal range <10.

IgG antibodies to pigeon protein. Results in mg antigen/litre, normal range <32.

IgG antibodies to budgerigar protein. Results in mg antigen/litre, normal range <30.

TAT: 5 days.

Reference ranges established in-house.

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Anaphylaxis

Via encompass: to request Lab testing for Anaesthetic - Select "Anaesthetic Mast Cell Tryptase"

Process notes:

Serial blood samples in 4mL yellow topped gel sample tubes are required:

1st sample: as soon as resuscitation has started

2nd sample: 2 hours after reaction

3rd sample: 24 hours after reaction

Samples should be marked General Anaesthetic Panel and sent to the regional Immunology Laboratory, Royal Hospital, Belfast (02896151568)

Investigation of suspected anaphylactic reactions, in particular reactions occurring during anaesthesia.

Investigations are recommended for patients with Grade II (cardiovascular reaction: tachycardia, hypotension); Grade III (shock, life-threatening spasm of smooth muscles); Grade IV (cardiac and/or respiratory arrest).

The following are measured: mast cell tryptase and allergen specific IgE (as appropriate).

TAT: 14 days.



Mast cell tryptase

Raised levels are detected during anaphylaxis. Timing of blood sample is critical as maximum levels are observed within 3 hours post reaction. Elevated levels may also be found in patients with mastocytosis.

Post mortem samples should be taken within 48 hours from time of death.

Normal range: 1-11 µg/l. TAT: 7 days.

Reference ranges provided by Phadia AB, Sweden.

Due to the importance of the sample timings, plasma or lithium heparin samples may be accepted for this assay if no serum sample is available. However testing tryptase using these sample types is not UKAS validated.

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CELLULAR IMMUNOLOGY

Investigation of the cellular immune system should only be undertaken after discussion with Immunology medical staff. The appropriateness of testing and specimen requirements will be advised. Other assays may be available on request: Please contact the laboratory.

Lymphocyte subset phenotyping

Sample requirements: 5ml EDTA blood sample. Transport and store at room temperature.



Samples sent on a Friday must be received in the lab by 3pm. Any samples received after this time may not be tested due to time and staffing constraints.

Samples must be received by the laboratory within 48 hours of venepuncture. Please contact the laboratory for advice.

Indicated in diagnosis and monitoring of immunodeficiency and in leukaemia/lymphoma typing. Suspected cases of childhood T cell/combined immunodeficiency (SCID) should be regarded as URGENT and the laboratory contacted as soon as possible. Serial CD4 counts are of value in monitoring HIV disease, however measurement of CD4 cells has no place in the diagnosis of HIV infection, until serological status is established.

Requests for CD4 count as a “surrogate marker” of HIV infection will be refused.

Lymphocyte subset panel: CD3 (T cell), CD4 (T helper), CD8 (T cytotoxic), CD19 (B cell), CD16/56 (NK cell). Markers of maturation, activation, monoclonality available by arrangement.

Results given as percentage and absolute counts (see appendix 1).

TAT: 4 days

Lymphocyte activation marker/HLA-DR expression

Sample requirements: 5ml EDTA blood sample. Transport and store at room temperature.



Samples sent on a Friday must be received in the lab by 3pm.

Samples received after this time may not be tested due to time and staffing constraints.

Samples must be received by the laboratory within 48 hours of venepuncture. Please contact the laboratory for advice.

To rule out MHC class II deficiency (SCID) in paediatric patients, HLA-DR expression will now be performed on all infants less than 2 years old who have had lymphocyte subset phenotyping requested. This test will be a one off for each patient- repeat testing will not be performed on subsequent requests.

Results given as a percentage.

TAT 4 days

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Lymphocyte Function



Sample requirements: 4 ml Lithium heparin blood sample. Transport and store at room temperature.

A control sample from an unrelated, healthy volunteer must be sent with each request.

