Custom Cardiology Panel

Panel Gene List: ABCC6, ABCC9, ACADVL, ACTA1, ACTA2, ACTC1, ACTN2, ACVR1, ACVRL1, ADAMTS10, ADAMTS17, ADAMTS2, ADAMTSL4, AEBP1, AGL, AKAP9, ALDH18A1, ALMS1, ALPK3, ANK2, ANKRD1, APOB, ASPH, ATP6V0A2, ATP6V0D2, ATP6V1E1, ATP7A, B3GALT6, B3GAT3, B4GALT7, BAG3, BGN , BMPR1B, BMPR2, BRAF, CACNA1C, CACNA2D1, CACNB2, CALM1, CALM2, CALM3, CALR, CALR3, CASQ2, CAV1, CAV3, CBLN2, CBS, CHRM2, CHST14, COA5, COL11A1, COL11A2, COL12A1, COL1A1, COL1A2, COL2A1, COL3A1, COL4A1, COL5A1, COL5A2, COL9A1, COL9A2, COL9A3, COX15, CPT1A, CRYAB, CSRP3, CTF1, CTNNA3, DES, DMD, DNAJC19, DOLK, DSC2, DSE, DSG2, DSP, DTNA, EFEMP2, EIF2AK4, ELAC2, ELN, EMD, ENG, EYA4, FBLN5, FBN1, FBN2, FGF12, FHL1, FHL2, FHOD3, FKBP14, FKRP, FKTN, FLNA, FLNC, FOXC2, FOXE3, FOXF1, FOXRED1, GAA, GATA4, GATA5, GATA6, GATAD1, GDF2, GJA5, GLA, GLB1, GNB5, GPD1L, HCN4, HFE, HRAS, ILK, JAG1, JPH2, JUP, KCNA5, KCNB2, KCND3, KCNE1, KCNE1L (KCNE5), KCNE2, KCNE3, KCNH2 (HERG), KCNJ16, KCNJ2, KCNJ5, KCNJ8, KCNK3, KCNQ1, KCNT1, KLF10, KRAS, LAMA4, LAMP2, LDB3, LDLR, LDLRAP1, LMNA, LOX, LRRC10, LTBP2, LTBP4, LZTR1, LZTS1, MAP2K1, MAP2K2, MAP3K8, MAT2A, MED12, MFAP5, MIB1, MRPL3, MRPS22, MURC, MTO1, MYBPC3, MYH11, MYH6, MYH7, MYL2, MYL3, MYL4, MYLK, MYLK2, MYO6, MYOM1, MYOZ2, MYPN, NEBL, NEXN, NKX2-5, NKX2-6, NOS1AP, NOTCH1, NPPA, NRAS, PCSK9, PDLIM3, PI4KA, PKP2, PLEC, PLEKHM2, PLN, PLOD1, PLOD3, PPA2, PRDM16, PRDM5, PRKAG2, PRKG1, PTPN11, PYCR1, RAF1, RANGRF, RASA1, RASA2, RBM20, RIN2, RIT1, RRAS, RYR2, SCARF2, SCN10A, SCN1B, SCN2B, SCN3B, SCN4A, SCN4B, SCN5A, SCNN1A, SCO2, SGCD, SHOC2, SKI, SLC25A20, SLC25A3, SLC25A4, SLC2A10, SLC2A5, SLC39A13, SLMAP, SMAD1, SMAD2, SMAD3, SMAD4, SMAD6, SMAD9, SMS, SNTA1, SOS1, SOS2, SPRY1, SYNE1, SYNE2, TAB2, TANGO2, TAZ, TBX1, TBX20,TBX5, TCAP, TECRL,TGFB2, TGFB3, TGFBR1, TGFBR2, TMEM43, TMEM70, TMPO, TNNC1, TNNI3, TNNI3K, TNNT2, TNXB, TOR1AIP1, TPM1, TRDN, TRIM63, TRPM4, TSFM, TTN, TTR, TXNRD2, UPF3B, VCL, XK, ZNF469

Clinical Features:

This panel can assess for cardiac arrhythmias, cardiomyopathies, sudden unexplained death syndrome, Danon disease, syndromic cardiac disorders, Fabry disease, mitochondrial myopathy, or muscular dystrophy, heritable disorders of connective tissue, PAH, HHT, and familial hypercholesterolemia.

Inheritance Pattern/Genetics: Autosomal Dominant, Autosomal Recessive, X-linked, or Mitochondrial

Test Methods:

Genomic DNA from the submitted specimen was enriched for the complete coding regions and splice site junctions of the genes on this panel using a proprietary targeted capture system

developed by GeneDx for next generation sequencing with CNV calling (NGS-CNV). (Only exons 1-44 for CACNA1C, only exons 2-66 for FBN1, only the KCNQ1-binding domains including Ser1570 residue for AKAP9, excluding exon 6 of the PKP2 gene and the following genomic regions of the TTN gene: chr2:179527692- 179527782, 179523898-179523982, 179523731-179523815.) The enriched targets were simultaneously sequenced with paired-end reads on an Illumina platform. Bi-directional sequence reads were assembled and aligned to reference sequences based on NCBI RefSeq transcripts and human genome build GRCh37/UCSC hg19. After gene specific filtering, data are analyzed to identify sequence variants and most deletions and duplications involving coding exons. Alternative sequencing or copy number detection methods are used to analyze regions with inadequate sequence or copy number data. Reportable variants include pathogenic variants, likely pathogenic variants and variants of uncertain significance. Likely benign and benign variants, if present, are not routinely reported but are available upon request.

