Hydrops Fetalis

Precision Panel

Overview

Hydrops fetalis or fetal hydrops is a lethal fetal condition defined as abnormal accumulation of fluid in two or more fetal compartments presenting as ascites, pleural effusion, pericardial effusion and skin edema. It may also be associated with polyhydramnios and placental edema. Hydrops is usually detected using ultrasound in the first or second trimester of pregnancy. The etiology can be immune or nonimmune. Immune hydrops fetalis is due to Rhesus (Rh) or ABO incompatibility and other blood group antibodies causing hemolytic disease of the newborn. Nonimmune hydrops fetalis can be divided as fetal, maternal, placental and idiopathic. A wide spectrum of genetic causes may lead to nonimmune hydrops fetalis (NIHF), and so a phenotypic and genetic evaluation are necessary to determine the underlying etiology. The mode of inheritance is generally autosomal recessive and autosomal dominant, although several X-linked related pathologies have been identified.

The Igenomix Hydrops Fetalis Syndrome Precision Panel can be used to make a directed and accurate diagnosis ultimately leading to a better management and prognosis of the disease. It provides a comprehensive analysis of the genes involved in this disease using next-generation sequencing (NGS) to fully understand the spectrum of relevant genes involved.

Indications

The Igenomix Hydrops Fetalis Syndrome Precision Panel is indicated for those patients with ultrasound findings suggestive of hydrops fetalis or with the following manifestations:

- Twin pregnancy
- Previous fetal death
- Prolonged or excessive jaundice in siblings as newborns
- Family history of genetic disorders, chromosomal abnormalities, or metabolic diseases
- Polyhydramnios or oligohydramnios
- Evidence of viral illness in mother or fetus
- Decreased fetal movements
- Fetal tachyarrythmias
- Maternal history of: Rh negative blood type, known presence of isoimmune blood group antibodies, illicit drug use, collagen vascular disease, blunt abdominal trauma, coagulopathy, hemoglobinopathy etc

Clinical Utility

The clinical utility of this panel is:

- The genetic and molecular confirmation for an accurate clinical diagnosis of a symptomatic patient.
- Early initiation of treatment in the form early referral to a high-risk center, multidisciplinary counselling and close coordination between obstetric and neonatal specialists or early invasive fetal treatment.
- Risk assessment of asymptomatic family members according to the mode of inheritance.
- Improvement of delineation of genotype-phenotype correlation.

