Genetics Testing

Western Diagnostic Pathology offers a comprehensive range of molecular and cytogenetic tests covering a wide spectrum of clinical indications to help in the diagnosis, management and treatment of disease using genomic technologies.

Our tests include carrier and diagnostic testing for inherited disorders, testing for somatic mutations in cancer, and pharmacogenetic testing. Cytogenetic testing services (including molecular cytogenetics) include the full range of sample types including prenatal, post-natal, as well as haematological and solid tissue malignancies.

The requirements and costs can vary for each molecular test. Whilst some testing is covered by Medicare, many others will incur an out of pocket expense to the patient.

For further enquiries regarding testing availability, collection requirements and costs, please contact:

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Western® Diagnostic PATHOLOGY

Inherited Haematological Disorders

Test	Brief Description	Medicare Eligibility
Alpha-Thalassaemia Deletion Mutation Detection	Molecular testing for alpha thalassaemia must be preceded by appropriate consultations with a haematologist, and laboratory haematology tests, including FBC and film, Hb EPG, and iron studies. Request in patients with anaemia of unknown cause, especially if low MCV, MCH and of South East Asian, African, Middle Eastern or Mediterranean origin, or in patients with a family history of alpha-thalassaemia. Alpha-thalassaemia is characterised by defects in the alpha globin chain of the haemoglobin molecule that decrease haemoglobin production with resulting anaemia. **Sample:** EDTA.	✗ No Medicare rebate available.
Factor V Leiden Mutation Detection	Request in patients with clinically suspected inherited thrombophilia predisposition. Used in patients with DVT, other thromboembolic events,or a family history with proven mutation in a first degree relative. May be useful in women contemplating using oral contraceptives or getting pregnant. Enables consideration of an alternative form of contraceptive therapy or venous thromboembolism prophylaxis during pregnancy and/or post-partum for those women with the FVL allele. **Sample:** EDTA.	✓ Eligible for Medicare rebate if patient has had a proven venous thrombosis or pulmonary embolism or has a first degree relative with the mutation.
Prothrombin G20210A Mutation Detection	Request in patients with clinically suspected inherited thrombophilia predisposition. Used in patients with DVT, other thromboembolic events, or a family history with proven mutation in a first degree relative. May be useful in determining the method and duration of anticoagulation therapy in patients with venous thromboembolism, and screening for women contemplating using oral contraceptives or wishing to become pregnant. **Sample:** EDTA.	✓ Eligible for Medicare rebate if patient has had a proven venous thrombosis or pulmonary embolism or has a first degree relative with the mutation.
Hereditary Haemochromatosis (*HFE* gene) Mutation Detection	Used to differentiate causes of high ferritin and high transferrin saturation. Also used to differentiate iron overload that is alcohol-related, due to ineffective erythropoiesis (thalassaemia and sideroblastic anaemia) or porphyria cutanea tarda from patients with hereditary haemochromatosis gene mutations at C282Y and H63D. S65C also tested. Use in first degree relatives of those with family history of haemochromatosis or specific gene mutation (C282Y /C282Y and C282Y/H63D) **Sample:** EDTA.	✓ Eligible for Medicare rebate if patient has elevated transferrin saturation or ferritin on repeat testing or patient has a first degree relative with haemochromatosis or first degree relative with homozygosity for C282Y or compound heterozygote C282Y/H63D.