Test Sensitivity:

The clinical sensitivity of sequencing and deletion/duplication analysis of the genes included in the Combined Cardiac Panel depends in part on the patient's clinical phenotype and family history. In general, the sensitivity is highest for individuals with clearly defined cardiomyopathy and a family history of disease. The technical sensitivity of sequencing is estimated to be > 99% at detecting single nucleotide events. It will not reliably detect deletions greater than 20 base pairs, insertions or rearrangements greater than 10 base pairs, or low-level mosaicism. The copy number assessment methods used with this test cannot reliably detect copy number variants of less than 500 base pairs or mosaicism and cannot identify balanced chromosome aberrations. Assessment of exon-level copy number events is dependent on the inherent sequence properties of the targeted regions, including shared homology and exon size. For B3GALT6, CTF1, FKRP, FOXE3, HRAS, SCO2, TBX1 genes, sequencing but not deletion/duplication analysis, is performed. Gene specific exclusions for exon-level deletion/duplication testing for this panel are: CALM1, COA5, GATA5, SCN1B, TAZ, TBX20 genes only whole gene deletions or duplications may be detected.

Gene	Protein	Inheritance	Disease Association(s)
ABCC6	ATP-BINDING CASSETTE, SUBFAMILY C, MEMBER 6	AR	Pseudoxanthoma elasticum
ABCC9	ATP-BINDING CASSETTE, SUBFAMILY C, MEMBER 9	AD	DCM, BrS, Cantu syndrome and related disorders
ACADVL	ACYL-CoA DEHYDROGENASE, VERY LONG-CHAIN	AR	neonatal HCM/VLCAD deficiency
ACTA1	ACTIN, ALPHA, SKELETAL MUSCLE 1	AD/AR	Cardiomyopathy, myopathy
ACTA2	ACTIN, ALPHA-2, SMOOTH MUSCLE, AORTA	AD	fTAAD
ACTC1	ACTIN, ALPHA, CARDIAC MUSCLE	AD	CHD, DCM, HCM, LVNC
ACTN2	ACTININ, ALPHA-2	AD	DCM, HCM
ACVR1	ACTIVIN A RECEPTOR, TYPE II-LIKE KINASE 2	AD	Fibrodysplasia ossificans progressiva (FOP)
ACVRL1	ACTIVIN A RECEPTOR TYPE II-LIKE 1	AD	HHT, PAH
ADAMTS10	A DISINTEGRIN-LIKE AND METALLOPROTEINASE WITH THROMBOSPONDIN TYPE 1 MOTIF, 10	AR	Weill-Marchesani syndrome 1