Genes & Diseases

GENE	OMIM DISEASES	INHERITANCE*	% GENE COVERAGE (20X)	HGMD**
A2ML1	Noonan Syndrome	AD,MU,P	100	23 of 23
ADA2	Childhood-Onset Polyarteritis Nodosa, Sneddon Syndrome, Blackfan-Diamond Anemia	AR	100	NA of NA
ADAMTS3	Hennekam Lymphangiectasia-lymphedema Syndrome, Hennekam Syndrome	AR	99.97	4 of 4
AGGF1	Klippel-trenaunay Syndrome		99.96	1 of 1
AHCY	Hypermethioninemia With S-adenosylhomocysteine Hydrolase Deficiency	AR	100	11 of 11
ALG1	Congenital Disorder Of Glycosylation Type Ik	AR	100	46 of 46
ALPK3	Familial Hypertrophic Cardiomyopathy	AR	97.29	7 of 7
ASAH1	Farber Lipogranulomatosis, Spinal Muscular Atrophy With Progressive Myoclonic Epilepsy, Farber Disease	AR	99.98	69 of 70
BRAF	Cardiofaciocutaneous Syndrome, Leopard Syndrome, Noonan Syndrome, Cardiofaciocutaneous Syndrome	AD	100	80 of 80
BSND	Infantile Bartter Syndrome With Sensorineural Deafness	AR	99.95	21 of 21
CALCRL	Lymphatic Malformation	AR	99.89	1 of 1
CARS2	Combined Oxidative Phosphorylation Deficiency	AR	99.14	6 of 6
CASP10	Autoimmune Lymphoproliferative Syndrome Type Iia , Familial Non-hodgkin Lymphoma, Autoimmune Lymphoproliferative Syndrome	AD	99.86	6 of 6
CBL	Juvenile Myelomonocytic Leukemia, Noonan Syndrome-like Disorder With Or Without Juvenile Myelomonocyticleukemia, Aggressive Systemic Mastocytosis, Noonan Syndrome	AD	100	46 of 47
CCBE1	Hennekam Lymphangiectasia-lymphedema Syndrome, Hennekam Syndrome	AR	100	16 of 16
CDAN1	Dyserythropoietic Congenital Anemia Type I	AR	99.59	68 of 68
COL11A1	Fibrochondrogenesis, Marshall Syndrome, Stickler Syndrome Type II, Autosomal Dominant Myopia-midfacial Retrusion-sensorineural Hearing Loss-rhizomelic Dysplasia Syndrome	AD,AR	100	104 of 106
COL1A1	Caffey Disease, Ehlers-danlos Syndrome Type VII, Osteogenesis Imperfecta, Arthrochalasia Ehlers-danlos Syndrome, Dermatofibrosarcoma Protuberans	AD	99.98	1156 of 1159
COL1A2	Osteogenesis Imperfecta, Arthrochalasia Ehlers-Danlos Syndrome, Cardiac-Valvular Ehlers-danlos Syndrome	AD,AR	100	576 of 581
COL2A1	Achondrogenesis Type II, Czech Dysplasia Metatarsal Type, Epiphyseal Dysplasia Multiple, With Myopia And Conductive Deafness, Kniest Dysplasia, Legg-Calve-Perthes Disease, Platyspondylic Lethal Skeletal Dysplasia, Spondyloepimetaphyseal Dysplasia, Stickler Syndrome, Dysspondyloenchondromatosis, Kniest Dysplasia , Spondyloepimetaphyseal Dysplasia Congenita	AD,MU	100	583 of 583
CTSA	Neuraminidase Deficiency With Beta-Galactosidase Deficiency, Galactosialidosis	AR	100	40 of 40
DYNC2H1	Short-Rib Thoracic Dysplasia With Or Without Polydactyly, Jeune Syndrome, Short Rib-Polydactyly Syndrome, Verma-Naumoff Type	AR,MU,D	99.78	214 of 221
DYNC2I1	Short-Rib Thoracic Dysplasia With Or Without Polydactyly, Jeune Syndrome, Short Rib-Polydactyly Syndrome, Verma-Naumoff Type	AR	97.76	14 of 14