Haematological Oncology

Test	Brief Description	Medicare Eligibility
BCR-ABL RQ-PCR	The BCR-ABL1 gene fusion is commonly seen in chronic myeloid leukaemia and acute lymphoblastic leukaemia. The detection and quantitation of transcript levels is important in the diagnosis and monitoring of the patients with these disorders. **Sample:** EDTA peripheral blood or bone marrow.	✓ Medicare rebate available.
FLT3 & NPM1 Mutation Detection	Mutations in the FLT3 and NPM1 genes are seen in acute myeloid leukaemia (particularly in cases with a normal cytogenetic karyotype) and are of prognostic significance. **Sample:** EDTA peripheral blood or bone marrow.	✓ Medicare rebate available.
JAK2 Mutation Detection	The V617F mutation is seen in a number of myeloproliferative disorders such as polycythaemia vera, essential thrombocytosis and idiopathic myelofibrosis. **Sample:** EDTA peripheral blood or bone marrow.	✓ Medicare rebate available.
Calreticulin (CALR) exon 9 Mutation Detection	CALR exon 9 mutations are seen in a number of myeloproliferative neoplasms. Consider CALR mutations in conjunction with, or following other molecular tests for these disorders. **Sample:** EDTA peripheral blood.	✗ No Medicare rebate available.

Haematological Oncology

Test	Brief Description	Medicare Eligibility
Lymphocyte Gene Rearrangement Studies	**B-cell immunoglobulin heavy chain (IgH) gene rearrangements:** This test is for the IgH gene rearrangements (FR1, FR2 and FR3) and will detect greater than 80% of B-cell lymphoproliferative disorders. **Sample:** EDTA peripheral blood or bone marrow, fresh or paraffin embedded tissue.	✗ No Medicare rebate available.
	Bcl-2: This test is specific for the major breakpoint region (mbr) of the bcl-2 associated translocation [t(14;18)]. This translocation is associated with up to 85% of lymphomas with a follicular morphology, and with approximately one third of diffuse large cell lymphomas. **Sample:** EDTA peripheral blood or bone marrow, fresh or paraffin embedded tissue.	✗ No Medicare rebate available.
	Bcl-1: This test is specific for the translocation involving the Cyclin D1 gene [t(11;14)]. It is commonly associated with Mantle Cell Lymphoma (MCL). **Sample:** EDTA peripheral blood or bone marrow, fresh or paraffin embedded tissue.	✗ No Medicare rebate available.
	T-cell Receptor (beta and gamma) gene rearrangements This test is for detecting monoclonality of T lymphocytes using primers targeted at both beta and gamma gene rearrangements, and will detect at least 90% of T-cell lymphoproliferative disorders. **Sample:** EDTA peripheral blood or bone marrow, fresh or paraffin embedded tissue.	✗ No Medicare rebate available.
Thrombopoietin Gene (MPL) Mutation Detection	The MPL mutations W515L and W515K are seen in a number of myeloproliferative disorders such as polycythaemia vera, essential thrombocytosis and idiopathic myelofibrosis. Consider testing in conjunction with, or following other molecular tests for these disorders. **Sample:** EDTA peripheral blood or bone marrow.	✓ Medicare rebate available if requested by appropriate specialist referral.

Molecular (solid tissue) Oncology Pharmacogenetics

Test	Brief Description	Medicare Eligibility
BRAF Mutation Detection	Qualitative detection of the V600 somatic mutations in the BRAF oncogene. Tested in patients with metastatic melanoma to aid the clinician in identifying patients who qualify for access to vemurafenib under the Pharmaceutical Benefits Scheme. **Sample:** Histopathological slides with pathologist assessment.	✓ Medicare rebate available if requested by appropriate specialist referral.
EGFR Mutation Detection	Qualitative detection of 29 mutations in the epidermal growth factor receptor (EGFR) gene. Tested in patients with non-small cell lung cancer to aid the clinician in identifying patients who qualify for access to gefitinib under the Pharmaceutical Benefits Scheme. **Sample:** Histopathological slides with pathologist assessment.	✓ Medicare rebate available if requested by appropriate specialist referral.
KRAS Mutation Detection	Qualitative detection of the codon 12 and 13 somatic mutations in the KRAS oncogene. Tested in patients with metastatic colorectal cancer to aid the clinician in identifying patients who qualify for access to cetuximab under the Pharmaceutical Benefits Scheme **Sample:** Histopathological slides with pathologist assessment.	✓ Medicare rebate available if requested by appropriate specialist referral.
NRAS Mutation Detection	The *NRAS* gene is in the Ras family of oncogenes, which includes KRAS. Qualitative detection of NRAS mutations to aid the clinician to identify cancer patients that are likely to benefit from cancer therapies that act specifically on the NRAS gene or where NRAS is a crucial factor within the pathway. **Sample:** EDTA.	✗ No Medicare rebate available.