Gene (cont.)	Protein	Inheritance	Disease Association(s)
ADAMTS2	ADAM METALLOPEPTIDASE WITH THROMBOSPONDIN TYPE 1 MOTIF 2	AR	dEDS
ADAMTSL4	ADAMTS-LIKE 4	AR	Ectopia lentis
AEBP1	AE-BINDING PROTEIN 1	AR	EDS, unclassified
AGL	AMYLO-1,6-GLUCOSIDASE, 4-ALPHA-GLUCANOTRANSFERASE	AR	GSD, type IIIa GSD, Type IIIb
AKAP9	A-KINASE ANCHOR PROTEIN 9	AD	LQTS
ALDH18A1	ALDEHYDE DEHYDROGENASE 18 FAMILY MEMBER A1	AD	Cutis laxa
ALMS1	CENTROSOME AND BASAL BODY ASSOCIATED PROTEIN	AR	Alstrom syndrome, infantile DCM
ALPK3	ALPHA-KINASE 3	AR	Pediatric Cardiomyopathy
ANK2	ANKYRIN 2	AD	Arrhythmia, LQTS
ANKRD1	ANKYRIN REPEAT DOMAIN-CONTAINING PROTEIN 1	AD	HCM, DCM
APOB	APOLIPOPROTEIN	AD	HeFH/HoFH
ASPH	ASPARTATE BETA-HYDROXYLASE	AR	Ectopia lentis, spontaneous filtering blebs, and craniofacial dysmorphism
ATP6V0A2	ATPASE H+ TRANSPORTING V0 SUBUNIT A2	AR	Cutis laxa
ATP6V0D2	ATPase, H+ TRANSPORTING, LYSOSOMAL, 38-KD, V0 SUBUNIT D, ISOFORM 2	AR	Cutis laxa
ATP6V1E1	ATPASE H+ TRANSPORTING V1 SUBUNIT E	AR	Cutis laxa
ATP7A	ATPASE COPPER TRANSPORTING ALPHA	XL	Menkes, OHS
B3GALT6	BETA-1,3-GALACTOSYLTRANSFERASE 6	AR	spEDS
B3GAT3	BETA-1,3-GLUCURONYLTRANSFERASE 3	AR	Joint dislocations, short stature, dysmorphisms, CHD
B4GALT7	BETA-1,4-GALACTOSYLTRANSFERASE 7	AR	spEDS
BAG3	BCL2-ASSOCIATED ATHANOGENE 3	AD	DCM, myofibrillar myopathy
BGN	BIGLYCAN	XL	Meester-Loeys syndrome Spondyloepimetaphyseal dysplasia
BMPR1B	BONE MORPHOGENETIC PROTEIN RECEPTOR, TYPE IB	AD, AR	PAH
BMPR2	BONE MORPHOGENETIC PROTEIN RECEPTOR, TYPE II	AD	PAH
BRAF	V-RAF MURINE SARCOMA VIRAL ONCOGENE HOMOLOG B1	AD	Noonan/CFC/Costello
CACNA1C	CALCIUM CHANNEL, VOLTAGE-DEPENDENT, L TYPE, ALPHA-1C SUBUNIT	AD	BrS, Timothy syndrome, LQTS
CACNA2D1	CALCIUM CHANNEL, VOLTSGE-DEPENDENT ALPHA-2/DELTA SUBUNIT 1	AD	BrS
CACNB2	CALCIUM CHANNEL, VOLTAGE-DEPENDENT, BETA-2 SUBUNIT	AD	BrS
CALM1	CALMODULIN 1	AD	LQTS,CPVT
CALM2	CALMODULIN 2	AD	LQTS, CPVT
CALM3	CALMODULIN 3	AD	LQTS, CPVT
CALR	CALRETICULIN	AD	Arrhythmia
CALR3	CALRETICULIN 3	AD	HCM
CASQ2	CALSEQUESTRIN 2	AR	CPVT
CAV1	CAVEOLIN 1	AD	PAH, lipodystrophy
CAV3	CAVEOLIN 3	AD, AR	HCM, LQTS, LGMD, Tateyama-type distal myopathy, SIDS, rippling muscle disease
CBS	CYSTATHIONINE BETA-SYNTHASE	AR	Homocystinuria
CHRM2	M2-MUSCARINIC ACETYLCHOLINE RECEPTOR	AD	DCM
CHST14	CARBOHYDRATE (DERMATAN 4) SULFOTRANSFERASE 14	AR	mcEDS
COA5	CYTOCHROME C OXIDASE ASSEMBLY FACTOR 5	AR	HCM
COL11A1	COLLAGEN TYPE XI ALPHA 1	AD	Fibrochondrogenesis Stickler syndrome

Gene (cont.)	Protein	Inheritance	Disease Association(s)
COL11A2	COLLAGEN TYPE XI ALPHA 2	AD	Fibrochondrogenesis Stickler syndrome, non-ocular
COL12A1	COLLAGEN TYPE XIIALPHA 1	AD	mEDS
COL1A1	COLLAGEN TYPE I ALPHA 1	AD	aEDS cEDS Osteogenesis Imperfecta
COL1A2	COLLAGEN TYPE I ALPHA 2	AD, AR	aEDS Osteogenesis Imperfecta cvEDS
COL2A1	COLLAGEN TYPE II ALPHA 1	AD, AR	OSMED; Stickler syndrome
COL3A1	COLLAGEN TYPE III ALPHA 1	AD	vEDS
COL4A1	COLLAGEN TYPE IV ALPHA 1	AD	fTAAD
COL5A1	COLLAGEN TYPE V ALPHA 1	AD	cEDS
COL5A2	COLLAGEN TYPE V ALPHA 2	AD	cEDS
COL9A1	COLLAGEN TYPE IX ALPHA 1	AD, AR	Stickler syndrome
COL9A2	COLLAGEN TYPE IX ALPHA 2	AD, AR	Stickler syndrome
COL9A3	COLLAGEN TYPE IX ALPHA-3	AD, AR	multiple epiphyseal dysplasia (MED)/Stickler syndrome
COX15	CYTOCHROME c OXIDASE ASSEMBLY FACTOR COX15	AR	HCM/COX deficiency
CPT1A	CARNITINE PALMITOYLTRANSFERASE I, LIVER	AR	carnitine palmitoyltransferase 1A (CPT1A) deficiency
CRYAB	CRYSTALLIN, ALPHA-B	AD, AR	DCM, myofibrillar myopathy
CSRP3	CYSTEINE- AND GLYCINE-RICH PROTEIN 3	AD	HCM, DCM
CTF1	CARDIOTROPHIN 1 I	AD	DCM
CTNNA3	CATENIN, ALPHA-3	AD	ARVC
DES	DESMIN	AD	DCM, ARVC, myopathy, AV block, LGMD
DMD	DYSTROPHIN	XL	DMD, BMD, DCM
DNAJC19	DNAJ/HSP40 HOMOLOG, SUBFAMILY C, MEMBER 19	AR	DCM with ataxia
DOLK	DOLICHOL KINASE	AR	DCM, congenital disorder of glycosylation type Im
DSC2	DESMOCOLLIN	AD, AR	ARVC, ARVC+skin and hair findings , DCM
DSE	DERMATAN SULFATE EPIMERASE	AR	mcEDS
DSG2	DESMOGLEIN	AD	ARVC, DCM
DSP	DESMOPLAKIN	AD, AR	ARVC, DCM, Carvajal syndrome
DTNA	DYSTROBREVIN, ALPHA	AD	LVNC, CHD
EFEMP2	EGF CONTAINING FIBULIN-LIKE EXTRACELLULAR MATRIX PROTEIN 2	AR	Cutis laxa
EIF2AK4	EUKARYOTIC TRANSLATION INITIATION FACTOR 2-ALPHA KINASE 4	AR	PVOD2, PCH, PAH
ELAC2	ELAC, E. COLI, HOMOLOG OF, 2	AR	infantile HCM
ELN	ELASTIN	AD	Cutis laxa
EMD	EMERIN	XL	EMD
ENG	ENDOGLIN	AD	HHT +/- PAH
EYA4	EYES ABSENT 4	AD	DCM
FBLN5	FIBULIN 5	AD, AR	Cutis laxa
FBN1	FIBRILLIN 1	AD	Marfan syndrome
FBN2	FIBRILLIN 2	AD	Congenital contractural arachnodactyly
FGF12	FIBROBLAST GROWTH FACTOR 12	AD	BrS, VT
FHL1	FOUR-AND-A-HALF LIM DOMAINS 1	XL	HCM, LVH, EMD, skeletal muscle, muscle hypertrophy, Myofibrillar myopathy
FHL2	FOUR-AND-A-HALF LIM DOMAINS 2	AD	HCM
FHOD3	FORMIN HOMOLOGY-2 DOMAIN-CONTAINING PROTEIN 3	AD	DCM
FKBP14	FK506 BINDING PROTEIN 14	AR	kEDS, myopathy, and hearing loss
FKRP	FUKUTIN RELATED PROTEIN	AR	DCM, muscular dystrophy
FKTN	FUKUTIN	AR	DCM, LGMD, Fukuyama Congenital Muscular Dystrophy