All tests must be booked with the laboratory in advance. The laboratory may not be able to process unbooked samples due to time and staffing constraints.

Samples can be sent on Monday, Tuesday and Wednesdays only.

Samples must arrive in the lab by 12 noon for same day referral.

Samples received on the wrong day will be rejected.

Indicated in further definition of humoral and/or cellular immunodeficiency. Proliferative responses to mitogen.

Stimulants: Phytohaemagglutinin (PHA, CD3, Candida).

Results reported as normal / impaired / absent PHA response.

The assay is performed by the Immunology Camelia Botnar Laboratories, Great Ormond Street, London.

Neutrophil Function Tests



Sample requirements: 5mL EDTA blood sample. Transport and store at room temperature.

A control sample from an unrelated, healthy volunteer must be sent with each request.

Samples sent on a Friday must be received by the lab by 3pm. Samples received after this time may not be tested due to time and staffing constraints.

Samples must be received by the laboratory within 24 hours of venepuncture.

Please contact the laboratory for advice.

Indicated in investigation of recurrent skin infections, chronic gingivitis, recurrent deep seated bacterial and fungal infections.

The following functional assays are available: Neutrophil Respiratory Oxidative Burst.

Results given with reference to normal control value.

TAT: results within 24hr of sample receipt.

Lymphocyte subsets neutrophil (CD11a, CD18) (Integrins)

5ml EDTA (patient) and 5ml EDTA (control)

Assay by special request only.

The assay is performed by the Immunology Camelia Botnar Laboratories, Great Ormond Street, London.

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Addison's disease	Anti-adrenal antibody
Allergy	IgE allergen specific IgE
Anaphylaxis	Mast cell tryptase IgE Allergen specific IgE
Angioedema	C1 esterase inhibitor C1q
Anti Phospholipid Syndrome (APS)	Anti-cardiolipin antibody (anti-beta2 glycoprotein I)
Chronic Active Hepatitis	Anti-smooth muscle antibody Anti-liver kidney microsomal antibody Anti-mitochondrial antibody Anti-nuclear antibody (CTD screen)
Chronic Granulomatous Disease	Neutrophil function test
Coeliac Disease	Anti-transglutaminase antibody Anti-endomysial antibody
Congenital Heart Block	Anti-Ro antibody (CTD Screen)
Connective Tissue Diseases	Anti-nuclear antibody (CTD Screen) Anti dsDNA antibody Antibodies to ENA
CREST	Anti-centromere antibody (CTD Screen)
Dermatitis Herpetiformis	Anti transglutaminase antibody Anti-endomysial antibody
Dermatomyositis	Anti-Jo-1 antibody (CTD Screen)
Diabetes	Anti-IA2 antibody Anti GAD antibody

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DLE	Anti-nuclear antibody (CTD Screen)
Dressler's Syndrome	Anti-cardiac muscle antibody
Extrinsic allergic alveolitis	IgG to aspergillus fumigatus. IgG to micropolyspora faeni IgG to avian proteins proteins (pigeon and budgerigar)
Fibrosing Alveolitis	Anti-nuclear antibody (CTD Screen)
Glomerulonephritis	Anti-neutrophil cytoplasmic antibody Anti-myeloperoxidase antibody Anti-proteinase 3 antibody Anti-GBM antibody
Goodpasture's Syndrome	Anti-GBM antibody
Guillain-Barre Syndrome	Anti-GM1 / GM2 antibody Anti-GQ1b / GD1a antibody
HIV Infection	Lymphocyte phenotyping (CD4+ count)
Immunodeficiency	Functional antibodies Haemolytic complement Cellular investigations
Juvenile Chronic Arthritis	Anti-nuclear antibody (CTD Screen)
Leukaemia/Lymphoma	Cellular studies
Lymphoproliferative disorders	Cellular studies
Mastocytosis	Mast cell tryptase
Membranoproliferative Glomerulonephritis (MPGN)	C3 nephritic factor
Microscopic Polyangiitis	Anti-neutrophil cytoplasmic antibody Anti-myeloperoxidase antibody Anti-proteinase 3 antibody
Mixed Connective Tissue Disease (MCTD)	Anti-nuclear antibody (CTD Screen) Anti-ENA antibody Anti-RNP antibody