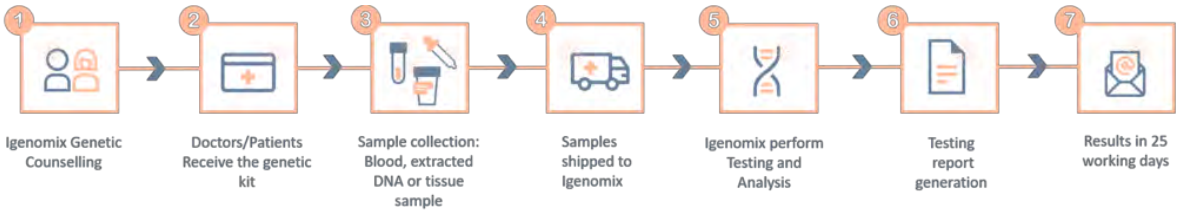
DYNC2I2	Short-Rib Thoracic Dysplasia With Or Without Polydactyly, Jeune Syndrome, Short Rib-Polydactyly Syndrome, Verma-naumoff Type	AR	99.54	23 of 23
EPB41	Hereditary Elliptocytosis	AD,AR	99.69	11 of 11
EPHB4	Capillary Malformation-Arteriovenous Malformation, Nonimmune Hydrops Fetalis	AD	100	65 of 65
FAS	Autoimmune Lymphoproliferative Syndrome, Behçet Disease, Vog-Koyanagi-Harada Disease	AD	100	135 of 135
FASLG	Autoimmune Lymphoproliferative Syndrome	AD	99.98	8 of 9
FAT4	Hennekam Lymphangiectasia-Lymphedema Syndrome, Van Maldergem Syndrome, Cerebrofacioarticular Syndrome, Hennekam Syndrome	AR	99.8	41 of 41
FIG4	Amyotrophic Lateral Sclerosis, Charcot-Marie-Tooth Disease, Cleidocranial Dysplasia With Micrognathia, Amyotrophic Lateral Sclerosis, Bilateral Parasagittal Parieto-Occipital Polymicrogyria, Yunis-Varon Syndrome	AD,AR	99.92	72 of 72
FLNB	Atelosteogenesis, Boomerang Dysplasia, Larsen Syndrome, Spondylocarpotarsal Synostosis Syndrome, Atelosteogenesis	AD,AR	100	124 of 124
FLT4	Congenital Heart Defects, Lymphatic Malformation, Milroy Disease, Tetralogy Of Fallot	AD	100	119 of 120
GATA1	X-linked Anemia With Or Without Neutropenia And/Or Platelet Abnormalities, Down Syndrome, Dyserythropoietic Anemia With Thrombocytopeni, Beta-thalassemia-X-linked Thrombocytopenia Syndrome, Blackfan-Diamond Anemia, Congenital Erythropoietic Porphyria, Thrombocytopenia With Congenital Dyserythropoietic Anemia	X,XR,G	99.93	NA of NA
GATB	Combined Oxidative Phosphorylation Deficiency	AR	99.98	NA of NA
GATC	Combined Oxidative Phosphorylation Deficiency	AR	100	1 of 1
GBA	Perinatal Lethal Gaucher Disease, Gaucher Disease-Ophthalmoplegia-Cardiovascular Calcification Syndrome	AD,AR	100	469 of 471
GBE1	Glycogen Storage Disease IV, Adult Polyglucosan Body Disease	AR	99.95	71 of 74
GRIP1	Fraser Syndrome	AR	100	17 of 17
GUSB	Mucopolysaccharidosis, Type VII	AR	100	65 of 66
GYPC	Hereditary Elliptocytosis		100	1 of 1
HADHA	Long-Chain 3-Hydroxyacyl-CoA Dehydrogenase Deficiency, Mitochondrial Trifunctional Protein Deficiency	AR	100	75 of 75
HADHB	Mitochondrial Trifunctional Protein Deficiency	AR	99.99	66 of 68
HBA1	Alpha-Thalassemia, Heinz Body Anemias, Hemoglobin H Disease, Alpha-Thalassemia-Intellectual Disability Syndrome Linked To Chromosome 16, Hb Bart's Hydrops Fetalis	AD	98.87	125 of 152
HBA2	Alpha-Thalassemia, Heinz Body Anemias, Hemoglobin H Disease, Alpha-Thalassemia-Intellectual Disability Syndrome Linked To Chromosome 16, Hb Bart's Hydrops Fetalis	AD	74.46	118 of 231
IFT80	Asphyxiating Thoracic Dystrophy, Jeune Syndrome, Short Rib-Polydactyly Syndrome, Verma-Naumoff Type	AR	99.96	16 of 16
KIAA0586	Joubert Syndrome, Short-Rib Thoracic Dysplasia With Polydactyly, Joubert Syndrome	AR	99.84	31 of 32
KLF1	Dyserythropoietic Congenital Anemia Type IV, Blood Group-Lutheran Inhibitor, Hereditary Persistence Of Fetal Hemoglobin-Beta-Thalassemia Syndrome	AD	99.76	48 of 50
KRAS	Aplasia Cutis Congenita With Epibulbar Dermoids, Cardiofaciocutaneous Syndrome, Noonan Syndrome, Ras-associated Autoimmune Lymphoproliferative Syndrome Type IV, Somatic, Schimmelpenning-Feuerstein-Mims Syndrome, Cardiofaciocutaneous Syndrome, Encephalocraniocutaneous Lipomatosis, Toriello-Lacassie-Droste Syndrome	AD	100	38 of 38
LBR	Hydrops-Ectopic Calcification-Moth-Eaten Skeletal Dysplasia, Pelger-Huet Anomaly, Reynolds Syndrome, Greenberg Dysplasia	AD,AR	99.98	34 of 34
LZTR1	Noonan Syndrome	AD	99.99	136 of 136
MAP2K1	Cardiofaciocutaneous Syndrome, Melorheostosis, Noonan Syndrome	AD	100	31 of 31
MAP2K2	Cardiofaciocutaneous Syndrome, Neurofibromatosis-Noonan Syndrome	AD	100	37 of 37
MRAS	Noonan Syndrome	AD	100	3 of 3
NEK1	Amyotrophic Lateral Sclerosis, Short Rib-Polydactyly Syndrome, Type II, Orofaciodigital Syndrome	AD,AR,MU,D	99.83	73 of 74
NEK9	Arthrogryposis, Perthes Disease, And Upward Gaze Palsy, Lethal Congenital Contracture Syndrome	AR	99.98	4 of 4
NEU1	Neuraminidase Deficiency, Congenital Sialidosis Type 2	AR	100	68 of 68
NF1	Juvenile Myelomonocytic Leukemia, Neurofibromatosis-Noonan Syndrome, Watson Syndrome	AD	97.97	3082 of 3166