Gene (cont.)	Protein	Inheritance	Disease Association(s)
FLNA	FILAMIN A	XL	EDS with periventricular heterotopia
FLNC	FILAMIN C	AD	RCM, HCM, ARVC
FOXE3	FORKHEAD BOX E3	AD	fTAAD
FOXF1	FORKHEAD, DROSOPHILA, HOMOLOG-LIKE 5	AD	PAH
FOXRED1	FAD-DEPENDENT OXIDOREDUCTASE DOMAIN-CONTAINING PROTEIN 1	AR	Cardiomyopathy, myopathy
GAA	GLUCOSIDASE, ALPHA, ACID	AR	Cardiomyopathy, GSD II
GATA4	GATA-BINDING PROTEIN 4	AD	AF, CHD, cardiomyopathy, SUDS
GATA5	GATA-BINDING PROTEIN 5	AD	AF, CHD, cardiomyopathy
GATA6	GATA-BINDING PROTEIN 6	AD	AF, CHD, cardiomyopathy
GATAD1	GATA ZINC FINGER DOMAIN-CONTAINING PROTEIN 1	AR	DCM
GDF2	GROWTH/DIFFERENTIATION FACTOR 2	AD	HHT +/- PAH
GJA5	GAP JUNCTION PROTEIN, ALPHA-5	AD	AF, HB, SADS, SIDS, CHD
GLA	GALACTOSIDASE, ALPHA	XL	Fabry disease
GLB1	GALACTOSIDASE, BETA-1	AR	HCM, DCM
GNB5	GUANINE NUCLEOTIDE-BINDING PROTEIN, BETA-5	AR	Intellectual developmental disorder with cardiac arrhythmia
GDPIL	GLYCEROL-3-PHOSPHATE DEHYDROGENASE 1-LIKE	AD	BrS
HCN4	HYPERPOLARIZATION-ACTIVATED CYCLIC NUCLEOTIDE-GATED POTASSIUM CHANNEL 4	AD	BrS, SSS
HFE	HUMAN HEMOCHROMATOSIS PROTEIN	AR	Hereditary Hemochromatosis
HRAS	V-HA-RAS HARVEY RAT SARCOMA VIRAL ONCOGENE HOMOLOG	AD	Costello syndrome
ILK	INTEGRIN-LINKED KINASE	AD	DCM
JAG1	JAGGED 1	AD	Allagile syndrome
JPH2	JUNCTOPHILIN 2	AD	HCM
JUP	JUNCTION PLAKOGLOBIN	AD, AR	ARVC, Naxos Disease
KCNA5	POTASSIUM CHANNEL, VOLTAGE-GATED, SHAKER-RELATED SUBFAMILY, MEMBER 5	AD	Arryhtmia, AF, PAH
KCNB2	POTASSIUM CHANNEL, VOLTAGE-GATED, SHAB-RELATED SUBFAMILY, MEMBER 2	AD	BrS
KCND3	POTASSIUM CHANNEL, VOLTAGE-GATED, SHAL-RELATED SUBFAMILY, MEMBER 3	AD	BrS, SIDS, Spinocerebellar ataxia
KCNE1	POTASSIUM CHANNEL, VOLTAGE-GATED, ISK-RELATED SUBFAMILY, MEMBER 1	AD, AR	LQTS, JLNS
KCNE2	POTASSIUM CHANNEL, VOLTAGE-GATED, ISK-RELATED SUBFAMILY, MEMBER 2	AD	LQTS
KCNE3	POTASSIUM CHANNEL, VOLTAGE-GATED, ISK-RELATED SUBFAMILY, MEMBER 3	AD	BrS
KCNE1L (KCNE5)	POTASSIUM CHANNEL, VOLTAGE-GATED, ISK-RELATED FAMILY, MEMBER 1-LIKE	XL	BrS, AF, VF
KCNE2	POTASSIUM CHANNEL, VOLTAGE-GATED, ISK-RELATED SUBFAMILY, MEMBER 2	AD	LQTS
KCNE3	POTASSIUM CHANNEL, VOLTAGE-GATED, ISK-RELATED SUBFAMILY, MEMBER 3	AD	BrS
KCNH2 (HERG)	POTASSIUM CHANNEL, VOLTAGE-GATED, SUBFAMILY H, MEMBER 2	AD	LQTS, SQTS
KCNJ16	POTASSIUM CHANNEL, INWARDLY RECTIFYING, SUBFAMILY J, MEMBER 16	AD	BrS
KCNJ2	POTASSIUM CHANNEL, INWARDLY RECTIFYING, SUBFAMILY J, MEMBER 2	AD	Andersen-Tawil syndrome, SQTS
KCNJ5	POTASSIUM CHANNEL, INWARDLY RECTIFYING, SUBFAMILY J, MEMBER 5	AD	LQTS