Other Pharmacogenetics

Test	Brief Description	Medicare Eligibility
Thiopurine Methyltransferase (TPMT) Variant Testing	Request in patients prior to commencement of treatment with thiopurine drugs. Certain genetic variations are associated with altered metabolism and increased risk of dose related toxicity. **Sample:** EDTA.	✓ Medicare rebate available.

Inherited Immunological Disorders

Test	Brief Description	Medicare Eligibility
Genetic Testing for Coeliac Disease Risk Predisposition by HLA allele genotyping	Request in patients with possible coeliac disease, e.g., gluten intolerant, GIT symptoms, diarrhoea, poor weight gain/nutritional concerns. Absence of high risk genetic pattern makes coeliac disease very unlikely. Complementary to coeliac serology testing. Request in families with history of coeliac disease. **Sample:** EDTA.	✓ Medicare rebate available.
HLA-B27 Genotyping	Request in patients suspected of having ankylosing spondylitis, along with CRP. May be requested in patients when cause of arthritis is unclear. May be requested in acute anterior uveitis. **Sample:** EDTA.	✓ Medicare rebate available.

Respiratory, Fertility, and Development

Test	Brief Description	Medicare Eligibility
Cystic Fibrosis Genetic Screening (CFTR gene)	Useful in couples planning pregnancy (screening for carrier status). Useful in children with clinical features of CF (including recurrent respiratory illnesses). Useful in infertile men. Cystic fibrosis (CF) is the most common lethal autosomal recessive disease in Caucasians with a prevalence of 1/2500 to 1/3300 and a carrier rate of 1/25 to 1/29. **Sample:** EDTA.	✗ No Medicare rebate available.
Alpha-1-Antitrypsin Genotyping (S and Z Mutations)	Request in patients with low serum alpha-1-antitrypsin levels. This test checks for the 2 common mutations found in the *SERPINA-1* gene which are responsible for alpha-1-antitrypsin deficiency. Patients with these genetic mutations may have chronic obstructive pulmonary disease or liver disease **Sample:** EDTA.	✗ No Medicare rebate available.
Y Chromosome Microdeletion Analysis	Useful in infertile men, in particular those with oligo/azoospermia. The deletion of the AZF (azoospermic factor) is thought to be involved in areas of male infertility associated with azoospermia or severe oligospermia. Microdeletions involving the DAZ gene account for ~6% of infertile men classified as idiopathic oligo/azoospermia. **Sample:** EDTA.	✗ No Medicare rebate available.
Fragile X Syndrome (FRAXA) PCR	Request in children with intellectual disability, and/or any family history of Fragile X syndrome. In this clinical setting, also consider Chromosomal Microarray studies. Relevance: Fragile X syndrome is the most common cause of inherited mental retardation. Approx. 1 in 4000 individuals (male and female) are affected. Most affected males demonstrate moderate mental retardation. Affected females have milder (if any) cognitive impairment and may experience premature ovarian failure at later age. Please note, inconclusive PCR result will be followed by Southern Blot analysis. **Sample:** EDTA.	✓ Eligible for Medicare rebate if patient exhibits intellectual disability, ataxia, neurodegeneration or premature ovarian failure, or if patient has a relative with a FMR1 mutation.