NRAS	Noonan Syndrome, Ras-associated Autoimmune Lymphoproliferative Syndrome Type IV, Schimmelpenning-Feuerstein-Mims Syndrome, Noonan Syndrome	AD	100	15 of 15
PIEZO1	Dehydrated Hereditary Stomatocytosis, Hereditary Lymphedema	AD,AR	99.98	107 of 107
PIGA	Multiple Congenital Anomalies-Hypotonia-Seizures Syndrome, Paroxysmal Nocturnal Hemoglobinuria, West Syndrome	X,XR,G	97.98	NA of NA
PKLR	Elevated Adenosine Triphosphate Of Erythrocytes, Hemolytic Anemia Due To Red Cell Pyruvate Kinase Deficiency	AD,AR	100	283 of 285
PLD1	Developmental Cardiac Valvular Defect	AR	99.98	4 of 4
PMM2	Congenital Disorder Of Glycosylation Type Ia	AR	100	127 of 129
PPP1CB	Noonan Syndrome-like Disorder With Loose Anagen Hair	AD	99.87	12 of 12
PRKCD	Common Variable Immunodeficiency, Autoimmune Lymphoproliferative Syndrome	AR	100	9 of 9
PTH1R	Chondrodysplasia, Eiken Skeletal Dysplasia, Metaphyseal Chondrodysplasia, Blomstrand Lethal Chondrodysplasia, Ollier Disease	AD,AR	100	48 of 48
PTPN11	Juvenile Myelomonocytic Leukemia, Leopard Syndrome, Metachondromatosis, Noonan Syndrome	AD	100	150 of 151
QRSL1	Combined Oxidative Phosphorylation Deficiency	AR	99.91	6 of 7
RAF1	Dilated Cardiomyopathy, Leopard Syndrome, Noonan Syndrome	AD	100	64 of 64
RASA2	Noonan Syndrome		99.82	5 of 5
RASGRP1	Immunodeficiency, Autoimmune Lymphoproliferative Syndrome	AR	98.41	8 of 9
RIT1	Noonan Syndrome	AD	99.85	27 of 27
RPL11	Diamond-Blackfan Anemia	AD	100	52 of 52
RPL15	Diamond-Blackfan Anemia	AD	99.74	8 of 9
RPL18	Diamond-Blackfan Anemia	AD	100	1 of 1
RPL26	Diamond-Blackfan Anemia	AD	92.97	1 of 1
RPL27	Diamond-Blackfan Anemia	AD	100	2 of 2
RPL31	Diamond-Blackfan Anemia		100	0 of 1
RPL35	Diamond-Blackfan Anemia	AD	100	1 of 1
RPL35A	Diamond-Blackfan Anemia	AD	100	12 of 12
RPL5	Diamond-Blackfan Anemia	AD	100	95 of 95
RPS10	Diamond-Blackfan Anemia	AD	100	7 of 7
RPS15A	Diamond-Blackfan Anemia	AD	98.74	1 of 1
RPS17	Diamond-Blackfan Anemia	AD	0	0 of 7
RPS19	Diamond-Blackfan Anemia	AD	78	159 of 165
RPS24	Diamond-Blackfan Anemia	AD	90.17	11 of 14
RPS26	Diamond-Blackfan Anemia	AD	100	28 of 29
RPS27	Diamond-Blackfan Anemia	AD	99.85	1 of 1
RPS28	Diamond-Blackfan Anemia	AD	100	1 of 1
RPS29	Diamond-Blackfan Anemia	AD	100	4 of 4
RPS7	Diamond-Blackfan Anemia	AD	100	7 of 10
RRAS	Noonan Syndrome		95.86	3 of 3
RRAS2	Noonan Syndrome	AD	99.8	6 of 6
RYR1	Central Core Disease Of Muscle, Minicore Myopathy With External Ophthalmoplegia, Congenital Myopathy, With Fiber-Type Disproportion, Centronuclear Myopathy, Benign Samaritan Congenital Myopathy, Congenital Multicore Myopathy With External Ophthalmoplegia	AD,AR	97.63	733 of 746
SHOC2	Noonan Syndrome-like Disorder With Loose Anagen Hair	AD	99.98	8 of 8
SLC17A5	Infantile Sialic Acid Storage Disorder	AR	99.91	49 of 49
SLC26A2	Achondrogenesis, Diastrophic Dysplasia, Epiphyseal Dysplasia, Atelosteogenesis Type II, Diastrophic Dwarfism	AR	99.59	51 of 56
SOS1	Noonan Syndrome, Hereditary Gingival Fibromatosis	AD	100	103 of 104
SOS2	Noonan Syndrome	AD	99.48	6 of 7
SOX18	Hypotrichosis-Lymphedema-Telangiectasia-Renal Defect Syndrome	AD,AR	67.33	5 of 7
SPTA1	Hereditary Elliptocytosis, Hereditary Spherocytosis	AD,AR	100	106 of 107
SPTB	Hereditary Elliptocytosis, Hereditary Spherocytosis	AD	100	152 of 152
TALDO1	Transaldolase Deficiency	AR	95	13 of 14
TAPT1	Complex Lethal Osteochondrodysplasia	AR	89.49	3 of 3
TRIP11	Achondrogenesis, Osteochondrodysplasia	AR	98.94	20 of 21
TSR2	Diamond-Blackfan Anemia With Mandibulofacial Dysostosis	X,XR,G	99.96	NA of NA
UROS	Congenital Erythropoietic Porphyria	AR	100	44 of 50
VAC14	Childhood-Onset Striatonigral Degeneration, Yunis-Varon Syndrome	AR	100	11 of 11