Gene (cont.)	Protein	Inheritance	Disease Association(s)
KCNJ8	POTASSIUM CHANNEL, INWARDLY RECTIFYING, SUBFAMILY J, MEMBER 8	AD	ERS, SIDS
KCNK3	POTASSIUM CHANNEL, SUBFAMILY K, MEMBER 3	AD	PAH, AF
KCNQ1	POTASSIUM CHANNEL, VOLTAGE-GATED, KQT-LIKE SUBFAMILY, MEMBER 1	AD, AR	JLNS, LQTS, SQTS
KCNT1	POTASSIUM CHANNEL, SUBFAMILY T, MEMBER 1	AD	BrS
KLF10	KRUPPEL-LIKE FACTOR 10	AD	HCM
KRAS	V-KI-RAS2 KIRSTEN RAT SARCOMA VIRAL ONCOGENE HOMOLOG	AD	Noonan/CFC/Costello
LAMA4	LAMININ, ALPHA-4	AD	DCM
LAMP2	LYSOSOME-ASSOCIATED MEMBRANE PROTEIN 2	XL	Danon disease
LDB3	LIM DOMAIN-BINDING 3	AD	DCM, LVNC, myopathy
LDLR	LOW-DENSITY LIPOPROTEIN RECEPTOR	AD	HeFH/HoFH
LDLRAP1	LOW-DENSITY LIPOPROTEIN RECEPTOR ADAPTOR PROTEIN 1	AR	ARFH
LMNA	LAMIN A/C	AD, AR	DCM, congenital muscular dystrophy, EMD, ARVC
LOX	LYSYL OXIDASE	AD	FTAAD
LRRC10	LEUCINE-RICH REPEAT-CONTAINING PROTEIN 10	AD, AR	DCM, HCM, congenital muscular dystrophy, EMD
LTBP2	LATENT TRANSFORMING GROWTH FACTOR-BETA-BINDING PROTEIN 2	AD, AR	Ectopia lentis, Weill-Marchesani syndrome, Marfan syndrome
LTBP4	LATENT TRANSFORMING GROWTH FACTOR BETA BINDING PROTEIN 4	AR	Cutis laxa, autosomal recessive
LZTR1	LEUCINE ZIPPER-LIKE TRANSCRIPTIONAL REGULATOR 1	AD, AR	Noonan syndrome
LZTS1	LEUCINE ZIPPER, PUTATIVE TUMOR SUPPRESSOR 1	AD	EDS, hypermobile
MAP2K1	MITOGEN-ACTIVATED PROTEIN KINASE KINASE 1	AD	Noonan/CFC/Costello
MAP2K2	MITOGEN-ACTIVATED PROTEIN KINASE KINASE 2	AD	Noonan/CFC/Costello
MAP3K8	MITOGEN-ACTIVATED PROTEIN KINASE KINASE KINASE 8	AD	Noonan syndrome
MAT2A	METHIONINE ADENOSYLTRANSFERASE II, ALPHA	AD	fTAAD
MED12	MEDIATOR COMPLEX SUBUNIT 12	AD	Lujan syndrome, fTAAD
MFAP5	MICROFIBRILLAR-ASSOCIATED PROTEIN 5	AD	fTAAD
MIB1	MINDBOMB E3 UBIQUITIN PROTEIN LIGASE 1	AD	LVNC
MRPL3	MITOCHONDRIAL RIBOSOMAL PROTEIN L3	AR	HCM
MRPS22	MITOCHONDRIAL RIBOSOMAL PROTEIN S22	AR	Cardiomyopathy
MTO1	MITOCHONDRIAL TRANSLATION OPTIMIZATION 1, S. CEREVISIAE, HOMOLOG OF	AR	HCM
MURC	MUSCLE-RELATED COILED-COIL PROTEIN	AD	DCM
MYBPC3	MYOSIN-BINDING PROTEIN C, CARDIAC	AD	HCM, DCM
MYH11	MYOSIN, HEAVY CHAIN 11, SMOOTH MUSCLE	AD	fTAAD
MYH6	MYOSIN, HEAVY CHAIN 6, CARDIAC MUSCLE, ALPHA	AD	CHD, DCM, HCM, SSS
MYH7	MYOSIN, HEAVY CHAIN 7, CARDIAC MUSCLE, BETA	AD	DCM, HCM, myopathy
MYL2	MYOSIN, LIGHT CHAIN 2, REGULATORY, CARDIAC, SLOW	AD	HCM
MYL3	MYOSIN, LIGHT CHAIN 3, ALKALI, VENTRICULAR, SKELETAL, SLOW	AD, AR	HCM
MYL4	MYOSIN, LIGHT CHAIN 4, ALKALI, ATRIAL, EMBRYONIC	AD, AR	AF
MYLK	MYOSIN LIGHT CHAIN KINASE	AD	fTAAD
MYLK2	MYOSIN LIGHT CHAIN KINASE 2	AD	HCM
MYO6	MYOSIN VI	AR	HCM and hearing loss
MYOM1	MYOMESIN 1	AD	HCM, DCM
MYOZ2	MYOZENIN 2	AD	HCM