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Myasthenia Gravis	Anti-acetylcholine receptor antibody Anti MuSK antibody Anti skeletal muscle antibody
Partial Lipodystrophy	C3 nephritic factor
Pernicious Anaemia	Anti-gastric parietal cell antibody Anti-intrinsic factor antibody
Polymyositis	Anti-Jo-1 antibody (CTD Screen)
Premature Ovarian Failure	Anti-adrenal antibody Anti-steroid producing cell antibodies
Primary Biliary Cirrhosis	Anti-mitochondrial antibody
Progressive Systemic Sclerosis	Anti-nucleolar antibody Anti-nuclear antibody (CTD Screen) Anti-Scl-70 antibody (CTD Screen)
Raynaud's Phenomenon	Anti-centromere antibody
Sjogren's Syndrome	Anti-nuclear antibody (CTD Screen) Anti-Ro antibody Anti-La antibody
Systemic Lupus Erythematosus	Anti-nuclear antibody (CTD Screen) Anti-dsDNA antibody Anti-ENA antibodies Anti-cardiolipin antibody
Vasculitis	Anti-neutrophil cytoplasmic antibody Anti-myeloperoxidase antibody Anti-proteinase 3 antibody
Granulomatosis with polyangiitis	Anti-neutrophil cytoplasmic antibody Anti-PR3-ANCA antibody

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Appendix 1: Lymphocyte Subset Reference Ranges

Table I. Relative size of lymphocyte subpopulations in blood

Lymphocyte subpopulations	Age groups									
	Neonatal (n = 20)	1 wk-2 mo (n = 13)	2-5 mo (n = 46)	5-9 mo (n = 105)	9-15 mo (n = 70)	15-24 mo (n = 33)	2-5 yr (n = 33)	5-10 yr (n = 35)	10-16 yr (n = 23)	Adults (n = 51)
CD19 ⁺ B lymphocytes	12% (5-22)	15% (4-26)	24% (14-39)	21% (13-35)	25% (15-39)	28% (17-41)	24% (14-44)	18% (10-31)	16% (8-24)	12% (6-19)
CD3 ⁺ T lymphocytes	62% (28-76)	72% (60-85)	63% (48-75)	66% (50-77)	65% (54-76)	64% (39-73)	64% (43-76)	69% (55-78)	67% (52-78)	72% (55-83)
CD3 ⁺ /CD4 ⁺ T lymphocytes	41% (17-52)	55% (41-68)	45% (33-58)	45% (33-58)	44% (31-54)	41% (25-50)	37% (23-48)	35% (27-53)	39% (25-48)	44% (28-57)
CD3 ⁺ /CD8 ⁺ T lymphocytes	24% (10-41)	16% (9-23)	17% (11-25)	18% (13-26)	18% (12-28)	20% (11-32)	24% (14-33)	28% (19-34)	23% (9-35)	24% (10-39)
CD4/CD8 ratio per CD3 ⁺	1.8 (1.0-2.6)	3.8 (1.3-6.3)	2.7 (1.7-3.9)	2.5 (1.6-3.8)	2.4 (1.3-3.9)	1.9 (0.9-3.7)	1.6 (0.9-2.9)	1.2 (0.9-2.6)	1.7 (0.9-3.4)	1.9 (1.0-3.6)
CD3 ⁺ /HLA-DR ⁺ T lymphocytes	2% (1-6)	5% (1-38)	3% (1-9)	3% (1-7)	4% (2-8)	6% (3-12)	6% (3-13)	7% (3-14)	4% (1-8)	5% (2-12)
CD3 ⁺ /CD16-56 ⁺ NK cells	20% (6-58)	8% (3-23)	6% (2-14)	5% (2-13)	7% (3-17)	8% (3-16)	10% (4-23)	12% (4-26)	15% (6-27)	13% (7-31)

The relative frequencies are expressed within the lymphocyte population: median and percentiles (5th to 95th percentiles).