Inherited Cancer Genetic Testing

Test	Brief Description	Medicare Eligibility
Inherited breast and ovarian cancer testing (BRCA1 and BRCA2)	This is a complex genetic test which checks for all genetic aberrations in two well-known tumour suppressor genes. Mutation of these genes has been linked to hereditary breast and ovarian cancer. Testing should be performed in conjunction with appropriate specialist referral, counselling, and documentation. **Sample:** EDTA	✗ No Medicare rebate available.
Inherited bowel and uterine cancer testing (MLH1, MSH2, MSH6)	This is a complex genetic test which checks for all genetic aberrations in three well-known DNA repair genes. Mutation of these genes has been linked to hereditary bowel and uterine cancer. Testing should be performed in conjunction with appropriate specialist referral, counselling, and documentation. **Sample:** EDTA	✗ No Medicare rebate available. Referral for testing in conjunction with appropriate specialist referral, counselling, and documentation.

Cardiovascular

Test	Brief Description	Medicare Eligibility
Methylenetetrahydrofolate Reductase *(MTHFR)* Mutation (C677T & A1298C)	Used in patients with elevated homocysteine if other causes for high levels have been excluded (low folate, B6, or B12 deficiency). Only homozygotes for C677T or compound heterozygotes for C677T/A1298C have significantly increased plasma homocysteine levels and increased risk of thromboembolism as well as premature cardiovascular disease. These individuals may also show toxicity from medications (e.g., methotrexate) that affect folate metabolism. **Sample:** EDTA.	✓ Eligible for Medicare rebate if patient has had a proven venous thrombosis or pulmonary embolism or has a first degree relative with the mutation.
Apolipoprotein E Genotyping	Patients with high cholesterol and triglycerides who are suspected of having Type III hyperlipidaemia's including Familial Dysbetalipoproteinaemia may benefit from Apo E genotyping. May be useful in assessment of risk for cardiovascular disease or Alzheimer's disease. **Sample:** EDTA.	✗ No Medicare rebate available.

Molecular Cytogenetics

Test	Brief Description	Medicare Eligibility
Chromosomal Microarray Analysis (CMA)	Consider this test in individuals with developmental delay, intellectual disability, autism or at least two congenital abnormalities - to qualify for Medicare rebate. Discussion with a Paediatrician or Geneticist may also be helpful prior to requesting this test. Parental samples may be needed to clarify results in a child. Consent form and Clinical Submission form should be submitted with samples. **Sample:** EDTA.	✓ Eligible for Medicare rebate if patient has developmental delay, intellectual disability, autism or at least two congenital abnormalities.
Chromosomal Microarray (CMA- Prenatal)	Chromosomal Microarray (CMA- Prenatal): SNP (Single Nucleotide Polymorphism) microarray testing can detect gains (duplication) and loss (deletion) of segments of DNA and large regions of homozygosity. It is a whole genome investigation for the identification and diagnosis of many microduplication/microdeletion syndromes, as well as aneuploidy and triploidy. Prenatal chromosome microarray testing is the preferred test where there are abnormal ultrasound findings or there is concern regarding a chromosomal imbalance. This may also include family history of chromosome rearrangement or abnormal pregnancy screening results. **Sample:** Amniotic fluid or chorionic villus. Please contact the laboratory for specific requirements.	
Oncology FISH	Testing for common chromosome abnormalities in various haematological disorders such as CML, ALL, multiple myeloma and CLL. **Sample:** Bone marrow, peripheral blood.	✗ No Medicare rebate available.
Rapid Aneuploid FISH Screening	Request this test if patient requires FAST preliminary screen of PRENATAL samples. Common aneuploidies of chromosomes 13,18, 21, X and Y are tested for. Indications for this test may include a high risk pregnancy, high risk result from first or second trimester screen, U/S abnormalities or patient anxiety. **Sample:** Prenatal: amniotic fluid/CVS Postnatal: lithium heparin.	✗ No Medicare rebate available.
Paraffin Embedded Tissue - Malignancy	Targeted testing for known rearrangements in lymphoproliferative disorders and solid tumours (e.g., lymphomas, sarcomas, oligodendrogliomas). **Sample:** Paraffin embedded tissue.	✗ No Medicare rebate available.
ALK Rearrangements	A targeted test for the detection of rearrangements of chromosome 2p23 which are associated with non-small cell lung cancer (NSCLC).	
EWSR1	A targeted test for the detection of the chromosome rearrangement associated with Ewing sarcoma. This rearrangement is also observed at less frequency in a range of other solid tumours.	
IGH Rearrangements	A targeted investigation for the detection of IGH rearrangements that are associated with lymphoma, e.g CCND1/IGH; IGH/BCL2; MYC/IGH	