Gene (cont.)	Protein	Inheritance	Disease Association(s)
MYPN	MYOPALLADIN	AD	DCM, RCM, HCM
NEBL	NEBULETTE	AD	DCM, endocardial fibroelastosis
NEXN	NEXILIN	AD	DCM, HCM
NKX2-5	NK2 HOMEOBOX 5	AD	CHD, CCD
NKX2-6	NK2, DROSOPHILA, HOMOLOG OF, 6	AD, AR	CHD, AF, HB
NOS1AP	NITRIC OXIDE SYNTHASE 1 (NEURONAL) ADAPTOR PROTEIN	AD	LQTS,
NOTCH1	NOTCH, DROSOPHILA, HOMOLOG OF, 1	AD	fTAAD
NPPA	NATRIURETIC PEPTIDE PRECURSOR A	AD, AR	AF, atrial DCM
NRAS	NEUROBLASTOMA RAS VIRAL ONCOGENE HOMOLOG	AD	Noonan/CFC/Costello
PCSK9	PROPROTEIN CONVERTASE SUBTILISIN/KEXIN TYPE 9	AD	HeFH/HoFH
PDLIM3	PDZ AND LIM DOMAIN PROTEIN 3	AD	HCM, DCM
PI4KA	PHOSPHATIDYLINOSITOL 4-KINASE, CATALYTIC, ALPHA	AR	LQTS
PKP2	PLAKOPHILIN 2	AD	ARVC, DCM, BrS
PLEC	PLECTIN	AR	Cardiomyopathy, muscular dystrophy
PLEKHM2	PLECKSTRIN HOMOLOGY DOMAIN-CONTAINING PROTEIN, FAMILY M, MEMBER 2	AR	DCM, LVNC
PLN	PHOSPHOLAMBAN	AD	DCM, HCM, ARVC
PLOD1	PROCOLLAGEN-LYSINE, 2-OXOGLUTARATE 5-DIOXYGENASE	AR	kEDS, fTAAD
PLOD3	PROCOLLAGEN-LYSINE, 2-OXOGLUTARATE 5-DIOXYGENASE 3	AR	Connective Tissue disorder
PPA2	PYROPHOSPHATASE, INORGANIC, 2	AR	Sudden cardiac arrest, infancy Infantile cardiomyopathy
PRDM16	PR DOMAIN CONTAINING 16	AD	DCM, LVNC
PRDM5	PR DOMAIN 5	AR	BCS
PRKAG2	PROTEIN KINASE, AMP-ACTIVATED, NONCATALYTIC, GAMMA2	AD	HCM, Wolff-Parkinson-White syndrome
PRKG1	PROTEIN KINASE, cGMP-DEPENDENT, REGULATORY, TYPE I	AD	fTAAD
PTPN11	PROTEIN-TYROSINE PHOSPHATASE, NONRECEPTOR-TYPE 11	AD	Noonan/CFC/Costello
PYCR1	PYRROLINE-5-CARBOXYLATE REDUCTASE 1	AR	Cutis laxa, autosomal recessive
RAF1	V-RAF-1 MURINE LEUKEMIA VIRAL ONCOGENE HOMOLOG 1	AD	Noonan/CFC/Costello
RANGRF	RAN GUANINE NUCLEOTIDE RELEASE FACTOR	AD	BrS
RASA1	RAS P21 PROTEIN ACTIVATOR 1	AD	Capillary malformation-arteriovenous malformation, Parkes Weber syndrome, Basal cell carcinoma
RASA2	RAS p21 PROTEIN ACTIVATOR 2	AD	Noonan syndrome
RBM20	RNA-BINDING MOTIF PROTEIN 20	AD	DCM
RIN2	RAS AND RAB INTERACTOR 2	AR	MACS
RIT1	RAS-LIKE WITHOUT CAAX 1	AD	Noonan syndrome
RRAS	RELATED RAS VIRAL ONCOGENE HOMOLOG	AD	Noonan syndrome-like
RYR2	RYANODINE RECEPTOR 2	AD	ARVC, CPVT, LQTS
SCARF2	SCAVENGER RECEPTOR CLASS F, MEMBER 2	AR	Van den Ende-Gupta syndrome
SCN10A	SODIUM CHANNEL, VOLTAGE-GATED, TYPE X, ALPHA SUBUNIT	AD	BrS
SCN1B	SODIUM CHANNEL, VOLTAGE-GATED, TYPE I, BETA SUBUNIT	AD, AR	BrS, Cardiac conduction disease
SCN2B	SODIUM CHANNEL, VOLTAGE-GATED, TYPE II, BETA SUBUNIT	AD	BrS, AF
SCN3B	SODIUM CHANNEL, VOLTAGE-GATED, TYPE III, BETA SUBUNIT	AD	BrS, AF, VF, SIDS