WDR35	Cranioectodermal Dysplasia, Short-Rib Thoracic Dysplasia With Or Without Polydactyly	AR	100	31 of 33
WNT7A	Fibular Aplasia Or Hypoplasia, Femoral Bowing And Poly-, Syn-, And Oligodactyly, Ulna And Fibula, Absence Of, With Severe Limb Deficiency, Phocomelia	AR	100	10 of 10

*Inheritance: AD: Autosomal Dominant; AR: Autosomal Recessive; X: X linked; XLR: X linked Recessive; Mi: Mitochondrial; Mu: Multifactorial.
**Number of clinically relevant mutations according to HGMD

Methodology



Contact us

Call +34 963 905 310 or send an email to supportspain@igenomix.com for any of the following objectives:

- Get more information about the test.
- Request your kit.
- Request a pick up of the kit after collecting the sample.

References

1. Waring, G. J., Splitt, M., & Robson, S. C. (2019). Fetal hydrops: diagnosis and prognosis. *Archives of disease in childhood*, *104*(3), 209–210. https://doi.org/10.1136/archdischild-2018-315777
2. Mardy, A. H., Chetty, S. P., Norton, M. E., & Sparks, T. N. (2019). A system-based approach to the genetic etiologies of non-immune hydrops fetalis. *Prenatal diagnosis*, *39*(9), 732–750. https://doi.org/10.1002/pd.5479
3. Bellini, C., & Hennekam, R. (2012). Non-immune hydrops fetalis: A short review of etiology and pathophysiology. *American Journal Of Medical Genetics Part A*, *158A*(3), 597-605. doi: 10.1002/ajmg.a.34438
4. Sparks, T. N., Thao, K., Lianoglou, B. R., Boe, N. M., Bruce, K. G., Datkhaeva, I., Field, N. T., Fratto, V. M., Jolley, J., Laurent, L. C., Mardy, A. H., Murphy, A. M., Ngan, E., Rangwala, N., Rottkamp, C., Wilson, L., Wu, E., Uy, C. C., Valdez Lopez, P., Norton, M. E., … University of California Fetal–Maternal Consortium (UCfC) (2019). Nonimmune hydrops fetalis: identifying the underlying genetic etiology. *Genetics in medicine : official journal of the American College of Medical Genetics*, *21*(6), 1339–1344. https://doi.org/10.1038/s41436-018-0352-6
5. Désilets, V., Audibert, F., Wilson, R., Audibert, F., Brock, J., & Carroll, J. et al. (2013). Investigation and Management of Non-immune Fetal Hydrops. *Journal Of Obstetrics And Gynaecology Canada*, *35*(10), 923-936. doi: 10.1016/s1701-2163(15)30816-1
6. Jauniaux E. (1997). Diagnosis and management of early non-immune hydrops fetalis. *Prenatal diagnosis*, *17*(13), 1261–1268. https://doi.org/10.1002/(sici)1097-0223(199712)17:13<1261::aid-pd292>3.0.co;2-c