Table II. Absolute size of lymphocyte subpopulations in blood

Lymphocyte subpopulations	Age groups									
	Neonatal (n = 20)	1 wk-2 mo (n = 13)	2-5 mo (n = 46)	5-9 mo (n = 105)	9-15 mo (n = 70)	15-24 mo (n = 33)	2-5 yr (n = 33)	5-10 yr (n = 35)	10-16 yr (n = 23)	Adults (n = 51)
Lymphocytes	4.8 (0.7-7.3)	6.7 (3.5-13.1)	5.9 (3.7-9.6)	6.0 (3.8-9.9)	5.5 (2.6-10.4)	5.6 (2.7-11.9)	3.3 (1.7-6.9)	2.8 (1.1-5.9)	2.2 (1.0-5.3)	1.8 (1.0-2.8)
CD19 ⁺ B lymphocytes	0.6 (0.04-1.1)	1.0 (0.6-1.9)	1.3 (0.6-3.0)	1.3 (0.7-2.5)	1.4 (0.6-2.7)	1.3 (0.6-3.1)	0.8 (0.2-2.1)	0.5 (0.2-1.6)	0.3 (0.2-0.6)	0.2 (0.1-0.5)
CD3 ⁺ T lymphocytes	2.8 (0.6-5.0)	4.6 (2.3-7.0)	3.6 (2.3-6.5)	3.8 (2.4-6.9)	3.4 (1.6-6.7)	3.5 (1.4-8.0)	2.3 (0.9-4.5)	1.9 (0.7-4.2)	1.5 (0.8-3.5)	1.2 (0.7-2.1)
CD3 ⁺ /CD4 ⁺ T lymphocytes	1.9 (0.4-3.5)	3.5 (1.7-5.3)	2.5 (1.5-5.0)	2.8 (1.4-5.1)	2.3 (1.0-4.6)	2.2 (0.9-5.5)	1.3 (0.5-2.4)	1.0 (0.3-2.0)	0.8 (0.4-2.1)	0.7 (0.3-1.4)
CD3 ⁺ /CD8 ⁺ T lymphocytes	1.1 (0.2-1.9)	1.0 (0.4-1.7)	1.0 (0.5-1.6)	1.1 (0.6-2.2)	1.1 (0.4-2.1)	1.2 (0.4-2.3)	0.8 (0.3-1.6)	0.8 (0.3-1.8)	0.4 (0.2-1.2)	0.4 (0.2-0.9)
CD3 ⁺ /HLA-DR ⁺ T lymphocytes	0.09 (0.03-0.4)	0.3 (0.03-3.4)	0.2 (0.07-0.5)	0.2 (0.07-0.5)	0.2 (0.1-0.6)	0.3 (0.1-0.7)	0.2 (0.08-0.4)	0.2 (0.05-0.7)	0.06 (0.02-0.2)	0.09 (0.03-0.2)
CD3 ⁺ /CD16-56 ⁺ NK cells	1.0 (0.1-1.9)	0.5 (0.2-1.4)	0.3 (0.1-1.3)	0.3 (0.1-1.0)	0.4 (0.2-1.2)	0.4 (0.1-1.4)	0.4 (0.1-1.0)	0.3 (0.09-0.9)	0.3 (0.07-1.2)	0.3 (0.09-0.6)

Absolute counts ($\times 10^9/L$): median and percentiles (5th to 95th percentiles).

Reference

Immunophenotyping of blood lymphocytes in childhood

Reference values for lymphocyte subpopulations

Comans-Bitter et al. (The Journal of Pediatrics 1997; 130: 388-93).