Gene (cont.)	Protein	Inheritance	Disease Association(s)
SCN4A	SODIUM CHANNEL, VOLTAGE-GATED, TYPE IV, ALPHA SUBUNIT	AD, AR	BrS w/ muscle stiffness
SCN4B	SODIUM CHANNEL, VOLTAGE-GATED, TYPE IV, BETA SUBUNIT	AD	LQTS
SCN5A	SODIUM CHANNEL, VOLTAGE-GATED, TYPE V, ALPHA SUBUNIT	AD, AR	BrS, DCM, Heart block, LQTS, SSS, SIDS
SCNN1A	SODIUM CHANNEL, NONVOLTAGE-GATED 1, ALPHA SUBUNIT	AD	BrS
SCO2	SCO2 CYTOCHROME c OXIDASE ASSEMBLY PROTEIN	AD, AR	HCM
SGCD	SARCOGLYCAN, DELTA	AD, AR	DCM, LGMD
SHOC2	SOC-2 HOMOLOG	AD	Noonan-like syndrome with loose Anagen Hair 1
SKI	V-SKI AVIAN SARCOMA VIRAL ONCOGENE HOMOLOG	AD	Shprintzen-Goldberg syndrome
SLC25A20	SOLUTE CARRIER FAMILY 2 (FACILITATED GLUCOSE TRANSPORTER), MEMBER 10	AR	Arterial tortuosity syndrome
SLC25A3	SOLUTE CARRIER FAMILY 25 (MITOCHONDRIAL CARRIER), MEMBER 3	AR	Cardiomyopathy, myopathy
SLC25A4	SOLUTE CARRIER FAMILY 25 (MITOCHONDRIAL CARRIER, ADENINE NUCLEOTIDE TRANSLOCATOR), MEMBER 4	AD, AR	HCM, myopathy
SLC2A10	SOLUTE CARRIER FAMILY 2 (FACILITATED GLUCOSE TRANSPORTER), MEMBER 10	AR	Arterial tortuosity syndrome
SLC2A5	SOLUTE CARRIER FAMILY 2 (FACILITATED GLUCOSE/FRUCTOSE TRANSPORTER), MEMBER 5	AD	LQTS
SLC39A13	SOLUTE CARRIER FAMILY 39 MEMBER 13	AR	spEDS
SLMAP	SARCOLEMMAL-ASSOCIATED PROTEIN	AD	BrS
SMAD1	MOTHERS AGAINST DECAPENTAPLEGIC, DROSOPHILA, HOMOLOG OF, 1	AD	PAH
SMAD2	MOTHERS AGAINST DECAPENTAPLEGIC, DROSOPHILIA, HOMOLOG OF, 2	AD	FTAAD, LDS, CHD
SMAD3	MOTHERS AGAINST DECAPENTAPLEGIC, DROSOPHILA, HOMOLOG OF, 3	AD	LDS
SMAD4	MOTHERS AGAINST DECAPENTAPLEGIC, DROSOPHILA, HOMOLOG OF, 4	AD	Juvenile polyposis/HHT; Myhre syndrome
SMAD6	MOTHERS AGAINST DECAPENTAPLEGIC, DROSOPHILA, HOMOLOG OF, 6	AD	PAH
SMAD9	MOTHERS AGAINST DECAPENTAPLEGIC, DROSOPHILA, HOMOLOG OF, 9	AD	PAH
SMS	SPERMINE SYNTHASE	XL	Connective Tissue disorder
SNTA1	ALPHA SYNTROPHIN	AD	LQTS
SOS1	SON OF SEVENLESS, DROSOPHILA, HOMOLOG 1	AD	Noonan/CFC/Costello
SOS2	SON OF SEVENLESS, DROSOPHILA, HOMOLOG 2	AD	Noonan syndrome
SPRY1	SPROUTY, DROSOPHILA, HOMOLOG OF, 1	unknown	Noonan syndrome
SYNE1	SPECTRIN REPEAT-CONTAINING NUCLEAR ENVELOPE PROTEIN 1	AD	EMD
SYNE2	SPECTRIN REPEAT-CONTAINING NUCLEAR ENVELOPE PROTEIN 2	AD	EMD
TAB2	TAK1-BINDING PROTEIN 2	AD	CHD
TANGO2	TRANSPORT AND GOLGI ORGANIZATION 2, DROSOPHILA, HOMOLOG OF	AR	Noonan syndrome
TAZ	TAFAZZIN	XL	DCM, LVNC, Barth syndrome
TBX1	T-BOX 1	AD	Velocardiofacial syndrome, CHD
TBX5	T-BOX 5	AD	Holt-Oram syndrome
TBX20	T-BOX 20	AD	CHD, DCM, LVNC
TCAP	TITIN-CAP (TELETHONIN)	AD, AR	HCM, DCM, LGMD