Molecular Cytogenetics

Test	Brief Description	Medicare Eligibility
Oligodendrogliomas	A targeted FISH test of chromosome deletions for the differentiation of oligodendrogliomas from other forms of diffuse gliomas.	
SS18	A targeted test for the detection of chromosomal rearrangements associated with synovial sarcoma	
QF-PCR	Request this test if patient requires a RAPID preliminary screen of PRENATAL samples. Indications for a this test may include a high risk pregnancy, high risk result from first or second trimester screen, U/S abnormalities or patient anxiety.	✗ No Medicare rebate available.

Cytogenetics

Test	Brief Description	Medicare Eligibility
Chromosomal Karyotyping	Several important indications for requesting are: **Blood chromosomes** 1. Investigation of infertile couples - chromosomes should be done on both partners 2. Investigation of recurrent miscarriage - chromosomes on both partners and the products of conception (POC) sample 3. Family history of structural chromosomal rearrangement such as translocation, inversion, insertion or large deletion/duplication 4. Investigation of patients with abnormal phenotype such as Down syndrome, Turner syndrome or Klinefelter syndrome 5. Investigation of patients with developmental delay, intellectual disability or mental retardation - IF chromosomal MICROARRAY has already been performed and shown to be apparently normal (see below) **Sample:** Lithium heparin.	✓ Medicare rebate available.
	Prenatal chromosomes (Chromosomes requested on amniotic fluid, CVS tissue) 1. High risk pregnancy (advanced maternal age) 2. High risk report on first trimester screen or maternal serum screen (2nd trimester) 3. Abnormal ultrasound findings 4. Previous abnormal birth/fetus 5. Family history of chromosomal abnormalities 6. Patient anxiety **Sample:** Amniotic fluid, CVS, fetal tissue and cord blood.	✓ Medicare rebate available.
	Bone marrow / tumour chromosomes Chromosome studies in the investigation of haematological malignancies, lymphoproliferative disorders and tumours. **Sample:** Bone marrow, peripheral blood, fresh tissue.	✓ Medicare rebate available.
	Products of Conception Products of Conception: chromosome studies for the investigation of the causes of pregnancy loss. This test is appropriate where a patient has 3 or more miscarriages, family history of pregnancy loss, family history of developmental delay, dysmorphic features or congenital anomalies. It may also be performed where there are abnormal ultrasound findings or for confirmation of previously identified chromosomal imbalances. **Sample:** chorionic villus or foetal tissue.	

Other

Test	Brief Description	Medicare Eligibility
Gilbert Syndrome	Request to help differentiate cause of isolated high bilirubin in those with normal FBC, normal reticulocytes and haptoglobin. **Sample:** EDTA	✗ No Medicare rebate available.

Non-Medical Testing (Discussion with a medical practitioner may be appropriate, although medical requesting is not required)

Test	Brief Description	Medicare Eligibility
Parentage Testing	Provision of genetic evidence regarding biological parentage of an individual using standard genetic markers. **Sample:** Buccal cell specimens should be collected from the mother, child and putative father(s). Special collection and transfer procedures may apply if required for legal purposes and or immigration DNA testing. Please refer to our website for further details and documentation.	✗ No Medicare rebate available.