Gene (cont.)	Protein	Inheritance	Disease Association(s)
TECRL	TRANS-2,3-ENOYL-CoA REDUCTASE-LIKE PROTEIN	AR	CPVT3
TGFB2	TRANSFORMING GROWTH FACTOR, BETA-2	AD	LDS
TGFB3	TRANSFORMING GROWTH FACTOR BETA 3	AD	ARVC, Loeys-Dietz syndrome
TGFBR1	TRANSFORMING GROWTH FACTOR-BETA RECEPTOR, TYPE I	AD	LDS
TGFBR2	TRANSFORMING GROWTH FACTOR-BETA RECEPTOR, TYPE II	AD	LDS
TMEM43	TRANSMEMBRANE PROTEIN 43	AD	ARVC, EMD
TMPO	THYMOPOIETIN	AD	DCM
TNNC1	TROPONIN C, SLOW	AD	DCM, HCM
TNNI3	TROPONIN I, CARDIAC	AD, AR	DCM, HCM, RCM
TNNI3K	TNNI3-INTERACTING KINASE	AD	DCM
TNNT2	TROPONIN T2, CARDIAC	AD	DCM, HCM, RCM, LVNC
TNXB	TENASCIN XB	AR	Ehlers-Danlos syndrome, classic-like, 1
TOR1AIP1	TORSIN-1A-INTERACTING PROTEIN 1	AR	LGMD, Contractures, DCM
TPM1	TROPOMYOSIN 1	AD	DCM, HCM
TRDN	TRIADIN	AR	CPVT, LQTS
TRIM63	TRIPARTITE MOTIF-CONTAINING PROTEIN 63	AD	HCM
TRPM4	TRANSIENT RECEPTOR POTENTIAL CATION CHANNEL, SUBFAMILY M, MEMBER 4	AD	HB, BrS
TSFM	Ts TRANSLATION ELONGATION FACTOR, MITOCHONDRIAL	AR	HCM
TTN	TITIN	AD	DCM, ARVC, TTN-related myopathies and muscular dystrophies
TTR	TRANSTHYRETIN	AD	TTR-related amyloidosis
TXNRD2	THIOREDOXIN REDUCTASE 2	AD, AR	DCM
UPF3B	UPF3, YEAST, HOMOLOG OF, B	XL	Lujan syndrome
VCL	VINCULIN	AD	HCM, DCM, LVNC
XK	KELL BLOOD GROUP PROTEIN, MCLEOD SYNDROME-ASSOCIATED	XL	Cardiomyopathy, muscular dystrophy, AF
ZNF469	ZINC FINGER PROTEIN 469	AR	BCS

Abbreviations: AD- Autosomal dominant; aEDS- arthrochalasia Ehlers-Danlos syndrome; AF- Atrial Fibrillation; AR- Autosomal recessive; ARVC – Arrhythmogenic Right Ventricular Cardiomyopathy; ARFH – Autosomal recessive familial hypercholesterolemia; BCS – Brittle Cornea Syndrome; BMD – Becker Muscular Dystrophy; BrS – Brugada Syndrome; cEDS-classical Ehlers-Danlos syndrome; CHD – Congenital Heart Defects; CPVT – Catecholaminergic Polymorphic Ventricular Tachycardia; cvEDS- Cardiac-valvular Ehlers-Danlos syndrome; DCM – Dilated Cardiomyopathy; dEDS- dermatosparaxis Ehlers-Danlos syndrome; DMD- Duchenne Muscular Dystrophy; EMD – Emery Dreifuss Muscular Dystrophy; ERS-Early repolarization syndrome; fTAAD – familial thoracic aortic aneurysm and dissection; GSD- Glycogen storage diseae, HB-Heart Block; HCM – Hypertrophic Cardiomyopathy; HeFH – Heterozygous familial Hypercholesterolemia (FH); HoFH – Homozygous FH; JLNS – Jervell and Lange-Nielsen Syndrome; JP/HHT – juvenile polyposis/hereditary hemorrhagic telangiectasia; kEDS- kyphoscoliotic Ehlers-Danlos syndrome; LDS – Loeys-Dietz syndrome; LGMD – Limb Girdle Muscular Dystrophy; LQTS – Long QT Syndrome; LVNC – Left Ventricular Non-Compaction; MACS - Macrocephaly, alopecia, cutis laxa, and scoliosis; mcEDS- musculocontractural Ehlers-Danlos syndrome; OHS – Occipital horn syndrome; RCM – Restrictive Cardiomyopathy; SIDS – Sudden Infant Death Syndrome; spEDS-Spondylocheirodysplasia type Ehlers-Danlos syndrome; SSS – Sick Sinus Syndrome; vEDS- vascular Ehlers-Danlos syndrome; VF-Ventricular fibrillation; XL- X-linked

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